ORIGINAL PAPER

DOI: 10.26794/2587-5671-2023-27-2-76-86
UDC 336.7(045)
JEL G21, O30, O31

Assessment of the Characteristics, Scopes and Limits of the Application of Digital Innovations in the Financial Sector

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ABSTRACT

The overall degree of financial development of the State depends on innovative development of the financial sector. In this regard, it is important to conduct a comprehensive assessment of the characteristics, scopes and limits of the application of digital financial innovations both at the State level and at the global level, which determines **the relevance** of the research topic. **The aim** of the research is to develop an approach to assessment of the characteristics, scopes and limits of digital innovations in the financial sector and its approbation of the approach by the example of Russia. At the theoretical level, **the method** of literature analysis, abstraction and aggregation are used in the research. At the empirical level, **methods** of statistical, structural and coefficient analysis are applied. **The results** of the research in terms of the development of the theory of innovation in the financial sector are development of an approach to assessment of the characteristics and scope of digital innovation in the financial sector, to allow a comprehensive assessment of the development of financial innovation at the State level and comparison of the assessment results by country or with the world average values of the indicators proposed for assessment. The paper also proposes classifications of scopes and limits for the use of digital financial technologies, which allow for a qualitative analysis of the integrated development of financial innovations. Empirical research has allowed us to make **conclusions** about the accelerated development of the Russian financial technology market compared to the world average values based on the developed theoretical approach. At the same time, the problems of further development of financial innovations have been identified, namely, the low level of trust of the Russian population in small businesses in the field of financial technologies, limiting the inflow of foreign investment and narrowing the external market for the dissemination of Russian financial innovations in conditions of political instability. The following measures are proposed to solve these problems: improving the quality of education and improving the working conditions of specialists in the field of innovations, developing programs for concessional lending to small businesses in the field of financial technologies, and improving the financial literacy of the population as a consumer of innovative financial services.

Keywords: digital innovations; financial sector; financial technology risks; financial technology frontiers; financial literacy

For citation: **Zeleneva E.S. Assessment of the characteristics, scopes and limits of the application of digital innovations in the financial sector. *Finance: Theory and Practice*. 2023;27(2):76-86. (In Russ.). DOI: 10.26794/2587-5671-2023-27-2-76-86**

INTRODUCTION

Government financial development depends on the scale of the penetration of digital innovations into the financial sector. The authors use a variety of methods that consider the availability of financial services to the public and businesses when assessing the level of financial development in countries. [1–3]. This level of financial services availability is strongly influenced by the digitalization process [4]. Availability of financial services using the fintech-index is already assessed in the scientific literature [5]. In this regard, the role of digital innovation in the financial sector is significant.

However, the impact of digital technologies on the financial sector can be both positive and negative due to the formation of a number of risks and uneven development of financial industries. Moreover, the positive impact of digitization on the financial sector may be limited by external and domestic factors. All this indicates about the need to systematize and assess the characteristics, scope and limits of the application of digital technologies in the financial sector and determines the relevance of the research.

LITERATURE REVIEW

A unified approach to assessing the characteristics, scope and boundaries of digital innovation in the financial sector is not currently developed. However, the researchers dedicate

their paper to digital and financial innovation. These papers can be divided into three groups.

The first group focuses on the impact of digital financial innovation on macro and microeconomic indicators. J. Li and etc. [6] cite evidence that digital inclusive finance can stimulate household consumption. S.N.M. Daud and etc. [7] come to the conclusion that financial technology contributes to financial stability through artificial intelligence. P.K. Ozili [8] pays attention to the impact of the digitalization of the financial sector on the economic development of the government in its work. At the micro level, the impact of digitalization on the financial results of organizations studied by V.A. Cherkasova and G.A. Slepushenko [9]. Researchers provide evidence of the positive impact of digitalization on the operational companies' efficiency. A number of studies [10–12] prove that digitalization of financing has a significant impact on sustainable employment.

Summarizing the results of the analysis of the literature of the first group, it can be concluded that there is no unified understanding of the process of digitalization of the financial sector, market [6–8], digital availability of financial services [10], and digitalizing the economy as a whole [9, 11, 12] is analyzed to assess the impact of digital finance on economic performance. Need to develop a general approach to assessing the performance of digital innovation in the financial sector.

The second group includes research of digital development in various financial spheres.

Digitalization in the banking sector described by M. Jünger and M. Mietzner [13]. The authors prove that digital development of banking services is based on consumer confidence, their level of financial literacy, as well as transparency of fintech banking. V. Murinde and etc. [14] explore the possibility of replacing classic banks with fintech-startups. A. Boot and etc. [15] analyze possible directions of transformation of banking activity as digital technologies are implemented.

The evolution of the payment system in terms of digitalization is described by R.H. Salazar [16]. The author points to the need for proper regulation of the digital payment system from the government. A.L. Prete [17] has dedicated to research the relationship of digital payments with the financial and digital literacy of the population.

Q. Wang [18] analyses the impact of digital technologies on the insurance industry in its research and concludes that digitalization provides a solid basis for insurance industry supervision and development. S. Kaffash and etc. [19] are investigated the efficiency factors of insurance companies, which include innovative technologies.

The review of the second group shows that the authors analyze the degree of impact of innovative technologies on the development of the financial industry, but we do not find any papers on the question of the uneven digitalization of financial industries. Digital development of one financial industry makes it impossible to understand the general innovative financial development of government. Hence the need to develop an approach to assessing digital innovation in the financial sector.

The third group discusses the risks of introducing innovative technologies in the financial sector.

P. Yue and etc. [20] prove that digitalization of the financial sector multiplies the risks of households falling into the debt trap. About the security risks of digital payments wrote N. Shaw and etc. [21]. Country analysis conducted by researchers showed that privacy concerns and payment security risks vary as innovations develop depending on country. O. Akanfe and etc. [22] come to similar conclusions and provide recommendations for assessing privacy risks at the national level. The systemic risk of fintech-companies is investigated by S.M. Chaudhry and etc. [23]. The authors argue that the activities of fintech-companies are riskier than the activities of classical financial organizations, therefore, require strict regulation in order to minimize systemic risk.

The analysis of the third group of paper also shows a lack of a general approach to the

identification of financial technology risks. In addition, the authors do not pay attention to the limits of innovative technologies in the financial sector. Hence the importance and necessity of systematizing the risks of financial technology development, and defining the limits of innovation in the financial sector at both the macro and micro levels

Thus, a review of the literature shows that there is no general approach to the analysis of the characteristics, scope and limits of financial innovation at the macro level. These studies are aimed at analyzing the scope of application of innovative technologies in the financial industry, studying the characteristics and risks in the selected sphere. So, there is the problem of understanding the overall structure of digital technologies in the financial sector, its characteristics at the level of countries and limits of development. This allows us to conclude the need to systematize the characteristics, scope and limits of digital innovation in the financial sector, as well as the development of an approach to their evaluation.

ASSESSMENT OF APPLICATION THE FINANCIAL TECHNOLOGY

Digital innovation in the financial sector have led to a new fintech industry in the financial system of governments. Bank of Russia hold this position and describes the use of digital financial innovations by the term "Financial technologies" or "Fintech".[1] Analysts assess the financial technology market based on the total assets of fintech-companies. Thus, according to the forecast of Pichbuk,[2] by 2024 the global market of financial technologies will grow to 221 mln USD. It follows that volume of assets of the fintech market is a significant characteristic of its development.

The financial technology market is fast growing and innovative, and is developing through the inflow of foreign and domestic investment in the industry. Correlation analysis shows a direct, strong correlation of indicators of the volume of the Russian fintech-market and investments in it: correlation coefficient is 0.96. Consequently, the dynamics of investment in the fintech-market is also a characteristic of the general development of innovation in the financial sector on a government level.

In this regard, there are two main quantitative characteristics of the general development of the financial technologies' market on a government level: the volume of fintech-market, measured by the assets of the sector, and the volume of investment in the sector of financial technologies. These characteristics show the dynamics of the industry at the country level, but do not allow a comparison of the level of financial development of governments. Thus, we can calculate the relative indicators of the development of the fintech market, on the basis of which it is possible to measure the development of financial technologies of various countries, as well as to assess the level of development of the fintech market of government in comparison with the average world values, based on quantitative characteristics. We propose an approach to assess the characteristics of financial technology development based on the relative indicators given in the *Table*.

We propose a system of indicators that assess the volume markets of the financial technology and investment in the fintech-industry as% of GDP, which is the main indicator of economic growth on the government. Calculation of indicators relative to GDP allows to get economic coverage of the market of financial technologies. Comparison of the obtained indicators by countries and/or with world averages allows to assess the conformity of the level of development of financial technologies to the general economic development of the country.

To illustrate, let's make a calculation of proposed indicators for Russia and at the world level. Comparison of indicators for Russia with world indicators will allow to assess the characteristics of the Russian fintech-market

[1] Development of financial technologies. Bank of Russia: official website. URL: https://cbr.ru/fintech/ (accessed on 20.04.2022).

[2] Pitchbook. Analytics: official website. URL: https://pitchbook.com/news/reports/2021-annual-fintech-report (accessed on 20.04.2022).

Table

Relative Indicators for Assessing the Characteristics of the Development of the Financial Technology Market

The name of the indicator	Calculation formula
Economic coverage of the fintech-market, % of GDP	Fintech-market volume / GDP
Economic coverage of investment in the fintech-industry, % of GDP	Fintech- industry volume / GDP
Market share of government' financial technology in the world market	Government fintech-market volume / World fintech-market volume

Source: Compiled by the author.

in comparison with the world average in the dynamics (*Fig. 1, 2*).

As seen in *Fig. 1* and *Fig. 2*, the Russian market of financial technologies is growing faster than the global fintech market. In addition, the volume of investment in the sector of financial technologies in Russia is developing with more growth than the volume of the fintech-market. Thus, the economic coverage of the fintech market in Russia exceeded the economic coverage of the global market of financial technologies in 2016 by 7.8 times, and in 2020 — by 10.6 times. At the same time, the growth rate of the global fintech-market for five years remains at about 20%, while the growth rate of the Russian financial technology market more than doubled in five years, namely from 13 to 28%. Due to the high growth rate of the market of financial technologies in Russia, the Russian market share in the global fintech market is growing, which increased from 13.29 to 18.51% in 2016–2020.

Higher growth rates of the Russian fintech-market and increase in its share in the world can be associated with accelerated investment in the industry. Thus, the volume of investment in innovative financial technologies in Russia as a% of GDP in 2016 corresponded to the global average. At the same time, investments in the sector of financial technologies in Russia have been increasing annually and since 2017 are ahead of global investments, characterized by mixed dynamics. This helped accelerate the development of the Russian financial innovation sector.

However, despite the accelerated development of the fintech-industry, the Russian market share in the world as of 2020 is only 18.51%. Russia's fintech-market is not the largest, second to China (more than 40%) and the US (more than 47%).[3] To increase the share of the Russian market of financial technologies should contribute to investment in the fintech industry, as well as to improving the quality of IT-education, improving the working conditions of specialists in IT, increasing public confidence in financial technologies, improving the welfare of the population and the profitability of fintech services consumers.

Thus, indicators of the characteristics of the development of innovative technologies in the financial sector in Russia are increasing at an accelerated rate compared to the global average and significantly exceed them from 2017, which suggests a significant level of economic coverage of Russian financial technologies.

ASSESSMENT OF APPLICATION AREAS OF THE FINANCIAL TECHNOLOGY

Assessment of the characteristics of the development of the market of financial technologies allows to compare the overall level of development of this market with the values in other governments and global averages. A comparison of innovative financial development

[3] Market of innovative financial technologies and services — 2019. HSE. URL: https://dcenter.hse.ru/data/2019/12/09/1523584041/Рынок%20финансовых%20технологий-2019.pdf (accessed on 20.04.2022).

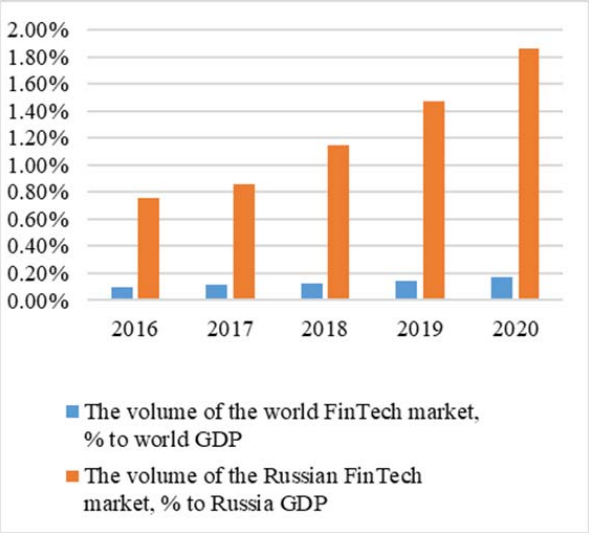

Fig. 1. **Economic Coverage of the Financial Technology Market in 2016–2020**

Source: Compiled by the author based on Pitchbook data. URL: https://pitchbook.com/news/reports/2021-annual-fintech-report (accessed on 20.04.2022).

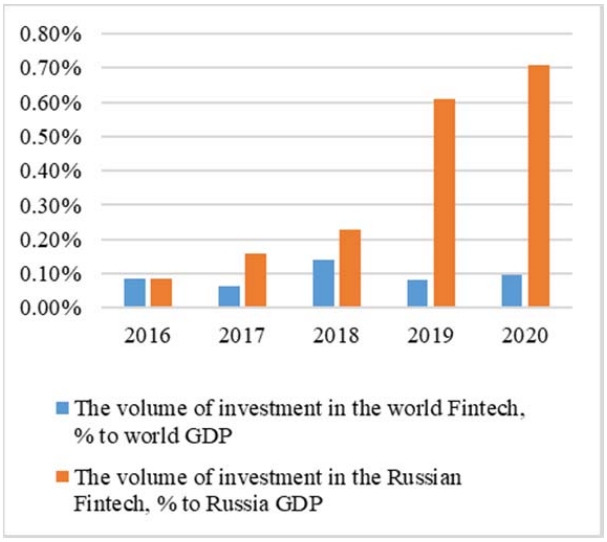

Fig. 2. **Economic Coverage of Investments in Financial Technologies in 2016–2020**

Source: Compiled by the author based on Pitchbook data. URL: https://pitchbook.com/news/reports/2021-annual-fintech-report (accessed on 20.04.2022).

of countries is possible not only on the basis of indicators of market characteristics, but also on the basis of an assessment of the development of innovative technologies in the financial sector.

Financial technologies are introduced in all sectors of the financial system of the state, so we provide a classification of the scope of innovation in the financial sector (*Fig. 3*).

Assessment of financial technology applications is possible using structural analysis of the fintech-market at the country and world level. Assessment of the application of innovative technologies in the financial sector will be carried out in order to compare the shares of the government from the share of the world and to identify the causes and factors of identified deviations.

Here is a structural analysis of existing fintech-services companies in Russia and the world, using statistics on the number of fintech-companies providing services in each area (*Fig. 4, 5*).

Figures 7 and *8* show that in Russia, as in the world, about 50% of fintech companies offer services for lending, asset management, payments and transfers. While the share of innovative lending in Russia is almost half less than in the world. Similarly, the share of banking in Russia is significantly lower than the global value. This is due to the high barriers to entry into the banking industry that have developed in Russia: more than 90% of assets of the banking sector are concentrated in the ten largest credit organizations, which have the highest level of public confidence.[4] The further development of small fintech business in the areas of credit and banking should be accompanied by an increase in the level of digital and financial literacy of the population of Russia, the development of legal regulation of the market of financial technologies, which helps to increase the level of trust of the public and business to Russian fintech-companies in the sphere of lending and banking.

In addition, it is necessary to develop the introduction of innovative technologies in the activities of Russian commercial banks, which have a high level of public and business confidence, and which are characterized by a large volume of assets for investment in the sector of financial technology. According to 2022 data, 60 fintech-companies provide high-

[4] Imaeva G.R., Aimaletdinov T.A., Sharova O.A. Russian financial services market // Sociologiya. Statistika.Publikatsii. Otrasleviye obzory. Vol. 8(12). NAFI Analytical center. Moscow: Publishers NAFI; 2017. 45 p.

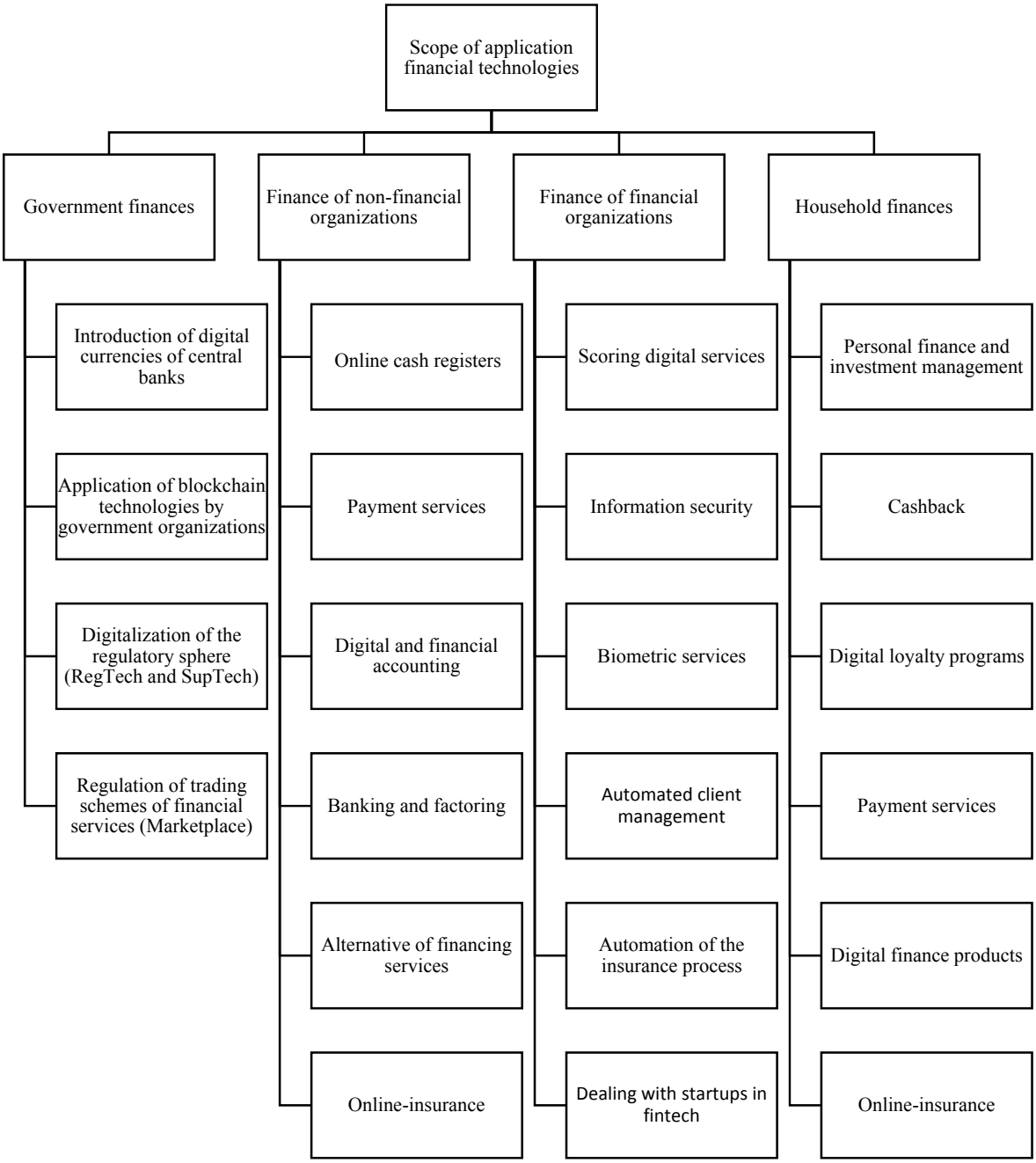

Fig. 3. **Scopes of Application of Digital Innovations in the Financial Sector**

Source: Compiled by the author based on data from the Bank of Russia and Rusbase. URL: https://cbr.ru/fintech/; URL: https://rb.ru/fintech-otkrytye-innovacii-v-bankah/#startlogo (accessed on 20.04.2022).

tech services for credit organizations in Russia, and 15 commercial banks actively cooperate with fintech-startups, providing them with additional financing, pilot site, sales channels and access to infrastructure.[5] Increase in the number of Russian banks interacting with fintech-companies may contribute to complete transition to digital banking model in Russia.

Application of high-tech services in the public finance sector can also have a positive impact on the overall financial development of the government. An important direction of innovative development of public finance is the

[5] Map of the Russian market FinTech. Rusbase: official website. URL: https://rb.ru/fintech-otkrytye-innovacii-v-bankah/#startlogo (accessed on 20.04.2022).

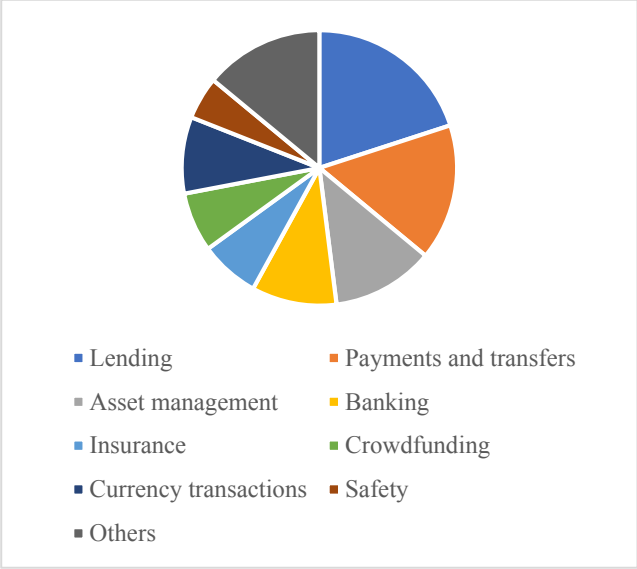

Fig. 4. **Distribution of Fintech Companies by Scopes of Innovative Services in the World**

Source: Compiled by the author based on data from the Higher School of Economics. URL: https://dcenter.hse.ru/data/2019/12/09/1523584041/Рынок%20финансовых%20технологий-2019.pdf (accessed on 20.04.2022).

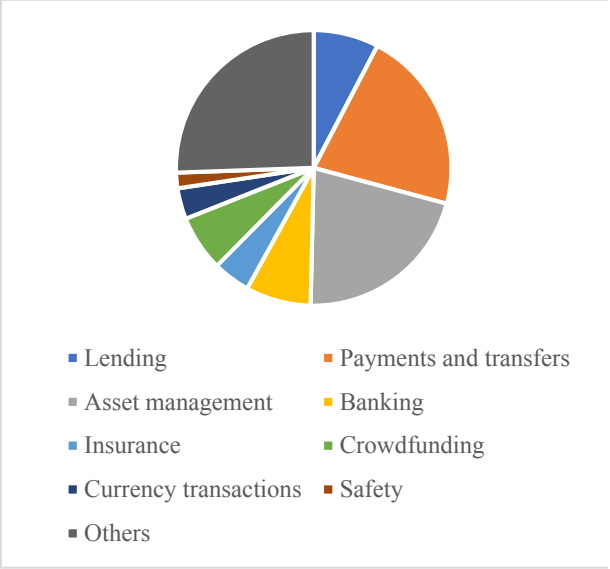

Fig. 5. **Distribution of fintech companies by Scopes of innovative services in Russia**

Source: Compiled by the author based on data from the Rusbase. URL: https://rb.ru/fintech-otkrytye-innovacii-v-bankah/#startlogo (accessed on 20.04.2022).

introduction of the digital currency of the central bank based on blockchain technology as a new form of money for the development of payment services and the emergence of new digital financial services. This will lead to increased competition in the financial technology industry and a significant improvement in the quality and cost of fintech services, as well as to overall digital development of the financial sector.

Blockchain technologies are used at the national level not only to create and use digital currencies of central banks, but also to automate the collection, storage and processing of big data in the field of government and municipal government. Automation of these processes allows to optimize the expenditures of the federal, regional and municipal budget on the government and municipal administration, that is, has a positive impact on the development of public finance.

In order to improve the quality of supervision and control over financial organizations, regulators use SupTech-solutions, which allow to automate and accelerate the process of analysis of compliance with regulatory requirements by financial market participants. At the same time, RegTech-solutions are used to simplify and automate the implementation of regulatory requirements by financial institutions. 6 SupTech- and RegTech-projects are already under implementation in Russia, and 7 projects are under development.[6]

Innovative technologies in the public finance sector are also used in the creation of marketplaces — platforms that unite retailers and consumers of financial services. Russian "Market Place" can contribute to the growth of competition in banking, credit, insurance, pension, investment markets, to reduce the costs of financial service providers, increase the benefits of their consumers, as well as automation and simplification of regulation of the financial system by the Bank of Russia.

THE LIMITS OF DIGITAL INNOVATION IN THE FINANCIAL SECTOR

The limits of innovative financial sector development are difficult to quantify, but it

[6] Development of financial technologies. Bank of Russia: official website. URL: https://cbr.ru/fintech/ (accessed on 20.04.2022).

is possible to make qualitative assessments by identifying trends in the expansion or narrowing of these limits. On the basis of the described trends, it is possible to emphasize further directions of development of financial technologies. While financial technology boundaries are not described or classified in the literature, we propose author's classification of microeconomic and macroeconomic limits (*Fig. 6*).

The microeconomic limits of innovation in the financial sector exist at the level of fintech companies and financial institutions implementing innovative technologies. Macroeconomic boundaries may arise from insufficient regulation of innovation by financial companies, with limited domestic investment in the financial technology industry.

Ehe development of the Russian fintech industry in 2022 faced political and economic sanctions from unfriendly governments, which limit the external market for the spread of Russian financial technologies, and reduce the flow of foreign investment in innovation to the Russian financial sector. External limits also hinder the general economic development of Russia, with a narrowing impact on the internal limits of the development of financial technologies. Thus, according to Bank of Russia forecasts in 2022, as a result of the sanctions, the decline in GDP may be 8–10%.[7] This, in turn, can lead to reduced consumer welfare for fintech-services. On the other hand, as a result of the economic sanctions, there is an outflow of foreign competitors from the Russian market of financial innovations, which leads to an increase in domestic demand for fintech-services of domestic companies and can contribute to the expansion of internal limits of Russian financial technologies in the long-term, provided that further investment in the industry.

It is important to note the expansion of the macroeconomic boundaries of financial innovations represented by the level of training of fintech-specialists. Since 2017, Russian universities develop and implement educational programs for the training of fintech-specialists. In addition, professional standards "Specialist in information (cyber) security" and "Specialist in the field of financial technologies",[8] are developed, which are necessary for the expanded launch of university fintech-programs.

Thus, despite the foreign policy and foreign economic constraints, in Russia there is an expansion of the macro- and microeconomic limits of the development of innovative technologies in the financial sector. This positive trend will continue in the future provided that further investment in the fintech-industry and the development of the education system of fintech-specialists.

CONCLUSION

Development of innovative technologies in the financial sector is a significant factor of financial development of the government. In order to identify the directions of further development of the fintech market, it is important to assess the characteristics, scope and limits of financial technologies. In the result of the study provides quantitative indicators of the characteristics of the application of financial innovations, taking into account the volume of fintech market in the government and the volume of investments in the development of financial technologies. Based on the proposed indicators, an assessment of the development of the Russian fintech market in comparison with the global average. The results of the analysis showed the accelerated development of financial technologies in Russia and the existence of prospects for development through increased investment in financial technology, improving the quality of education of fintech specialists and improving working conditions, as well as improving the welfare of the population and the profitability of industries — consumers of fintech services.

[7] Statement by the Chairman of the Bank of Russia E. Nabiullina on the results of the meeting of the Board of Directors of the Bank of Russia on 29 April 2022. Bank of Russia. URL: https://cbr.ru/press/event/?id=12857 (accessed on 20.04.2022).

[8] Market of innovative financial technologies and services — 2019. HSE. URL: https://dcenter.hse.ru/data/2019/12/09/1523584041/Рынок%20финансовых%20технологий-2019.pdf (accessed on 20.04.2022).

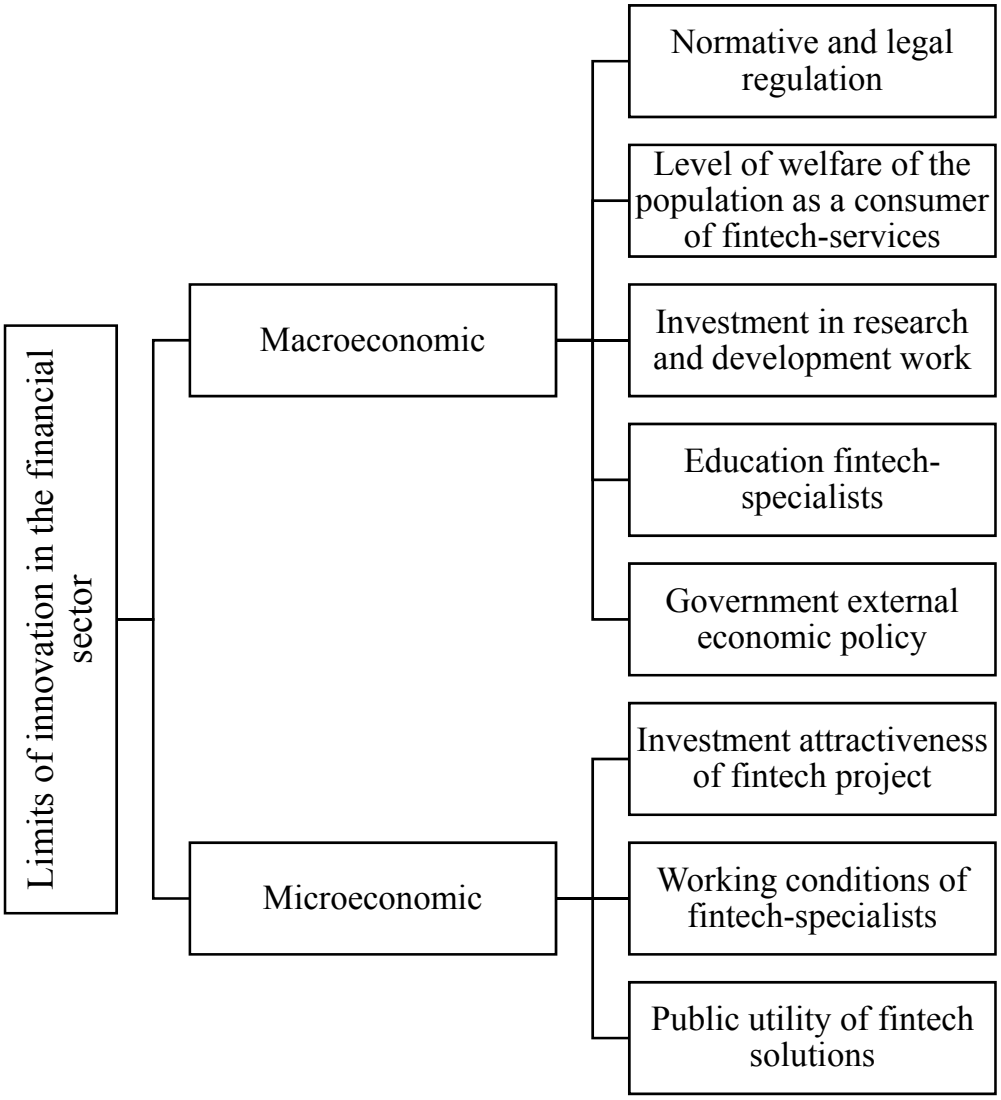

Fig. 6. **Classification of the Limits of Innovation in the Financial Sector**

Source: Compiled by the author.

The paper also systematizes the scope of application of innovative technologies based on the sectors of the financial system of the state, which represents the theoretical importance. It is proposed to conduct structural analysis of the industry and identify significant deviations from the structure of the global market of financial technologies to assess the selected areas of innovation in the financial sector. This analysis allows assessing the causes of structural deviations in the development of financial technologies in the government from global trends. Approbation of the approach on the data for Russia has revealed the problem of insufficient development of competition in the field of banking and credit financial technologies. As a solution to this problem is considered the need to further increase the financial literacy of the population of Russia and the development of legal regulation of the sector of financial technologies in order to increase confidence in fintech-startups.

As a result of researches, the limits of financial innovation are classified, which can only be assessed at a qualitative level by identifying the trends of narrowing or expanding the limits considered in the classification. Qualitative analysis of the limits of financial technologies in Russia showed prospects of expanding the limits of financial innovations, despite political

instability. This expansion will be facilitated by the inflow of domestic investment and an increase in the level of education of fintech-specialists.

In the framework of development of the flow of investment in financial technologies, the Bank of Russia should continue to develop programmes of preferential lending of innovative financial projects together with the Ministry of Economic Development and the Small and Medium-Sized Enterprise Corporation. It is also recommended to expand the list of fintech-services whose projects can be implemented in regulatory "sandboxes", in order to increase the confidence of potential investors to these projects.

To implement the direction of improving the quality of training of fintech-specialists it is necessary to increase the number of target places in the leading universities of the country in training programs related to financial technologies and data analysis. In order to retrain skilled IT-specialists and financiers, it is recommended to develop additional professional education programs in terms of increasing their accessibility to potential listeners and practical applicability. It is recommended to create a unified Russian platform of courses on financial technologies, similar to the platform "Marketplace", which will unite courses of universities and organizations of additional professional education. Use of this platform will simplify the search for the required course, will allow comparing the cost of programs and learning conditions. It will also contribute to competition in the market of financial technology courses, which should improve their quality.

Thus, the study is of theoretical and practical significance in assessing the characteristics, scope and limits of innovation in the financial sector and identifying problems and solutions regarding the further development of financial technologies at the national level.

ACKNOWLEDGEMENTS

The article is based on the results of the research carried out at the expense of the budgetary funds under the state assignment of the Financial University. Financial University, Moscow, Russia.

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Conflicts of Interest Statement: The author has no conflicts of interest to declare.

The article was submitted on 24.05.2022; revised on 27.06.2022 and accepted for publication on 27.01.2023. The author read and approved the final version of the manuscript.