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Modeling the Process of Introducing Banking Innovations Based on Financial Engineering in the Digital Economy

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Abstract: This study explores the integration of financial engineering principles in advancing banking innovations within the digital economy. It models the process of implementing cutting-edge financial technologies—such as blockchain, artificial intelligence, and machine learning—to enhance banking operations, improve risk management, and optimize financial services. By examining case studies and theoretical frameworks, the research highlights how these innovations streamline operations, foster financial inclusion, and drive economic growth. The findings underscore the importance of adapting traditional banking practices to contemporary digital advancements, offering a roadmap for financial institutions to leverage technology for competitive advantage and enhanced customer experiences.

Key words: risk management, financial services, financial inclusion, economic growth, banking innovations, banking operations.

Introduction

Currently, there is an increase in the level of competition within the framework of the banking system in Uzbekistan. In this market segment, the offer is represented by a wide range of financial products and services. Accordingly, we can observe competitive tensions in these conditions for the final consumer demand of credit institutions. Banking structures are aimed at actively attracting potential consumers, turning them into their customers, which mediates the offer of various popular credit products based on the introduction of bank injecting in conditions of digitization of the economy.

Focusing on digital transformation, creating and offering new technologies that mediate benefits for bank customers will allow us to increase our market stability.

Literature review

The growing interest in the introduction of digital innovations in the banking industry, for example, V. Zakhshevsky and A. Recorded by Pashuta:"... an important competitive advantage is given to credit organizations that are able to develop and implement new technologies based on financial engineering, modernize product types, develop alternative channels of customer service, that is, carry out the innovation process. [1]"

It should also be noted: when offering and introducing financial engineering innovations to the market, it is recommended that banks not only strive to increase their income, but also protect against risks. In modern conditions, where competition has grown and demand has not fully recovered, it is considered more important to create a "security limit", "market stability", reduce credit risk and improve interest income, and improve trust in the eyes of partners. Banks diversify their services in the current reality, offering credit products that distinguish different categories of consumers from each other. In other words, banks seek to increase their market share, influence market processes, create trends and increase their stability by focusing on the needs of their customers, which is often addressed on a new technical and technological basis.

At the initial stage, it is necessary to carry out serious analytical work, which involves financial engineering or conducting specialized marketing research when creating an updated loan or innavasion bank product; it is required to attract innovations, that is, to forecast future needs, taking into account the trends in the development of the market based on the use of cross-channel information resources.

Methodology

The study made extensive use of statistical tables and graphs to present data visually, allowing for clearer insights into the trends and patterns observed. Analytical comparisons were employed to draw parallels and distinctions between different datasets, facilitating a deeper understanding of the underlying factors at play. Logical and comparative analyses provided a robust framework for evaluating the relationships and differences among various elements within the study's scope. Grouping methods were also utilized to categorize data into meaningful clusters, enhancing the precision of the analysis. Furthermore, the research incorporated findings from both international and domestic specialists, ensuring a comprehensive perspective on the issue under investigation.

Analysis

In the context of digitization of the economy, we can determine a number of objective conditions that arouse interest in the organization of banking innovations on the basis of financial injection, namely:

- the fact that the modern economy, in general, is focused on innovation growth and consumer demand for services and innovation;
- the fact that innovations in the activities of banking structures can be considered a special case of the manifestation of a general trend characteristic of the current economic situation;
- the fact that innovations in the banking industry are based on a modification or a modern solution to the product itself;
- the fact that banking in the modern format relies on information technology in its daily activities, working with partners and consumers;
- conducting remote banking services using artificial intelligence, blockchain and computing technologies.

Within the framework of trends that involve changing the bank in the context of digitalization, two priority areas are noted: one of them is the production of new banking products created and presented on the basis of digital technologies; the second direction is to strengthen interaction with companies operating outside the banking sector and, together with the bank, they are non-banking products that are

In turn, opportunities were created for enterprises and organizations to dispose of funds in real-time bank accounts through remote control systems, to make payments, to send an order for the purchase (conversion) of foreign exchange funds in electronic form to the service bank, to transfer an electronic account to the bank to transfer monthly salary and equivalent payments, and to use other services.

It should be noted that the banking sector is determined based on the developments of scientists in our research question within this section, based on the classic rules related to the modeling of innovation processes in these types of systems. Y.In the modeling of processes in socio-economic systems, Schumpeter and his followers are instrumental in determining the desired results and goals that are striving for this system.

Schematically, the construction of such settlements in the socio-economic system can be expressed as follows (Figure 1).

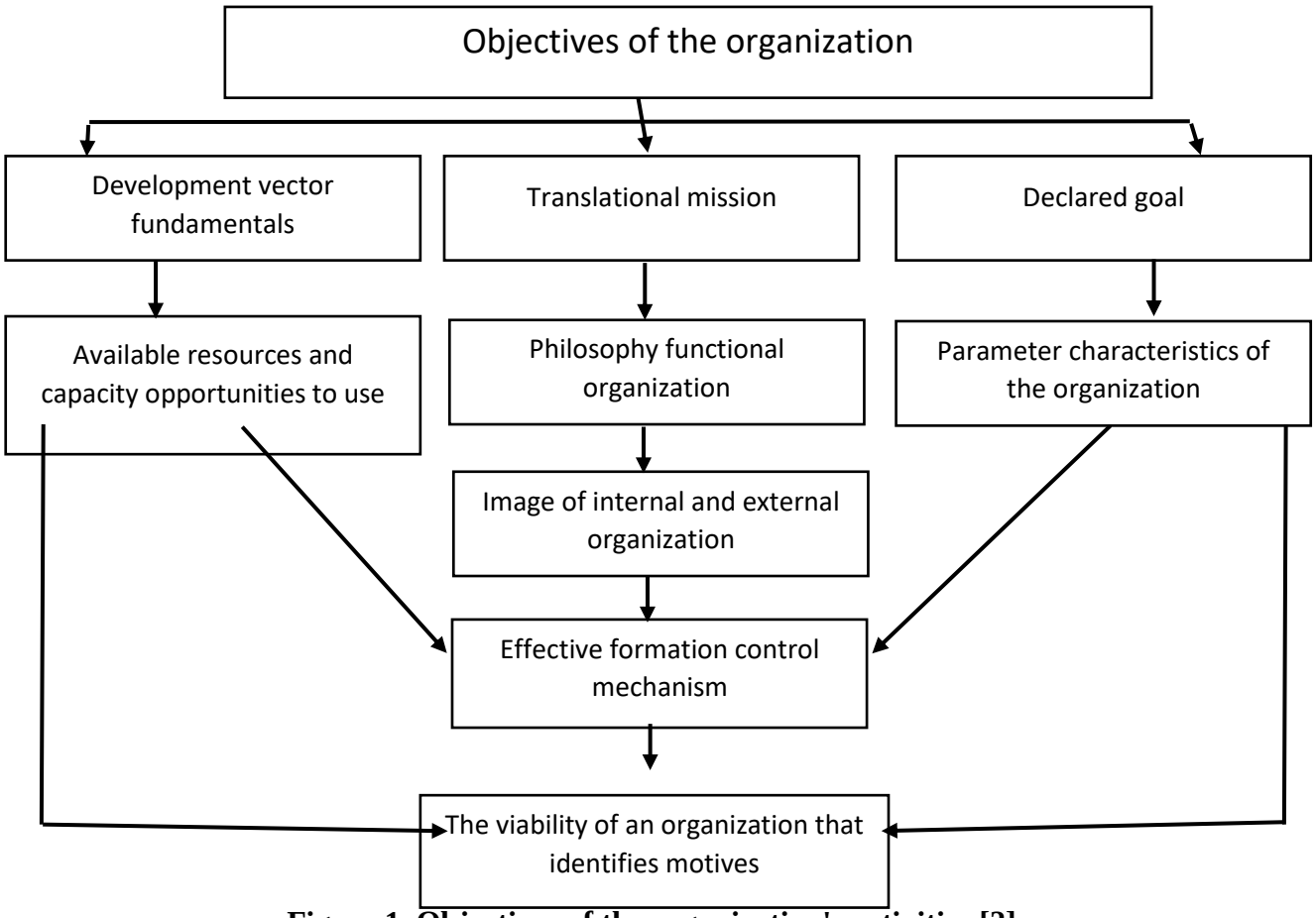

Figure 1. Objectives of the organization's activities [2].

If the organizational and economic system is aimed at introducing innovations, their impact on various functions of the organization may change, as well as the introduction of various innovations, in general, will not have the same effect on the organization and its activities. Thus, if financial engineering is carried out on time and reasonably, its impact will be positive and will be able to change the "type of life cycle" of the entire organizational structure. If the novelty is delayed (unlike competing organizations) or is not accepted by the market, all participants in interaction systems (partners, customers, intermediaries) the effect of its implementation is smoothed out or leads to losses due to costs that are not converted into added value.

Taking into account the different initial conditions of banks, their potential and opportunities for change in the digital environment, changes in the scope of the implementation of innovations also differ significantly, from small structures located in certain places of financial services to large ecosystem owners offering a wide range of banking and non-banking services.

In the process of modeling the process of introducing innavasion bank innovations based on financial injection in the conditions of the digital economy, possible options for banking specialization are presented in Figure 3 below.

The implementation of successful digital transformation in the format of modeling the process of introducing banking innovations in the banking services market, according to the above-mentioned main lines, in addition to the technological platform, it is necessary to carry out a number of organizational changes in the internal environment of the banking structure, as well as to work purposefully with representatives of the external Is to introduce banking innovation and take successive steps to implement it.

In this regard, a number of researchers correctly indicate the need for "internal flexibility" and the ability to work with partners in creating a digital business ecosystem, in this case in the banking

sector. The digital banking ecosystem refers to a single platform of solutions and communications based on the formation of cross-country channels.

Internal organizational changes are also relevant to the personnel potential of employees by attracting professionals in demand in promising areas for the bank due to the emergence of resources that are not directly related to digital technologies, but accumulated as a result of profit growth due to the introduction of digital innovation solutions. In such conditions, various organizations, including banks, tend to attract employees with a wide range of powers, which allows them to make a profit by introducing banking innovations in the context of digitization of the economy.

General directions of change in the internal and external environment of the bank, which are necessary for the full implementation of digital innovations in the banking sector. Banking can be expressed as follows (Figure 3).

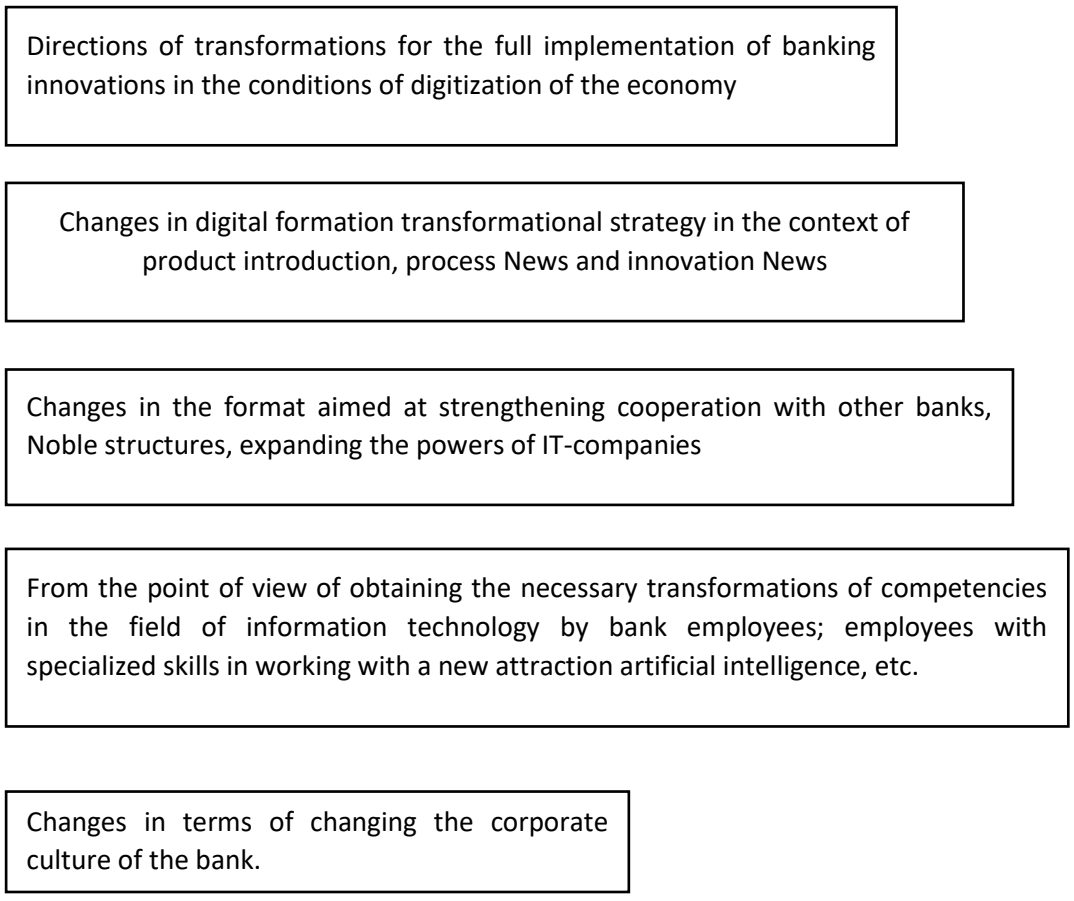

Figure 3-the banking environment necessary for the full implementation of the general directions of internal and external transformations of banking innovations in the conditions of digitization of the economy. [3]

It should be noted that the possibilities of modeling the process of introducing banking innovation in the digital economy include: product innovations, business model process implementation of innovations and innovations, that is, the construction of a business banking ecosystem, ideally embedded in one high-level ecosystem, can be efficiently implemented and will have to be developed on the basis of a cross-channel banking infrastructure.

Therefore, the process of introducing financial engineering banking innovations into the digital economy is based precisely on the successful development of cross-channel banking infrastructure, which allows you to form a banking ecosystem and adapt it to a high-level digital ecosystem.

In the digital banking ecosystem, the main parameter that ensures its uninterrupted and mutually beneficial operation allows transparency in the creation and provision of new products or services based on mutual trust, financial engineering. This means the need for a simultaneous transition to a single digital platform by all participants in a developing banking ecosystem based on the use of modern cross-channel banking infrastructure.

Depending on the technologies used in the creation and further implementation of modern banking products, it is advisable to divide the interconnected information infrastructure in a credit and financial organization into three main types.

Conclusion

Among the typical examples of the use of expanded and autonomous cross-channel banking infrastructure in the formation and implementation of innovations in banking activities, we can highlight the use of the following technologies:

- The practical application of robotic techniques in banking allows customers to use their capabilities to advise, collect cash and make decisions on their choice.
- Artificial intelligence technology, the use of which makes it possible to improve the quality of existing business processes in the bank and reduce operational costs and risks.
- A combination of customization technologies and artificial intelligence.

Over the past five years, commercial use of cross-channel banking infrastructure using artificial intelligence technologies has become widespread in the banking industry.

Banking innovations in product and process are actively implemented, but their application has been observed even earlier, and the digital transformation of all fields of activity and business processes is a new approach to the development of cross-channel banking infrastructure, which goes beyond interaction within the organization, which covers interbank infrastructure. The relationship of all divisions of the bank with the external environment, including customers, regulators, competitors, partners of their financial and non-financial environment is considered.

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