DIGITAL TRANSFORMATION OF THE BANKING INDUSTRY IN DEVELOPING COUNTRIES

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ARTICLE INFO	ABSTRACT
	Purpose: The study's objective is to test the impact of digital transactions on banking performance. Based on the previous research and the actual situations, it has been recognized that the critical role of digital banking is in developing the banking industry, especially in developing countries. **Theoretical framework:** In the next section, the study presents background information to promote the research. The digital transformation has changed how customers use financial services. This has pushed banks to adapt more quickly to the wave of digital transformation if they don't want to lose their valuable customer base. **Design/methodology/approach:** the methodology applied uses POOL, FEM, REM, and FGLS models to examine the impact of banking transactions made by digital technology on the bank's deposit and lending revenue. This article studies banking operations on digital platforms from 2012 to 2019 in developing countries. **Findings:** The article's findings showed that digital banks' flexible products and services bring many benefits with a high level of interaction, such as supporting the relationship between customers and banks and improving operating revenue. **Research, Practical & Social implications:** Practical implications enhanced the development potential of digital banking is relatively large, stemming from the market demand development orientation of the banking industry. **Originality/value:** The paper's originality and value help banks invest in digital technology as the way forward to better serve their customers.

TRANSFORMAÇÃO DIGITAL DA INDÚSTRIA BANCÁRIA NOS PAÍSES EM DESENVOLVIMENTO

RESUMO
Objetivo: O objetivo do estudo é testar o impacto das transações digitais no desempenho bancário. Com base na pesquisa anterior e nas situações reais, foi reconhecido que o papel crítico do banco digital é o desenvolvimento do setor bancário, especialmente nos países em desenvolvimento.
Referencial teórico: Na próxima seção, o estudo apresenta informações básicas para promover a pesquisa. A transformação digital mudou a forma como os clientes usam os serviços financeiros. Isso levou os bancos a se adaptarem mais rapidamente à onda da transformação digital, se não quiserem perder sua valiosa base de clientes.

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Desenho/metodologia/abordagem: a metodologia aplicada utiliza os modelos POOL, FEM, REM e FGLS para examinar o impacto das transações bancárias feitas por tecnologia digital nas receitas de depósitos e empréstimos do banco. Este artigo estuda as operações bancárias em plataformas digitais de 2012 a 2019 em países em desenvolvimento.

Resultados: Os resultados do artigo mostraram que os produtos e serviços flexíveis dos bancos digitais trazem muitos benefícios com alto nível de interação, como apoiar o relacionamento entre clientes e bancos e melhorar a receita operacional.

Implicações de pesquisa, práticas e sociais: as implicações práticas aumentaram o potencial de desenvolvimento do banco digital é relativamente grande, decorrente da orientação de desenvolvimento da demanda de mercado do setor bancário.

Originalidade/valor: A originalidade e o valor do papel ajudam os bancos a investir em tecnologia digital como caminho para melhor atender seus clientes.

Palavras-chave: Digital, Transformação, Setor Bancário, Países em Desenvolvimento, Vietnã.

TRANSFORMACIÓN DIGITAL DE LA INDUSTRIA BANCARIA EN PAÍSES EN DESARROLLO

RESUMEN

Propósito: El objetivo del estudio es probar el impacto de las transacciones digitales en el desempeño bancario. Sobre la base de la investigación anterior y las situaciones reales, se ha reconocido que el papel fundamental de la banca digital está en el desarrollo de la industria bancaria, especialmente en los países en desarrollo.

Marco teórico: En la siguiente sección, el estudio presenta antecedentes para promover la investigación. La transformación digital ha cambiado la forma en que los clientes utilizan los servicios financieros. Esto ha empujado a los bancos a adaptarse más rápidamente a la ola de transformación digital si no quieren perder su valiosa base de clientes.

Diseño/metodología/enfoque: la metodología aplicada utiliza modelos POOL, FEM, REM y FGLS para examinar el impacto de las transacciones bancarias realizadas por tecnología digital en los ingresos por depósitos y préstamos del banco. Este artículo estudia las operaciones bancarias en plataformas digitales de 2012 a 2019 en países en desarrollo.

Hallazgos: Los hallazgos del artículo mostraron que los productos y servicios flexibles de los bancos digitales brindan muchos beneficios con un alto nivel de interacción, como respaldar la relación entre los clientes y los bancos y mejorar los ingresos operativos.

Implicaciones sociales, prácticas y de investigación: las implicaciones prácticas mejoraron el potencial de desarrollo de la banca digital es relativamente grande, y se deriva de la orientación de desarrollo de la demanda del mercado de la industria bancaria.

Originalidad/valor: la originalidad y el valor del papel ayudan a los bancos a invertir en tecnología digital como el camino a seguir para servir mejor a sus clientes.

Palabras clave: Digital, Transformación, Industria Bancaria, Países en Desarrollo, Vietnam.

INTRODUCTION

The health crisis has amplified the trend of digitalization for both consumers and financial institutions, seeking solutions to meet the needs of business operations during the complex epidemic conditions. Due to the Covid-19 pandemic, the current context has created a profound change in the banking sector, and an urgent need for financial services is to add new features to adapt to the new digital era. The defined remote work will be incorporated into the banking digital technology system to provide customers and banks with safety and no interruption in the execution of transactions.

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In that context, the digitization of the banking system must be sustained by digital skills. Digital banking is a new innovation in the financial services industry. Digital banking users get the ease of financial transactions with digital technology's benefits. Digital banking provides services for users to access financial data through mobile phones, credit cards for online shopping, remote account management, transfer money to other banks, and use online banking transactions easily without going directly to the bank. The development of digital banking has been positive since it first launched. This can be seen through the growing number of digital banking users. However, there have been objections to the digital banking system due to cybercrime issues, fear of theft, and poor customer service handling. Customers may face disadvantages, especially in transaction safety, information security, account top-up, and transactions dependent on smartphones and internet connections. While everyone used a regular bank, it would be much safer because banks had organized financial data and physical locations.

Although the operation of credit institutions, in general, has seen many positive changes, the competition among commercial banks has also increased in line with the trend of international economic integration. In response to the growing challenges in the banking industry, each commercial bank has been motivated to seek new opportunities for profit growth, such as enhanced customer engagement with services by new innovation services integrated with real experiences. The banking revolution, which uses more technology and open regulations, will reduce barriers to market entry, and more entities will participate. The emergence of massive data sources and integrated processing, automatic collection, and analysis by digital technology will create a turning point in revenue development on a large scale. Some banks saw an opportunity to develop new products, digital or virtual banking products. The impact of information technology on value chains and business models is changing existing growth speed limits across industries. In particular, digital technology is forecasted to have one of the most significant impacts on the financial services sector, such as reorganizing the value chain with new factors. Digitization has led to a fundamental transformation of bank core products and value chains.

The study's objective is to test the impact of digital transactions on banking performance. Based on the previous research and the actual situations, it has been recognized that the critical role of digital banking in the development of the banking industry, especially in developing countries. In the next section, the study presents background information to promote the research. Section 3 outlines the empirical approaches of the research model.

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Specifically, the study uses POOL, FEM, REM, and FGLS models. The estimated results are then presented and discussed in section 4. Finally, Section 5 provides some conclusions.

THEORETICAL FRAMEWORK

Theories of the Digital Transformation in Bank Business Activities

Digital banking, commonly referred to as electronic banking, uses electronic and telecommunications networks to provide a wide range of value-added products and services to a bank's customers. The use of information technology in banking activities is called electronic banking. Electronic banking uses electronic devices to provide banking services, primarily through the internet and mobile phones. Digital banking uses the internet, mobile phones, and other electronic devices as a distribution channel for banking services, including all traditional services such as balance inquiry, statement printing, transfer of money to other accounts, bill payments, and net banking services such as presenting and paying bills electronically without necessarily going to the bank (Mukherjee & Nath, 2003).

Technology Acceptance Model (TAM) is a standard model for companies to adopt new innovative solutions. The technology acceptance model, stated by Davis (1989), proposes that the perceived usefulness and ease of use will influence customer acceptance of new technology, directly affecting behavioral intention to use the bank's existing digital technology system. Davis (1989) defined perceived usefulness as the degree to which a person believes that using a particular plan will improve their job performance or reduce their workload. According to Davis (1989), users of digital banking platforms will accept and continue to use electronic banking systems if they believe that the system offers benefits, flexibility, ease of access to information, and friendly transaction completion with quick connection with the customer service banks. This helps banks reduce time to serve customer needs and increase convenience, ease of transaction, access to information, and customer care. The results will determine whether customers use digital banking or not. If users feel that digital banking platforms are easy to use, secure, and free, they will readily accept and use them. The Technology Acceptance Model approach is the most relevant and applicable theory in technology adoption. According to the technology adoption model, ease of use is how potential users expect new technology to be adopted, a free effort associated with its transfer and use (Davis, 1989).

The digital transformation of the banking system is tied to the flexible features of financial services, where innovation is integrated to connect banks and customers to enhance the value and growth of financial institutions. Digital banking delivery's high availability will

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save time for consumers and credit institutions with customized products in a more convenient and adaptable context. Digital banking integrates digitization and digital technology into all banking sectors (Vial, 2019; Busby, 2017). This integration enables the creation or modification of existing business processes, culture, and customer experiences to meet changing market requirements and customer desires. Digital transformation helps banks save costs and streamline operational processes. This integration also makes for a more accessible and engaging customer experience (Diener & Špacek, 2021; Schuelke-Leech, 2018). Digital banking can do most of the banking transactions online on the internet. Customers do not have to go to bank branches when using digital banking transactions, minimizing the associated paperwork. At the same time, digital banking can be performed anytime, anywhere, regardless of time.

Motivations for Digital Transformation in Business Activities

The digital technology development model proposed by Davis (1989) showed that consumers' intention to use new technology is mainly driven by the convenience and the usefulness of products when applying technology. While other studies (Mangin et al., 2014; Aldás-Manzano et al., 2009) argued that comfort cannot be the sole reason for the growing trend of new technologies in the financial field. They explain this trend through consumer personality traits by linking consumer behavior to more complex determinants.

Jüngera & Mietznerb (2020) outlined the significant influence of trust, transparency, and financial expertise to explain the shift of German households from traditional banks to FinTechs payment applications. The study also found that price does not seem to affect conversion motivation. Young people have a greater affinity for digital innovations. Furthermore, the analyses of Choudrie and Vyas (2014) and Choudrie et al. (2018) showed a low level of adoption of digital banking among older adults.

Three main determinants of customer acceptance of digital banking services in Romania: (1) trust - security and privacy issues; (2) ease of use/accessibility and (3) technology infrastructure. Baicu et al. (2021) highlighted the impact of the Covid-19 pandemic on consumer behavior through the Model technology trust (TAM) using a Romanian consumer survey questionnaire in the retail banking sector. Trust has become one of the variables of prime importance during the pandemic because of the limitations of distance and access to financial services through conventional vehicles. Thus, it paved the way for a wide range of online solutions. The survey results conducted by Baicu et al. (2021) showed that during the Covid-

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19 crisis, approx. 58% of respondents have never been to their bank's physical locations, while almost 26% of them only visit their bank once a month, although using cash is still very important to Romanian people.

Information networks and mobile devices are equipped with mobile bandwidth (3G and 4G). Consumers are increasingly adapting to digital media interactions, enabling them to share information, make transactions, shop online, and access new services. Consumers today require financial services anytime, anywhere that are compatible with their daily needs (Clement, 2020; Anwar et al., 2021).

Another critical factor driving digital transformation is the expansion and growth of mobile devices. According to Skinner (2014), the average usage rate of mobile phones worldwide is reaching 70%, laying the foundation for developing new mobile applications. This is evidenced by a survey of consumers from 22 countries, where the use of mobile banking applications increased by 19% between 2013-2014, while the use of Internet banking services has remained virtually unchanged (Bain & Company, 2014; Payne et al., 2021).

Factors Affecting the Digital Banking Technology

Casaló et al. (2007) examined the role of five factors (safety, security, usability, trust, and commitment) in developing online banking in Spain. The study was based on the data collected from 142 surveys conducted online with customers. The results confirmed the positive and meaningful effect of securely handling consumers' personal data on the online banking site. In addition, trust and commitment to using online banking services are also considered very important in maintaining relationships with customers. The results showed that the lack of security is one of the leading causes of decreased trust, thereby reducing the development of electronic transactions.

Lee (2009) examined the impact of factors on the dependent variable (intent to use banking online), including 7 independent variables (ease of use, benefits, risks, security/privacy, performance, reputation, and time) by using an integrated model of the technology acceptance model (TAM) and the theory of planning behavior (TPB). The research model proved appropriate and suitable for explaining and predicting customers' behavior using online banking. The research suggested that risks should be considered more than benefits for customers' online banking behavior.

Zandhessami & Geramayeh (2014) conducted an empirical investigation to determine the factors affecting Internet banking users. The paper used the DEMATEL (Drop Test and

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Evaluate) technique to measure the determinants of online banking using data from Iranian companies. The results showed that trust is the most critical factor (Wessel et al., 2021).

Considering online banking as an effective service that can help customers easily carry out daily transactions, Foon and Fah (2011) investigated behavioral intentions toward online banking adoption by conducting a survey in Kuala Lumpur under the framework of UTAUT. With 200 respondents, the paper showed that performance, effort, social influence, facilitation, and trust significantly and positively influenced the intention to use online banking in Malaysia.

Sharif & Raza (2017) emphasized that satisfaction, motivation, trust, self-efficacy, and habit are essential for predicting intention to use online banking in Pakistan. Based on the research results, the authors pointed out the importance of improving customers' skills in using online banking and the need to change the online banking apps and add a more innovative interface to attract more customers to use online banking (Koroleva & Kudryavtseva, 2020).

The Digital Banking Platform

New digital services in customer-related processes have emerged (Newton, 2016; Zhao et al., 2019). These services include all banking processes in payments, investments and financing, advisory services, financial information, and cross-process areas. E-wallets allow customers to replace all elements of their physical wallets with electronic alternatives, such as credit and debit cards, loyalty cards, etc. With the innovations of technology such as Bitcoin's Blockchain, digital services can be delivered as items that are secure and protected when accessed.

The Open Banking APIs - Many core banking application providers are starting to publicly or even open up their application programming interfaces (APIs) entirely to third-party service providers. Other providers can develop new services as part of the core banking application in the first case. In the second case, core banking providers supplement their applications with a service marketplace, allowing third-party service providers to offer their services directly to core banking service providers (Gasser et al., 2017; Glover & Benbasat, 2010).

Standardization - a significant challenge of new digital customer services is the lack of interoperability and standardization (Gasser et al., 2017). For example, if a customer uses Wealthfront's investment app, the client cannot integrate the app with the customer's banking inventory, and it is difficult to get an overview of all investment products and their performance. Standardization communities, such as BIAN, the Open banking project, or the customer data

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connectivity project, try to solve this problem by providing standards for technical services. But so far, no app allows multi-vendor and multi-application access and will enable customers to get an overview of their investments and financial products.

Blockchain - the technology of Bitcoin and other distributed ledger approaches is another critical digital platform development that could promote standardization and enablement of improved processes and multi-vendor engagement (Tsindeliani et al., 2022; Kitsios et al., 2021). Compared to existing financial infrastructures that are centralized and controlled by banks and other regulated financial intermediaries, a blockchain is a decentralized approach that automatically records all customer transactions at a specific time. Instead of transactions between different actors being routed to a central clearinghouse and then settled on the internal ledgers of all agents, the Blockchain allows transactions to be fixed instantly, with every participant seeing the transaction on a distributed ledger. Each participant keeps a copy of this ledger to ensure the transparency of all trades (Alt et al., 2018). Many financial service providers are experimenting with Blockchain in different areas, such as payments or investments (Chanias et al., 2019). Some of the significant challenges are technical issues such as scalability and privacy and a lack of trust, collaboration, and governance (Iansiti & Lakhani, 2017).

Trends of Digital Transformation in Business Activities

In the digital era, traditional services provided by banks have ceased to respond to changes in consumer behavior. More and more customers prefer the simplicity and convenience of products and services while accessing and using products and services quickly via mobile devices and tablets. Grasping the value of the digital revolution, commercial banks are no longer encapsulated in the traditional model of operating through branches. Many banks have taken digital banking as a strategic goal and competitive advantage. According to a report by Barquin & Vinayak (2015), the impact of digital technology had brought the chance of banks' net profit ranging from 43% to 48% in 2014.

Digitization is transforming the financial services industry. These developments not only enable new business processes but also lead to entirely new business models and even represent the fundamental transformation of the banking value chain in a similar way to the value chain in other industries such as media or tourism has been wholly transformed (Ito et al., 2017; Pramanik et al., 2019).

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According to the report of Gasser et al. (2017), the trend of digital banking technology will take place in the following direction: Direct customer consultation will gradually decrease, and the increase in using electronic channels forces many banks to adapt to new customer transaction processes to stay in touch with customers. Interaction with customers creates connections in many media, even between different companies, the digital and physical worlds. Digital technology can follow the trend of reducing the market share of banks due to fierce competition with other banks and non-bank credit institutions, a low-interest-rate environment, and increased costs due to regulatory requirements such as franchising that have led to a reduction in the profitability of banks.

The development of new digital ecosystems allows banks to reposition themselves in the banking value chain and other value chains and develop new business models. For instance, it can be the collaborations with other innovative service providers, such as investment platforms, or the development of Fintech services (Stoeckli et al., 2018; Udin, 2023). The digital technology trend of banks will be based on the integration of innovative services such as social banking, self-documenting or automated consulting services seamlessly into new customer transaction processes, which allow all stakeholders to access the same application and data. The banking system developed in the direction of big data is a tool to provide new services related to customers and internal services to achieve operational efficiency. The growing amount of digital data allows banks to get a more complete view of their customers and offer them new services, such as value chain optimization services for commercial customers based on rating records. The internal use of big data is the optimization of risk management processes.

In recent years, many non-bank institutions have joined the banking value chain. For example, technology companies like Apple (ApplePay) or Google (Google Wallet) compete with banks. They offer their services directly to customers and use only banks as processing transaction providers. Another example is non-bank financial service providers such as Wealthfront or Nutmeg, which provide investment advisory services or peer-to-peer lending in finance. These developments represent a shift towards new banking value chains and force banks to radically restructure their existing business models. Automated benefits of digital banking and automated customer consultation will encourage bank customers to increase their use of electronic services and channels. Advanced technologies enable more autonomous and self-service robot consulting, which in the future will completely change the direct interaction with customers and lead to a higher degree of automation without the need for interaction between people in many fields. Collective wisdom enables better investment decisions to be

made through the understanding of the crowd than the expert advice of individuals. (Crosby et al., 2013; Matt et al., 2015; Yazid et al., 2023).

Banking products are digital products; thus, it is difficult to distinguish them from other products. Financial products became commoditized due to the development of information technology, leading to a higher degree of automation and virtual representation of banking products. An example is a credit card, which can be used to make purchases online or via a mobile device without any manual interaction (Krasonikolakis et al., 2020). The cards are no longer physically shipped but are stored in the customer's E-Wallet on their phone. The same commoditization process also occurs in investment products where investment decisions are based on the crowd's intelligence and, in many cases, provide better solutions than individual client advisors. Due to virtualization, automation, crowdsourcing, and robotics, banking products are interchangeable between bank vendors, and/or other products are just one click. Some banks offer bank accounts, cards, etc., without any fees. This trend could eventually lead to new revenue models in which banks provide all their primary transactional products and services for free and focus on Paid mentoring excellence private banking services (Ernst & Young, 2016).

RESEARCH METHODS

Research Database: The scope of the study is the impact of banking digital services on banking business activities in 11 developing countries: Argentina; Brazil; Hungary; India; Mexico; Russia; Turkey; Indonesia; Malaysia; Thailand; Vietnam, where the data is taken for the period from 2012 to 2019 in the report of International Monetary Fund (IMF). The variables are the total number of card accounts opened at the country's bank (CARD). The total number of accounts that conduct digital transactions through the country's banks (NO MI) and the total value of transactions in the form of digital technology through the national banks will have an impact on the performance of those national banks (VAL MI), and the sales of deposits and loans of those national banks (TOTAL DL) are trend variables without normal distribution with a high deviation. The study converted these variables to the logarithm of the natural base so that the variable meets the input data conditions of the model.

Regression Model

The panel data are expected in economic studies. The model's main advantage is that it can include many variables without being constrained by the number of observations like a time

series model. However, it is essential to choose whether to apply the fixed-effects models (FEM) or the random-effects models (REM) when using these models for research. In addition, the effects of variables can change over time instead of being constant, as in conventional FEM and REM (Michael, 2019). The research model is set up as follows:

The panel data regression model:

$$\textbf{TOTAL DL}_{it} = \beta 0 + \beta 1 \textbf{CARD}_{it} + \beta 2 \textbf{NO MI}_{it} + \beta 3 \textbf{VAL MI}_{it} + \varepsilon_{it}$$

There is:
TOTAL DL$_{it}$: the dependent variable of the model, which shows the total deposits and loans of national banks i in the year t.
CARD$_{it}$: the independent variable of the model, indicating the total number of card accounts opened at the bank of country i in the year t.
NO MI$_{it}$: the independent variable of the model, showing the total number of accounts that conduct digital transactions through banks of country i in the year t.
VAL MI$_{it}$: the independent variable of the model, showing the total value of digital transactions through banks of country i in the year t.
β0, β1, β2, and β3 are intercept terms of the model.
ε$_{it}$: error terms of the model, ε$_{it}$ satisfies the hypothesis of OLS
i: nation, i (Argentina; Brazil; Hungary; India; Mexico; Russian; Turkey; Indonesia; Malaysia; Thailand; Vietnam), t: year, t (2010, 2020)

The authors assumed that the effect of the dependent variable is the same in all countries of the model.

If the eigenvalue of i exists or does not exist without affecting the TOTAL DL, then OLS estimation can be used on data consisting of many objects. Pooled regression model (POOLED regression) will be used.

If the characteristic feature of i exists and has an impact on the TOTAL DL, then assuming the eigenvector effect only causes the difference in intercept (orthogonal) between the objects, there are two cases:

- If the difference is the intercept terms between the regressions function of the objects is determined and can be calculated. The Fixed effects model (FEM) will be used (Michael, 2019).

- If the difference of the intercept between the regressions function of the objects is random. The Random effects model (REM) will be used.

Variables Description of the Model

The research object is to study the impact of digital banking technology on banking business activities. The study examines the increased level of digital banking technology. The

study has 4 variables: TOTAL DL, CARD, NO MI, and VAL MI. The total number of card accounts opened at the country's banks, the total number of reports conducting digital transactions through the banks, and the total value of transactions made in digital technology. Besides, the banks impact the banks' activities by increasing deposits and the sales of loans from the national banks

EMPIRICAL RESULT

Opportunities and Challenges of Digital Transformation to the Banking Industry

Over the past years, the financial-banking market has operated more and more healthy, safe, and standard, the Opportunities in digital transformation bring to the banking industry.

Firstly, digital transformation for banking activities such as the internet, cloud computing, big data storage, etc., will provide opportunities for accelerating the progress towards standardization of banking services in future banking models, which includes non-cash payment activities. Digital transformation allows domestic and commercial banks to reshape business models, governance, and electronic payments, toward building innovative digital banks in the future. Since then, the bank has focused on developing target customers - users who use many digital banking services.

The driving force behind adopting these forms comes from convenience. Consumers can make the bank. According to Visa survey data, digital banks receive great support from consumers, with 70% and 31% of consumers using these services. The bill payment service is the most preferred by consumers (72%), followed by money transfer to family and friends (67%). Digital technology will contribute to changing the structure of revenue and business efficiency. By 2020, assets managed by robot advisers will increase by 68% per year to $2.2 trillion; 60% of IT investment will go to cloud computing. Besides, the storage of big data and business analytics will help improve business efficiency.

In the context of the outbreak of the Covid-19 epidemic, considered a blow to the world, leverage stimulates the digital transformation process in the banking system, in which the habit of offline to "online" transactions has been shaped more and more clearly. Therefore, some commercial banks take advantage of the opportunity to continue investing in developing digital banking services following this trend. Consumers are the core consumer force of social commerce, with 85% of people surveyed already knowing about social networks and 68% currently using social media. These trends for young users are a huge opportunity to view below.

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Challenges of Digital Transformation to the Banking Industry

The banking industry's digital transformation creates challenges in payment and completes the legal framework for electronic payment activities. The legal framework and mechanisms and policies related to services, online payment means, new and modern electronic, virtual money, virtual card, and electronic money are new issues and complex and need to be further researched, evaluated, modified, and supplemented to meet the actual requirements and the rapid development of information technology and telecommunications.

The remaining challenge is that the business model and payment management may need to be reconsidered to match the trend of intelligent governance, mobile banking, digital banking, digital payment, and electronic math. In addition, banks need to research and maximize customer experience in the payment field to meet the cashless payment needs of customers in the technology age.

The challenge for the banking industry in general and for the payment sector, in particular, is the safety issue for the banking system, the payment system the problem of the payment system. For the payment field, including card payment via POS, electronic payment has recently experienced complicated developments. The increasingly sophisticated development of digital technology also leads to an increase in security holes and high-tech crimes, information security, and the problem of high-tech crimes and challenges in terms of qualifications, capacity, quantity, and quality of information technology staff.

The Optimal Selections of the Regression Model

Digital transformation is often understood as changing the operating method, leadership, working process, and bank culture. Seting up the correlation coefficient matrix to show the degree of interaction of the independent variables with each other. The correlation analysis table 1 shows that all independent variables can be included in the model and ensure that the model does not have multicollinearity.

Along with the economic restructuring, the application of technologies is an essential factor in improving the productivity, quality, and competitiveness of the economy in the context that the world is transitioning to a new phase, the digitalization, and profound changes in the structure of economic sectors and global production and supply chains due to the Covid-19 pandemic. The article analyzes the digital transformation trend and assesses the current situation of digital transformation in the field of financial-banking services.

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Table 1: The correlation matrix between independent variables

Value	CARD	NOMI	VALMI
CARD	1.000		
NOMI	0.326	1.000	
VALMI	-0.109	0.303	1.000

Source: Prepared by the authors (2022)

Table 1 shows that conducting OLS estimative regression model on data of multiple objects. Then the POOL model is used.

Table 2: The POOL model's result

F(3, 85) =	117.32		Prob > F =	0.000		
R =	0.8055					
TOTALDL	Coef.	Std. Err.	t	P>|t|	[95% Conf.]	
CARD	0.991	0.150	6.60	0.000	0.692	1.290
NOMI	-0.692	0.089	-7.72	0.000	-0.870	-0.514
VALMI	0.853	0.045	18.61	0.000	0.762	0.944
_cons	-1.682	2.809	-0.60	0.551	-7.269	3.903

Source: Prepared by the authors (2022)

Table 2 shows that P = 0.000, the POOL model has statistical significance. Based on the model shows the total number of card accounts opened at the country's banks (CARD), the total number of reports conducting digital transactions through the country's banks (NOMI), the total value of transactions in the form of digital technology through the national banks (VALMI) will have an impact on the performance of the national banks through the impact on deposits and loans of the country's bank (TOTALDL). Conducting a regression with the difference in the blocking difference between the respirable function of the objects is determined. Then the Fixed Effects Model (FEM) is applied.

Table 3: Estimating regression using POOL, FEM, REM, FGLS

F(3,75) =	32.29		P > F =	0.000		
TOTALDL	Coef.	Std. Err.	t	P>|t|	[95% Conf.]	
CARD	0.784	0.269	2.92	0.005	0.248	1.320
NOMI	0.0742	0.0646	1.15	0.254	-0.0544	0.202
VALMI	0.0429	0.0577	0.74	0.459	-0.0720	0.157
_cons	0.745	4.029	0.19	0.854	-7.281	8.772
F test that all u_i=0: F(10, 75) = 300.73			Prob > F = 0.0000			

Source: Prepared by the authors (2022)

Table 3 showed that the conducting a regression with the blocking difference between the resized function of the objects being random. Table 3 showed that with P = 0.000, the FEM model has statistical significance. The model shows that the total number of card accounts opened at the country's bank (CARD) will impact the performance of those country's banks

through the impact on the number of deposits and loans of those national banks (TOTALDL). The random-effects model (REM) is used.

Table 4: The REM model's result

Wald chi2(3)	=	81.37		Prob > chi2	=	0.000	
TOTALDL	Coef.	Std. Err.	t	P>|t|		[95% Conf.]	
CARD	0.551	0.258	2.14	0.033	0.0453	1.057
NOMI	0.0109	0.0699	0.16	0.876	-0.126	0.147
VALMI	0.149	0.0584	2.56	0.011	0.0349	0.264
_cons	4.404	3.907	1.13	0.260	-3.253	12.063

Source: Prepared by the authors (2022)

Table 4 shows that P = 0.000, the REM model has statistical significance. Based on the model, the total number of card accounts opened at the country's bank (CARD) and the total value of digital transactions through the country's bank (VALMI) will have an impact on the performance of those national banks through the implications for those national banks' deposits and loans (TOTALDL).

According to the result of the research models, the authors will perform tests such as F (to choose between Pooled OLS and FEM), the Hausman test (to select between REM and FEM), and choose the appropriate estimative method.

The authors use F-test to select the model between Pooled OLS and FEM, assuming:

H0: Choosing the OLS model is more suitable for sample data than the FEM model

H1: Choosing the FEM model is more suitable for sample data than the OLS model

Through the F test: P= 0.000, a = 0.05

Then P= 0.000 < 0.05, reject H0. Therefore, choosing the FEM model is appropriate.

Performing the Hausman test to select the model between FEM and REM, with the assumption:

H0: Choose the REM model that is more suitable for sample data than the FEM model

H1: Choose the FEM model that is more suitable for sample data than the REM model

From the test results, P = 0.058 > 0.05, then H0 is accepted. Thus, the REM model is applied for the research that brings the best results.

The tests of the regression model

Multicollinearity Test: Multicollinearity is the phenomenon of independent variables in the linear correlation model with each other. The study conducted hypothetical testing without multi-linear sensations by using VIF.

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Table 5: Multicollinearity Test

Estimated results	VIF	1/VIF
NOMI	1.29	0.777
CARD	1.18	0.845
VALMI	1.16	0.859
Mean VIF	1.21	

Source: Prepared by the authors (2022)

Table 5 shows that all correlational values, less than 2, show no multicollinearity phenomenon between independent variables in the model. It suggests that the independent variables can be used to estimate the model.

Heteroskedasticity Test: The variance of the error changes will make the estimates obtained by the OLS method stable but ineffective. The regression coefficient tests are no longer reliable. Test the hypothesis that the error variance is constant by the Breusch - Pagan Lagrangian test, with the hypothesis H0: There is no phenomenon of heteroskedasticity. With the alpha significance level = 5%, the Breusch and Pagan Lagrangian tests result: P = 0.000. Thus P < 0.05, the hypothesis H0 should be rejected: There is no phenomenon of heteroskedasticity. Thus, the model has the phenomenon of heteroskedasticity. Chibar2(01) is 237.95 and Prob > chibar2 is 0.000.

Autocorrelation Test: The phenomenon of autocorrelation is that errors with a correlation relationship will make the estimates obtained by the OLS method stable but ineffective; the regression coefficient tests are no longer reliable. The study was conducted to test the phenomenon of autocorrelation on panel data with the hypothesis H0: there is no autocorrelation. Autocorrelation Test is 236.409 and Prob > F is 0.000.

With the significance level alpha = 1%, the test results are: P = 0.0000. Thus, P < 5%, the hypothesis H0 should be rejected. Then, the model has the phenomenon of autocorrelation.

After testing, if the model violates assumptions such as autocorrelation and heteroskedasticity, these methods are not optimal. It must use another better approach, the feasible generalized least squares (FGLS), to overcome the above phenomenon to ensure that the obtained estimates are stable and efficient

Table 6: The FGLS model's result

Wald chi2(3)	=	38.57		Prob > chi2	=	0.000	
TOTALDL	Coef.	Std. Err.	t	P>|t|		[95% Conf.]	
CARD	-0.0221	0.141	-0.16	0.876	-0.300	0.256
NOMI	0.154	0.026	5.74	0.000	0.206	0.101
VALMI	0.194	0.042	4.60	0.000	0.111	0.277
_cons	14.898	2.391	6.23	0.000	10.211	19.584

Source: Prepared by the authors (2022)

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Table 6 showed that the significance level alpha = 1%, the result is: P = 0.000. Then P < 1%, so the hypothesis H0 should be rejected. Thus, the model overcomes the phenomenon of autocorrelation and heteroskedasticity.

Table 7: Summary of POOL - FEM - REM - FGLS model results

Model	POOLed OLS	FEM	REM	FGLS
Value	TOTALDL	TOTALDL	TOTALDL	TOTALDL
CARD	0.992***	0.785***	0.551**	-0.022
	[6.60]	[2.92]	[2.14]	[-0.16]
NOMI	-0.692***	0.0742	0.0109	0.154***
	[-7.72]	[1.15]	[0.16]	[5.74]
VALMI	0.853***	0.0430	0.150**	0.194***
	[18.61]	[0.74]	[2.56]	[4.60]
_cons	-1.683	0.746	4.405	14.90***
	[-0.60]	[0.19]	[1.13]	[6.23]
*	P < 0.1, ** p < 0.05, *** p < 0.01			
	t statistics in brackets			

Source: Prepared by the authors (2022)

Table 7 showed that the experimental results of the research model. The authors discuss and comment on the impact of digital banking technology on banks' business activities in developing countries: Argentina, Brazil, Hungary, India, Mexico, Russia, Turkey, Indonesia, Malaysia, Thailand, and Vietnam. The above partial test results show that the model with multicollinearity is evaluated as not serious. However, the model has autocorrelation and heteroskedasticity between errors, which will make the results obtained by conventional regression on panel data ineffective, and the tests are no longer reliable.

The authors used the feasible general least squares method – FGLS to overcome the phenomenon of autocorrelation between errors to ensure that the obtained estimates are stable and efficient. Along with the economic restructuring, the application of technologies is an essential factor in improving the productivity, quality, and competitiveness of the economy in the context that the world is transitioning to a new phase, the digitalization, and profound changes in the structure of economic sectors and global production and supply chains due to the Covid-19 pandemic. The article analyzes the digital transformation trend and assesses the current situation of digital transformation in the field of financial-banking services.

Digital banking technology helps improve the business performance of banks in developing countries: Argentina, Brazil, Hungary, India, Mexico, Russia, Turkey, Indonesia, Malaysia, Thailand, and Vietnam. Based on the above research results, it shows that with the significance level alpha = 1%, the total number of accounts conducting digital transactions through the country's banks (NOMI), the full value of transactions made by Digital Technology

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through the country's banks (VALMI) will have an impact on the operations of those countries' banks through the effects on the volume of deposits and loans made by those banks (TOTALDL): Argentina, Brazil, Hungary, India, Mexico, Russian, Turkey, Indonesia, Malaysia, Thailand, and Vietnam. Accounts conducting transactions in digital technology through the country's banks (NOMI) increase by 1 unit, and the bank business activities will increase the volume of deposits and loans of those national banks (TOTALDL) by +0.154 units. When the total value of transactions in digital technology through those country's banks (VALMI) increases by 1 unit, the bank's business activities will increase the number of deposits and loans of those banks (TOTALDL) +0.194 units. The study results are entirely consistent with previous studies.

How has a digital transformation in banks brought benefits: (1) Customer service: Personal and corporate bank accounts are available on any device. Few taps on the screen. This results in greater customer satisfaction as they can continuously monitor their account balances and manage the information on their personal profiles. In addition, banks offer automatic transfers with no additional fees for services. (2) Access to customers quickly at a cheaper cost: In the digital era, banks are no longer passive about how to approach and attract customers as before. Bank digital transformation has made it easier and less expensive for financial institutions to reach their potential customers. Consumers today choose a bank depending on how they perceive the organization through social media platforms, websites, and advertising. (3) Improve quality and save time for customers: With previous banking services, customers were very dissatisfied because they had to wait for hours for the bank staff to sort, check, compare, and process account opening registration information, loan documents, and payments, card declaration forms... Now, online banking operates 24/7, all year round, even on weekends, and with the development of digital transformation in banks, it only takes a few minutes for customers to complete the above procedures. (4) Personalize the user experience: Digital transformation in banking allows financial institutions to know what consumers really want. They can create personalized financial services and deliver on customer demand rather than guesswork. New innovative technological developments enable banks to increase customer engagement with personalized services. (5) Banks innovate and adapt: Digital transformation helps banking institutions quickly catch up with technology trends and market changes. Sophisticated digital technologies have changed the way traditional banking works. The emergence of integrated shopping portals, social channels, and mobile applications has opened many doors for banks to reach out to their customers. Banking institutions need to embrace this

new digital world by moving towards digital transformation. (6) Digital transformation in banking has helped reduce costs and simplify processes, leading to business transformation by introducing new digital technologies such as Blockchain and AI in banking. Easier management: Online accounts can be easily managed, although they require more information than traditional banks. Customers can add information themselves or contact the online assistant directly for support. Moreover, the payment recipient information is saved in the system.

Difficulties and challenges of digital transformation in the banking industry: (1) security: One of the most essential concerns for digital transformation in the banking sector. Many companies and organizations have found cybersecurity a concern that they have not been able to completely overcome. Using sophisticated software for data protection cannot provide 100% security from phishing hackers. (2) transactions: To perform complex transactions, customers may have to be present in person at bank branches. Furthermore, international transactions are not yet possible with all digital banks. (3) legacy software: The most challenging thing to overcome on the road to digitization in the banking sector is legacy systems and system integration challenges. In fact, even some big banks are still using the system built 35 years ago. Therefore, this is undeniably a key factor preventing banks' digital transformation. (4) technology: Banking systems providing online banking services must be constantly updated to have an appropriate level of security. Digital transformation is timeless as technologies improve daily, so staying up to date is essential.

CONCLUSION

The first changes in digital transformation have become apparent, both in the quality of services through new channels and in the number of branch networks implementing digital technology in developing countries. New forms of customer interaction and changes in the consumer experience are increasingly being made by the digital. As a result, opportunities for customer-bank contact through web and mobile applications began to increase, and new ATM functions and phone-based transactions were increasingly introduced by banks to serve more customers. Changes in consumer experience are the factors that make banking institutions differ from each other. Digital technology is a product that marks the difference and enhances competition among banks.

New forms of activity will prevail over the traditional methods. New competitors have shown that things can be done differently so that the bank has an efficient, faster process to

forego poor decisions and reduce costs. As a result, traditional banking will speed up operational processes, make decisions, act on the bank's choices, and correct bad decisions. As the digitalization of the banking business grows, organizations want to develop appropriate standard metrics across the entire financial system and transparently apply them to the market. This should be done so that it is possible to check whether the investments made are suitable and whether they produce the expected results. This is done under conditions comparable across organizations and countries.

These changes will happen in banking institutions with a clear direction to improve or maintain profitability. They will also need to protect themselves against fintech companies entering the financial markets. Overall, banks expect that the first effects will be cost reductions at some stage in the digital transformation. In addition, more advanced banking institutions will be able to offer differentiated products and services to generate higher income. Higher returns in the medium and long term will depend on making the right choices regarding digital investments, investment efforts, and internal changing attitudes. New ways to use financial services, and the competitive context in which big technology and FinTech companies have been booming, are forcing banks to face the issue of digitization as a matter of urgency in a dynamic market. The digitization of a bank involves developing new channels and products, adapting to technological infrastructure, and changing organizations to strategically position themselves in the digital environment. In developing countries, banks have embarked on this process before and are now at the stage of meeting new customer needs and can compete with further technical and financial service providers.

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