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## **FINANCIAL TECHNOLOGIES' IMPACT ON THE DEVELOPMENT OF BANKING**

**Abstract.** The development of financial technologies, so-called FinTech, has fundamentally changed the architecture of the modern financial services market, significantly affecting the role of banks in it. These changes determine the need of new approaches for the market behavior of both banks (to maintain competitive positions) and regulators (in order to prevent potential crisis phenomena).

It is substantiated that at the present stage of development of financial-credit intermediation, determinants of competitive behavior of banks are nonconventional factors such as a degree of freedom to enter the market, an information asymmetry, a level of services and marketing support, an emergence of electronic channels for banking products' distribution, the development of electronic payment systems and transfers of other banking information.

It is investigated main approaches to the definition of financial technologies (FinTech). It is justified the necessity of distinguishing this concept and the FinTech segment, it is proposed to define financial technologies in the narrow sense as the provision of financial services by non-banking institutions using modern information technologies, which is rationalizing the analysis of the FinTech's role in the banking.

In the article it is identified and characterized external (caused by the objective development of society and fundamental changes in the banks' environment) and internal (caused by the need of maintaining the competitive positions by banks) factors of financial technologies' development.

It is proved that the FinTech's impact on banking is determined by changes in the structure of the financial services market, a decrease in barriers to entry the market, and an increase of its spatial coverage. The development of FinTech leads to lower costs and higher efficiency of banks, increased competition in the banking environment, reduced information asymmetry, increased financial inclusion, but at the same time leads to the generation of new financial and technological risks for banks.

**Keywords:** banking, blockchain, competition, financial market, FinTech, innovations, non-bank financial institution, risk.

**JEL Classification** G10, G21, G23

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## **ВПЛИВ ФІНАНСОВИХ ТЕХНОЛОГІЙ НА РОЗВИТОК БАНКІВСЬКОГО БІЗНЕСУ**

**Анотація.** Розвиток фінансових технологій, або «FinTech», докорінно змінив архітектуру сучасного ринку фінансових послуг, суттєво вплинув на роль банків на ньому. Ці зміни обумовлюють необхідність нових підходів до ринкової поведінки як банків (для збереження конкурентних позицій), так і регуляторів (з метою запобігання потенційним кризовим явищам).

Обґрунтовано, що на сучасному етапі розвитку фінансово-кредитного посередництва детермінантами конкурентної поведінки банків стають нетрадиційні фактори, такі як ступінь свободи виходу на ринок, інформаційна асиметрія, рівень сервісу та маркетингового забезпечення, поява електронних каналів дистрибуції банківських продуктів, розвиток систем електронних платежів та передавання іншої банківської інформації.

Досліджено основні підходи до визначення поняття «фінансові технології» (FinTech). Обґрунтовано необхідність розмежування цього поняття та сегмента FinTech, запропоновано визначати фінансові технології у вузькому сенсі як надання фінансових послуг небанківськими інститутами із використанням сучасних інформаційних технологій, що сприяє раціоналізації аналізу ролі FinTech у банківському бізнесі.

Виокремлено та охарактеризовано екстернальні (зумовлені об'єктивним розвитком суспільства і докорінними змінами середовища функціонування банків) та інтернальні (зумовлені необхідністю збереження банками конкурентних позицій) чинники розвитку фінансових технологій.

Доведено, що вплив FinTech на банківський бізнес визначається змінами у структурі ринку фінансових послуг, зменшенням бар'єрів для вступу на ринок, збільшенням його просторового охоплення. Розвиток FinTech призводить до зменшення витрат і підвищення ефективності діяльності банків, посилення конкуренції в банківському середовищі, зменшення інформаційної асиметрії, підвищення фінансової інклюзії клієнтів, однак, разом з тим, призводить до генерації нових фінансових і технологічних ризиків для банків.

**Ключові слова:** банківський бізнес, інновації, конкуренція, небанківські фінансові інститути, ризик, фінансові технології, фінансовий ринок, блокчейн.

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## **ВЛИЯНИЕ ФИНАНСОВЫХ ТЕХНОЛОГИЙ НА РАЗВИТИЕ БАНКОВСКОГО БИЗНЕСА**

**Аннотация.** Развитие финансовых технологий, иначе «FinTech», коренным образом изменило архитектуру современного финансового рынка, существенно повлияло на роль банков на рынке и обусловило необходимость поиска новых подходов к рыночному поведению банков. Проанализированы существующие взгляды на определение FinTech, предложена дефиниция, позволяющая рационализировать оценку влияния FinTech на банковский бизнес. Определены экстернальные и интернальные факторы развития FinTech.

Обосновано, что влияние FinTech на банковский бизнес определяется изменениями в структуре рынка финансовых услуг, снижением барьеров входа на рынок, расширением его пространственного охвата. Развитие FinTech приводит к повышению эффективности деятельности банков, усилению уровня конкуренции в банковском секторе, уменьшению

уровня информационной асимметрии, повышению финансовой инклюзии, однако и к генерации новых финансовых и технологических рисков для банков.

**Ключевые слова:** банковский бизнес, инновации, конкуренция, небанковские финансовые институты, риск, финансовые технологии, финансовый рынок, блокчейн.

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**Introduction.** In recent years, the financial technologies' sector is acquiring an ever more rapid rate of development, significantly deforming the traditional architecture of national and global financial markets, and influencing on the role of banks as traditional financial intermediaries. Evidences of that are: the volume of investments in the specified sector, the number of implemented start-ups, and so on (e.g., in 2015 about \$ 19 bn. were invested in the development of FinTech, and in 2016 this amount increased 4 times, reaching \$ 88 bn.).

The proliferation of financial technologies has fundamentally changed the architecture of the financial services market, shifting the emphasis in the role of traditional financial institutions, and, accordingly, requiring new approaches and new solutions for banks (in the area of variable the existing business models in rapidly changing conditions) and for regulators (regarding the search for new approaches to control and oversight) in order to avoid or mitigate potential crisis phenomena and accumulated systemic risks.

**Analysis of research and problem statement.** Theoretical aspects of the formation and functioning of financial technologies, as well as their influence on modern banking, are researched in the works of such scientists as F. Allen, J. McAndrews and P. Strahan [1], J. Barberis and S. Chishti [2], R. Bons, R. Alt, H. Lee and B. Weber [3], G. Karcheva [4], V. Kovalenko [5], N. Morozko [6], P. Schueffel [7], L. Zherdetska [8] and others. Nevertheless, these authors often differ in their understanding of the essence of financial technologies and the character of their influence on the financial market — therefore, their research is full of contradictions and mutually exclusive methods for solving this problem.

Therefore, the proposed **article aims** to formalize the consistent concept of financial technologies and their role in modern banking.

**Research results.** In recent decades, the global financial system underwent significant changes due to various factors, among which the main ones are: the market globalization, the development of information and communication technologies, the liberalization of financial markets and their deregulation. These changes have led to the complete transformation of the financial environment — and as a result, to the growth of the level of uncertainty in which economic entities are operating.

The classic view on the banking sector (or the banking services market) implies that it is a heterogeneous oligopoly (a competitive structure dominated by several suppliers providing a heterogeneous product). However, the experience of post-crisis years shows that attempts to evaluate the oligopolistic influence of participants on the banking services market most often prove something else — the existence of monopolistic competition. The structure of modern banking now appears at an unusual angle: the competitive behavior of banks does not necessarily depend on the number of competitors in the market or their concentration. The key determinants of bank behavior are «non-conventional» factors, which can be divided into two groups, depending on the place of their rise.

There for the traditional market factors include freedom to enter the market [9], information asymmetry, number of branches (and the possibility of their free opening) and level of service and marketing support [10]. In the technological sphere, however, the fundamental importance has: the electronic banking, so called «scale effect» (the impact of the number of banks in the market on weighted average costs), the development level of electronic payment systems, credit bureaus and the emergence of FinTech.

Gaining increasing popularity in banking circles, this term lost more and more of its original meaning, acquiring new features under the influence of banking protocols and procedures. Important note is that in the scientific literature the term FinTech currently still does not have a

unite definition due to the fact that it is used to denote processes that are in terms of rapid development and constant transformations [11].

For example, Pricewaterhouse Coopers LLP uses the concept of FinTech to define a segment in which «the intersection of financial services and technologies» occurs, and which can be applied to start-ups, technology companies or even traditional service providers [12]. P. Schueffel, researched over two hundred scientific papers published over the past forty years, means under FinTech a new financial industry that uses technology to improve financial performance [7]. The Basel Committee on Banking Supervision defines FinTech as synonymous with technological innovation in financial services in its working papers. The definition proposed by the Financial Sustainability Committee (FSB) working group also applies in parallel: FinTech is a technologically provide financial innovation that can lead to the emergence of new business models, applications, processes or products that will have a significant impact on financial markets and institutions and the provision of financial services [13].

If in these cases it is told about the use of technological innovations in the financial sphere, L. Zherdetska indicates the subjects of these innovations — the so-called «FinTech start-ups», which use the combination of technology, customer-centric service and flexible business structures to reduce costs, expanding customer base and market share growth [8]. It can be argued, however, that in recent times banks are introducing an increasing number of innovative products and services that, by their nature, match the above definition: they are using technological advances aimed to improve financial services. This necessitates the division of the research subject into two components: the influence of FinTech on the development of banking (in fact or in content — of introduced technologies) and the influence of non-bank FinTech-entities on the structure of the financial services market.

Therefore, it is expedient to define FinTech as the provision of financial services (traditional or fundamentally new) by non-bank institutions using modern information technologies, which separate the concepts of «financial technologies» and «FinTech sector» for a rational consideration of the role of banks in it. This approach allows to focus on two components of banking transformation under the influence of FinTech: endogenous changes (concerning the internal business models of banks, namely the need of applying innovative development models) and exogenous changes (the emergence of new, de iure non-banking, but de facto financial competitors, which leads to the need of transformation of external business models of banks).

The path of FinTech's development is largely determined by the reasons that triggered the emergence of this concept. The results of the analysis of previous studies allow to identify two groups of factors that initiated the development of the sector.

The group of externalities (external to banks and other financial intermediaries) include factors arising from the development of objective processes in society, the appearance of which fundamentally changed the environment in which financial institutions operate, i.e.:

1) the development of information technologies, in particular the speed of processing and transmitting information, the use of new software, etc.;

2) the significant reduction of cost for used technologies, including a reduction in the level of technical and cost barriers to the enter the technology market;

3) the loss by banks due to the 2008 crisis confidence of banking services' consumers, which led to the desire to «bypass» banks in financial intermediation;

4) the increasing the technological inclusion of the population (use of the Internet, mobiles, smartphones and other gadgets), first in developed countries, and then in developing ones.

Among the internal factors, the following should be noted:

1) the need of reducing the cost of maintaining traditional business models to ensure an acceptable rate of profit for owners and investors;

2) the use of innovations to circumvent stricter regulatory standards;

3) the need of satisfying the increasing needs of users in the speed, diversity and costs of provided services;

- 4) increasing demands of consumers of financial services in connection with the penetration of non-financial companies, in particular GAF A (Google, Apple, Facebook and Amazon);
- 5) the active use by regulators the financial innovations that increase macro-financial stability [14].

The analysis of the subject of the study should be carried out taking into account the classification of the development directions of FinTech (*Tabl.*).

Table

Sectors of innovative services [11]

Sectorial innovations			
Credit, deposit and capital-raising services	Payments, clearing and settlement services		Investment management services
	Retail	Wholesale	
Crowd-funding	Mobile wallets	Value transfer networks	High-frequency trading
Lending marketplaces	Peer-to-peer transfers	FX wholesale	Copy trading
Mobile banks	Digital currencies	Digital exchange platforms	E-trading
Credit scoring			Robo-advise
Market support service	Portal and data aggregators		
	Ecosystems (infrastructure, open source, APIs)		
	Data applications (big data analysis, machine learning, predictive modeling)		
	Distributed ledger technology (blockchain, smart contracts)		
	Security (customer identification and authentication)		
	Cloud computing		
	Internet of things / mobile technology		
	Artificial intelligence (bots, automation in finance, algorithms)		

Almost all FinTech directions intersect banking operations in one way or another: some of them are substitutes for traditional services (e.g., crowd-funding, credit marketplaces, P2P lending) and with some or other rate can use and are used by banks. The modern banking sector is an intensive user of innovative technologies: in particular, it is financial institutions occupy the largest share of IT-technologies users in USA [15]. Such technologies, called e-finance, boil down to the provision of banking services through electronic communication channels [1]. There are several such channels, for example, FinTech «in the narrow sense» — automated call centers, ATMs, Internet and mobile banking.

Innovations in financial engineering, information technologies and telecommunications influence the competitive behavior of banks within existing market structures. One of the examples of such technologies that have become familiar are ATMs. They serve as an alternative to creating expensive branch nets, which, as already mentioned, are perceived as a barrier for enter the market due to high maintenance costs. An ATM network is a cheaper form of physical distribution channel for basic banking services, which reduces the associated costs and facilitates market access. From the point of view of influence on competition, the expansion of the ATM network gives similar results with the expansion of the branch network — an increase in the spatial coverage of competition. In addition, with the introduction of the results of technical progress, the range of services provided to the client through an ATM has increased significantly over the past decade.

An alternative to expanding the ATM network is remote banking [16]. Due to technical progress in the field of information technologies and telecommunications, this form of service has the advantages of using both for a client and for a bank. A banking service provider improves efficiency by reducing fixed costs and economies of scale, gets a simple and cheap channel to inform a large group of customers, and has the ability to gather valuable information about customers to personalize the offer of new services. In turn, a consumer of banking services at the

expense of reducing intermediate costs (fare) and direct payments (fees and commissions) perceives the offer as more profitable in terms of prices, and thanks to absolute availability (24 hours a day, seven days a week) a client gets the ability to continuously monitor the status of his accounts, as well as ease of access without waiting in lines or even leaving home.

Finally, the last form of remote service is the mobile banking. The proliferation of smartphones and tablets with Internet access prompted banks to use this distribution channel, especially since customers using mobile devices interact with the bank 3.5 times more often than users of traditional Internet banking [3]. Researches show a growing interest of banking service providers in this channel of distribution of services: in 2013, 45% of banks stated that mobile banking is a priority channel, and 63% of banks believe that it will not lose its relevance over the next decade [17]. Like more online banking, mobile banking has become an alternative channel for distributing of banking services.

Thus, competition through the branch network ceases to be a source of market power for banks, since technological progress leads to the fact that the proximity of a bank branch ceases to be the most important selection criterion for a client. As a result, the significant shift towards e-banking can cause a transition from spatial to price competition, and this always has a positive effect for the industry.

The role of modern IT solutions is currently shifted from supporting business processes to supporting operations [18]. In other words, technological innovation is an indispensable feature of modern banking. The technologies, however, are available to all banks, regardless of their size. Smaller banks can simply order specialized services to support websites. In the literature on this issue, has been proven a positive relation between the use of the Internet and the increase risks carried by banks [19].

One of multiply examples of such innovations for securing operations is the blockchain — a multifunctional and multi-level information technology designed to reliably account for various assets. Thanks to its economic, political, humanitarian and legal advantages, the blockchain has been transformed into a powerful subversive innovation that can fundamentally change most part of aspects of society's functioning. Practical application of the use this technology conditionally possible in three areas:

- 1) emission mechanism: generation of crypt-currencies used in various applications and substituting money, for example, in systems of electronic transfers and payments;

- 2) contracts: whole classes of economic, market and financial applications, which are based on the blockchain, work with different types of financial instruments — stocks, bonds, futures, mortgages, legal titles, smart assets and smart contracts;

- 3) applications, the sphere of which is beyond the transactions, finance and markets: they apply to the areas of public administration, health, science, education, culture and art.

The use of blockchain technology in banking also has real advantages. One of the products used by leading international banks to implement the payment of contracts in foreign trade is a documentary letter of credit — a written commitment by the importer's bank to pay the exporter's accounts receivable in exchange for the provision of documents representing goods. A letter of credit guarantees the availability of funds and the safety of their receipt, thereby reducing the risk of collection and the risk of payment by the exporter, since the latter receives payment when submitting documents in accordance with a letter of credit. An importer, on the other hand, can significantly reduce its product risk and quality risk by requiring the inclusion of a detailed specification for purchased goods in documents.

However, the limitation of a letter of credit is the need for the exchange of physical documents and the participation of intermediaries, which lengthens the process, increases costs and puts risks on risks. Using the blockchain protocol allows to register transactions between an exporter and an importer as so-called smart contract, i.e. legal relations created, controlled and implemented automatically using this protocol.

This means that the fulfillment of terms of a contract and the authentication by a decentralized registry automatically starts the steps included in the contract (for example, it releases

funds in the importer's bank and transfers them to the exporter's account). This eliminates the need to transfer documents, which is replaced by storing key parameters as data in blocks (*Fig.*). The transaction is carried out automatically — therefore, faster, cheaper and reducing the risk of errors, delays or fraud, while maintaining the main advantages of a letter of credit, such as guarantee of funds and their payment by the importer's bank. The transaction is stored in a block that cannot be modified or rewritten, so it is protected.

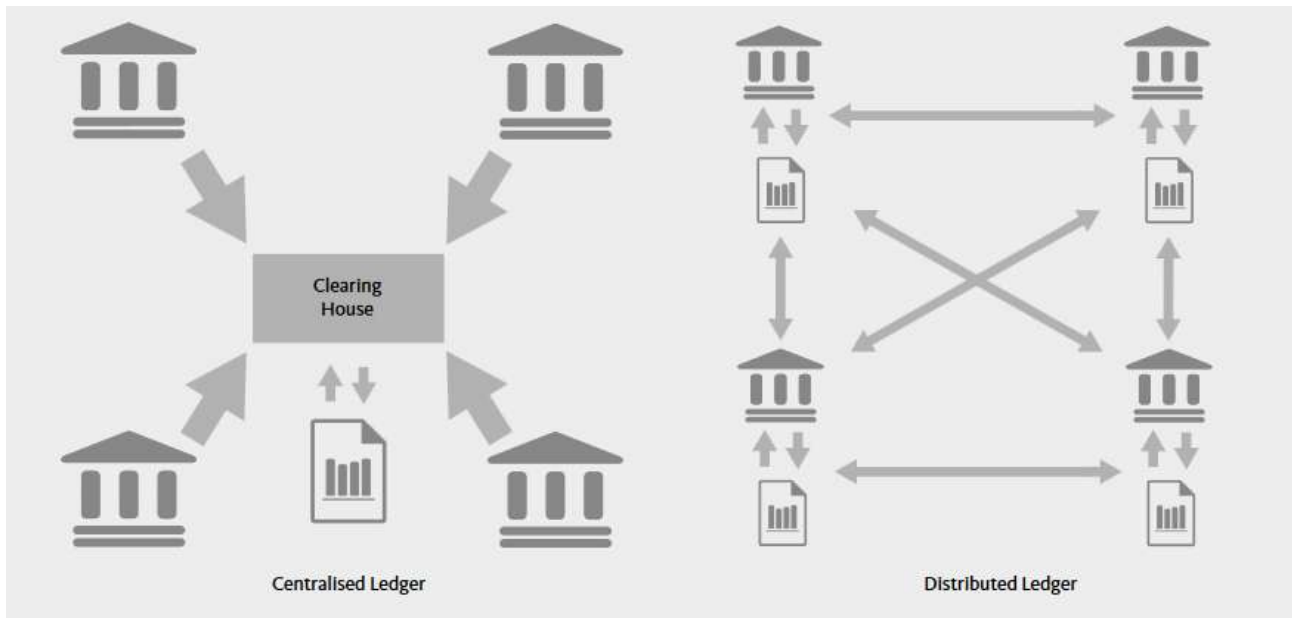


Fig. Distinction of centralized and decentralized (blockchain) interbank payment system [20]

Information technologies implemented by banks contribute to the «virtualization» of the banking services market [21]: a bank transforms traditional operations with cash into electronic payments, and paper certificates, promotions and consultations at the branch into its digital alternatives, replacing physical trading platforms with electronic markets [3]. The early introduction of new technologies by large banks and the outsourcing of Internet technologies by small but competitive banks lead to increased interbank cooperation and reduced competition.

The use of new technologies provides important and easily measurable results, such as electronic payments, remote banking operations or ATM networks. It is difficult to assess the impact of some innovations, for example, the exchange of information. The implications of introducing financial technologies also depend on their use strategy. In the front-office sphere, banks, as a rule, use a mixed approach consisting in combining the existing service channels (physical access to the branch) with new ones (Internet, smartphone), which meets the expectations of both traditionalists and clients open to technical innovations. Back-office technologies, which are formally less important for customer service, are being introduced more decisively due to the «scale effect».

Thus, based on the above analysis, it can be stated that the further progress of FinTech will have a significant impact on the development of the banking. The use of FinTech, of course, provides banks with new opportunities, but at the same time — with new risks that banks will have to care of and manage. In general, Fintech reduce costs, increase banking efficiency and competitive banking environment, reduce information asymmetry and increase access to financial services.

At the same time, Fintech poses a potential threat to the financial system. First of all, it concerns issues related to the protection of the rights of consumers of financial services and investors, the need for FinTech's legal regulation, the adequacy of existing financial protection systems, including the functions of lenders of last instance of central banks and potential threats to financial integrity.

**Conclusions.** Financial technologies affect the banking mainly through changes in the market structure: they reduce barriers of entry to the market and increase its spatial coverage. The strength of this influence depends on the appearance of the same innovations, but also on the spread of these innovations in the market. The banking services market is also affected by competition from non-banking financial institutions, including FinTech companies. They have financial assets, i.e. property obligations of other organizations, and meet the same or similar needs as banks. Thus, banks operate under conditions of enhanced competition, and in order to maintain a competitive advantage, it is necessary to offer services that compete with insurance companies, investment funds or other para-bank institutions, as well as with the rapidly growing FinTech sector.

If initially Fintech was an alternative and a threat to traditional banking, now the introduction of these innovations in the banking market is so significant that banks began to conquer the situation and compete with Fintech companies. Because of their financial strength, banks acquire that entities, which is preserving and further increasing the attractiveness of financial technologies for market subjects.

The declining role of classical financial intermediation in the banking sector today can only be countered by radical consolidation. Mergers and acquisitions of banks in order to increase their market share will free up the full potential of the «economies of scale», and this, in turn, will give banks the opportunity to compete with FinTech not only in the field of innovative business processes, but the usual way for banks — price competition.

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