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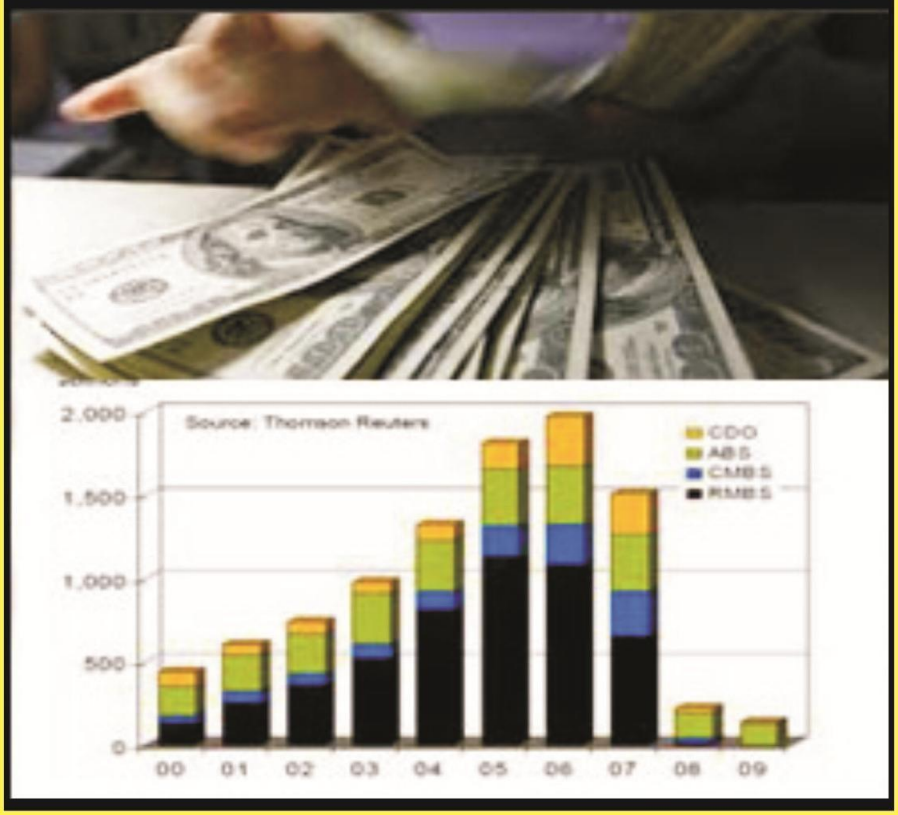

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EMPIRICAL STUDY OF RISK ASSESSMENT OF INVESTMENT PROJECTS OF INDUSTRIAL ENTERPRISE OF UZBEKISTAN

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ABSTRACT

This article identifies typical problems of risk assessment of investment projects of industrial enterprises of Uzbekistan, focused on the modernization and renewal of their production base. On the example of industrial enterprises of Uzbekistan, a phased development of a special methodology is considered, the use of which will solve the identified problems. The implementation of this methodology is designed to provide an assessment of the risks of investment projects in industrial enterprises and, in general, with a focus on achieving the criteria values of key performance indicators.

KEYWORDS: *Risk Of Investment Projects, Industrial Enterprise, Methodology Of Risk Analysis, Economic Factors, High Uncertainty, Effective Method Of System Analysis.*

INTRODUCTION

In the current conditions of the mass restructuring of not only large, but also medium-sized enterprises taking place in Uzbekistan, the role of solving the problems of their development in conditions of high uncertainty is growing, when, in addition to quantitative financial and economic factors, it is also necessary to take into account factors that are not quantified. First of all, we are talking about the need to assess the numerous risk factors that accompany the implementation of investment projects. The available methods of risk analysis are mainly of a purely qualitative nature, or are based on production statistics, which, for obvious reasons, are still insufficient in the economy of Uzbekistan.

The current situation in this area of economic knowledge necessitates the use of modern effective methods of system analysis, which, in particular, include modeling and forecasting methods that make it possible to compare investment projects for a number of quantitative and qualitative factors. These methods have already been sufficiently mastered by economists and analysts, but there are still no methodological developments that would allow them to be introduced into the practice of top managers of industrial enterprises.

Based on the foregoing, the task of improving the methodology for assessing the risks of investment projects of an industrial enterprise for the modernization of production processes, based on the latest modeling and forecasting methods, is an urgent task.

The issues of developing a methodology for evaluating investment projects, including the problems of risk analysis, were considered in the works of E.M. Blekha, I.M. Volkova, P.L. Vilensky, O.S. Vikhansky, M.V. Gracheva,D. Gozibekova, N. Zhumaeva,PM Kachalova, G.B. Kleiner, V.N. Livshits, N.P. Tikhomirov,M. Khamidulina, N. Khaidarova, B. Toshmurodova, S. Elmirzaevaand etc.

The analysis of these works showed that the theoretical and methodological provisions contained in them can be used in the development of the chosen research topic, at the same time, the scientific development of the methodology for assessing the risks of investment projects of an existing industrial enterprise cannot be considered sufficient.

The purpose of the study is to develop methods for assessing the risks of investment projects of an industrial enterprise for the modernization of production processes.

In the period 1991 - 2000. The development of the economy of Uzbekistan proceeded against the backdrop of a deep investment crisis, the external manifestations of which were an acute shortage of capital-forming investments in the market and a steady reluctance of investors to invest in the production (real) sector of the economy. The main reasons are inflation, high growth of interest rates with inadequate low profitability of production, high riskiness of investments, long payback periods compared to investments in operations with securities, bonds, the negative impact of the shadow sector, an unprecedented outflow of capital abroad.

The current period of development of the real sector of the economy of Uzbekistan is characterized by an increase in the investment activity of industrial enterprises, and in this regard, the urgency of developing scientifically based methods for analyzing investment projects intended for practical use directly by the top management of industrial enterprises is increasing. At the same time, since the adoption of investment decisions is associated with a high level of risk, an indispensable requirement for their development is to take into account risk factors in the course of investment design.

As a result of a comparative analysis of methods for assessing the risks of investment projects of industrial enterprises, it was found that in the conditions of high uncertainty that accompanies investing in the modernization of production processes, an expert-analytical approach to risk analysis and risk management takes the lead. This approach has recently been increasingly used in the practice of making managerial decisions insofar as it allows taking into account numerous risk factors that either cannot be quantified in principle, or such an assessment is associated with labor-intensive calculations, which, however, are not based on reliable data.

In this case, it is natural to turn to expert knowledge.

At present, a rather coherent theory of expert-analytical modeling has been developed, which, in fact, is an important section of system analysis. Within the framework of this theory, it is postulated that any, even a weakly structured problem can be represented as a hierarchy of interacting layers (levels) of this problem - goals, subgoals, factors, criteria, actors (actors), goals of actors, their policies, alternative scenarios for the development of the situation. The main method of expert-analytical modeling is proposed - the method of analysis of hierarchies (MAH), mathematically based on the theory of inversely symmetric matrices.

Later, the method of analysis of hierarchies was significantly improved, and now we can talk about the creation of a generalized method of analytical networks (MAN), a special case of which is the method of analysis of hierarchies (MAH). In mathematical terms, the method of analytical networks (MAN) involves the construction of a supermatrix, blocks and which are matrices of individual hierarchies; With the help of fairly simple operations on the supermatrix, it is possible to significantly refine expert information by taking into account feedback and interactions between layers and elements of the hierarchical model.

Despite the existence of a complete theory of expert-analytical modeling, as well as quite numerous examples of its application to solving specific problems of the economy, including the analysis of investment projects, it is still too early to talk about the widespread use of expert-analytical modeling not only by specialists - practitioners directly involved in implementation of investment projects, but also by specialists of consulting firms. There are several reasons for this, but the main one is the creativity of solving specific problems. Among such problems is the risk - the analysis of investment projects of industrial enterprises. Existing methods of risk analysis of investment projects based on expert-analytical modeling are fragmentary and do not cover all its aspects; in particular, methods for analyzing the sensitivity of investment projects to changes in risk factors have not been developed. In addition, the known methods do not reflect the latest achievements of the method of analytical networks, accounting for which can significantly increase the reliability of management decisions on choosing the direction of investment.

The paper substantiates that the development of risk assessment methods for investment projects of industrial enterprises based on expert-analytical modeling should be carried out simultaneously in three areas:

1) development of basic risk analysis models based on the hierarchy analysis method (MAH) and the analytical network method (MAN);

2) development of econometric models for sensitivity analysis of investment project risk assessments;

3) improvement of risk tools - analysis of investment projects based on the use of neural network technologies.

It seems that the combination of these areas can ensure the achievement of a new quality of risk management.

The central idea of the expert-analytical approach to quantitative risk assessment of investment projects is to represent a weakly structured problem in the form of a cognitive hierarchical model, which in the simplest case contains three levels: focus (goal), criteria, alternatives. In the specific case of risks of investment projects of industrial enterprises, these are the following levels:

- The first level - focus - assessment of the priorities of alternative investment projects in terms of their risks;

- The second level - types of risks of investment projects (production, investment and financial, market, financial, social, environmental and political risks);

- The third level - alternative investment projects.

In most cases, investment projects of existing industrial enterprises are associated with the modernization of production processes, and in this regard, the following types of projects should be considered: transition to less expensive technologies; replacement of worn out equipment; release of products new to the enterprise; personnel training. However, these investment projects are not alternative in the classical sense either - for example, the release of new products for the enterprise will most likely be accompanied by the replacement of equipment and the transition to other technologies; personnel training accompanies each of these areas, etc. Therefore, we should rather not talk about alternative projects, but about alternative directions of investment - in view of the limited resources, it seems unlikely that full investment will be made simultaneously in all directions.

Using the example of a risk-analysis of investment projects of an industrial enterprise to modernize the production process, a basic hierarchical model is substantiated, which allows, as a result of its filling with expert knowledge, to obtain estimates of risk weights by investment areas, on the one hand, and types of risks, on the other. The peculiarity of the proposed basic model is that it takes into account both direct and reverse influence of the two main components of the hierarchy - types of risk and areas of investment, which makes it possible to increase the reliability of expert assessments of the ratio of their priorities.

In this regard, new concepts are introduced in the work - direct and inverse hierarchical models of risk analysis. The direct hierarchical risk-analysis model (MAH - 1 model) contains the above three levels in sequence: goal (focus) - types of risks of investment projects - alternative directions of investments. The inverse hierarchical risk analysis model (MAH - 2 model) also contains these levels, but in a different sequence: goal (focus) - alternative investment directions - types of investment project risks. In principle, both models provide an estimate of the priorities of both types of risk and areas of investment, but if in the first case the estimates of the priorities of areas of investment are more reliable, since they are calculated as components of the final priority vector,

The iterative nature of the process of expert-analytical modeling lies in the fact that if the experts recognize some elements of the hierarchy as insignificant, or, on the contrary, the need to include additional elements in the cognitive model, adjustments are made. As a result of excluding any elements from the cognitive model created in the Expert Decide expert-analytical system, all assessments made by experts are saved, and it becomes possible to obtain the final result. When adding elements, experts are invited to supplement the matrices of paired comparisons with their judgments about the degree of significance of new pairs of elements, while maintaining the paired comparisons made by him and earlier.

The basic hierarchical model discussed above, however, does not take into account the feedback between the levels "types of risk" and "directions of investments", as well as the interaction of elements at these levels. The purpose of the network, as before, is to assess the risks of investing in the modernization of a food industry enterprise. But now the top level is the types of investment risks: production, investment and financial, market, political, financial, institutional and legal, social, the bottom is the areas of investment: replacement of equipment, transition to less expensive technologies, release of new products. These levels form two components, each of which contains the specified elements. It is assumed that the types of risk, as well as the direction of investment, are interrelated. It is also assumed that not only the types of risks determine the priorities of investment areas,

According to the theory of analytical networks, the network model corresponds to a supermatrix, which has a block structure.

In the paper, supermatrices corresponding to a complicated model are considered step by step: taking into account feedback (MAN-1 model); taking into account the correlation of risk types (MAN-2 model); taking into account the correlation of investment directions (MAN-3 model); taking into account both feedback and correlation of risk types and investment directions (MAN-4 model).

Estimates of the priorities of investment directions and types of risk, obtained as a result of a survey of experts and subsequent mathematical operations with supermatrices, are presented in Table. 1. Here are the results obtained earlier on the hierarchical models MAH-1 and MAH-2.

Table 1 Comparison of priorities of investment directions and types of risk of investing in the modernization of production processes of a food enterprise

industries according to hierarchical network models

Model	Investment directions				Types of risk				
	Equipment replacement	Transition to less expensive technologies	Release of new products	Education personnel	Production risk	Investment and financial risk	Market risk	financial risk	social risk
MAH -1	0,287	0,180	0,459	0,065	0,156	0,111	0,471	0,198	0,069
MAH -2	0,189	0,129	0,462	0,053	0,145	0,187	0,279	0,282	0,103
MAH -1	0,319	0,217	0,619	0,076	0,181	0,211	0,201	0,259	0,141
MAH -2	0,281	0,171	0,479	0,072	0,164	0,199	0,227	0,268	0,127
MAH -3	0,313	0,209	0,398	0,069	0,178	0,229	0,219	0,249	0,116
MAH -4	0,281	0,170	0,481	0,066	0,165	0,234	0,241	0,253	0,101

It can be seen that the priority vector of investment directions according to the hierarchical model MAH-2 differs markedly from the priority vectors of investment directions according to the hierarchical model MAH-1, as well as the priority vectors of investment directions according to network models. On the other hand, the vector of priorities of types of investment risks according to the hierarchical model MAH -1 differs from the vectors of types of investment risks according to the hierarchical model MAH - 2, as well as from the vectors of types of investment risks according to the network models MAN - 1 ... MAN - 4.

Since the spread of priorities of the elements of hierarchical models is small, i.e. five models MAH - 2, MAN - 1 ... MAN - 4 in the case of assessing the weights of risk types, on the one hand, MAH - 1, MAN - 1 ... MAN - 4 in the case of assessing risk weights by investment areas, on the other hand, are homogeneous samples, they are averaged. Investments in the creation of products new to the enterprise are characterized by the greatest risks; here, too, there is the greatest variability of expert estimates for different models. Minimum risks - for investments in personnel training, the minimum spread of expert estimates also corresponds to the same

direction of investment. Market risks are less than financial risks, but exceed investment and financial risks. Social risks are less - 95% confidence interval is below the average for this hierarchical level of 0.2.

The obtained results confirm the expediency of using network expert-analytical models for risk analysis of investment projects, taking into account the feedback between risk types and investment directions, as well as the correlation of individual types of risk and investment directions. The representation of network expert-analytical models in the form of a hierarchy facilitates the work of experts in the process of risk analysis of investment projects, which increases the reliability of the estimates obtained.

An important part of the risk analysis of investment projects is the assessment of the sensitivity of project risk priorities to changes in the factors that determine them. As a rule, sensitivity analysis occurs sequentially - a single change in each variable: only one of the variables changes its value by the predicted percentage, and on this basis the new value of the criterion used is recalculated. We propose a different approach, based on econometric modeling, which allows moving from a sequential-single change in each variable to a simultaneous change in all variables included in the analysis.

The paper proposes a method for forming an empirical base for econometric and neural network modeling of the sensitivity of risk assessments of investment projects. This technique is based on obtaining simulation scores when paired judgments are changed (variation of paired comparison scores within ± 1 division of the ratio scale) in a matrix created by experts.

Based on the empirical base obtained in this way, linear models for assessing the sensitivity of investment projects have been developed:

$$Y_1 = 0{,}532 - 0{,}496x_1 - 0{,}119\,x_2 + 0{,}044\,x_3 - 0{,}209\,x_4 - 0{,}421\,x_5 \quad (1)$$

$$Y_2 = 0{,}471 + 0{,}168x_1 - 0{,}059\,x_2 + 0{,}183\,x_3 + 0{,}301\,x_4 + 0{,}132\,x_5 \quad (2)$$

$$U_3 = 0{,}089 + 0{,}276x_1 + 0{,}112\,x_2 + 0{,}009\,x_3 - 0{,}006\,x_4 + 0{,}402\,x_5 \quad (3)$$

Here, Y_1, Y_2, Y_3 are risk assessments of the investment directions "New product launch", "Equipment replacement", "Switching to less expensive technologies", respectively; x_1, x_2, x_3, x_4, x_5 - estimates of the priorities of production, investment and financial, market, financial and social risks.

Models (1) - (3) are statistically significant at a level no worse than 0.0005, which made it possible to calculate the elasticity coefficients in the center of the simulation "experiment", characterized by the following values of risk assessments: production risk $(x_1)_{aver}$ = 0,158; investment and financial risk $(x_2)_{aver}$ = 0,106; market risk $(x_3)_{aver}$ = 0,398; financial risk $(x_4)_{aver}$ = 0,188; social risk $(x_5)_{aver}$ = 0,061, according to the formula

$$Ei = bi * (x_i)_{aver} : Y_{aver}$$

where bi is the regression coefficient.

The results obtained are presented in table 2.

The most sensitive risk factors include: production risk - rating 1 in the direction of investments "Launch of new products" and rating 2 in the directions of investments "Switching to less expensive technologies" and "Replacement of equipment"; social risk - rating 2 in the directions

"New product launch" and "Switching to less expensive technologies"; financial risk – rating 3 in the New Product Launch segment and rating 1 in the other two investment segments. Obviously, when quantifying cash flows, special attention should be paid to these types of risks.

Table 2 Elasticity coefficient and rating of risk factors by areas investments in the production process of enterprise modernization Food Industry

Predictor (type of risk)	Direction of investment					
	Release of new products		Equipment replacement		Transition to less expensive technologies	
	Elasticity	Rating	Elasticity	Rating	Elasticity	Rating
Production risk	- 0.156	1	0.059	2	0.059	2
Investment and financial risk	- 0.028	5	0.000	0	0.026	3
Market risk	- 0.037	4	0.057	3	0.000	0
Financial risk	- 0.064	3	0.061	1	0.061	1
social risk	- 0.075	2	0.024	4	0.051	2

In principle, to analyze the sensitivity of investment project priorities, it is sufficient to have linear models of multiple regression of the type of models (1) - (3). However, it is not always possible to confine oneself to linear models; in addition, they give an estimate of elasticity only on the "average", in the center of the simulation experiment. In this regard, using the example of modeling the assessment of the sensitivity of investments in the direction "Transition to less expensive technologies" for three types of risks (see formula (3)) the paper substantiates the fundamental possibility of using neural network models for this purpose, which can be used to describe nonlinear dependencies in practice any complexity.

The Neural Connection v. system was chosen for neural network modeling 2.1, which compares favorably with a combination of interface transparency with advanced functional characteristics. This system allows you to apply four types of neural networks and three statistical methods, of which two neural networks are most often used to solve modeling and forecasting problems - a multilayer perceptron (MLP) and a radial basis function (RBF). The network of the first structure can simulate a nonlinear function of almost any complexity, moreover, this complexity is determined by the number of layers and the number of elements in each layer.

Based on this, to solve the problem, a multilayer perceptron was built - a network based on a multilayer perceptron with automatic parameter settings, consisting of: a central module multilayer perceptron (MLP-1), input module Input-1, output text and graphic modules Text-1, Output -1, TSP-1, Graph-1, Whatlf-l, control modules - Filter-1, Sim-1 simulator.

When forming a set of training examples, it is recommended to have at least $N=l0*(m+n)$ "examples", where m is the number of input factors, n is the number of output factors, which in this case is $10*(3+1)=40$ "examples". However, the available data array with the number of "examples" N = 21 turned out to be sufficient to divide the initial sample into training (17 facts), test (2 facts) and control (2 facts).

An analysis of the diagrams of the actual and predicted values of the output variable by the non-network model showed that the multilayer perceptron (MLP) network provides a satisfactory

match between the expert and model-predicted risk assessments in the areas of investment "Switching to less expensive technologies".

The Neural Connection 2.1 system allows you to build a graph and dependencies of the output variable on the levels of input factors in the form of so-called "grid surfaces", in which each combination of input factor levels is compared with the calculated values of the output variable - in this case, the risk assessment predicted by the neural network model by investment directions "Transition to less costly technologies". There are three input risk factors, so an analysis of a set of three similar graphs can give a complete picture.

The "WhatIf ..." module available in the Neural Connection system - "What if?" allows you to build "sections" of the resulting three-dimensional graphs in order to analyze the change in the output variable when the input factors change, as well as to evaluate the elasticity of the output variable for any input factor, which is extremely important in economic research.

The predictive capabilities of the "WhatIf..." tool are demonstrated in the work on the example of predicting the elasticity of the risk of the direction of the investment project “Switching to less expensive technologies” for social risk.

The results of the prediction of the elasticity coefficient are given in the text part of the working field: with an increase in the priority of social risk from 0,076003 to 0,079680, i.e. by 6,25%, the risk priority of the Investment direction "Switching to less expensive technologies" increases by 0,92% (from 0,180630 to 0,182279). Hence we have:

$E(Y_3/x_5) = 0,92/6,25 = 0,147.$

This forecast corresponds to the investment and financial risk priority of 0,119 and the initial value of the social risk priority of 0,074; both values can be changed using the "sliders" on the horizontal and vertical axes of the left diagram of the working field.

Similarly, estimates of risk elasticity of the considered direction for investment and financial risk $E(Y_3/x_2) = 0,068$ and risk elasticity of this direction for production risk $E(Y_3/x_1) = 0,271$ were obtained.

Comparing the obtained estimates of elasticity, we can conclude that the risk elasticity of the considered direction of investment for production risk exceeds the elasticity for social risk by 1,85 times and for investment and financial risk by 4,00 times.

The paper notes that sensitivity estimates obtained using neural network technologies have an undoubted advantage over estimates and linear multiple regression models - if the latter are "average" estimates, then the first are "instantaneous" elasticity values corresponding to a specific combination of risk priorities of different kind.

Based on the results obtained, the above methodology for analyzing the sensitivity of project assessments to risk factors based on neural network modeling can be recommended for practical use.

The main results of the work are as follows:

1. A basic, hierarchical model for assessing the risks of investment projects of an industrial enterprise has been developed, which, as a result of filling it with expert knowledge, allows obtaining estimates of risk weights by investment areas, on the one hand, and types of risks, on the other. The peculiarity of the proposed basic model is that it takes into account both

direct and reverse influence of the two main components of the hierarchy - types of risk and areas of investment, which makes it possible to increase the reliability of expert assessments of the ratio of their priorities.

2. A technique has been developed for the formation of an empirical base for econometric and non-grid modeling of the sensitivity of risk assessments of investment projects. The technique is based on obtaining simulation estimates when paired judgments are changed in a matrix created by experts.

3. The insufficiency of using multiple linear regression models for assessing the sensitivity of investment projects is shown. A neural network model has been created, with the help of which the fundamental non-linearity of the sensitivity model has been revealed and the risk elasticity of projects has been assessed by types of main risks.

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TRANSFORMATION OF THE REGULATION OF COMMERCIAL BANKS IN THE CONDITIONS OF THE DEVELOPMENT OF THE DIGITAL ECONOMY OF UZBEKISTAN

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ABSTRACT

This article identifies common problems substantiating the feasibility of using and developing a unified system of innovative banking services based on the analysis and systematization of various systems of remote banking services and methods for assessing its effectiveness. On the example of large commercial banks of Uzbekistan, innovative banking, the use of which will solve the identified problems. Implementation of the specified unified system of innovative banking servicesis designed to provide banking service systems based on the systematization of various distance systems as a whole, with a focus on achieving criterial values of key performance indicators.

KEYWORDS: *Performance Criteria, Innovative Banking System, Systematization Of Various Remote Service Systems, Internet Technology, Remote Banking, Communication Technology.*

INTRODUCTION

The rapid spread of digital technologies, often referred to in the scientific community as the “digital revolution”, is fundamentally changing the economic structure, creating new conditions for the functioning of markets and affecting the change in the traditional business landscape. According to expert surveys, 67% of executives from 86 countries believe that new technologies will radically change their business in the next 5 years. In Uzbekistan, 69% of managers share the same point of view.

New phenomena in the economy, its information support and the use of digital technologies have a great impact on the banking sector. The importance of a strategic choice and the search for new priority models for the development of banking business in the context of digitalization is growing. Using better technologies, banks are able to reduce costs and increase revenues, and customers, in turn, often get better conditions from their use than before.

At the same time, there is a significant demand for remote banking services. More than half of Uzbeks 53% use mobile banking, choosing smartphones as their preferred method for receiving banking services and conducting banking transactions. Under these conditions, the nature and scale of risks to which banking institutions are exposed in the context of the development of the digital economy are undergoing significant changes. All this implies not only the transformation

of banking business models, but also the emergence of new tasks for regulators. The complex combination of technological and competitive changes can only be adequately managed if the specifics of the new financial activity are properly taken into account.

The cardinal pace of digitalization leads to the fact that the actions of regulators, as a rule, are late and do not fully take into account the conditions of the new reality. In this regard, the problem of transforming banking regulation in the context of digitalization and the search for effective mechanisms for its implementation seems to be very relevant. Thesecircumstancespredeterminedthetopicofthestudy.

The works of scientists and practitioners are devoted to the consideration of issues of economic content, essence, goals, objectives and role of banking regulation: M.A. Abramova, M. Bordeaux, P. Gauthier, G. James and others. At the same time, the study of the works of local and foreign authors on the topic of the study revealed that, to date, the issues of transforming banking regulation in the context of the development of the digital economy remain insufficiently studied, namely, both legislative and practical measures necessary to ensure conditions for the development of innovations have not been determined in the banking sector. These circumstances determined the choice of the research topic, the formulation of its goals and objectives.

The aim of the study is to develop theoretical and methodological provisions and practical recommendations for the transformation of banking regulation in the context of the development of the digital economy.

General scientific methods (analysis and synthesis, induction and deduction, abstraction and aggregation, classification, systematic approach, grouping and comparison methods), as well as special methods of cognition (statistical method) are used as a methodological basis.

The analysis made it possible to develop a classification of the stages of transformation of banking regulation, which differs from the known ones by adding its new criterion, defined as the response of the state to the constant modernization of banking under the influence of historical circumstances caused by the development of the national economy. The study found that the transformation of banking regulation throughout the historical period occurred simultaneously with the development of banking. These circumstances predetermined the choice of the above criterion as a classifying feature, according to which the following stages of the transformation of banking regulation were identified.

The first stage (until the end of the 14th century) was characterized by the introduction of government measures to force “quasi-banking” institutions to account for the money accepted for storage, as well as to limit interest rates on loans. At the second stage (from the 15th century to the first half of the 17th century), the regulation of banking activities expanded: measures were introduced to force banks to account for the money given to them for storage, to limit interest rates on loans issued, and circulation of bills was limited. At the third stage (from the end of the 17th century to the 30s of the 20th century), a full-fledged regulatory regime for the activities of banks was introduced - from the moment of creation to the regulation of the main types of banking operations and their liquidation. At the fourth stage (from the 30s to the 80s of the XX century), regulation was reduced to the expansion of measures of influence and strengthening of sanctions, and there were also requirements for an independent audit. Supranationalorganizationswerecreatedtoactasglobalregulators.

At the fifth stage (from the 80s of the 20th century to the present), the active introduction of computer technologies, modern telecommunications and, subsequently, digital technologies leads to significant shifts in the way banking operations and the provision of banking services, which had a significant impact on the transformation of banking regulation. Thus, the requirements and standards recommended by supranational banking organizations at this stage have a key impact on the modernization of national legislation.

The proposed classification made it possible to substantiate the need to transform the regulation of banking activities at the present stage in the direction of institutional changes. The structuring of the cycle of the process of digital transformation of banking activity and the corresponding transformation of banking regulation has been completed. The analysis made it possible to single out three successive stages in the process of banking digitalization: the first stage, during which new interaction channels, products and services are developed; the second stage, during which the adaptation of the technological infrastructure takes place; the third stage implies long-term changes in the bank, which allow achieving a strategic positioning in the digital environment.

At the first stage, the response of banks to changes in supply and demand for financial services consisted in the development of new digital channels of interaction with clients, as well as in the creation of financial products with which the bank could position itself in a new competitive environment. In recent years, along with the modernization of online banking platforms, significant efforts of banks have been focused on the development of new channels of interaction with customers through mobile devices.

The development of new products and digital communication channels at this stage involves making significant changes to the existing technological infrastructure, which must be integrated with previous developments.

The second stage in the banking digitalization process involves the transformation of the technological platform, that is, its transformation into a modular and flexible infrastructure that allows integrating new technologies, as well as accelerating the development of new products.

Technological solutions such as the introduction of biometric identification, the transition to electronic document management, increasing the level of transaction security, simplifying use and expanding the range of remote banking products and services are actively used. Another characteristic feature of digitalization in the second stage is the desire of banks to automate processes: the focus is not only on work in the back office, but also on the introduction of automated processes in the front office. For example, banks use sophisticated AI-based analytics to improve customer credit scores, tailor banking product offerings to customers, or provide personalized advisory services.

In the third stage of digital transformation, banks are facing far-reaching organizational changes that aim to simplify their structural and operating models, designed to speed up decision-making and make strategy customer-centric. Corresponding changes affect the entire organization - from the branch network to the back office, and in many cases they become the object of internal resistance, since the introduction of such innovations involves a radical change in the organizational culture of the credit institution. Banks set statistical metrics that quantify the impact of digital investments in terms of attracting new customers, selling products and services, and increasing the loyalty of old customers. Another notable change at this stage is the adoption of agile software development approaches, as opposed to the long cycles in previous stages,

when the time elapsed between needs analysis and commercial release of software was so long that the result often no longer met the needs of the banking business at the moment. For each stage of the digital transformation of banking activities, the main problems of banking regulation are highlighted.

The main directions of development of banking business are systematizedmodels and justified the most applicable of them for the digital transformation of banks in Uzbekistan. The following areas of transformation of banking business models have been identified:

a) the focus on exclusively banking areas ignores the opportunities that the bank has, relying on its many clients. By expanding the range of services provided, banks can move towards the development and implementation of ecosystems that, based on their existing customer base and operational capabilities, will increase interaction and access even more data to better understand the needs of their customers.

b) a key feature of this banking business model is providing customers with access to a wide range of financial services and products within a single interaction channel. The creation of a marketplace allows banks to focus on the development of more marginal products. In order to increase profitability and increase sales during the development of marketplaces, banks use recommendation services that, based on the analysis of data about customers and their operations, form personalized offers.

c) a significant proportion of banking business models, as a rule, is focused on traditional sales of banking products and services. For example, to provide mortgages to customers when the main goal is to buy real estate. At the same time, interaction with clients at other stages of the decision-making process can be a promising tool for increasing bank profits: banks can provide advisory services to determine the best mortgage products, orienting the client to more favorable mortgage rates and repayment periods.

d) This direction of development of banking business models can increase profits in several ways. First, banks can improve the efficiency of using their own data by investing in analytical capabilities. Secondly, banks can sell both raw data and analytical reports to other interested companies. These opportunities are due to the fact that most banks have a large amount of exclusive data about their customers, and their use for commercial purposes, subject to legal restrictions and regulations on the confidentiality of personal data, can be useful for companies in areas not related to the financial sector. For example, in the telecommunications industry, retail (retail), industry and others.

e) Large banks can generate revenue growth by using internal assets to create and provide products or services for smaller banks. This direction of development of the business model is due to the fact that many small financial institutions lack the infrastructure, assets or capabilities of existing banking licenses. Large banking institutions can meet this need by developing a portfolio of products to sell directly to or through third parties, providing their infrastructure, effectively renting it out. A traditional example of such services are those banks that allow third parties to process their bank cards.

f) The use of digital channels and innovative business models can enable incumbent banks to expand their operations into new regions or market segments. This becomes possible due to the fact that previously, using traditional banking approaches, new lines of business were prohibitively expensive for them. According to the results of the study, the most applicable

business models for the digital transformation of banks in Uzbekistan are recognized as: the transformation of a bank into a digital ecosystem, the creation of a financial supermarket (marketplace), the development of non-banking activities, monetization of data, the expansion of ways to use the banking infrastructure, the use of digitalization opportunities to expand the geographical presence , the use of which, unlike the well-known ones, will allow more efficient use of digital technologies in banks in order to increase competitiveness.

The necessity of institutional transformation of banking regulation through the introduction of new institutions, which, unlike traditional ones, would take over the functions of regulating innovative banking products and services, and contribute to improving the efficiency of banking regulation, is proved. According to the results of the study, it was recognized that the most effective measures of institutional transformation are the creation of regulatory "sandboxes", the internal reorganization of the banking regulator, the creation of a center for the use of supervisory technologies, the creation of innovative hubs and incubators:

- Regulatory sandboxes. Such an approach to banking regulation as the creation of regulatory "sandboxes" can represent a solution to the problem when legislative norms are an obstacle to the development and implementation of innovative banking products and services. This regulatory regime is applied both to operating banks and to other entities. The Sandbox is a regulatory mechanism that allows the development and testing of innovative banking products and services in a regulated environment during a trial period, without the usual licensing requirements and in accordance with minimum legal requirements. The sandbox allows banks to develop and test their products and services in real-life conditions and interact with regulators to better comply with and adapt to existing regulatory requirements.
- internal reorganization of the banking regulatory body. Changing traditional banking business models, their structure and range of operations requires regulators to reallocate their resources to ensure effective regulation of the banking system. In particular, some banking regulators (Singapore, Hong Kong, Canada) have created separate divisions in response to the problems associated with the development of financial technologies. The powers of these divisions are varied and include such functions as the development of a legislative framework, analytical research, licensing, use of surveillance technologies, and so on.
- Creation of a center for the use of surveillance technologies. Surveillance technology improves the relevance and quality of data available to regulators, improves digitalization and process automation, deepens analytical capabilities, strengthens control and oversight of the development of new banking products and services, and more effectively regulates new, non-traditional business models.
- Creation of innovation hubs and incubators. The essence of this method of banking regulation as an analogue of the regulatory sandbox lies in the simultaneous involvement of industry experts, representatives of the regulator and other participants in a joint examination.

These institutions can provide legal advice and help regulators gather more information about new banking developments, assist banks in accessing funding, provide access to necessary data, technology or software that banks do not have access to.

Practical recommendations have been developed on the use of supervisory technologies and on the further development of the regulatory "sandbox", as well as proposals for amending the regulatory framework in order to transform banking regulation in the context of the development of digital technologies in Uzbekistan.

At present, there is virtually no legal and regulatory framework covering remote banking and the use of underlying technologies. At the same time, those single provisions that exist are contained in regulatory documents of various levels (as a rule, by-laws), and for this reason they are fragmented. In addition, the current legislation does not contain the very concept of "remote banking".

With regard to the further development of the regulatory sandbox, it seems appropriate to expand the circle of participants in testing innovative banking products and services at the expense of banks that have technological developments, but are unable to fully finance the introduction of innovations. For such cases, it is possible to provide assistance from the regulator, which consists either in attracting funding from third-party organizations interested in the development of certain technologies, or in providing preferential lending terms.

The study found that the speed of technological change is requiring regulators to be more flexible. The active participation of the state in the development of digital technologies in financial markets seems to be one of the key factors for successful digitalization.

At the same time, all the problems associated with the development of digital technologies in the banking sector are not fully covered by the traditional approach to regulation, which is mainly focused on establishing capital or liquidity requirements. In this regard, it seems important for regulators to develop optimal, balancing regulatory methods that would not hinder the transformation of the banking sector.

In order to provide conditions for the development of innovations in the banking sector in various countries, new mechanisms and tools for regulating innovative financial technologies, products and services are being created. At the same time, not all of them can be implemented in Russian reality.

The development of relevant proposals required an in-depth analysis of the methods used by the Central Bank of the Republic of Uzbekistan to transform the regulation of banking activities in the context of digitalization. The study identified and substantiated the main problems associated with the regulatory innovations of the Central Bank, as well as possible ways to solve them.

Taking into account the analysis carried out, specific proposals were developed to change the current regulatory framework for banking regulation in Uzbekistan, aimed at ensuring the conditions for the development of banking innovations, as well as practical recommendations were given to improve approaches to the use of supervisory technologies and further develop the regulatory "sandbox".

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