МРНТИ 06.81.15
JEL: G21, O33, L86
DOI: https://doi.org/10.58732/2958-7212-2024-3-6-23

The effect of digital transformation on the performance of the banking sector in Kazakhstan

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Abstract

This paper examines the impact of banking digitization on the development of the banking industry, particularly on banking performance. This study aims to identify critical factors for the development of financial banks and factors for the development of banking digitization in the banking sector of Kazakhstan. Based on this purpose, the core of banking digitization and its definition will be examined. The study conducted a comprehensive analysis that provided quantitative and qualitative characteristics of the development of digital technology and its impact on the development of the banking industry. The problems set out in this paper are solved using quantitative and financial analysis methods. The point index method was used during the study. Data from Halyk Bank's annual reports from 2019 to 2023 were used to assess digitalization's penetration into the banking industry. A panel approach is also used, allowing for data analysis for individual banks. Our research concludes that bank digitalization clearly impacts bank performance, focusing on the number of digital banking users, digital banking transactions, and IT investment growth on bank performance (such as return on equity, RoAE). The research findings provide implications for the practice of digital transformation of banks, especially in terms of digital investment and performance improvement. This study lays a foundation for future research on the impact of digital transformation on bank performance and provides a reference for investment decisions in the Kazakhstan banking industry.

Keywords: digital banking, banking performance, digital transformation, digital banking users, digital transaction volume, investment, Kazakhstan, banking industry

Цифрлық трансформацияның Қазақстандағы банк секторының көрсеткіштеріне әсері

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Түйін

Бұл мақала банктік цифрландырудың банк саласының дамуына, әсіресе банк қызметінің тиімділігіне әсерін зерттейді. Бұл зерттеу қаржылық банктердің дамуының маңызды факторларын және Қазақстанның банк секторындағы банктік цифрландыруды дамыту факторларын анықтауға бағытталған. Осы мақсаттың негізінде банктік цифрландырудың өзегі және оның анықтамасы қарастырылатын болады. Зерттеу барысында цифрлық технологияның дамуының сандық және сапалық сипаттамалары және оның банк саласының дамуына ықпалы қарастырылған кешенді талдау жүргізілді. Бұл жұмыста көрсетілген мәселелер сандық және қаржылық талдау әдістерін қолдану арқылы шешіледі. Зерттеу барысында нүктелік көрсеткіш әдісі қолданылды. Цифрландырудың банк саласына енуін бағалау үшін Халық банкінің 2019-2023 жылдарға арналған жылдық есептерінің деректері пайдаланылды. Жеке банктер үшін деректерді талдауға мүмкіндік беретін панельдік тәсіл де қолданылады. Біздің зерттеулерімізге сүйене отырып, біз банкті цифрландыру цифрлық банкингті пайдаланушылар санына, цифрлық банктік транзакцияларға және банк өнімділігіне АТ инвестицияларының өсуіне (мысалы, меншікті капиталдың кірістілігі, RoAE) назар аудара отырып, банктің жұмысына нақты әсер етеді деген қорытындыға келдік. Зерттеу нәтижелері банктердің цифрлық түрлендіру тәжірибесіне, әсіресе цифрлық инвестициялар мен өнімділікті арттыруға қатысты әсер етеді. Бұл зерттеу цифрлық трансформацияның банк жұмысына әсері туралы болашақ зерттеулердің негізін қалайды және қазақстандық банк индустриясындағы инвестициялық шешімдерге анықтама береді.

Кілттік сөздері: цифрлық банкинг, банктік өнімділік, цифрлық трансформация, цифрлық банкинг пайдаланушылары, цифрлық транзакция көлемі, инвестиция, Қазақстан, банк индустриясы

Влияние цифровой трансформации на эффективность банковского сектора Казахстана

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Аннотация

В данной статье рассматривается влияние банковской цифровизации на развитие банковской отрасли, в частности на банковскую эффективность. Целью данного исследования является выявление критических факторов для развития финансовых банков и факторов развития банковской цифровизации в банковском секторе Казахстана. Исходя из этой цели, будут рассмотрены ядро банковской цифровизации и ее определение. В ходе исследования был проведен комплексный анализ, который предоставил количественные и качественные характеристики развития цифровых технологий и их влияния на развитие банковской отрасли. Проблемы, изложенные в данной статье, решаются с использованием количественных и финансовых методов анализа. В ходе исследования использовался метод точечного индекса. Для оценки проникновения цифровизации в банковскую отрасль использовались данные из годовых отчетов Народного банка за 2019–2023 годы. Также используется панельный подход, позволяющий проводить анализ данных по отдельным банкам. На основании нашего исследования мы приходим к выводу, что банковская цифровизация явно влияет на эффективность банка, уделяя особое внимание количеству пользователей цифрового банкинга, транзакциям цифрового банкинга и росту инвестиций в ИТ на эффективность банка (например, рентабельность капитала, RoAE). Результаты исследования дают выводы для практики цифровой трансформации банков, особенно с точки зрения цифровых инвестиций и повышения производительности. Это исследование закладывает основу для будущих исследований влияния цифровой трансформации на производительность банков и предоставляет справочную информацию для инвестиционных решений в банковской отрасли Казахстана.

Ключевые слова: цифровой банкинг, банковская эффективность, цифровая трансформация, пользователи цифрового банкинга, объем цифровых транзакций, инвестиции, Казахстан, банковская отрасль

Introduction

In recent years, the banking sector has undergone tremendous change, moving from automation to digitization, driving innovation and improving the efficiency of financial services. First, banks automated services through ATMs and smart cards, reducing manual operations and improving business processing efficiency. Later, the arrival of the electronic stage gradually popularized interbank transfers, mobile payments, online shopping payments, online lending, and other services, which significantly improved the financial transaction experience of customers.

Today, digitalization has become the core of the development of the banking industry, and the widespread application of technologies such as digital currency, innovative finance, and artificial intelligence customer service has improved financial service operations and promoted the transformation and upgrading of business models. The digital transformation of the banking industry not only accelerates the application of financial technology and improves the overall customer experience through innovative products and smart services. This trend represents the transformation of banking from traditional offline operations to a full range of online service models, laying the foundation for the intelligent development of the future financial system [1].

In this article, the focus is on the relevance of this digital transformation to Kazakhstan's banking sector. Given that Kazakhstan is developing its economy at a rapid pace and has a high demand for inclusiveness and modernization in the financial industry, the topic of banking digitalization has become an indispensable part of the growth and sustainable development of this industry. Kazakhstan is in a stage of rapid economic development, and the demand for modernization of the financial system is increasing.

Against this background, the digital transformation of the banking industry has become an indispensable factor in promoting industry growth and sustainable development. In recent years, with the popularization of digital technology in the global financial field, Kazakhstan's banking industry has also responded positively, accelerating the shift from traditional operating models to digitalization by introducing innovative financial services such as digital banking services, mobile payments, and online loans. Changes in service models [2].

From the Kazakhstan government's support policies for financial technology innovation, we can see that Kazakhstan has a highly inclusive financial environment. At the same time, more and more banks realize that digital transformation is not only a means to improve efficiency, but also enhance market competitiveness. Strategic choices to attract customers and meet diverse needs. Especially as consumer demands become increasingly diversified, the convenience of digital banking service models that enable customers to access financial services anytime and anywhere has greatly improved customer experience and also reduced banks' operating costs [3].

Against this background, this study aims to analyze the specific impact of digitalization on the performance of banks in Kazakhstan and to study the optimization of operational efficiency and customer satisfaction in the wave of digitalization. This not only provides digital transformation strategies for financial institutions to learn from, but also provides data support and practical cases for governments and relevant regulatory authorities to formulate policies to support the development of financial technology.

The purpose of this paper is the impact of digitalization of the banking industry on the operational performance of banks in Kazakhstan. To this end, after reading a large amount of literature on the digital transformation of the banking industry, learn and understand the current research and challenges on the digitalization of the banking industry. At the same time, based on the research purpose of this article, after reviewing the relevant documents of the Bank of Kazakhstan, the most representative Halyk Bank was selected as the research object, and various types of information were reviewed to find the required data.

By collecting and analyzing key indicators of digitalization, such as the number of digital banking users, transaction volume, and IT investments, this study aims to elucidate the impact of digital banking adoption on bank performance. It is worth mentioning that the article also includes research on Kazakhstan's macroeconomics to understand the basic premises on which bank digitalization is based, which can be used as random variables in the analysis process of this study. Of course, digitalization is a double-edged sword. While we enjoy the benefits it brings, we also need to pay attention to the corresponding hazards such as information security. At the same time, digitalization has certain requirements for infrastructure and other costs [4].

The results of this study provide further analysis and research on the digital development of the banking industry, make a certain contribution to the digital ecosystem, and can also provide certain valuable opinions for the formulation of corresponding rules for the Kazakhstan banking industry.

Literature review

The development of digital banking

Digital banks, also known as virtual banks, represent a new generation of financial institutions that have emerged to address the shortcomings of traditional banking systems. Unlike classic banks, digital banks rely on the latest financial technologies (fintech) to offer essential banking services - such as deposits, loans, and money transfers - through online channels. This removes the need for physical branches, significantly simplifying access to financial services for many users [5].

Today, these banks offer mobile applications, web platforms, and other digital tools, providing convenient, fast, and secure access to services anytime and from anywhere. Digital banks play a critical role in promoting financial inclusion, mainly by providing banking services to populations that previously had limited access to traditional financial products and services. This is especially important for residents of rural areas, where physical bank branches are scarce. Thanks to the simplicity and accessibility of digital banks, people in remote regions can obtain loans, make deposits, and conduct payments, which contributes to their integration into the economy. Thus, digital banks provide essential financial opportunities for previously underserved populations, making it easier to access necessary resources for everyday life and business. By supporting digital banks, we can all contribute to a more inclusive financial system [6].

The growth of digital banks is especially pronounced in emerging markets, where traditional banks can only sometimes meet the high demand for banking services. In regions like Asia and South America, large populations and limited traditional banking

structures drive the demand for alternative financial services. Digital banks, offering low-fee microfinance products and services, attract individuals and small businesses needing access to credit and financial tools.

Between 2009 and 2014, digital banks began to appear worldwide. Europe and North America became the first regions where such banks started to develop, driven by breakthroughs in fintech and regulatory support. In particular, European countries implemented regulatory policies aimed at increasing the transparency and accessibility of banking services, which facilitated the spread of digital banks. In North America, a strong focus on innovation and the presence of significant fintech companies also contributed to the rapid development of online banking (Figure 1).

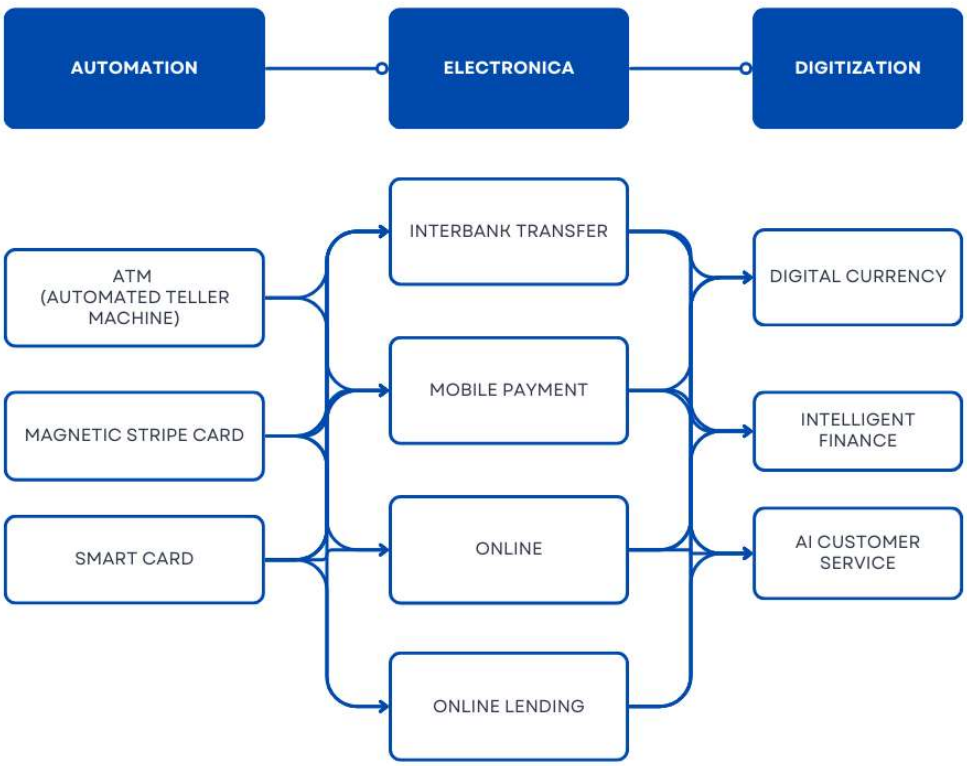

Figure 1. Technological Evolution Path in Banking Digital Transformation

Note: compiled by the authors

The global payment industry is trending towards digitalization and the development of cashless payments. Technology and fintech companies and the global digital ecosystem are increasing their role in developing innovative electronic and instant payments, such as QR code payments and mobile phone number payments [7].

Since 2019, digital banks have seen significant growth in customer base, asset size, revenue and market share due to improvements in core infrastructure such as cloud computing and mobile internet access. The COVID-19 pandemic has also accelerated this growth. By the end of 2023, the number of licensed digital banks will reach 235

globally, and the number of players offering a wide range of digital banking services will exceed 300.

Figure 2 only includes institutions that have obtained banking licenses from national regulatory authorities or have special "virtual bank" licenses.

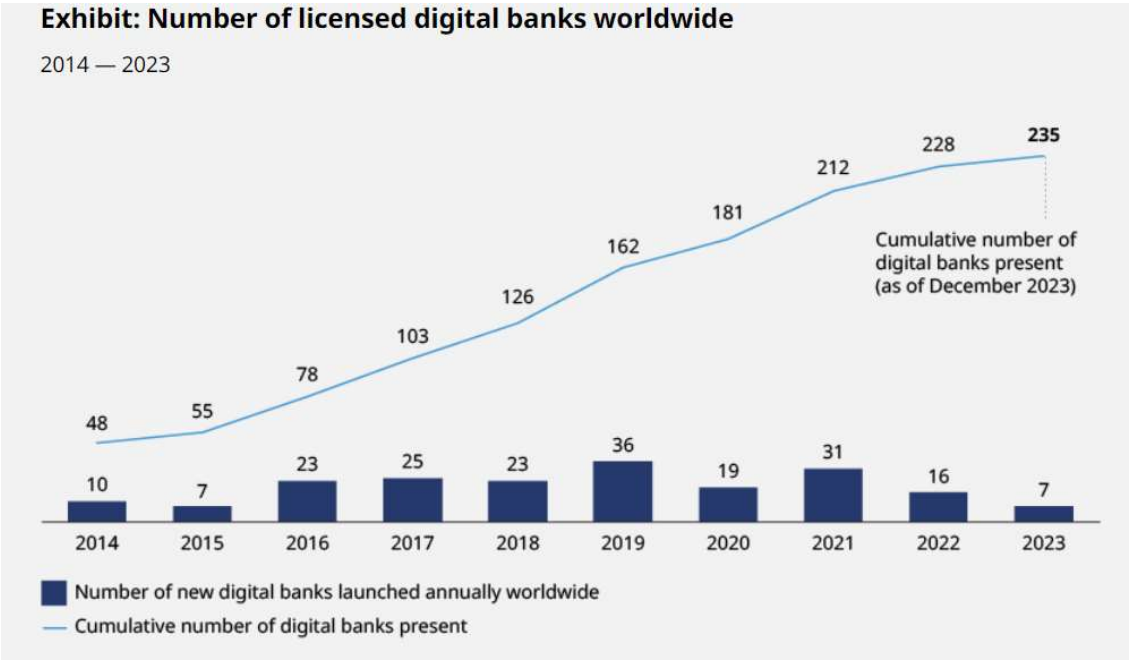

Figure 2. Licensed Digital Banks (the respective financial regulations of various countries and regions)

Note: compiled by the authors

Digital Banking and Its Operating Model

The digitization of banks is the basis for the realization of digital banking, which can be seen as a concrete manifestation of bank digitization. Digital banking is a broad concept often used to describe a banking model that utilizes digital technologies and innovations to deliver financial services. This concept includes fully digital and virtual banks, as well as various digital services and channels adopted by traditional banks in their digital transformation journey. With digital banking, users gain access to more personalized financial products, enhancing their engagement and satisfaction with services. Additionally, digitization enables banks to streamline processes, reduce costs, and accelerate transaction processing—critical advantages in the increasingly competitive financial services market [8].

Digital banks emphasize using technology to enhance customer experience, streamline business processes, reduce costs, and often have faster response times and broader service coverage. We chose digital-only banks as an example for analysis. Pure digital banking is a banking model that provides services based entirely on digital channels, with no physical branches. All banking transactions are processed and

completed through the Internet, mobile applications, or other digital platforms. This banking model typically has a high degree of automation and online transaction processing (Table 1).

Table 1. Digital and Mobile banking differences

Factor	Digital Banking	Mobile and Internet Banking
Registration	Fully online through pre-downloaded app; cards are sent directly to the customer (no contact with the bank employee)	Register through the bank and download the app
Physical Form	Branchless, has no physical bank	Has physical bank and branches
Account Verification	Digital sign, online and biometric verification	Physical and in-person verification by coming to the bank
Features (financial services) offered	Including investment account opening (i.e. mutual funds, bonds, time deposit, etc.); e-wallet with NFC top-up	Limited to day-to-day transactions

Note: compiled by the authors based on source [9]

The impact of digitalization on bank performance

The digitalization process of the banking industry has become a significant development trend in the global banking business. It is increasingly found that digital transformation not only affects banks' operating models but also significantly impacts their financial performance. The existing literature generally assumes that digital transformation will ultimately improve banks' overall financial performance by increasing operational efficiency, reducing operating costs, and increasing revenue streams [10].

Digital transformation enables banks to reduce manual costs and improve transaction efficiency through automated processes, increasing the flexibility and speed of operations and reducing errors and customer churn. Banks have expanded their business reach through digital channels and are no longer limited by branch opening hours and location restrictions. They can offer more flexible services to customers, expanding their customer base [11,12]. Some research also showed that the use of digital banking services can increase banks' revenues, especially by expanding banks' revenue sources by offering value-added services (e.g., electronic payments, investment platforms, online lending approval, etc.). Digital technologies also enable banks to more effectively manage risks and optimize credit risk assessment through big data analytics and artificial intelligence technologies, thereby improving loan portfolio quality and increasing lending operations' profitability [13].

However, although digitalization has led to significant improvements in bank performance, some studies also point to potential problems. In the process of digital transformation, banks need to invest heavily in technology upgrades, which may lead to

higher costs in the short term and may be accompanied by problems such as systemic risks. security risks. Therefore, the impact of digital transformation on banking operations may vary at different stages of development and in different market conditions [14,15,16]. Overall, current research shows a positive correlation between banks' digital transformation and their financial performance. Digitalization can directly or indirectly improve banks' financial performance by increasing business efficiency, reducing costs, and providing more service channels, but this effect may vary in different market conditions.

Technology Acceptance Model (TAM).

The Technology Acceptance Model named (TAM), which is rely on the theory of reasoned action model and is used as a link between perceived usefulness and ease of adoption to help predict consumer use [17]. IS technology. The technology acceptance model has received considerable attention in the information systems/information technology acceptance and use literature. Because it is the most correct and commonly used theory to describe people's perception of IT systems. Thanks to TAM, IT/IS usage behavior is related to the attitude toward using the system.

Methodology

Study Design

This section describes this article's research design and model, defines each variable, and details the data sources and analysis methods. This study uses quantitative analysis techniques to examine the impact of bank digitization on bank performance. It aims to analyze the relationship between relevant variables using regression models to explore the degree and direction of digitization's impact on banking performance. For this purpose, this study uses the panel data analysis method and conducts an empirical analysis based on the data on the digital development of banks in Kazakhstan.

Based on the theoretical framework of the existing literature, this study proposes the following research framework and model. The study's central hypothesis is as follows: the popularity and development of digital banking products and services have a significant positive effect on the efficiency of banks. This research model includes the following independent variables, dependent variables, and control variables:

Independent variables:

X1: Number of digital banking users (indicates the level of penetration of digital technologies in banks)

X2: Digital Banking Transaction Volume (indicates a bank's digital transaction activity)

X3: Banks' IT investment (indicates banks' investment in digital transformation)

Dependent variable:

Y: Bank performance indicators (e.g., bank profit margin, return on assets, and other financial indicators).

Control variables:

Macroeconomic factors (GDP growth rate, inflation rate, etc.)

The size of the bank (the amount of assets, the number of branches, etc.)

The model equation can be expressed as follows (1):

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \in \quad (1)$$

where,
β_0 - the intercept,
$\beta_1, \beta_2, \beta_3$ - the coefficients of the independent variables,
$\in$ - the error term.
Definition of variables
The variables selected in this study are defined as dependent and independent variables. Dependent variable: ыNumber of digital banking users (X1): The number of registered users using digital banking services per year indicates their popularity. The data source is Halyk Bank's annual reports (Table 2).

Table 2. Number of Digital Banking Users (X1)

Year	Home bank Monthly Active Users (MAU, million)	Home bank Daily Active Users (DAU, million)	Online bank Corporate Users (million)	Online bank Monthly Active Users (MAU, thousand)
2019	2.1	0.63	0.21	88
2020	2.6	0.79	0.34	156
2021	5.4	1.7	0.42	254
2022	7.8	2.6	0.67	418
2023	9.4	3.1	0.81	500

Note: compiled by the authors based on source [18]

This table shows the growth of digital banking users from 2019 to 2023 in Kazakhstan's Halyk Bank, including data for the Homebank (retail clients) and Onlinebank (corporate and SME clients) platforms. Digital Banking Transaction Volume (X2): The number of financial transactions completed annually through digital channels, reflecting a bank's digital transaction activity (Table 3).

Table 3. Digital Banking Transaction Volume (X2)

Year	Total Digital Transactions (trillion KZT)	Digital Loans for SMEs (billion KZT)	Halyk Market GMV (billion KZT)	Auto Insurance Policies (billion KZT)
2019	57	38	—	—
2020	65	52	15.7	2.1
2021	80	75	23.5	2.3
2022	91	112	27.2	2.6
2023	109.5	150	35.4	3.0

Note: compiled by the authors based on source [18]

This table summarizes the total volume of transactions processed through digital channels in Halyk Bank from 2019 to 2023. The data is in Kazakhstani Tenge (KZT) and reflects key digital transactions on the Homebank and Onlinebank platforms. Bank IT investment (X3): the sum of the bank's annual investment in digitization and IT, usually including expenditure on hardware, software, system maintenance, and security.

The source of this information is the bank's financial statements (Table 4).

Table 4. IT Investment growth (X3)

Year	The growth of IT Investment (%)	Digitization Transformation Initiatives	Increase in IT staff (times)	Agile Teams (% of the workforce)
2019	6.2	Introduction of digital products	1.2	10%
2020	8.5	Expansion of digital services	1.3	15%
2021	9.8	Introduction of new digital channels	1.5	25%
2022	11.7	Launch of Data Factory, digital loans	1.8	30%
2023	14.5	Further automation and digitization	2.0	35%

Note: compiled by the authors based on source [18]

This table describes Halyk Bank's IT and digital infrastructure investment growth from 2019 to 2023, reflecting its commitment to digital transformation and innovation.

Independent variable:

Bank efficiency (Y): Indicators such as return on assets (ROA) and net profit can be used to measure a bank's financial performance. The source of data is the annual financial report of the Halyk Bank (Table 5).

Table 5. Bank Performance Indicators (Dependent Variable - Return on Average Equity, RoAE)

Year	Return on Average Equity (RoAE, %)
2019	28.8
2020	25.5
2021	29.7
2022	31.7
2023	32.5

Note: compiled by the authors based on source [18]

This table records Halyk Bank's Return on Average Equity (RoAE) from 2019 to 2023, a vital indicator of the bank's performance. The data for the number of digital banking users (Table 2) and digital transaction volumes (Table 3) were collected from Halyk Bank's annual reports for 2019-2023.

The data on investment growth (Table 4) are taken from Halyk Bank's official financial statements and digital transformation program reports. The bank performance indicator (Return on Average Equity, Table 5) was sourced from Halyk Bank's performance reviews and key financial metrics published in the bank's annual reports and quarterly statements between 2019 and 2023. Supplementary data were gathered from Kazakhstan's National Statistics Bureau and relevant economic databases, where applicable [12].

Control variables:

Macroeconomic factors: GDP growth rate, inflation rate, etc. These variables control the external environment's influence on banking activity. Data sources are the National Bureau of Statistics and related economic databases. Following moderate growth in 2022, the Kazakh economy grew considerably in the last quarter of 2023, and GDP growth for the year reached 5.1%. The increased business activity in 2023 was driven by an unplanned injection by the National Fund of an additional KZT1.3 trillion in funds into the economy, a recovery in oil production, and a simultaneous rise in trade. In addition, the low base of the previous year's GDP growth, of just 3.2%, played a substantial role in the economy achieving record growth since 2013 (Figure 3).

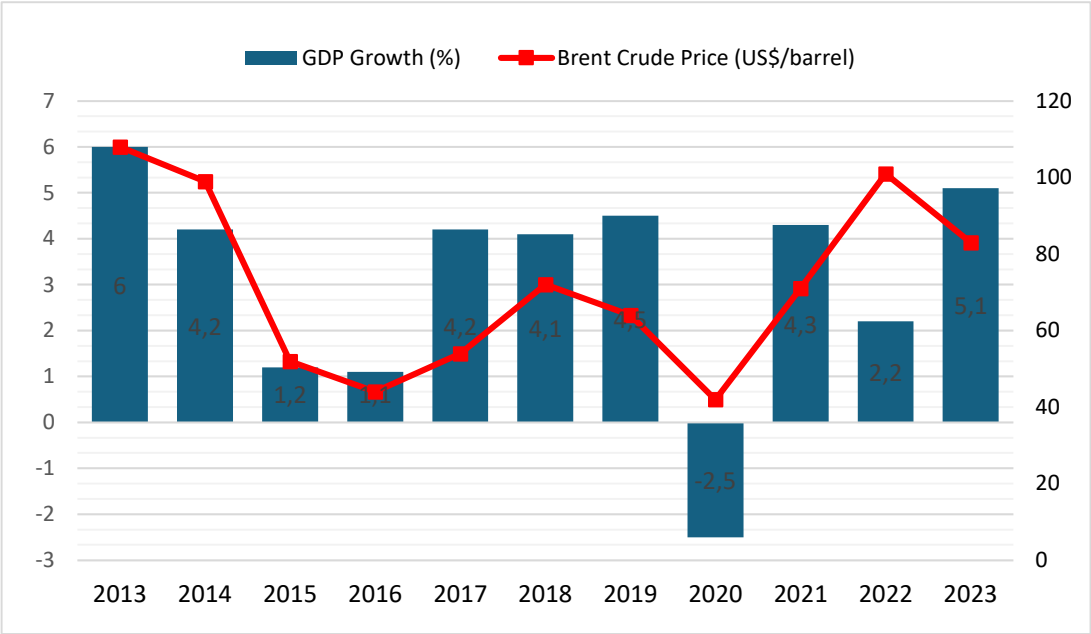

Figure 3. Economic Growth in Kazakhstan

Note: compiled by the authors based on source [19]

While revenues from oil sales declined in 2023, the oil sector contributed substantially to Kazakhstan's overall economic growth amid increased hydrocarbon production. We estimate the oil sector's contribution to GDP growth was around 0.5 percentage points. However, national oil production has been steadily declining since 2019, which has noticeably reduced the total output. In these conditions, the non-oil

sectors have been saved by continuous injections from the National Fund, averaging more than US$10 billion annually since 2020 (Figure 4).

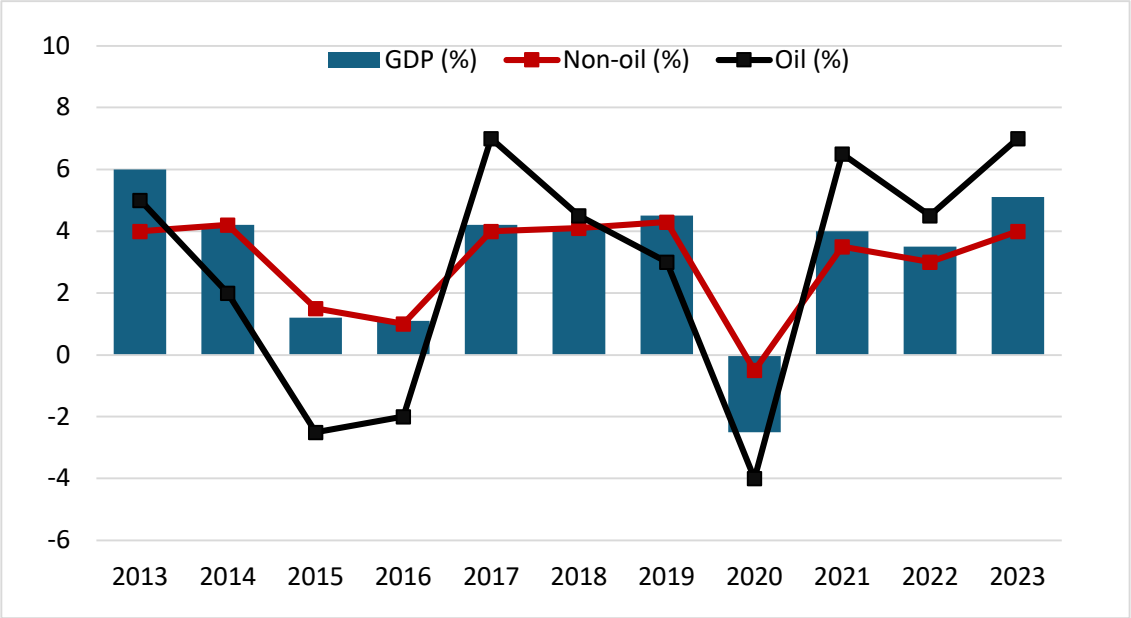

Figure 4. GDP by component

Note: compiled by the authors based on source [19]

Bank size: total bank assets or number of branches. These variables control for differences in the performance of banks of different sizes during digital transformation. The source of data is the bank's annual report.

Data collection methods

The data for this study is collected from various reliable sources, including qualitative and quantitative financial information. In particular, data on digital banking performance and related variables are obtained from Banks' annual reports provide detailed information on key variables such as the number of digital banking users, IT investments, and transaction volume. Banks usually disclose these figures in financial statements, management commentary, or performance reviews.

Reports of national banks and central banks. For example, reports from the National Bank of Kazakhstan or other countries' central banks typically include digital banking and fintech trends, mobile payment penetration rates, and industry statistics. Financial and market databases: Platforms such as Statista, World Bank, OECD, and Euromonitor provide macroeconomic data and industry statistics related to digital banking developments and technology investments.

Industry studies and white papers: Reports from consulting firms like McKinsey, Deloitte, and PwC provide broad context on global and regional innovation and adoption trends in digital banking. Government bodies and regulatory bodies: The Financial Market Supervision Service of Kazakhstan or similar government bodies can provide information about the national mobile payment system and regulatory framework.

Choosing a data model

The selection of the data model is based on the following criteria:

Time frame: The data covers a 5-year period (e.g., 2019-2023) to observe the long-term impact of digitization on banking.

Geographic coverage: Focuses on Kazakhstan, providing analysis using data from emerging markets.

Bank selection: The sample includes digital and traditional banks that have undergone digital transformation, focusing on banks with data on key variables such as customer base, transaction volume, and IT investments HALYK bank.

Industry Relevance: To ensure research relevance, the selected banks and financial institutions should be significantly involved in digital banking services such as online or mobile banking, digital payments, and IT infrastructure investments.

Appropriate search keywords for effective data collection may include: "Statistics of Digital Banking Users"; "Annual Report of Banking Investments in the IT Sector"; "Penetration level of mobile payments in Kazakhstan"; "Volume of Internet banking operations"; "Trends of digital banking in Kazakhstan 2019-2023". These keywords are available in Google Scholar, financial reports, and related databases.

Results and discussion

Regression analysis model

This study uses multiple linear regression analysis to estimate the effect of bank digitization (independent variable) on bank performance (dependent variable). The main idea of this model is to observe a linear relationship between several independent variables (such as the number of digital bank users, bank IT investments, mobile payment penetration rate, etc.) and dependent variables (such as the bank's net profit, profitability of assets, etc.). This analysis of the impact of digitization (Table 6).

Table 6. Regression Analysis Data

Year	Y: Return on Average Equity (RoAE) (%)	X1: Number of Digital Banking Users (million)	X2: Digital Banking Transaction Volume (trillion KZT)	X3: IT Investment Growth (%)
2019	28.8	4.5	57	6.2
2020	25.5	6.1	65	8.5
2021	29.7	7.8	80	9.8
2022	32.4	9.4	91	11.7
2023	32.5	10.2	109.5	14.5

Note: compiled by the authors based on source [18]

In this study, a linear regression analysis was conducted to assess the impact of digital transformation on the operational performance of the Kazakhstan banking industry. The dependent variable is Return on Average Equity (RoAE), and the independent variables include the number of digital banking users (X1), the number of digital banking transactions (X2), and the growth rate of IT investment (X3). Table 1

summarizes the regression output. The model achieved a high R-squared value of 0.9246, indicating that the independent variables can explain about 92.46% of the variance in RoAE. This shows that the model has strong explanatory power.

Conclusions

Analysis of the Impact of Digital Products on Banking

By analyzing a large amount of literature and data related to the banking industry in Kazakhstan, it can be concluded that digital banking products have a significant positive impact on the performance of banks. First, the widespread adoption of digital products has significantly improved the operational efficiency of banks. Technologies such as online banking, mobile payments, and remote account opening have considerably reduced customers' time costs in banking transactions. For banks, these digital services reduce dependency on physical branches and manpower, reducing operational costs. For example, the popularity of online payments and mobile financial services has allowed banks to open fewer branches, reduce maintenance and operating costs, and increase gross profit margins.

Second, digital products have also greatly enhanced banks' customer service capabilities and customer satisfaction. Especially through mobile applications and e-wallets, banks can provide services to customers 24/7, and this flexibility greatly enhances the customer experience.

Finally, the use of digital technology also helps banks improve their risk management and compliance processes. With big data and artificial intelligence technologies, banks can more effectively identify and predict potential credit risks and improve risk control capabilities. Moreover, digitization also increases transparency and real-time data flow, which helps increase banks' responsiveness in terms of money laundering, compliance, and regulatory requirements.

Digital Characteristics of the Banking Industry in Kazakhstan

In Kazakhstan, the digitization of the banking industry is steadily progressing. According to local data, mobile payments, remote customer identification and contactless payment technologies have become very popular in the market in recent years. Data shows that since 2020, the volume of online payment transactions in Kazakhstan has grown at a double-digit rate each year, with the growth of mobile payments being particularly significant, reflecting the growing acceptance of digital banking.

Banks in Kazakhstan have also made extensive use of AI technology to provide customer service, such as using intelligent customer service robots to handle customer queries and daily transactions. This not only improves service efficiency, but also reduces labor costs. In addition, the introduction of remote biometric technology allows customers to complete account opening and identity verification without visiting a physical bank branch, greatly facilitating access to financial services.

However, the digital development of the banking sector in Kazakhstan still faces some limitations compared to other countries. Especially with regard to big data analytics and automated services, the Bank of Kazakhstan's technology implementation is still at a relatively early stage.

Although some leading banks are beginning to experiment with using big data to improve customer service and risk management, widespread adoption of these technologies will require further investment and infrastructure development. Overall, the process of digitizing the banking industry in Kazakhstan has made significant progress, but there is still a lot of room for future development, especially in terms of improving data analytics capabilities and fully automated services. Enhanced regulatory frameworks and stronger partnerships with fintech companies could also accelerate the adoption of advanced digital solutions across the sector.

From these results, it can be concluded that digitalization has played a positive role in improving the performance of Kazakh banks, but in order to achieve global leadership, further investment and innovation in using advanced technologies and building infrastructure are still needed.

Developing talent in data science and digital skills within the sector will also be critical to sustain growth and ensure a competitive edge on the global stage. Additionally, fostering collaborations with international fintech and tech firms could accelerate the adoption of best practices and new solutions.

Acknowledgments. The research was funded by the Scientific Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan. (Grant "Investigating the impact of macroeconomic, political, and digital processes on financial sustainability of Kazakhstan" No. AP19674948).

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