

ANNOTATION
to the dissertation work of Isanov Arman Serikgaliyevich
«Modernization Kazakhstan’s banking sector in the context of digital transformation», submitted for the degree of Doctor of Philosophy (PhD)
in the educational program 8D04110 – «Finance»

Relevance of the research topic. In the context of the accelerating digitalization of the global economy, Kazakhstan’s banking sector is becoming one of the key institutions bearing substantial responsibility for maintaining financial stability and adapting to new technological and regulatory requirements. Digital technologies are ceasing to be merely auxiliary tools and are turning into a decisive factor that fundamentally transforms banks’ business models, their interaction with clients, and the nature of service delivery. In the Address of the President of the Republic of Kazakhstan, Kassym-Jomart Tokayev, dated September 8, 2025, “Kazakhstan in the Era of Artificial Intelligence: Current Tasks and Their Solution through Digital Transformation,” the strategic importance of introducing artificial intelligence, big data, and smart systems into the financial sphere is emphasized. These objectives are aimed at strengthening the resilience of financial markets, improving risk management, and enhancing the quality of digital solutions.

From this perspective, a systemic analysis of the main financial indicators of Kazakhstan’s banking sector becomes particularly significant. In accordance with the subject of the study, the key indicators include the dynamics of banking sector assets and liabilities, the quality and structure of the loan portfolio, the volume of operating expenses, the share of overdue debt, funds allocated to information and communication technologies (hereinafter ICT), equity capital, total profit of the banking sector, and other important indicators. Along with this, macroeconomic variables such as gross domestic product, inflation, the base rate of the National Bank of the Republic of Kazakhstan (hereinafter NBRK), as well as the volume of household deposits, play a substantial role in the comprehensive assessment of the banking sector. An analysis of the activities of such leading institutions as JSC Halyk Bank of Kazakhstan, JSC Kaspi Bank, and JSC Bank CenterCredit makes it possible to identify stable trends, weaknesses, and growth points in the context of digital transformation.

The consequences of the post-pandemic period, geopolitical uncertainty, and the rapid spread of fintech technologies intensify pressure on traditional banking models. Under these conditions, digitalization is no longer a matter of choice and becomes an important instrument for improving the efficiency of financial services, expanding their accessibility, and enhancing risk management systems. At the same time, the dynamics of national economic development show that the modernization of the banking sector, even without radically changing the structure of the real sector, is capable of forming a more resilient and flexible financial infrastructure that can serve as a foundation for long-term economic growth. The combination of these factors determines the relevance of a comprehensive study of the processes of digital modernization in Kazakhstan’s banking sector.

The degree of scientific elaboration of the topic. This dissertation research relies on the works of contemporary scholars who analyze the impact of digital technologies on the banking sector and its structural changes under the influence of fintech innovations. An important place in this field belongs to the works of Brett King, who demonstrated how digitalization transforms traditional banking models. The works of Don and Alex Tapscott make it possible to better understand the role of blockchain technology in restructuring financial processes. Issues related to central bank digital currencies are widely examined in the materials of the International Monetary Fund and the Bank for International Settlements, which emphasize the complexity of their technical and institutional integration.

Studies by S. Hardt and McKinsey experts devoted to Open API and open banking demonstrate the intensification of market competition through data exchange and the changing roles of financial institutions. At the same time, Deloitte and other researchers working in the field of digital risks draw attention to the growth of cyber threats and the need for banks to implement continuous monitoring systems. In works on SupTech and RegTech, the possibilities of digital tools for increasing supervisory efficiency are widely discussed.

International experience demonstrates that digital transformation requires a revision of regulatory mechanisms. At the same time, there is an obvious shortage of systemic scientific studies devoted to examining these approaches within the domestic banking sector. Accordingly, it is precisely this scientific gap that increases the relevance of the present research.

In Kazakhstani academic literature, issues of banking, its stability, and banking sector reform are systematically examined in the works of G. S. Seitkassymov, S. B. Makysh, M. Iskakova, A. G. Konakbaev, A. K. Sembekov, A. M. Rakhmetova, D. B. Kulumbetova, N. Kh. Maulina, A. B. Asanova, S. B. Isabaeva, D. D. Kerimkulova, M. T. Zholamanova, O. Tsapova, S. Smolyaninova, Z. Kenzhebaeva, E. T. Askarova, D. A. Zhoshibaeva, A. S. Daribekova, F. M. Osmanova, S. O. Tanatova, D. B. Kanagatova, V. N. Sidorenko, D. D. Igibaeva, G. Lukhmanova, G. Seitova, A. S. Alimbaeva, N. S. Ulakov, A. K. Kurmanalina, Zh. A. Gusmanova, S. K. Yerzhanova, R. R. Seisekenova, V. Yu. Dodonov, M. Yskakbek, A. S. Nurbatsin, Sh. R. Abzhalelova, A. D. Chelekbai, and other authors. These studies comprehensively analyze the functioning of banking system institutions, lending and regulatory instruments, the relationship between banks and the real sector, as well as issues of financial stability during crisis periods.

However, the analysis conducted shows that the aspects of digital transformation in most of these works are considered only within the framework of automating certain operations, whereas the comprehensive impact of digitalization on banking stability and efficiency has been insufficiently studied.

At the same time, Russian and Western researchers such as E. S. Vdovina, M. A. Kulikova, E. A. Aksyonova, A. A. Volkov, E. V. Petrova, A. Smith, J. Locke, K. Marx, T. Jefferson, J. Schumpeter, M. Friedman, J. M. Keynes, F. A. von Hayek, P. A. Samuelson, W. D. Nordhaus, J. Dimon, B. Moynihan, N. Quinn, K. Saving, Zhang Q., Ou Y., Chen R., S. P. Kolchin, and others pay particular attention to the functioning of banks in the digital environment, risk management, and the

modernization of the regulatory system. Their works examine new financial products, online service channels, and the changing structure of risks, while also exploring the intersection of national and international approaches in assessing the impact of global digital trends on the banking systems of different countries.

The global theoretical foundations of the digital transformation of the financial sector are comprehensively revealed in the works of B. King, for example in “Bank 4.0” (2018), as well as in the studies of other authors. These works describe the transition from traditional banking services to ecosystem models based on artificial intelligence, mobile services, and open interfaces. McKinsey reports such as “The Digital Banking Imperative” (2020) and Deloitte reports such as “Global Digital Banking Survey” (2021) empirically demonstrate the impact of digitalization on revenue growth, cost reduction, and the restructuring of risks for banks in emerging markets.

In the Kazakhstani context, official reports of the NBRK, materials on the development of the payment system, documents on the implementation of a central bank digital currency, and the Open API concept are of particular importance. However, these documents are predominantly statistical in nature and do not fully reveal the impact of digital innovations on the stability of the banking sector, its business models, and its regulatory environment.

Summarizing the analysis conducted, it can be noted that the issue of adapting international experience in digital modernization to the institutional specificities of Kazakhstan has been insufficiently studied. The shortage of academic works is especially noticeable in cases where such factors as ICT expenditures, operational and cyber risks, macroeconomic challenges, and ESG requirements would be examined within a single analytical framework. It is precisely this scientific gap that substantiates the need for a comprehensive dissertation study.

Objectives and tasks of the study. The objective of the dissertation research is to develop conceptual solutions for the modernization of the banking sector of the Republic of Kazakhstan in the context of digital transformation, aimed at enhancing its stability and its capacity to adapt to contemporary technological and institutional challenges.

In accordance with this objective, the study sets the following tasks:

1. To systematize the theoretical and methodological foundations of banking sector modernization and to clarify the conceptual framework that characterizes the economic essence of digital transformation in banking activity.
2. To analyze the main stages in the formation and digital transformation of Kazakhstan’s banking sector, to determine the changing role of banks in the financial system, and to identify the institutional directions of modernization.
3. To examine the nature of digital threats and risks arising in the process of banking sector digitalization and to assess their impact on financial stability.
4. To analyze the role of the National Bank of the Republic of Kazakhstan and commercial banks in implementing digital transformation, as well as to identify the factors of effective development through a comparison of domestic and international experience.

5. To assess the dynamics of the main financial indicators of the banking sector and to forecast their development trends on the basis of economic and mathematical models, taking into account the influence of digital factors.

6. Based on the results of the analysis and modeling conducted, to develop a set of practical recommendations aimed at modernizing Kazakhstan's banking sector in the context of digital transformation.

The object of the study is the banking sector of the Republic of Kazakhstan, whose mechanisms of functioning and development are undergoing transformation under conditions of widespread application of digital technologies.

The subject of the study is the economic relations arising in the process of banking sector modernization under the influence of digital technologies, as well as the changes occurring in the risk management system.

The theoretical and methodological framework of the study. The theoretical basis of the research is formed by the concepts of the digital economy, theories of banking, approaches to financial risk management, as well as methods for analyzing institutional changes in the financial sector.

The methodological framework includes the following general scientific methods:

- analysis and synthesis;
- induction and deduction;
- comparison and abstraction.

At the same time, special economic-statistical and econometric methods were employed, making it possible to identify and quantitatively assess the relationships between digital factors and banks' performance indicators.

During the study, regression analysis, modeling, and forecasting methods were applied, which provide the basis for constructing development scenarios for the banking sector with due regard to digital trends and macroeconomic conditions.

Empirical basis of the study. The empirical basis of the dissertation research consists of the following data and materials:

- official statistical data of the National Bank of the Republic of Kazakhstan and the Bureau of National Statistics;
- reports on the financial results and key indicators of JSC Halyk Bank of Kazakhstan, JSC Kaspi Bank, and JSC Bank CenterCredit;
- materials from the research internship conducted at the Plekhanov Russian University of Economics (Department of Finance) in the Russian Federation;
- the results of research practice carried out at JSC Halyk Bank;
- data obtained in the course of research conducted at the Department of Finance of Karaganda University of Kazpotrebsoyuz in the city of Karaganda;
- statistical and analytical reports of international organizations devoted to the digital transformation and resilience of banks, including the Bank for International Settlements (BIS), as well as consulting companies such as McKinsey, Deloitte, and others.

Scientific novelty of the research. The scientific novelty of the dissertation research is determined by the set of theoretical and applied results obtained through the analysis of the digital transformation of Kazakhstan's banking sector and the

proposed directions for its modernization. In the course of the study, the key categories characterizing the digital evolution of banks were refined, and a methodological framework was proposed that makes it possible to consider the banking sector as an open digital platform interacting with public institutions, fintech companies, and consumers of financial services.

The scientific novelty of the research is characterized by the following results:

1. An authorial system of concepts specific to the digital environment has been refined. The bank is considered as a financial-digital ecosystem, while the banking sector is viewed as a digitally resilient system in which traditional banking services and innovative technologies interact. The concept of the digital tenge is disclosed as an updated non-cash form of money based on digital technologies. Open interfaces (Open API) are defined as a secure and organized standard for data exchange between banks and fintech partners.

2. A theoretical and methodological approach to the analysis of the banking sector as an open digital ecosystem has been developed. The proposed approach explains the modernization of the banking sector as a process consisting of gradual changes in institutional, technological, and regulatory mechanisms. This perspective makes it possible to redefine the role of banks in maintaining financial stability under conditions of digitalization.

3. An integrated model for the modernization of macroprudential supervision has been proposed. The model includes digital indicators, sustainable development criteria (ESG), and cybersecurity parameters. Unlike the typical approaches of the International Monetary Fund and the Bank for International Settlements, this model is adapted to the institutional characteristics of Kazakhstan and provides for the use of Explainable AI elements in risk monitoring and assessment.

4. Economic and mathematical models have been developed and tested. These models make it possible to forecast the dynamics of profit, equity capital, and other key indicators of the banking sector for 2025–2030, taking into account digital factors and macroeconomic conditions. The modeling results are suitable for use in strategic planning and in determining modernization priorities.

5. Practical recommendations for the modernization of the banking sector have been developed. These proposals are aimed at improving the management of digital and cyber risks, increasing the efficiency of investments in digital infrastructure, and introducing SupTech and RegTech instruments into the activities of the National Bank and commercial banks.

Main scientific provisions submitted for defense. Based on the results of the study, the author submits the following provisions for defense:

1. The results of the theoretical and methodological analysis of the directions for modernization of Kazakhstan's banking sector, which substantiate the need to move from a linear model of the banking system to a digitally integrated financial ecosystem. Such an ecosystem enhances resilience to external shocks and ensures a new level of financial stability.

2. The author's system of concepts and refined categories, including the consideration of the bank as a digital-financial ecosystem, the interpretation of the digital tenge as a modernized non-cash form of money based on digital technologies, and the definition of open interfaces, Open API, as a mechanism for the institutional implementation of open banking. These concepts form the methodological basis for the regulation and development of the banking sector in a digital environment.

3. The results of the analysis of digital transformation and macroprudential regulation mechanisms, which demonstrated the insufficiency of traditional approaches based on statistical observation and the need to transition to an intelligent risk monitoring system using digital, ESG, and cyber-resilience indicators.

4. Economic and mathematical models aimed at forecasting the main indicators of Kazakhstan's banking sector for 2025–2030, which take into account the influence of digital factors and make it possible to apply scenario planning methods when selecting modernization options.

5. A set of practical recommendations for the modernization of the banking sector aimed at strengthening cyber resilience, increasing the efficiency of digital investments, and the phased introduction of modern supervisory technologies such as SupTech and RegTech into the activities of the National Bank and commercial banks.

Theoretical and practical significance of the dissertation. The results of the study substantiate not only their theoretical soundness, but also the possibility of their adaptation within the real financial system. The proposed approaches and assessment tools make it possible to analyze the processes of digital transformation in the banking sector in a systemic manner and to identify risks at an early stage. It is particularly important that the use of digital instruments and elements of model-based assessment facilitates data-driven decision-making for regulatory authorities. Alongside this, the results of the study may be applied within the internal management system of the National Bank of the Republic of Kazakhstan and commercial banks, while a set of modernized solutions aimed at increasing operational efficiency and reducing digital threats is proposed.

As a result of the dissertation research, a number of scientific-theoretical and practical findings concerning the modernization of the banking sector of the Republic of Kazakhstan in the context of digital transformation were generalized.

The study identifies the theoretical and methodological foundations of banking sector modernization, comprehensively examines the content and risks of digital changes, the mechanisms of regulatory influence, the level of digitalization of commercial banks, as well as economic and mathematical models and forecast trajectories of the main financial indicators. Accordingly, on the basis of the analysis, assessment, and modeling carried out within the framework of the dissertation's goals and objectives, the following scientific-theoretical and practical results were formulated:

1. The study substantiates the process of modernization of Kazakhstan's banking sector in the context of digital transformation not as a simple technological upgrade, but as a profound systemic phenomenon that changes the institutional

nature of banking activity. At the theoretical core of the dissertation, the need for a transition from the traditional linear model of the banking system to a digitally integrated financial ecosystem is demonstrated, since under current conditions a bank becomes not merely a financial intermediary, but a complex structure that processes data, assesses risks in advance, builds multichannel interaction with clients, and operates in close connection with digital infrastructure. From this perspective, the concept of modernization is not limited to the replacement of technical platforms, but implies a reconsideration of the bank's role, its market function, methods of regulation, and the architecture of resilience. Such an approach directly corresponds to the purpose of the dissertation, since the research is aimed at developing conceptual solutions intended to enhance the resilience of the banking sector and its ability to adapt to contemporary technological challenges.

2. Within the framework of the study, the content of the conceptual apparatus characterizing digital transformation was deepened, and an authorial system of categories was formed, which constitutes an important part of the theoretical novelty of the dissertation. In particular, the bank is substantiated as a digital-financial ecosystem, the digital tenge as a modernized non-cash form of money, and Open API as a mechanism for the institutional implementation of open banking. Such clarification cannot be regarded merely as terminological supplementation. Its scientific significance lies in the formation of a new methodological basis for analyzing the regulation and development of the banking sector in a digital environment, since without a clear definition of categories it is difficult to systematically explain either the economic boundaries of digital changes or their regulatory consequences. Thus, the system of concepts proposed in the study forms an integral interpretative model adapted to the theoretical analysis of the phenomenon of digital banking in the conditions of Kazakhstan.

3. The dissertation develops a theoretical and methodological approach that makes it possible to consider the banking sector as an open, multi-level, and environmentally sensitive digital ecosystem. The peculiarity of this approach lies in the fact that the development of banks is explained not only through financial indicators, but also through a set of interrelated factors such as institutional adaptation, the quality of digital infrastructure, data management, cyber risks, and regulatory flexibility. As a result, the content of the concept of financial stability is also expanded: it now rests not only on capital adequacy or liquidity, but also includes the technological resilience of the banking system, the reliability of digital services, and the ability to respond promptly to shocks. Such a theoretical position fully corresponds, in substantive terms, both to the objective of studying the nature of digital threats and risks and to the objective of determining the changing role of banks in the financial system.

4. The study provides a theoretical justification that traditional macroprudential supervision models are no longer able to fully meet the increasingly complex requirements of the digital financial environment. Although the dissertation shows that credit, liquidity, and funding risks continue to retain their importance, it simultaneously demonstrates that such digital factors as Big Data, Open API, automated reporting, and cybersecurity parameters are becoming new components

of the supervisory system. On this basis, an expanded paradigm of supervision is formulated, integrating digital indicators, ESG dimensions, and cybersecurity parameters. The theoretical value of this result lies in substantiating the transition from a reactive control model to a preventive model focused on the early identification of risks, that is, the logic of supervision shifts from post factum фиксация to predictive analytics.

5. The dissertation theoretically and methodologically proves that the stability and development dynamics of the banking sector are shaped by the combined influence of digital factors and macroeconomic variables. The study shows that explaining banking performance solely through the internal management of a bank or individual market operations is no longer sufficient. On the contrary, assets, deposits, the loan portfolio, equity capital, inflation, the base rate, as well as expenditures on digital technologies and digital investments, interacting with one another, exert a complex influence on the resulting indicators. In this regard, the dissertation employs a synthetic scientific approach to the study of digital transformation, combining institutional analysis, retrospective assessment, and econometric modeling. This conclusion is directly linked to the fifth research objective, namely forecasting the dynamics of the main financial indicators while taking into account the influence of digital factors.

6. From a practical point of view, one of the significant results of the study was the development of multifactor correlation-regression models intended for forecasting the main financial indicators of Kazakhstan's banking sector in the medium term. The dissertation shows that this approach is based on a real data set for 2013–2025 and makes it possible to take into account the inertia of banking intermediation, the features of the balance-sheet structure, and sensitivity to the macroeconomic environment. Such modeling is not reduced to the simple repetition of statistical characteristics, but offers the regulator and bank management a tool that makes it possible to explain future development trajectories in both quantitative and analytical dimensions. Consequently, this result is suitable for practical decision-making, since it creates conditions for substantiating the consequences of digital modernization not only qualitatively, but also at a measurable level.

7. The scenario-based forecast of banking sector profit for 2026–2030 is one of the most significant practical conclusions of the study. According to the calculations, under the realistic scenario profit increases from KZT 2.651 trillion in 2026 to KZT 4.677 trillion in 2030; under the optimistic scenario, from KZT 2.959 trillion to KZT 8.106 trillion; and under the pessimistic scenario, from KZT 2.545 trillion to KZT 3.815 trillion. These data, on the one hand, show the preservation of positive profit dynamics across all scenarios, and on the other hand, reveal the high sensitivity of its growth rates to inflationary pressure and the stringency of monetary policy. In practical terms, this result proves that changes in inflation and the base rate cannot be ignored when assessing the profitability of the banking sector, while for the regulator such a forecast becomes a specific instrument for preliminarily assessing the influence of macroeconomic decisions on the financial market.

8. As a result of the study, forecast trajectories of equity capital for 2026–2030 were also calculated, which made it possible to demonstrate in practical terms

the importance of capitalization as a factor of banking sector resilience. In the dissertation, capital formation is substantiated both theoretically and quantitatively, and it is shown that capital acts as the main buffer for covering possible losses and counteracting external shocks. The results of the scenario analysis show that under all macroeconomic conditions positive dynamics of both profit and capital are preserved; however, the growth rates depend on monetary policy, the inflationary environment, and the overall economic situation. The practical meaning of this lies in the fact that equity capital is considered no longer merely as a calculated indicator, but as a strategic resource ensuring the long-term viability of the banking system in conditions of digital transformation, regulatory pressure, and market uncertainty. In this sense, the capital forecast performs the function of an early guidance instrument both for the regulator and for the strategic management of banks.

9. On the basis of combining the modeling results and international experience, the dissertation develops an authorial scenario program for the modernization of Kazakhstan's banking sector, which constitutes a direct applied result of the study. In this program for 2026–2030, specific measures, executors, timeframes, implementation conditions, and expected results are systematized under realistic, optimistic, and pessimistic scenarios. Thus, the realistic scenario provides for the development of digital infrastructure, the introduction of SupTech monitoring, and the development of open APIs; the optimistic scenario considers the accelerated introduction of the digital tenge, the expansion of fintech ecosystems, and the international integration of payment systems; whereas under the pessimistic scenario stabilization measures, including the strengthening of macroprudential control, are given priority. The practical advantage of this program lies in its connection with the quantitative forecasts presented in the dissertation. In other words, the proposed measures are presented not as abstract intentions, but as a set of managerial decisions based on specifically calculated development trajectories.

10. In the conclusion of the study, a set of specific practical recommendations was developed for the National Bank of the Republic of Kazakhstan and commercial banks, aimed at improving the institutional and technological mechanisms of digital modernization. These recommendations include the introduction of a unified national standard for QR payments, the formation of interoperable infrastructure based on Open API, the creation of an integrated real-time cyberincident monitoring center, the phased implementation of SupTech and RegTech instruments, as well as the systematic assessment of the effectiveness of digital investments. Most importantly, these recommendations are presented in the study not as isolated ideas, but as elements of a general logic of transition from the reactive nature of banking supervision to a preventive control model based on prior forecasting. Therefore, the practical value of the dissertation results may be assessed very highly: they are suitable for use in regulatory policy, banking management, digital infrastructure development programs, and national strategies aimed at ensuring financial stability.

Approbation and implementation of the main results of the dissertation research. Based on the research findings, a number of scientific papers were published in co-authorship with academic supervisors in open-access publications,

and the results were also presented at international and scientific-practical conferences. These include:

- one article published in a journal indexed in the Scopus database;
- three articles published in journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Republic of Kazakhstan;
- three papers presented at international scientific-practical conferences.

The final results of the dissertation were reviewed, and supporting letters were received from the Karaganda branch of JSC Halyk Bank, the Karaganda branch of JSC BCC, as well as the Karaganda branch of the State Institution “National Bank of the Republic of Kazakhstan,” confirming the application of the results in their activities.

Structure and scope of the dissertation. The dissertation consists of normative references, symbols and abbreviations, an introduction, three chapters, a conclusion, a list of references, and appendices. The content of the dissertation is presented on 154 pages and includes 168 sources, 35 tables, 15 figures, and 5 appendices.

Doctoral student



Isanov A. S.