

# The financial technologies transformation in the digital economy

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**Abstract.** The fourth industrial revolution is changing the technological face of the economy. Digital technologies are especially widespread in it. They affect all areas of the economy. These changes require in-depth research. The purpose of the article is to analyze financial technologies considered as a factor in the development of the financial sector in the digital economy. To achieve this goal, methods of institutional, retrospective and comparative analysis, modeling and forecasting were used. As a result of the research, theoretical approaches to the study of digital financial technologies have been systematized; perspective areas of their application are considered; the prerequisites, factors and risks of their application in the financial sector are determined. The main trend in the considered area is the intensification of competition between banks and IT companies, which makes it necessary for banks to change the traditional banking business model. Banks will transform into IT companies. And IT companies will penetrate deeper into the financial sector using fintech start-ups. It is expected that the convergence of these sectors of the economy will increase, which will lead to the formation of new integral industries based on digital and platform fintech technologies. Comprehensive support for the development of new digital financial technologies is needed. The tools of such support are support for the creation and implementation of digital financial innovations, stimulation of digital start-ups, support for companies in the implementation of digital financial technologies, the formation of a digital market, etc.

## 1 Introduction

The modern economy is at the stage of digital development. The rapid development of digital technologies has led to the emergence of the phenomenon of the "digital economy" [1, 2, 3, 4, 5, 6, 7, 8], which is a consequence of the "fourth technological revolution" [9, 10]. Digital transformations affect all areas of economic and social activity [11, 12, 13, 14, 15, 16, 17, 18, 19]: production, logistics, marketing, services, public administration, etc. Given that the financial and real sectors are closely linked in the economy, progress in the digitalization of these sectors must be synchronized.

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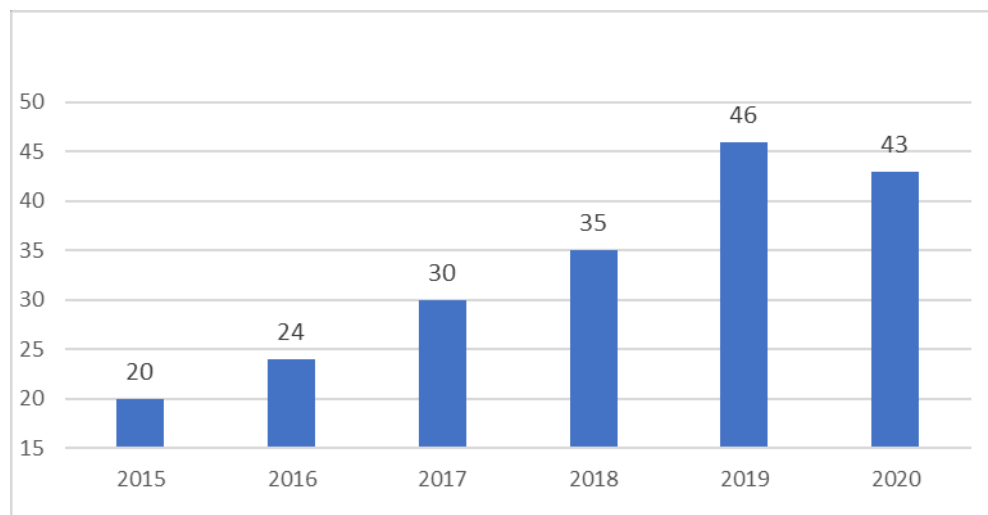
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Due to the virtualization of modern finance, fintech companies are actively developing. Their activity does not just use digital technologies, as it happens in the real sector of the economy or in traditional banks but is completely based on them. The virtual nature of finance contributes to its accelerated digitalization. The processes under consideration are uneven. This is due to their high novelty and innovativeness. In this regard, a scientific analysis of financial technologies, considered as a factor in the development of the financial sector in the digital economy, is needed.

## 2 Materials and Methods

The modern economic system is based on the circulation of commodity and cash flows between participants in market relations. This movement is carried out within the financial sector, mediating the distribution and use of funds at the level of the state, firms and households. At the current stage of economic development, global changes are taking place in the financial sector. They are associated with the use of modern digital technologies. These technologies allow regulating financial flows without using intermediaries. This makes transactions faster and cheaper. Rapid development and integration of diverse services are shaping the financial ecosystem.

The pace of transformation in the financial sector is evidenced by data on investments in financial technologies in Russia (Figure 1). In the period 2015-2019, the volume of investments ( $I$ ) is described by the linear equation  $I = 6.3 \times \text{Year} + 12.1$  ( $R^2 = 0.9633$ ). That is, on average, investments in fintech have grown by \$12.1 billion annually over the course of five years. In 2020, there was a recession caused by a general decline in economic activity and the global crisis. The cause of this crisis is the pandemic of the new coronavirus infection COVID-19. After overcoming the crisis, one can expect a recovery in the growth of this indicator.



**Fig. 1.** Investments in financial technologies in Russia, billion US dollars. Compiled by Vardomatskya and Kuznetsova.

Investments in the fintech sector bring tangible annual income - about 20% on the invested capital (see: <https://www.statista.com/statistics/751455/expected-roi-on-fintech-projects-among-financial-institutions-by-region>). Therefore, not only banks, but also

various other investors are actively investing in fintech. IT companies are very active. Banks are interested in cooperation with IT companies for several reasons:

- This collaboration influences their ability to adapt to structural changes in the financial sector.
- The activation of IT companies in the financial market increases the threat of banks losing their client base and income because of the outflow of users to IT companies. IT companies show more flexibility in working with clients, since in their activities they are not constrained by the regulator to the same extent as banks.
- Due to new technological developments, IT companies provide a high level of cybersecurity.

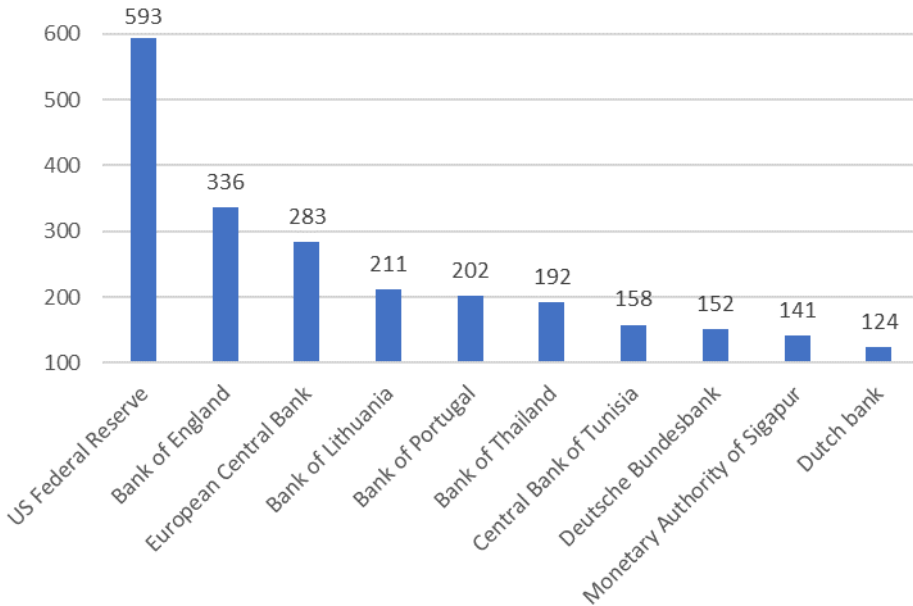
New digital financial technologies are used in various market segments. The most common of them are: mobile acquiring, replacing traditional POS terminals for plastic cards; non-bank lending and microfinance through the use of mobile phones; money transfers and online trading; applications that help manage personal finances and conduct electronic accounting in the field of small businesses; sales management using digital marketing; digital insurance services and crowdfunding; e-wallets, debit and credit cards; scoring platforms used to assess investment risk; distributed ledger technology (blockchain), thanks to which transactions become transparent, are carried out instantly, shortening in time and covering any distance. In the financial sector, blockchain technology is used for transfers and payments, cybersecurity, and ensuring high liquidity of assets.

For example, Le Banque de France successfully tested the central bank digital currency (CBDC) in a pilot project with the placement of tokenized shares of a foreign exchange fund worth more than € 2 million. The regulator used a private blockchain platform for this for the first time. The project started on December 17, 2020. As part of the experiment, investors bought and sold shares of a foreign exchange fund on the blockchain of the British company SETL. Calculations were made in digital currency issued using DLT technology.

The experiment required the development and implementation of smart contracts that ensured the issuance and control of the CBDC, as well as the transfer of digital currency simultaneously with the supply of tokenized shares to the investor's portfolio. This project was attended by the insurance group Groupama, financial conglomerate Citigroup, bank Caceis, asset manager OFI AM, blockchain project IZNES and IT company DXC. This experiment reflects tremendous progress in evaluating the instruments that the digital currency of the Central Bank provides to improve the efficiency and sustainability of the settlement of financial assets in the blockchain environment and thereby contributes to the successful functioning of the real economy.

Analysis of publications by central banks (and other similar central monetary regulators) revealed interest in blockchain technology. In a study by the analytical company Mindsmith (January 2021) [20], a semantic analysis of publications of 191 central banks was carried out. Researchers have identified interest in blockchain technology among 127 (74%) regulators, they mentioned it in their official publications 4408 times (Figure 2). And many of them are taking concrete actions for this. In aggregate, central banks, to one degree or another interested in blockchain technology, serve 67% of the world's population and the respective countries account for about 75% of world GDP. The main areas of blockchain application by central banks:

- Retail CBDC and wholesale CBDC.
- Interbank settlement of securities.
- Mechanism to ensure the stability of the payment system.
- Issue and life cycle management of bonds.
- KYC and AML procedures; data exchange platforms.



**Fig. 2.** Top-10 national financial regulators (by the number of the blockchain technology mentions on the official website). Source: [20].

The possibilities of blockchain technology are vast, today it is used not only in the public, but also in the private sphere. Blockchain technologies make it possible to ensure transparency of financial flows, more affordable access to markets not only for large but medium and small enterprises, increase the rate of turnover of financial assets, increase the efficiency of transactions, and counteract fraud.

Thus, it becomes possible to transfer the main operating financial systems to the blockchain technology platform. The use of digital financial technologies can reduce paperwork and reduce transaction costs for banks. This is confirmed by the following data: the costs of banks associated with the opening and maintenance of accounts are reduced by 67-75%; by issuing cash by 40-60%, transferring money saves banks 90-95% of their previous expenses [21].

### 3 Results and Discussion

The review of digital technologies shows that they are becoming inseparable from each other in the provision of many financial services. The increasingly widespread use of modern financial technologies means an accelerating retreat from traditional forms of financial relations and a transition to such elements of the digital economy as: cryptographic encryption of transmitted information, the use of devices for systematizing and analysing Big Data, the use of mathematical algorithms in the Internet of Things, etc. fields of the digital economy due to the use of digital financial technologies, the share of the traditional economy tends to decline.

The digital economy of the financial sector is a virtual or modified economy operating through fintech, which is based on one of the fundamental Economic Laws - the law of saving time. Saving time in the financial sector comes down to intensifying processes based on accelerating innovation processes, saving time at all stages of transactions. The main factor in the intensification of financial services is the growth of labor productivity. It can

be expressed by the number of transactions per unit of time, or by the amount of time spent on the production of one transaction.

An increase in the productivity of social labour is expressed in a reduction in the total cost of labour per worker, or per unit of product. With the rapid development and implementation of new achievements of fintech, the speed of transactions is increasing, the range of financial products sold on fintech platforms and services becomes more diverse. In this case, high-performance equipment is used, which increases the return on assets. Under these conditions, the share of past labour consumed increases, and the amount of living labour decreases, which is characteristic of the stage of production development, in which manual labour is actively replaced by machine labour. That is, from a theoretical point of view, *during the period of the Fourth Industrial Revolution, the industrialization of the financial sector of the economy is taking place.*

Intensification based on the high speed of transactions, dramatically reduces labour costs, it is the main factor in increasing the efficiency of the financial sector. The practical significance of this theoretical conclusion lies in the fact that in conditions of relative scarcity of resources, based on saving labour costs, economic resources are released that can be used in other sectors of the national economy. The law of saving time extends its effect not only to working hours, but also partially to non-working hours. By fulfilling various household duties that are outside the formal economy, fintech users reduce the cost of non-working time, using it with greater comfort and convenience. As a result, the share of leisure in the general fund of public time increases, which is a true value, an indicator of the growth of the quality of life and can be used for the all-round development of the individual.

Thus, the use of financial technologies is accompanied by a reduction in the time to produce financial services, an increase in non-working and free time. This brings benefits to both society and business and individuals (households). In addition to this factor, there are other prerequisites for the introduction of digital technologies in the financial sector. In particular:

- Technological transformations of the information economy, based on new computing paradigms, have led to the formation of a new stage in the development of the economy - the digital economy, one of the main elements of which is technologies that operate with cryptography.
- The predominance of classical instruments for the provision of financial services came into conflict with the main trends in the development of the economy, with its digitalization.
- The entry into the financial market of new players, namely IT companies offering users new, more convenient tools for obtaining services, has caused a situation that encourages banks to use digital technologies. If the banks don't, they will play in competition.

Digital technologies in the new economy are becoming the main economic factor of production, which can radically transform economic ties, minimizing human participation in them. Thus, the Internet of Things, which is a collection of physical objects interconnected by a computer network and equipped with built-in software and hardware modules that allow them to interact with themselves and with the outside world, is used in various areas of the economy. It is estimated that the Internet of Things connects about 26 billion devices, and the turnover of the Internet economy reaches 9 trillion US dollars (see: <https://attivonetworks.com/gartner-says-the-internet-of-things-installed-base-will-grow-to-26-billion-units-by-2020>).

The ongoing changes in the economy make it necessary to change the approaches to the selection and traditional content of financial services and the way they are provided. The

prerequisites for digital reform of the financial sector formed certain factors that accelerated this process:

- Increase in the level of profitability of the financial sector due to the use of digital financial instruments in the provision of services.
- Expansion of the range of financial products provided and simplification of their availability for residents of small towns, villages, rural settlements, persons with disabilities.
- In the face of heightened competition with IT companies for a client base and income, banks faced the need to change their business models, the main component of which is fintech, through which the transformation of traditional financial institutions into IT companies is taking place. Banks and IT companies are experiencing convergence.
- The need to ensure the country's competitiveness in the world market in the development and application of digital technologies. Digitalization has made the financial market global. Countries that do not pay enough attention to the digital transformation of the economy are doomed to technological lag.
- High level of return on capital invested in fintech, transparency of financial transactions. But these circumstances are offset by a high level of risk.

The analysis shows that in the coming years, the digital financial services market will develop under the influence of the following technological factors [22]:

- Expanding the field of the digital financial economy, which will accelerate the transformation of traditional financial institutions into IT companies, which are new businesses.
- Most of the services will be provided digitally. This will lead to a gradual increase in the share of the digital financial economy over the traditional one. Ultimately, the digital financial economy will dominate.
- The main element of the financial infrastructure will be a public cloud, featuring a wide range of financial services and personal data of a huge number of clients, which can be used to analyse the volume of revenue, profit margins and other indicators.
- With the development and introduction of new technologies to the market, the risks of cyber fraud will increase, and therefore the regulator will fully extend its functions to financial IT companies.

These factors indicate that the digital financial services market has significant growth potential. In the next few years, we can expect that: more than half of banking customers will use mobile applications; more than 82% of financial institutions will cooperate with IT companies or build their activities on a new business model, which means their transformation into IT companies; more than 50% of companies will digitally transform their business [23].

## 4 Conclusion

In the era of the digital revolution and the fourth industrial revolution, the development of the fintech industry is a priority. This industry is of great importance because contributes to the growth of well-being and socio-economic progress. In this regard, comprehensive support for the development of new digital financial technologies is needed. The tools of such support are support for the creation and implementation of digital financial innovations, stimulation of digital start-ups, support for companies in the implementation of digital financial technologies, the formation of a digital market, etc.

From a business standpoint, the use of digital technologies and their development lead to a reduction in costs and an increase in the level of profitability, better adaptation to market demands. In this regard, in the near future it is possible to predict the acceleration of

the implementation of Artificial Intelligence, as well as other digital technologies, which, along with Big Data, will be used to analyse consumer preferences, enhance cybersecurity, and improve the efficiency of both traditional and digital financial companies.

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