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**ASSESSMENT OF THE IMPACT OF  
BLOCKCHAIN TECHNOLOGIES ON  
FINANCIAL INSTITUTIONS IN BULGARIA –  
PROBLEMS, TRENDS AND SOLUTIONS**

**ABSTRACT**

of a dissertation for the award of the educational and scientific degree "Doctor"  
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Scientific advisor:  
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The dissertation consists of 170 pages: title page, table of contents, introduction, main text, bibliography, appendices. Structurally, the work includes an introduction, an exposition in three chapters and a conclusion. In support of the exposition, 27 figures and one table are provided.

The dissertation was discussed and directed for defense in accordance with the Law on the Development of the Academic Staff of the Department of Finance and Credit at the D. A. Tsenov Academy of Economics at a meeting held on 27.06.23.

The open meeting of the scientific jury for the defense of the dissertation will take place on 14.01.2025 at 13.30 in the Conference Hall "Rectorate" of the Academy of Economics "Dimitar A. Tsenov" - Svishtov.

The materials for the defense are available to those interested in the Department of Doctoral Studies and Academic Development of the Academy of Economics "Dimitar A. Tsenov" - Svishtov.

# I. GENERAL CHARACTERISTICS OF THE DISSERTATION

## 1. Relevance of the research topic

The relevance of the topic is provoked by the great interest of financial institutions in financial applications of blockchain technologies in the economy, the dynamic development of fintech companies and the possibilities for establishing adequate regulations in the financial sector.

## 2. Object and subject of the study

The subject of the dissertation is blockchain technologies with their features and the advantages they provide to financial institutions, and the subject of the research is the possibilities for using blockchain technologies in the financial sector in our country.

## 3. Research thesis, goal and objectives of the dissertation

*The research thesis* of this dissertation can be formulated as follows: the transparency of blockchain and its provision of higher efficiency and security at a lower cost will lead to a revolution in payment processing and easy access to financial resources.

In connection with proving this thesis, we will research and analyze several working hypotheses to find a reasoned choice of the most appropriate solution for financial institutions in Bulgaria regarding the use of blockchain technologies in the provision of rational financial services.

With the object, subject and author's thesis thus presented, the **main goal** of the dissertation work is set: to reveal the extent of the impact and the challenges that blockchain technologies present with their entry into the financial sector in Bulgaria.

To achieve this **goal**, we also set the following tasks in our study:

1. Research of leading theoretical propositions for determining the essence and characteristics of blockchain technology;
2. Study of the main problems and solutions in the application of blockchain technologies;
3. Research of possible effective regulations in the use of blockchain technologies;
4. Challenges facing fintech companies in financing with alternative methods;

5. Impact of blockchain technologies and fintech models on the financial sector.

#### **4. Research methodology**

In methodological terms, the development is based on several basic scientific **research methods**: analysis and synthesis; abstraction and generalization; induction and deduction; classification of scientific research. The study will also apply the so-called grounded theory, which represents a systematic research method. It leads to the emergence of theories in the process of scientific data collection. Comparative analysis is also used to outline the characteristics and distinctive features of both the theoretical and practical aspects of the impact of blockchain technologies on credit institutions in Bulgaria. In proving the working hypotheses, SWOT analysis and a simulation mathematical model based on a questionnaire survey, field research, statistical tools - SPSS, Excel, PP are applied. To illustrate the results and achieve better clarity, tables and graphical images are included in the study.

#### **5. Limitations of the study**

Outside the scope of the study remain topics related to the possibility of effective application of blockchain technologies in other sectors of the economy, outside of financial institutions.

#### **6. Approbation of the dissertation work**

The dissertation work was discussed at a meeting of the Department of Finance and Credit at the D. A. Tsenov Academy of Economics - Svishtov. Two articles and one report have been published on the topic of the dissertation in specialized scientific publications.

## **II. STRUCTURE AND CONTENT OF THE DISSERTATION**

The dissertation work has been developed in compliance with the requirements of the Regulations for the Implementation of the Law on the Development of Academic Staff in the Republic of Bulgaria. It consists of an introduction, an exposition in three chapters, a conclusion, a bibliography and appendices. The research has been developed in a volume of 165 standard pages, of which 125 pages are the main text and 39 pages are appendices. The main text of the research presents 1 table and 25 figures. At the end of the work, 5 appendices are presented. The bibliographic reference contains 71 sources, including 11 from the scientific school of the Finance Department, a total of 22 in Bulgarian, 39 in a foreign language and 10 electronic sources.

Specifically, the dissertation is structured as follows:

## **Table of Contents**

### **Introduction**

#### **Chapter One Characteristics of Blockchain Technologies and Cryptoassets.**

1. Blockchain – Essence, Evolution, Challenges.
2. Evolution from Cryptoassets to Cryptocurrencies.
3. Blockchain Technology and the Direction for Solving Regulatory Challenges in Financial Institutions.

#### **Chapter Two Fintech Companies – Essence, Role, Regulation and Financing.**

1. Characteristics of Fintech Companies.
2. The Impact of Blockchain Technologies on Financing Fintech Companies.
3. Regulations on the Use of Blockchain Technologies in the Fintech Sector.

#### **Chapter Three Effects of Financial Applications of Blockchain Technologies.**

1. Blockchain Technologies and Security of Financial Transactions.
2. Embedded Payments and Innovative Solutions in the Fintech Sector.
3. Challenges Facing the Financial Sector in Adopting Blockchain Technologies.

### **Conclusion**

### **Literature Cited and Used**

### **Appendices**

## **III. SHORT SUMMARY OF THE DISSERTATION**

### **INTRODUCTION**

The introduction of the dissertation outlines the relevance of the topic, the object and subject of the dissertation work, formulates the research thesis and sets the main goal and objectives. The limitations of the study are indicated.

### **FIRST. CHARACTERISTICS OF BLOCKCHAIN TECHNOLOGIES AND CRYPTO-ASSETS**

#### **Blockchain – essence, evolution, challeng**

In the modern world, blockchain technologies occupy an increasingly important place in the digital economy. Their constantly growing popularity, widespread application and their ability to generate financial values make them a

target for research, development and adaptation in academic and corporate environments. On their basis, large business projects are increasingly being implemented through digital payments, smart contracts and database and record management. (Ammous, 2016). "To understand the power of blockchain systems and the things they can do, it is important to distinguish between three things that are usually confused, namely the Bitcoin currency, the specific blockchain that underlies it, and the idea of blockchains in general. (Leaders, 2015)"

Blockchain technology itself is based on the concept of a decentralized database (distributed ledger technology, DLT<sup>1</sup>), which databases are located on multiple computer systems and each copy of the data is the same. (Sarmah S. S., 2018, p. 24) When a transaction is made, it is recorded as a "block" of data. These transactions contain information about the movement of an asset (it can be tangible or intangible). Each block is linked to those before and after it. The blocks form a chain of data, and when an asset moves from place to place or changes ownership, then the blocks confirm the exact time and sequence of transactions. All blocks are securely linked together to prevent any block from being changed or a block from being inserted between two existing ones. (What is blockchain technology?, 2022)

The blockchain architecture consists of three main elements: applications, distributed ledger (DLT), and peer-to-peer network. Applications are the top layer of the architecture, followed by the distributed ledger, and at the bottom is the peer-to-peer network. (Sarmah S. S., 2018, p. 24) All participants in the network have access to the distributed ledger and its immutable record of transactions. With this shared ledger, transactions are recorded only once, eliminating the duplication that is typical of traditional business networks.

Blockchain technology is generally based on two concepts (Braun-Dubler N., Gier H.-P., Bulatnikova T., Langhart M., Merki M., Roth F., 2020, p. 64):

- The continuous validation of transaction data, their completion in blocks at regular intervals of time and their cryptographic connection in a continuously growing chain. The cryptographic connection helps ensure that a given transaction cannot be changed without redirecting all blocks added to the chain after the changed transaction. This is the process of "chaining" the blocks (forming a sequential record of information), from which the term "blockchain technology" is derived.

- Blockchain data replication<sup>2</sup> in a set of different computers. The computers that participate in the blockchain chain are called nodes. A consensus protocol built into the blockchain software ensures that blockchain data is synchronized between nodes. The more nodes that participate, the more difficult

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<sup>1</sup> DLT – Distributed Ledger Technology – a decentralized database that is managed by multiple participants. In other words, a blockchain is stored in a ledger where data is recorded and stored, and this ledger is accessible to everyone but is immutable. This makes it safe and secure.

<sup>2</sup> Replication is a process in which data is recorded and stored on separate servers, but by managing the information flow, the results are systematized on a central server.

it becomes to tamper with the data, which is why the technology is also referred to as distributed ledger technology.

Of essential importance for this dissertation is the clarification of the essence of blockchain technologies and the study of their impact on financial institutions.

According to Melanie Swan, founder of the Blockchain Institute, blockchain technology is “a network software protocol that provides a reliable way to transfer money, assets, and information over the Internet, without the need for an intermediary, such as a bank” (Swan, 2017, p. 6).

Don and Alex Tapscott, in their book “The Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World” (Don Tapscott and Alex Tapscott, 2016), describe blockchain as “a second-generation part of the Internet that has the potential to transform finance, business, government, and society.” According to them, blockchain is “a secure platform, ledger, or database where buyers and sellers can store and exchange value without the need for traditional intermediaries.” (Don Tapscott and Alex Tapscott, 2017)

Blockchain technology is “a distributed, peer-to-peer database of every transaction that does not require a central authority or third-party intermediaries in the network for programming” (Chen, 2018).

A blockchain is “a ledger containing information that tracks the creation and transfer of Bitcoins, much like bank ledgers track payments between bank accounts” (K. Low and E. Teo, 2017).

Blockchain technology can also be described as “a type of distributed electronic database (ledger) that can contain any information (e.g., records, events, transactions) and can set rules for how that information is updated” (Sikorski, Janusz J. & Houghton, Joy & Kraft, Markus, 2017).

According to Seyfedin Amus, “the first effective application of blockchain technology to date is Bitcoin. The most frequently heralded potential applications of blockchain technology – payments, asset registers – can work to the extent that they use the decentralized currency of the blockchain. No blockchain without a currency has moved from the prototype phase to commercial use” (Amus, 2020, p. 356).

In the financial literature, we can find many more definitions of blockchain technology. According to the study by E. Garcia-Barriocanal (García-Barriocanal, E., Sánchez-Alonso, S., Sicilia, M.-A., 2017), “blockchain technology is a data structure that falls under the category of decentralized database architectures, relying on cryptographic techniques and distributed consensus to provide protection against tampering of distributed ledgers.”

According to another definition by M. Janssen (Janssen, M., Weerakkody, V., Ismagilova, E., Sivarajah, U., Irani, Z., 2020), blockchain technology is a carrier of trust, anonymity, security and integrity of data, without using third parties as controlling authorities.

In the scientific discussion of blockchain technology in our country, we will share the opinion of D. Petrov (Petrov, 2018, p. 25), who says that “the functional essence of blockchain technology can be described as a shared digital register, with identical copies maintained on multiple computers, controlled by different users”. Assoc. Prof. Dr. N. Filipova (Filipova, 2018) says that “Blockchain is one of the possible forms of the distributed register. This is a data structure for organizing distributed information while ensuring its integrity and confidentiality.”

### **Blockchain technology and the direction for solving regulatory challenges for financial institutions.**

The analysis presented in this section is a continuation and addition to the analysis made by the author in the article “New Opportunities for the Development of the FinTech Sector through the Regulatory Sandbox Regime” (Milinova, 2021).

The extreme development of technology is changing not only the financial industry, but also the way it is regulated and the legal provisions that are adopted. In the fintech group, a new section is emerging, the so-called Regulatory Technology (RegTech). While at first the focus was on customers, and how quickly, easily and cheaply to provide services, recently companies have increasingly turned their attention to other important aspects, namely the regulation of innovations.

The Financial Conduct Authority (FCA) in the UK defines RegTech as “the application of new technologies to facilitate the implementation of regulatory guidelines”. The Institute of International Finance (IIF) defines RegTech as “the use of technology to address regulatory issues and to improve compliance with financial innovation.”

Other definitions of RegTech can be cited, but they all refer to the idea of regulatory technology bringing regulatory compliance to the risk management of new financial innovations. It focuses on technology-based solutions to alleviate or resolve regulatory and supervisory hurdles that accompany the FinTech industry.

The regulatory regime surrounding the various applications of blockchain technologies, including cryptocurrencies and crypto-assets, is not clearly defined and ranges from a complete ban in some countries to jurisdictions where it is legally protected. Currently, there is no single regulatory framework in place for digital assets, and the development of such a standard is associated with many challenges.



Regarding the need to introduce a single regulatory regime, we will highlight the most important aspects of the report by the American-Canadian company Thomson Reuters, which in mid-2021 published a study on the regulations of digital assets based on blockchain technologies in different countries. In this report, Todd Ehrt and Susannah Hammond point out that the Canadian Securities Administrators (CSA) recently issued a “Guide to the Application of Securities Laws to Entities Facilitating the Trading of Crypto-Assets.” It describes that companies involved in trading crypto assets must be registered with the Financial Transactions and Reports Analysis Centre of Canada (FINTRAC). According to Canadian law, trading in digital assets/currencies is a money services business and therefore falls under the authority of the Anti-Money Laundering Act. Canada is one of many countries that is trying to introduce the best measures to serve and control the fintech sector, including trading in crypto assets based on blockchain. In 2018, with the adoption of the Financial Technology Institutions Regulation Act, Mexico became one of the first countries to introduce legislative provisions on fintech and blockchain technologies. The law aims to offer a regulatory sandbox regime, both for traditional fintech companies and for blockchain-based solutions for experimentation, including new methods of raising capital and financing. In 2019, the Mexican Financial Stability Council began to pursue a more reactionary policy towards cryptocurrencies. Thus, in 2021, the main financial regulators in Mexico adopted the following directives: virtual assets are not legal tender in Mexico and are not accepted as currencies under current legislation; financial institutions may, with the prior approval of the Mexican Central Bank, enter into transactions with virtual assets that correspond to this activity. Mexico's proximity to the United States favors the development of cryptocurrencies and access to blockchain technologies. And although the population's access to the Internet and telecommunications devices is severely limited, cryptocurrencies may prove decisive in providing financing to a population where only 40% have bank accounts. According to a study by Global Legal Insights (a leading company in the field of specialized legal analysis) in Mexico, there is no official definition of cryptocurrencies, and the following explanation has been introduced for virtual assets: "virtual assets are a representation of value recorded electronically and used by society as a method of payment, and its transfer can only be carried out by electronic means."

Thus, in Mexico, the use of virtual assets is subject to regulation by the Fintech Law and by the provisions set forth in the Federal Law for the Prevention and Identification of Operations with Resources of Illegal Origin (Ley federal para la prevención e identificación de operaciones con recursos de procedencia ilícita – LFPIORPI).

There are differing opinions on how blockchain technology should be regulated in the United States, according to the Treasury Department, the

Securities and Exchange Commission (SEC), the Federal Trade Commission (FTC), including the Commodity Futures Trading Commission (CFTC), the Internal Revenue Service (IRS), and the Bureau of Financial Crimes Enforcement Network (FinCEN). Under current U.S. law, cryptoassets will be simultaneously recognized as: currency by the Financial Crimes Enforcement Network, property by the Internal Revenue Service, and commodities by the Commodity Futures Trading Commission. Thus, each of these agencies will not only introduce its own definition of cryptoassets, but transactions with them will also be subject to multiple regulations, many of which will not always be consistent. (Goforth, 2019, p. 107)

At the same time, if an agency has proposed a number of legislative measures, they may be administratively objective for all market participants. For example, what should be the reaction of the Securities and Exchange Commission (SEC) if there are diverse requests from Exchange Traded Funds (ETFs) that will operate with cryptocurrencies. ETFs are essentially open-ended funds, the shares of which are traded on stock exchanges. They allow investors to buy a “basket of securities” through a brokerage firm on a stock exchange. Various analysts believe that crypto ETFs are “critical to legitimizing crypto trading.” Unfortunately for investors, the Securities and Exchange Commission has so far refused to approve such a crypto ETF, rejecting several Bitcoin ETF applications to date. The commission’s position is that the proposals pose too great a risk of market manipulation. (Young, 2021)

After the Financial Action Task Force (FATF) published guidelines on cryptocurrencies in June 2019, the Financial Crimes Commission (FinCEN) said it would propose a new rule for crypto exchanges — the so-called Travel Rule , which would require financial institutions to collect data and maintain records on certain cryptocurrency transactions and beneficiaries.

In 2021, the Biden administration turned its attention to stablecoins in an effort to address the threat of token inflation. Later that year, the President’s Task Force on Financial Markets issued a series of recommendations that included the need for new legislation. Congress then considered the status of cryptocurrency providers in 2021, with the new ones being included in the Biden administration’s infrastructure bill. Under the new regulations, cryptocurrency exchanges are considered brokers and must comply with the relevant reporting and recordkeeping obligations under the Anti-Money Laundering and Anti-Terrorism Financing Regulations. (Cryptocurrency Regulations Around The World, 2022)

The US legislature does not provide a precise definition of “cryptocurrency”, but various definitions are adopted such as “virtual currency”, “digital assets”, “digital tokens”, “cryptoassets”, etc. At a Senate hearing in September 2021, the chairman of the Securities and Exchange Commission told

lawmakers that the regulator is working on a specific set of rules to oversee the cryptocurrency and blockchain technology market while protecting American innovators. This statement was accompanied by the assurance that the Commission has no intention of banning trading in cryptoassets. Thus, in October 2021, the Securities and Exchange Commission approved the first Bitcoin futures ETFs in the US, which are based on SME Bitcoin futures contracts. (IMF, 2021)

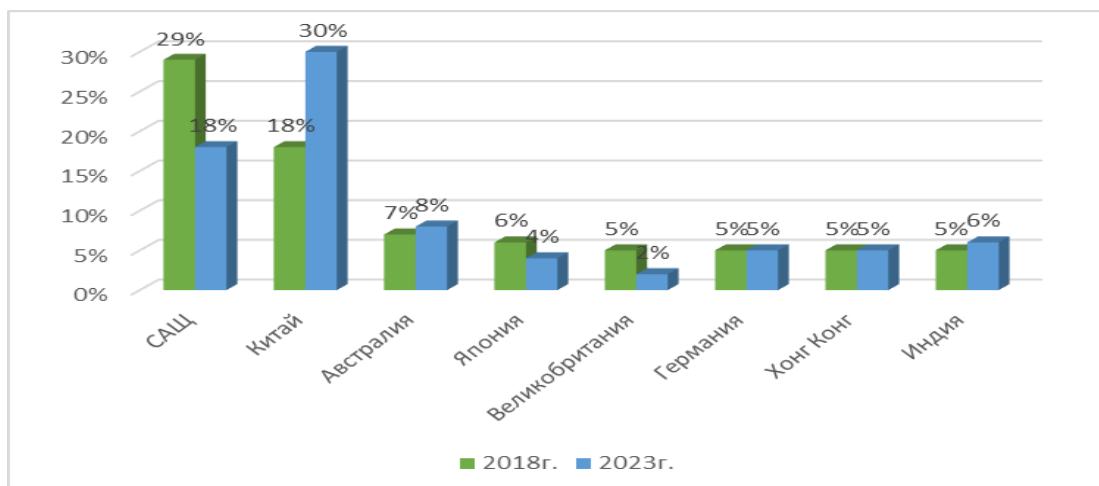
Arizona is the first state in the US to adopt a regulatory sandbox regime to control the development of new technologies such as fintech, blockchain and various crypto-assets within its borders. Arizona's law provides a number of regulatory reliefs for innovators in these sectors who want to introduce new services to the market. Under the program set out in the regulatory sandbox regime, companies can test their products for a period of 2 years and serve up to 10 thousand customers before applying for official licensing. Following Arizona, similar regulatory regimes have also been introduced by Wyoming, Utah, Kentucky, Vermont, Nevada and Hawaii. (Josias N. Dewey, Holland & Knight LLP, 2022)

Hong Kong is another important jurisdiction that has adopted basic laws to strengthen free market trading and thus maintains its leading position as an international financial center, although it still does not have specific laws that define and regulate the trading of crypto assets and other blockchain technologies. (Yu Pui Hang (Henry Yu); L&Y Law Office / Henry Yu & Associates, 2021, p. 266)

The rapidly developing crypto market in China has drawn the attention of the legislator to adopt new legislative regimes and regulations to protect the interests of investors and legally define this type of asset within an effective legal framework. In the early 21st century, the People's Bank of China (PBOC) prohibited financial institutions from processing Bitcoin transactions. In 2017, prohibits ICOs and domestic cryptocurrency exchanges, meaning that cryptocurrencies are not legalized, and the country's reputation is preserved by having clear regulations in place regarding crypto asset trading. In 2021, China introduced a ban on financial institutions and payment companies from providing services related to cryptocurrency transactions, "mining" and crypto asset transactions. (Nasdaq, 2022, p. 9)

The Chinese government's financial policy is aimed at supporting blockchain technology and leading the digital currency market, with the People's Bank of China working to introduce an official digital currency by finalizing pilot tests of the e-CNY digital currency in several cities. The e-CNY token is designed to be exchanged for cash and coins and will be accepted as payment for goods,

bills, and tolls. (Cryptocurrency Regulations Around The World, 2022) (See Fig. 1)



*Fig. 1 Blockchain technology leading countries – 2018 and 2023.*

Unlike China, Japan has the most dynamically developing regulatory regime related to the trading of crypto assets and currencies. This makes it a world leader in having a legal framework in place to regulate the trading of Bitcoin and other digital assets, which are recognized as legal tender under the Payment Services Act (PSA). The Financial Services Agency (FSA) in Japan is a regulatory authority that monitors compliance with the Payment Services Act - adopted in April 2017. The amendments introduced to the Payment Services Act and the Financial Instruments and Exchange Act (FIEA) of 2020 change the term virtual currency to “crypto asset” and introduce new regulations on the management of users’ virtual money and facilitate the trading of crypto derivatives.

In 2021, the Financial Services Agency established a section for the supervision of digital and decentralized funds and adopted new regulations. Under the new rules, cryptocurrency custody service providers (which do not sell or buy crypto assets) are included in the scope of the PSA, while cryptocurrency derivatives businesses fall under the scope of the FIEA. (Cryptocurrency Regulations Around The World, 2022)

In India, cryptocurrencies are not legal tender. The Reserve Bank of India has repeatedly warned the public against investing in digital currencies, saying it is in the interest of consumers, ensuring market integrity, and preventing money laundering and terrorist financing. Although there is currently no clarity on the tax status of cryptocurrencies, the finance minister indicated in February 2022 that cryptocurrency transactions could be subject to a 30 percent tax. Cryptocurrency exchange regulations in India are becoming increasingly strict. In 2018, the

Reserve Bank of India (RBI) banned banks and financial institutions from “dealing in or settling with virtual currencies.” (Cryptocurrency Regulations Around The World, 2022) In October 2021 The Securities and Exchange Board of India (SEBI) has issued a warning that “investment advisors should refrain from engaging in unregulated activities with cryptocurrencies. Any dealings and unregulated activities by investment advisors may lead to actions falling under the ambit of the SEBI Act, 1992.”

While the Indian government is against private cryptocurrencies, in November 2021 the Standing Committee on Finance held a working meeting with representatives of crypto exchanges and presented a position that “cryptocurrencies should be regulated, not banned”. The parliamentary vote on the Cryptocurrency Bill in February 2022 did not receive approval from the Indian Parliament, which means that the legislative status of cryptocurrencies in the country remains unclear. (Cryptocurrency Regulations Around The World, 2022)

In order to ensure a uniform regulatory approach against money laundering and terrorist financing, through the fifth directive (MLD5) the European Union decided to adopt a definition of virtual currencies, which definition is linked to the guidelines of the Financial Action Task Force (FATF) from 2014. According to the MLD5 Directive issued by the EC, virtual currency is defined as: *"a digital representation of value that is not issued or guaranteed by a central bank or public authority, is not necessarily linked to a legally established currency, and has no legal status as currency or money, but is accepted by individuals or legal entities as a medium of exchange and can be transferred, stored, and traded electronically"*.

The application of such a broad definition in the MLD5 directive will allow for the emergence of other different forms of virtual assets and transferable cryptographic coins or tokens to fall within its scope.

The governing bodies of the European Union have a rather favorable attitude towards the development of blockchain technologies and distributed ledgers. In 2017, the divisions of the EU executive bodies announced an initiative with which they support a number of projects based on blockchain transactions and relationships between citizens, companies, governments, etc. Most importantly, in addition to the significant encouragement from the governing bodies of the EU, individual member states continue to issue additional regulations that are beneficial to the development of blockchain. (Keil, 2022)

In June 2021, the European Commission proposed regulations requiring companies that transfer Bitcoin or other crypto assets to collect details of senders and recipients to help authorities tackle money laundering and make crypto transactions transparent and traceable.

In the EU, discussions on the introduction of a Market in Crypto Assets (MiCA) regulation have been underway since July 2021. The idea is for this regulation to apply to cryptocurrencies that do not qualify as financial instruments, including utility tokens and payment tokens, with a primary focus on stablecoins. (Nasdaq, 2022, p. 4)

As noted above, there is no outright ban on cryptocurrencies in the UK. There is also no specific regulatory regime for crypto assets in the UK. In this situation, whether a particular cryptocurrency is subject to financial regulation in the UK depends on whether it falls within the general financial regulatory framework established by the Financial Services and Markets Act 2000 (FSMA) and discussed in the Money Transfers Act and the Anti-Money Laundering Measures Act, established under the Payment Services Regulations 2017 (PSRs) and the Electronic Money Regulations 2011 (EMP). (Dewey J. N., 2022)

The legislative measures that the UK will introduce in the future regarding the control of blockchain innovation and cryptocurrencies will remain largely compatible with the EU regulatory framework in the short term, but will still undergo changes. In 2021 The leadership of Her Majesty's Treasury (HM Treasury) announced the UK's intention to consider approving and including certain cryptocurrencies within the scope of the "financial promotions regulation" and to continue to consider a "broader regulatory approach" to crypto assets. In January 2022, the government decided to regulate cryptocurrency advertising. (Cryptocurrency Regulations Around The World, 2022)

With the adoption of the revised *Payment Services Directive (PSD2)* and the *General Data Protection Regulation (GDPR)* Europe is establishing itself as a leading market for so-called open banking. In the UK and Germany, legal regimes are in place that favour the progress of alternative banking models. (Kirova, 2019, pp. 22-23) By 2024, the EU should introduce a robust regulatory framework that will help create a compatible digital identity for individuals, thus enabling new customers to have quick and easy access to financial services. (FSC, 2022)

The European institutions are researching, analysing and proposing various effective mechanisms for Member States to connect and access free tools, support and funding to help build accessible digital services and achieve competitiveness. (P. Ruskov and N. Stoyanova, 2020, p. 35)

In Bulgaria, the main regulatory authorities for financial services are the Bulgarian National Bank (BNB) and the Financial Supervision Commission (FSC). For Bulgaria, blockchain technology and cryptocurrencies are a relatively new concept, based on the idea of a free market, without administrator intervention. In 2020, a legal definition of virtual money was given for the first

time. This was done with changes to the Law on the Protection of Financial Instruments. According to Bulgarian law and the European Banking Authority, “virtual currencies” are digital representations of value that are not issued or guaranteed by a central bank or a public authority, are not necessarily linked to a legally established currency and do not have the legal status of currency or money, but are accepted by individuals or legal entities as a medium of exchange and can be transferred, stored and traded electronically. (NBC, 2022)

The National Revenue Agency (NRA) issued instructions regarding cryptocurrencies in 2012-2013. According to them, the NRA considers cryptocurrencies to be a financial asset and therefore profits from these cryptocurrencies are subject to declaration and taxation. In its Clarification No. 3-580 of 19.03.2018, the NRA provides answers, albeit with a reservation about their conditionality, to some basic questions regarding the tax treatment of transactions with virtual currencies. Bulgarian regulators have issued various standard warnings to the public and potential investors about the risks that accompany transactions with digital assets and ICOs. As a member of the EU, Bulgaria applies the provisions of the European supervisory authorities (EBA, EIOPA and ESMA). Of paramount importance for the Bulgarian fintech market is the creation of a national legal and regulatory framework that will provide security to companies. The timely adoption of blockchain and crypto regulations increases the chances of Bulgarian fintech companies to attract and profit from the development of these technologies.

The academic discussions on the definition and possibilities for effective international regulations in crypto-asset trading continue. This leads the EC to consider the creation of a pilot regime for market infrastructures that trade and settle transactions in financial instruments in the form of cryptocurrencies. The pilot regime, which will allow for violations of existing rules, will provide regulators with experience in using classified ledger technology in a market infrastructure and for companies to test solutions. The idea is to allow companies to test and learn more about how existing rules work in practice. (Law Firm Ilieva, Vucheva & Co, 2021)

By building effective regulatory mechanisms for Europe, the European Commission is also taking decisive steps to promote blockchain innovation by providing transparent and up-to-date information to entrepreneurs, as the European Blockchain Partnership is launched. The European Union Blockchain Observatory and Forum and the European Blockchain Services Infrastructure – EBSI (European Blockchain Services Infrastructure), which is the world's first cross-border blockchain initiative in the field of public administration, are being established. The latest trends in blockchain technologies are being presented and assistance is being provided to all interested economic entities operating in the

field of blockchain, with an important place here being given to financial institutions and increasing their cybersecurity.

Increasing the efficiency of financial audits and cybersecurity through alternative methods of data storage, transparency, traceability and reliability of transactions are some of the main advantages of blockchain technologies, which will save time and costs in the financial sector while maintaining financial sustainability.

The European Union is working on a comprehensive regulatory framework to create legal certainty and encourage innovation in the field of digital assets and smart contracts. In addition to these high-level initiatives, the European Commission is providing funding for blockchain startups, for the development and promotion of blockchain technologies and their application in business. The European Commission aims to use existing initiatives as a basis, ensure their cross-border compatibility, consolidate the experience gained and combat the new challenges arising from blockchains (disintermediation, reliability, security and traceability by design).

Blockchain policy in Europe has progressed significantly since the Observatory was launched. This includes the formation of the European Blockchain Services Infrastructure (EBSI), an initiative to build a blockchain infrastructure for cross-border government services, and the International Association of Trusted Blockchain Applications (INATBA), a public/private partnership designed to bring together European Member States together with the private sector, as well as other stakeholders such as academia, to advance the blockchain ecosystem in Europe. The next steps that EU regulators are expected to take are to create a single legal framework that is GDPR-compliant and provides clarity on the legal and financial status of cryptocurrency tokens and outlines the rules for the exchange of crypto-assets.

At the end of the first chapter we can draw the following *conclusions*:

*First.* In the scientific literature, the meaning of the term blockchain is presented as a broad concept for which there is no unambiguous definition and technical definition. Blockchain is a technology that will continue to develop in the future. Its main goal is to reduce the costs and time for carrying out transactions with various areas of application. Therefore, we can synthesize the most commonly used definitions of Blockchain technology to present it as: “an unlimited, decentralized distributed electronic database, open to anonymous users, which, through cryptographic techniques and a consensus algorithm, offers traceability, security and speed of transactions, without the need for an intermediary.”



*Second.* The author presents a current theoretical and practical analysis that substantiates the relationship and role of fintech companies in the implementation of blockchain technologies, in the context of applicable specifics and regulations in the fintech sector.

*Third.* Based on a thorough scientific analysis, the author offers an argumentative complex systematization of the theoretical aspects in the field of blockchain technologies and cryptoassets, and their significance for the activities of financial institutions. The presented policies to promote the use of innovative blockchain technologies will provide fundamental changes in the financial sector, which will help financial institutions achieve better financial sustainability.

## **SECOND. FINTECH COMPANIES – ESSENCE, ROLE, REGULATION AND FINANCING.**

### **Characteristics of fintech companies**

FinTech<sup>3</sup> technologies have been developing dynamically since the beginning of the 21st century and have assumed key importance in the implementation of digital, high-tech financial services to facilitate the world's leading companies in managing their business with clients who expect money transfers, lending, consultations in the field of investment and savings management, etc. This determines the term "fintech" to be used in scientific literature in the application of software and other modern information, blockchain and communication technologies that companies use to improve security and automate their financial services.

In their daily activities, financial institutions are exposed to numerous and different risks in their nature. Some of them arise from the specific features of traditional financial activities such as lending and deposit collection. (B. Bozhinov, Ya. Dimitrov, A. Popov, 2006, p. 303) This makes financing of fintech companies less preferred than traditional credit institutions.

All financing methods, outside the classical methods applicable to companies (equity financing, bank financing, stock exchange listing, etc.) can be considered as alternative financing methods and are particularly important for fintech companies. In most cases, they are newly created (start-up) companies, without significant equity and company history, which in turn makes them too risky for financing through traditional methods. The main alternative financing methods that they have the opportunity to use are: crowdfunding, crowdsourcing,

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<sup>3</sup> Fintech is an abbreviation of the words "finance" and "technology" and encompasses a number of players that classify themselves as fintech companies.

angel investors, venture capital funds, initial public offering of digital coins (ICO), security tokens (STO), initial exchange offering (IEO).

The main problems faced by small and newly established companies after the 2008 crisis are the lack of financing and limited access to it. (Golić, 2014, p. 39) The growth of companies seeking capital in the last few years in financing their business activities leads to an increased search for various alternative methods for its collection. Technological innovations, social changes, incl. the Covid 19 crisis inevitably lead to a decrease in the role of traditional banks and an increased search for new ways of financing. Thus, new alternative ways of financing companies are an increasingly common way of providing capital, compared to traditionally used sources such as banks, financial institutions or the state. (Wierzbicka, 2018, p. 57)

According to K. Wierzbicka, alternative financing (AF) is an innovation in the financial market, whose main role is to finance the development of start-ups and small and medium-sized companies, and this is achieved mainly through social platforms and the Internet.

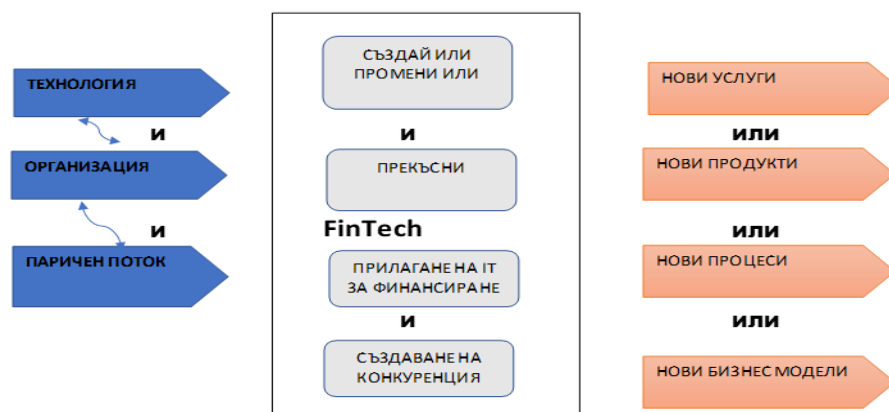
*Fintech companies are establishing themselves as economic entities that use in their activities mainly: software, mobile applications, algorithms, etc., with the aim of providing financial services as a cheap, fast and reliable alternative to services from the traditional financial sector. They also often use hardware to build virtual reality trading platforms and other fintech services related to managing money transfers between accounts, online loan applications, as well as more complex financial tasks, such as exchanging crypto currencies and P2P (peer-to-peer) connections<sup>4</sup>.*

*The most widespread and frequently used fintech technologies today in the European market are related to payments, money transfers with automatically converted currencies, cryptocurrencies and blockchain technologies.*

The global financial crisis after 2008 ensured a lasting distrust of traditional banking systems, and expensive and traceable interbank transfers proved to be the basis for the emergence of Bitcoin in 2009. Modern mobile phones are a technological prerequisite and contribute to the revolutionary development of fintech technologies and related fintech companies. Fintech companies strive to deliver a given financial service cheaper, faster and more securely than traditional banks. The conceptual framework of fintech technologies can be presented through the following figure: (See Fig.2):

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<sup>4</sup> P2P connections - platforms for shared lending and investing



*Fig.2 Conceptual framework of fintech technologies (L. Zavolokina, M. Dolata, G. Schwabe, 2016, p. 9)*

Thus, after 2008, based on the financial crisis, fintech companies began to change the profile of their activities – from payments and lending to more complex activities such as robotic process automation, RegTech and many others.

According to the report by the consulting firm KPMG <sup>5</sup>, Fintech investments in the world in 2018 almost doubled - from \$50.8 billion in 2017 to \$111.8 billion, with America reaching \$54.5 billion with 1,245 deals. American fintech companies received \$52.5 billion in investments, mainly from M&A<sup>6</sup> activity. In Europe, during the same period, investments in fintech companies reached 34.2 billion dollars, with London being the city with the most technological investments (most of them from American and Asian investors). In Asia, in 2018, investments in fintech companies were 22.7 billion dollars.

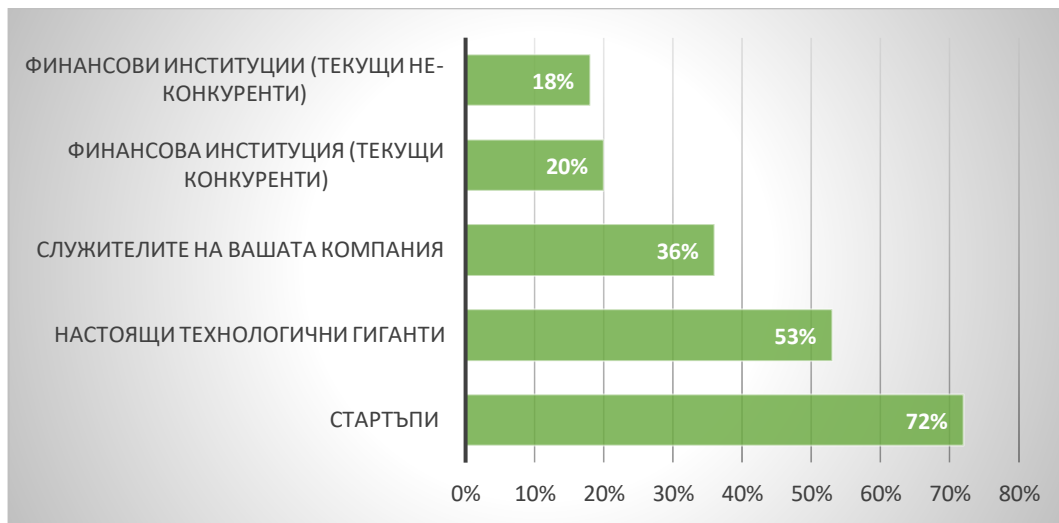
The main goal of fintech startups is to offer innovative high-tech financial services and displace the leaders in the market of traditional financial services. To achieve this goal, they need not only capital, but also customers.

At the same time, financial institutions cannot take advantage of every opportunity to invest in fintech, so prioritization is crucial in extracting maximum benefit from their investments and activities. For them, the analysis of fintech investments includes an assessment of a number of factors such as: predictability of development, potential size of impact, current organizational capabilities and assets, and their alignment with specific initiatives and areas that may not be large

<sup>5</sup> The pulse of FinTech 2018, 13.01.2019, p. 2-3

<sup>6</sup> M&A – transactions related to mergers and acquisitions of companies.

today, but have the potential to lead to significant changes in the future. (I. Pollari, M. Raisbeck, 2017) (See Fig. 3)<sup>7</sup>



*Fig. 3 Sources of fintech innovation for the period 2017-2023.*

Due to the risky nature of the business, fintech companies rely primarily on alternative financing methods – forms of raising funds that are outside the institutional financial system of banks and capital markets, as well as on entirely emerging technological financing instruments (ICO, STO, IEO).

### **Impact of blockchain technologies on financing fintech companies.**

Among the main alternative methods of financing fintech companies, we can highlight:

1. **Crowdfunding** – According to E. Mollick (Mollick, 2014, p. 2), crowdfunding refers to the efforts of entrepreneurs to finance their ventures with relatively small contributions from a relatively large number of individuals using the Internet, without standard financial intermediaries. It is a practice of raising capital to finance a project or venture by collecting usually small amounts from a large number of people. This method uses the efforts of a large number of participants for mass financing - mainly online, through various social platforms. Investors receive various bonuses or often a percentage of future profits.

Depending on the type of product or service the company offers and its growth goals, we distinguish several types of crowdfunding (P. Belleflame, T. Lambert, A. Schwienbacher, 2014):

<sup>7</sup> KPMG International global fintech survey, 2017, p. 15

- donation-based crowdfunding – in this model, no rewards are offered to participants. According to a 2015 report by marketing agency MaSSolutions (Hobey, 2015), donation-based crowdfunding generates the second largest volume of funding in the world.

- reward-based crowdfunding – this type of financing provides funders with a non-monetary return – for example – one of the first products produced, participation in a social event, etc. Entrepreneurs invite their customers to order in advance, quite often at a lower price. This type of fundraising is characterized by the fact that there is no financial return or profitability.

- capital /investment/ financing (crowdinvesting) – it is quite suitable for small and medium-sized enterprises that need a large amount of capital to start their business. This type of crowdfunding is the fastest growing compared to other types. Unlike methods based on rewards and donations, collective financing based on shares allows investors to become private owners of the given company. Accordingly, they receive a financial return on their investments in the form of dividends. This form of crowdfunding involves accredited investors such as venture capitalists (VC), business angels (angel investors) through special platforms (Wagner, 2014).

- debt financing – this type of crowdfunding is also known in some countries as “short-term” (peer-to-peer lending - P2P). This type of financing occupies the largest share among other types of crowdfunding. In it, financing is based on debt – these are loans that must be repaid within a certain period with a certain interest rate.

- Invoice trading – in this, investors purchase unpaid invoices at a discount. This type of financing allows small companies to obtain short-term liquidity. In this way, investors directly finance the working capital of the business. In exchange for purchasing the invoices, investors receive a statement indicating the difference between what they pay for the invoices and the amounts stated on the invoices themselves.

A brief description of the essence of these five types of crowdfunding can be presented through the following figure: (See Fig. 4).



Source: Dietrich, A., S. Amrein, *Crowdfunding monitor Switzerland 2019*, Lucerne University of applied sciences and art, p. 8

**Figure 4. Types of crowdfunding**

Overall, crowdfunding can be defined as a unique support for new and existing entrepreneurs on many levels. According to the report by K. Buysere (K.D. Buysere, O. Gajda, R. Kleverlaan, D. Marom, 2012), small businesses are massively using crowdfunding to finance their marketing and market research. No other form of financing can provide the advantages of pre-sales, “wisdom of the crowd” (Golić, 2014, p. 46), word-of-mouth promotion without additional costs. These advantages can reduce the costs of product development, thus providing revenue before production begins, which leads to a positive cash flow from the start. Crowdfunding has the real opportunity to apply leverage when all other formal financial instruments fail. It can provide risk diversification for startups and, last but not least, removes geographical barriers to investment.

*The main challenges facing crowdfunding are related to: low success rate, upfront investments, reputational risk. However, crowdfunding as an alternative way to finance fintech companies can make capital more efficient and accessible. Unfortunately, there is no accepted good practice in this area, and very often there is a comprehensive national and international regulatory framework (Golić, 2014, p. 47).*

2. **Crowdsourcing** – Jeff Howe first defined it as a concept that arose from outsourcing (translated from English "crowd" means - crowd and "sourcing" - source of resources).

The rapid development of information technologies, the increasing use of social platforms, has helped the objects to integrate into a certain aggregate, a “crowd” of users. Crowdsourcing gives an idea of how the negotiation processes between the many investors and the entrepreneur take place. Through

crowdsourcing, collaborators can give different ideas and suggestions for the further development of the company. Thanks to the Internet, they can create a network and communicate with each other. Within the framework of the integration of the objects of economic relations, such a phenomenon as crowdsourcing is developing quite rapidly (T. Branzov, N. Maneva, 2014, p. 7).

*The challenges of crowdsourcing are related to the need to use the potential of the large "crowd" - to solve their own tasks and find financial resources. The task is to use crowdsourcing in such a way that the idea is focused, transparent and generates income. In recent years, the emergence of new, best ideas and their rapid introduction to the market can lead to a competitive advantage.*

3. **Angel investor** – the funding comes from wealthy entrepreneurs with extensive business experience who provide funding to new companies (including startups) with promising future results. Interestingly, the companies that the “angels” invest in are often the same ones that the banks themselves lend to. Because of the high risk they take, they often require a high return on their funding. They are also distinguished by their anonymity.

Mason and Harrison (Mason, C. M., & Harrison, R., 2008, p. 8) define “angel” investors as an individual, acting alone or in an informal association, who directly invests his or her own money in a company that is not yet traded on the stock exchange, has no family connection, and who, after the investment, takes an active part in the management of the company (for example, a member of the board of directors). Syndicates of “angel” investors are associations where they pool their experience, capital and knowledge, thus diversifying the risk and investing their funds in better and larger deals. According to data from EBAN (European Business Angels Trade Association) and EVCA (European Private Equity and Venture Capital Association), the overall European early-stage investment market, including initial coin offerings (ICOs), is growing at an incredibly fast pace, with the chart below showing the main funding sources for fintech companies and startups in Europe at the beginning of the research period. (See Fig. 5)



Source: EBAN Statistics Compendium 2017, p. 5.

**Fig. 5 Total value of European early stage investments in 2017 (in billion euros)**

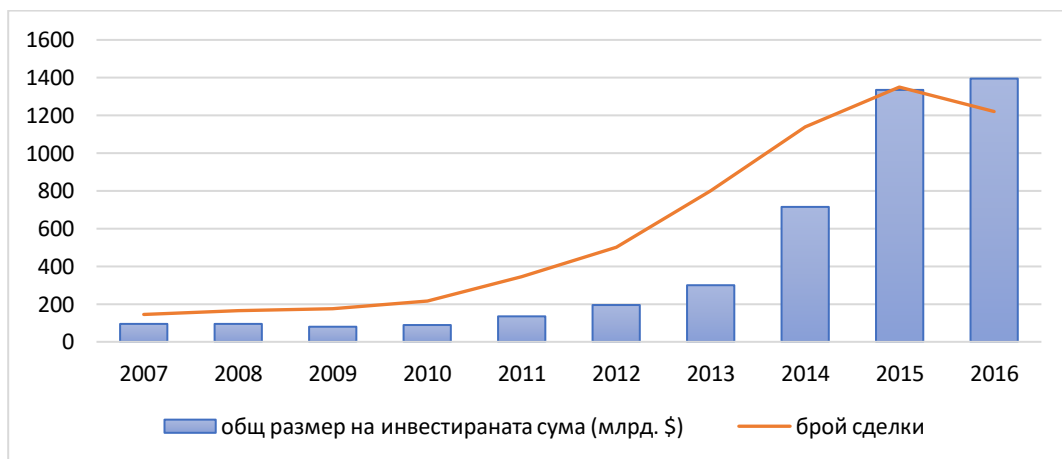
The advantages of this type of financing are that it provides a much cheaper form of capital. Angel investors have experience in the field of business, the financing is made without monthly payments on capital and interest, except for the share of the company's profit designated for the investor.

*The challenges of this funding method, which is particularly suitable for small, start-up fintech companies, are mainly related to the fact that angel investors can provide the necessary guidance for development, but some may have requirements for company control that entrepreneurs are unlikely to accept. Also, compared to venture capital funds, angel investors are much more difficult to research and contact.*

4. **Venture capital funds** – According to Y. Stefanova (Stefanova, 2014, p. 13), “the definition that EVCA gives for venture capital is that it is a subcategory of private equity, which is used to provide capital to enterprises that are not listed on the stock market, for the development of new products, technologies, acquisitions, buyouts, etc. investments.”

Venture capital is part of private equity. The factors supporting venture investments in the early stages of innovative firms are: the size of venture capital-financed deals; capitalization of venture capital funds; the scale of venture capital markets (Stefanova, 2014, pp. 76-77). According to Mladen Veleв and Ognyan Andreev (M. Veleв, O. Andreev, 2003, p. 159), “venture capital is an instrument of special financial intermediation. It is capital provided by specialized financial intermediaries (venture capital funds) for the creation, launch and expansion of small enterprises that specialize in new ideas or new high technologies (fintech)”.

The dynamic changes in global venture capital investments in fintech startups studied for a ten-year period before the pandemic can be presented in the following graph. (See Fig. 6).<sup>8</sup>



**Fig.6 Total value of European investments in early stage companies (in billion dollars)**

<sup>8</sup> PitchBook



*The peculiarities of venture capital funds are that they finance larger and established companies that need additional investments for development and less often invest in start-up entrepreneurial companies to provide management resources and potential for developing new technologies.*

5. **Seed startup accelerator** – these are programs for small business startups, most often in the technology, web and mobile sectors. They finance teams with limited resources to start their project and accelerate business development within 3-4 months, through intensive training and mentoring programs. The initial investment ranges from 20 thousand euros to 50 thousand euros. These programs have precise rules, structure and application processes.

*The challenges facing this method of financing, according to Miller & Bound<sup>9</sup> is determined by the main characteristics of the accelerators: the program has a fixed duration (from 3 to 12 months); they are usually growth-based (payment through capital, no fees). Once or twice a year they recruit candidates from startup entrepreneurs who need support for the development of their projects, etc.*

6. **Initial Public Offering of Coins (ICOs)** – according to the Financial Supervision Commission in Bulgaria - the initial coin offering can be defined as an initial offering, realized through the sale of tokens, the purpose of which is to raise capital for the implementation of projects or solve a relevant problem through the development of a specific business niche or model.

Initial coin offerings are an innovative method of raising funds using cryptocurrencies. Their use is most popular in projects that have not yet fully developed their platform, product or blockchain service. ICOs act as a voucher that can be used to pay for goods or services on a particular platform. Payment is usually made using Bitcoin or Ethereum<sup>10</sup>. ICOs are usually characterized by the following features: a business idea that is defined in a so-called whitepaper, a team of proposers, a target amount to collect, a given number of "tokens", a new cryptocurrency, and it is provided to subscribers, according to a predetermined exchange rate with one or more existing cryptocurrencies (G. Fenu, L. Marchesi, M. Marchesi, R. Tonelli, 20 March 2018, p. 26).

*Tokens* can be defined as cryptoassets issued by a company financing a project through ICOs, which can be a payment instrument (currency) only in the project ecosystem, providing similar capabilities as coins, but their holder also has other rights in the network, such as voting rights, dividend rights, rights to a share of the revenue, etc. Tokens are created as “smart” contracts based on a blockchain network such as Ethereum or Wave. Tokens can be recognized as

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<sup>9</sup> Miller, P., K. Bound, The startup factories: The rise of accelerator programmes to support new technology Ventures, Nesta.

<sup>10</sup> **Ethereum** (also known as ethereum) is a public, blockchain-based, open-source distributed computing platform and operating system offering smart contracts as functionality..

<https://bg.wikipedia.org/wiki/%D0%95%D1%82%D0%B5%D1%80%D0%B8%D1%83%D0%BC>

financial instruments or a good (or service) that can be used by the token holder (utility) depending on the characteristics of the cryptoasset.<sup>11</sup>

7. **Security Tokens (STO)** – or tokenized securities are a digital image of traditional securities recorded on a blockchain, which are purchased in order to ensure a long-term investment and receive a secure future income. The holder of security tokens receives the right to shares of the company, a share of its profits and, accordingly, dividends. One of the main advantages of security tokens is the high level of investor protection, they are more cost-effective, they offer an easy and well-regulated way for traditional investors to enter the crypto space and take advantage of a wide range of financial benefits. The risk of fraud in this area is minimized, so you can invest in any projects.<sup>12</sup> Tied to ordinary securities, security tokens are real investments of money. Therefore, companies with this type of token are also required to comply with securities laws and must provide reports.

8. **Initial public offering (IEO)** – takes place on a cryptocurrency exchange, i.e. the process of selling tokens is carried out through a peer-to-peer exchange, and not directly to investors. In this way, IEO is controlled by a cryptocurrency on behalf of a startup company aiming to raise funds by selling its tokens. The initial exchange offering appeared in 2018 and is an alternative to ICO. It is a new way to attract investments for various companies, where the cryptocurrency exchange is directly involved in the selection of projects and the sale of tokens (Myalo, 2019, p. 13). IEO is not open to the general public and everyone who wants to purchase tokens for the project must do so through accounts on the exchange. If a startup wants to raise funds through IEO, it must pay a registration fee on the exchange. The advantages of IEO over ICO are: the risk of fraud for investors is minimal; listing new tokens is fast; the funding rate is higher; the tokens are traded at the same price.

We can draw several important *conclusions* about fintech technologies:

1. Fintech technologies, as a basis for building alternative financial services, are of essential importance for fintech startups and for turning their businesses into profitable ones.

2. Fintech solutions (products and services) are an emerging alternative to traditional business models in various ways: creating new products and markets, competing with traditional financial products on the corporate market, creating effective, cheap and secure alternatives to financial products and services

3. Traditional financial (credit, insurance, etc.) institutions will find it increasingly difficult to maintain a leading position, as fintech technologies support a wide range of financial services:

- lending platforms on the market;
- capital crowdfunding platforms; ICOs, STOs and IEOs;

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<sup>11</sup> Financial Supervision Commission

<sup>12</sup> Marketing ICO Agency BlackBall

– insurance services driven by algorithms, robo-advisors offering smarter and more personalized financial solutions, and blockchain-based cryptocurrency and payment systems.

This explains this trend of growth in fintech investments, although deal activity slowed in 2020, there are no clear trends that indicate that fintech can permanently stop the dynamics of this process. (M. Fenwick, J. A. McCahery, E. P. M. Vermeulen, 2017)

In support of this analysis, we can also add the fact that based on the Report on FinTech: The Impact of Technology on the Future of the Financial Sector, prepared by the Committee on Economic and Monetary Affairs of the European Parliament in April 2017<sup>13</sup>, The European Union (EU) “welcomes new developments in the field of FinTech and calls on the Commission to prepare a comprehensive FinTech action plan within its Capital Markets Union (CMU) and Digital Single Market (DSM) strategies, which can contribute overall to an efficient, competitive, deeper, more integrated, stable and resilient European financial system, deliver long-term benefits for the real economy and meet the needs of consumer and investor protection and regulatory certainty”. This report also noted that: “FinTech can support the success of Capital Markets Union initiatives, for example by diversifying funding opportunities in the EU, and encourages the Commission to use the advantages of FinTech to advance the Capital Markets Union project”.

### **Regulations for the use of blockchain technologies in the fintech sector.**

All these measures, which are being implemented to regulate the use of blockchain technologies in the fintech sector, do not take the form of a single law on fintech. There is an adaptation of the existing legal framework to the specific features of fintech - regulation of shared lending platforms, etc. For this reason, the benefits and risks of fintech technologies are directly monitored by the Financial Stability Board (FSB)<sup>14</sup> with a particular focus on blockchains, distributed ledger technologies, etc. The aim is to ensure a timely and appropriate regulatory response to market innovations.

An essential part of the overall regulatory strategies is to explain to the managers new fintech innovations and the associated risks. The various forums that are held in connection with the supervision of the fintech industry are now more institutionalized and meet in the form of innovation hubs and sandbox regimes (Parenti, 2020, p. 10). The European Commission also provides support in facilitating access to innovative models through innovation facilitators. The

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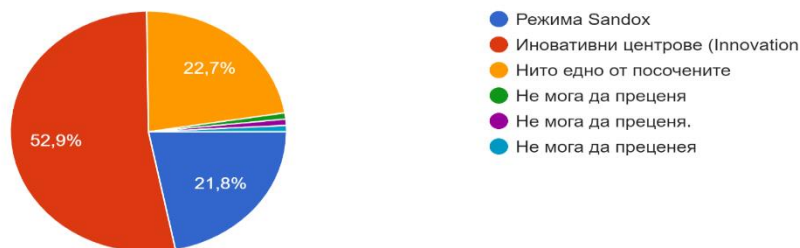
<sup>13</sup> [https://www.europarl.europa.eu/doceo/document/A-8-2017-0176\\_EN.pdf](https://www.europarl.europa.eu/doceo/document/A-8-2017-0176_EN.pdf)

<sup>14</sup> **Financial Stability Board (FCB)** – a global organization that regulates and provides guidance on the global financial system. It was established in 2009 in Basel, following a G20 meeting. The Standing Committee on Vulnerabilities Assessment (SCAV) is the FSB’s main committee for assessing risks and vulnerabilities in the global financial system. The assessment focuses on macro-financial vulnerabilities arising from structural deficiencies in the financial system, such as misaligned incentives, potential market stress, etc..

European Forum for Facilitating Innovation (EFIF)<sup>15</sup>, provides a platform for supervisory authorities to hold meetings and share technological experience in regulating innovative technologies.

There are two most popular regulatory approaches in our country towards Fin Tech, according to the answers of the respondents who participated in the survey that complements our research. (See Fig.7)

23. Кои според Вас са нај-популарните подходи спрема FinTech от страна на регулаторите?  
117 отговора



**Fig. 7 Possible regulatory approaches to Fintech**

*Regulatory sandbox regimes* are considered a relatively new innovation for which there is still insufficient empirical data and analysis. They are expected to have a beneficial financial impact in the long term.

At the beginning of the research period, the Financial Conduct Authority in the UK opened the first regulatory sandbox for companies. A regulatory sandbox is a “safe place” where businesses can test their innovative products and services, business models and delivery mechanisms, so that consumers are protected. New financial products and technologies can be tested to see if they meet certain rules, regulatory requirements and safety. Thus, a regulatory sandbox is a type of testing regulatory environment that allows fintech start-ups and other innovators to try out new business models that are not covered by existing regulatory frameworks and are not under the supervision of regulators or even outside the existing regulatory norm. This aims to reduce the costs of innovation and barriers to entry in a given market and allows regulators to collect important data and make decisions about introducing additional regulations. (Edmon Makarim, Zahrashafa Putri Mahardika, 2020, p. 166)

By definition, a regulatory sandbox is a safe environment where, within certain limits and rules, innovative companies can create their new financial models, through which they contribute to improving the performance of businesses. Through this regulatory regime, companies create innovative services

<sup>15</sup>EFIF – European Innovation Hubs Forum. It was established in 2019, as a result of a report by the European Supervisory Authorities (ESAs) on regulatory labs and innovation hubs. The aim of this forum is to ensure the necessary actions are taken to promote coordination and networking between innovation hubs in order to achieve greater uptake of fintech technologies across the EU single market.

with much less risk and cost, and in a much shorter time. Sandboxes help clarify the legislative framework, in a way that regulatory requirements are aligned with changes in the fintech sector. (Raya Rousan and Christophe Malherbe, 2020, p. 10)

Sandbox regulatory regimes provide better opportunities to attract investors because they help countries position themselves in international centers for foreign capital for innovation, in which the UK, Japan, Australia, Canada, Hong Kong, Singapore dominate. They support good competition - by reducing regulatory requirements and entry criteria. We will add that the expansion of one of the first sandbox regulators in the EU may lead to the attraction of new startups from other countries that do not have such attractive regulatory frameworks.

Each regulatory sandbox has its own risks and limitations, which are related to the powers of the regulator (Raya Rousan and Christophe Malherbe, 2020, p. 34). The size of the sandbox regulatory regime is influenced by human resources (involved in the management of the sandbox); the good selection of candidates for the regulatory sandbox; the limitations in the powers of the regulatory authority. On the other hand, unfair competition and negative public opinion can also create problems for this regime. For example, participants in sandbox regulatory regimes receive temporary relief compared to others who do not participate in it. Last but not least, there is a reputational risk in this type of regime. They can prevent the participation of companies that, according to the regulator, are considered unsuccessful; there may be problems with liability to regulators in the event of unsuccessful testing, which can be considered insufficient control by the regulator and reduce both its reputation and customer confidence in the financial system.

Despite the lack of empirical data and the risks that accompany them, sandbox regulators are a positive catalyst for encouraging investment in the fintech sector. (Jayoung James Goo and Joo-Yeun Heo, 2020, p. 16) At the end of 2020, Austria created its own sandbox regulator. Along with Denmark, the Netherlands, Lithuania, Poland and of course the United Kingdom, it is another European country to create such a test environment. (Eva Schneider, Stephan Pachinger, Stella Klepp, 2020) In 2019, Austria adopted a draft law to implement a sandbox regulatory regime.

In July 2020, the National Council (Nationalrat) voted to amend the law on the powers of the Financial Market Supervisory Authority (Finanzmarktaufsichtsbehördengesetz), and in September 2020, the sandbox regulator was launched in Austria. In this sandbox, testing will be carried out for a period of 2 years within the parameters set by the Financial Market Supervisory Authority in Austria. If the test phase is successful, the company will leave the sandbox controlled by the Financial Market Supervisory Authority with a financial services license that is no longer subject to restrictions.

At the same time, the sandbox regulatory regime also begins to operate in Poland, and any company interested in developing blockchain-based services can apply for participation. The Polish sandbox technology platform has the support of the National Clearing House KIR, IBM, the National Cloud Operator (Operator Chmury Krajowej, OChK), PKO Bank Polski, the Financial Market Supervisory Authority in Poland, and the Polish Fintech Association. Thanks to the sandbox, the operability of the local market in Poland will increase, while at the same time reducing the barriers to entry for innovative companies that are already able to build their offer based on blockchain technologies. The sandbox will enable companies from various sectors to test their own solutions based on the Hyperledger Fabric (HLF) framework, a project of the Linux Foundation, and those qualified to participate in the project will use it for free.

From the research conducted so far, the following **conclusions** can be drawn:

*First.* The analysis of the results regarding the development of models and policies to promote innovation is just beginning (Giulio Cornelli, Sebastian Doerr, Leonardo Gambacorta, Ouarda Merrouche, 2021). Efforts will be directed in this direction – towards promoting changes in the financial sector, without disruptions to financial stability, markets and consumers.

*Second.* Sandbox regulators enable regulators to facilitate this process. Through them, fintech companies and blockchain technologies can successfully develop in a controlled environment, thus giving regulators an idea of their benefits.

*Third.* Sandbox regulators set several important and effective goals, such as:

- further promoting innovation and competition;
- increasing convenience for consumers;
- strengthening financial stability.

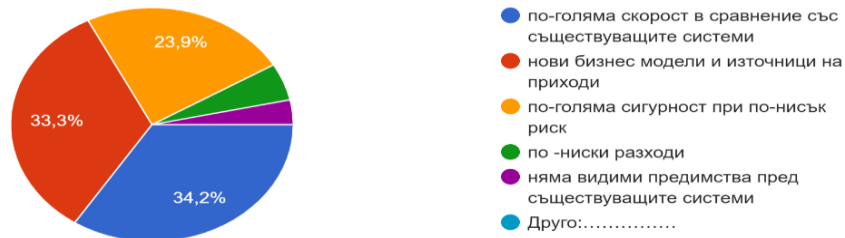
### **THIRD. FINANCIAL EFFECTS OF THE APPLICATION OF BLOCKCHAIN TECHNOLOGIES**

Blockchain technologies and the security of financial transactions are the most current technological challenges facing the financial sector. Although blockchain technologies have mainly entered fintech companies, banks realize that blockchain technology can have a significant impact on cross-border payments, lending and their activities in general, including through the possibility of implementing projects through a decentralized database. Based on the advantages that blockchain brings, banks can: reduce the costs of cross-border payments, increase the security and transparency of transfers and minimize risk and fees (OMFIF and CCBU, 2020, p. 5).

Representatives of various financial institutions who participated in our survey indicate as one of the three important advantages of blockchain

technology, greater security at lower risk. (See Fig. 8)

20. Кое от следните (ако има такава) смятате, че е най-значимото предимство на блокчейн пред съществуващите системи, когато мислите за вашата конкретна индустрия (отрасъл)?  
117 отговора



*Fig.8 Advantages of blockchain technology over existing systems.*

Blockchain is a collection of several technologies – a distributed database<sup>16</sup>, the consensus mechanism<sup>17</sup>, encryption algorithms, etc. (Palihapitiya, 2020, p. 2) This technology operates as a decentralized ledger that keeps track of transactions between two parties and makes it difficult for hackers to attack. In many financial institutions, this innovation has already been implemented in customer recognition operations, trade finance, real-time payments, clearing and settlement. As investments in blockchain technologies continue to grow, we can expect that in the near future the use of traditional currencies will gradually be limited by the introduction of various cryptocurrencies, which in turn will completely change the face of the financial world.

The responses of the respondents complement our conclusions that despite the potential that blockchain technology brings, financial institutions still approach it with distrust because they have always been a symbol of security and trust when it comes to payments and financing, and their clients have always sought security, speed and safety in carrying out their transactions. In this direction of increasing security in their activities and that of partners and clients, innovative technologies are most often used: Protected volume of information, digitization of documents, digital identification, payments, etc. (See Fig. 9)

<sup>16</sup> **Distributed database** - a logically integrated set of data (and its description) shared between individual users, physically distributed across the nodes of a computer network (Peneva, 2017)

<sup>17</sup> **Consensus mechanism** – this mechanism constitutes the basic principles for verifying blocks in the blockchain. Consensus mechanisms specify the conditions that validators must meet so that new blocks can be added. Consensus mechanisms play an important role in the proper functioning of any blockchain protocol.

5. Моля, изберете най-популярните случаи на използване на блокчейн, специфични за вашата организация или проект:

117 отговора

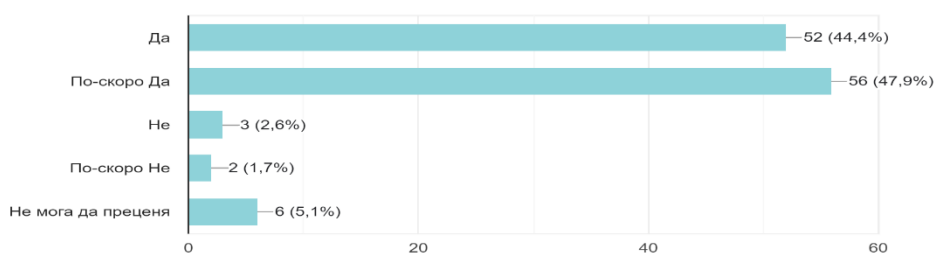


**Fig.9 Use of blockchain technologies in various cases of activity of respondents.**

Due to the increased number of users and the way credit institutions work, service fees are becoming increasingly large, and the growing total volume of transactions leads to their delay. To overcome these shortcomings, central banks are increasingly turning to blockchain technologies. At the same time, fintech companies with their new innovations and blockchain technologies are becoming a constant competition to traditional banking services, and their faster, cheaper and transparent services are capturing a significant share of the payment services market (Casey, M., Crane, J., Gensler, G., Johnson, S. & Narula, N. , 2018). The implementation of blockchain technologies in financial institutions can make them more resilient to financial shocks and increased competition. Such expectations are also shared by the respondents who participated in our survey. (See Fig. 10.)

7. Могат ли според Вас, технологиите от типа на блокчейн да променят начина на търгуване и финансиране?

117 отговора



**Fig. 10 Blockchain technologies and the possibilities for changing the way of trading and financing**

Here we must also take into account the emerging change in customer behavior, who are increasingly abandoning their loyalty to banking institutions in search of new and innovative forms of payments, electronic identity<sup>18</sup>, primary issuance of securities, clearing and settlement, trade financing, etc.

<sup>18</sup> According to Zahari Yankov (Bulgarian Center for Non-Profit Law), electronic identity is a set of characteristics recorded in electronic form, through which one person can be uniquely distinguished from other persons in the



The traditional way in which cross-border bank payments are currently carried out is quite slow and expensive and is still based on the use of so-called nostro accounts (correspondent account)<sup>19</sup>. Blockchain technology can significantly help banks to make international transfers much more economical and efficient (Guo, Y. & Liang, C., 2016). If banks have their own blockchain networks, they will be able to directly transfer funds to the other bank's network without the need for an intermediary, thus blockchain technology has the potential to drastically reduce the time and costs of the SWIFT system. This is also confirmed by the answers to the questions of our survey, which were given by various representatives of the financial sector. (See Fig. 11)



**Fig.11 Readiness for implementing blockchain technologies by respondents.**

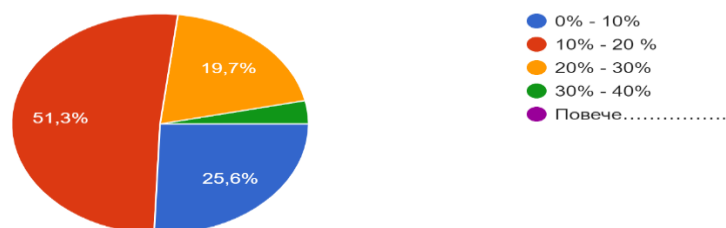
The mass use of blockchain technology has the potential to provide lasting positive changes to the banking industry by making it more reliable, transparent, and accessible to its customers, which will significantly improve financial results with faster and cheaper transactions and easier access to capital. The construction of an interconnected network of blockchains will have the potential to provide a large number of transactions with very high transparency and security for credit institutions and customers. These are the expectations of the survey participants. (See Fig. 12)

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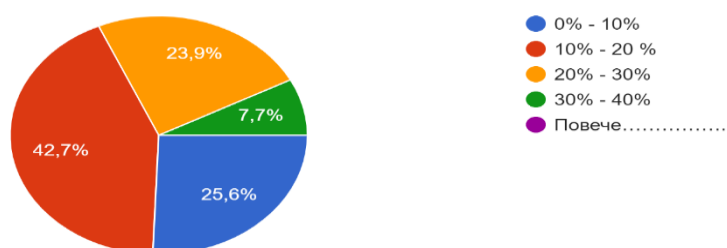
virtual environment in order to provide access to information systems or to provide the opportunity to make electronic statements.

<sup>19</sup> A **“Nostro” is an account** opened by a respondent bank in another financial institution that is its correspondent. A “Nostro” is an account opened by a respondent bank in another financial institution that is its correspondent.

14. Моля да посочите приблизителен процент на очакване на намаляването на разходите, в следствие на въвеждане и/или въведени финансови иновации  
117 отговора



15. Моля да посочите приблизителен процент на очакване на увеличаването на приходите, вследствие на въвеждане и/или въведени финансови иновации  
117 отговора



*Fig. 12 Expected positives from survey participants when introducing financial innovations.*

For the sake of completeness of this analysis, we should also point out the important place that the specialized cryptocurrency for interbank payments Ripple can take in this process. Its role in the field of international payments allows banking institutions to significantly limit their costs in international payments. On the other hand, Ripple makes it possible to make direct payments in real time. The advantages of this network are that banks correspond with each other without an intermediary; transparency and security of transactions are ensured; and large-scale payments can be achieved. David Gochstein, a Republican candidate for the New York House, shared on his social media profile that the costs for banks would be much lower if, instead of creating their own cryptocurrency, they simply accepted Ripple (Ripple XRP) as a partner)<sup>20</sup>. To date, 38 of the world's largest financial institutions have partnered with Ripple - including Money Gram, Santander, Uni Credit, the National Bank of Abu Dhabi, UBS Group, and others.

And although today transfers and payments are made in seconds, their clearing and settlement still require time. Interbank payments are often engaged

<sup>20</sup> Ripple (XRP) is a peer-to-peer cryptocurrency that works over the internet and provides a fast and easy way to make unlimited and instant payments. It allows you to send and receive transfers in any currency anywhere in the world.

with intermediary clearing companies, and accordingly transactions must be coordinated, since it takes time to book and initiate payment. And quite often this process is within 3 business days. While parties are trying to achieve real-time clearing systems, the aspiration to achieve real-time settlement is also not achieved. This is because of the need for banks to maintain available funds at all times. The implementation of clearing and settlement through a third-party intermediary makes payments much more expensive and slow, due to the performance of activities such as storing data, coordinating, initiating, confirming, executing and reporting transactions, etc. (Guo, Y. & Liang, C., 2016)

Another significant problem facing the banking community arises in connection with the prevention of money laundering and the financing of terrorism, financial institutions are introducing the requirement for "know your customer" and "beneficial ownership". Every bank client expects their financial institution to provide them with appropriate and high-quality services and to guarantee the security of their funds. To make this happen, financial institutions around the world apply the "Know Your Customer" principle.

In Bulgaria, with the latest changes to the Anti-Money Laundering Act, not only banks, but also all institutions, companies and liberal professions that must check transactions and payments for money laundering, are obliged to update information about their clients every year (by filling out questionnaires). Establishing the beneficial owners of various types of companies is the way to get to know the clients of legal entities.

One of the possible ways to solve this challenge is to introduce electronic identity. We can present the methodological case study developed in Estonia, which is the first to build a fairly large-scale electronic identity system, on the basis of which its citizens can vote electronically, access their medical records, sign documents, etc. "Estonians have access to over 2,500 public services in an electronic environment, which saves time and money for both citizens and the state. According to calculations by the Estonian government, e-government saves the country 2% of GDP per year" (Yankov, 2021“

Разбира се, това не е толкова лесно приложимо в глобален план в банковия сектор, тъй като към момента все още няма изградена споделена мрежа, която да служи на целите „опознай своя клиент“. Проблемите, които стоят пред приемането на една по-рационална споделена електронна идентичност са свързани с пречки от правен и регулаторен риск както и регламентите относно защитата на личните данни (Casey, M., Crane, J., Gensler, G., Johnson, S. & Narula, N. , 2018, стр. 20).

Blockchain technologies have the potential to transform the *capital market* trading system. The advantage of issuing a bond using this technology is that both parties have a shared record of the transaction and its changes. Capital markets are connected to many parties – banks, brokers, investors, agencies, etc. Currently, the main problem of the capital market is the multitude of systems that exist for clearing and settlement. The failure of one of the parties can have an impact on

the entire market. That is why blockchain technology can be successfully used to increase the quality and efficiency of securities trading. If participants share a common platform, transactions will be carried out in real time in complete transparency. The National Association of Automated Quotations of Securities Dealers (NASDAQ) is developing blockchain-based technology Linq and in 2015 registered a transaction with shares of a private company. The application provides complete accounting of the issuance and transfer of shares (Gupta, A. & Gupta, S., 2018).

Although commercial banks dominate the credit market, the reality is that when applying for a loan, more than half of small and medium-sized enterprises are often refused financing by credit institutions. The requirements that banks set and the guarantees they require are often too overwhelming and unfulfillable, especially for small start-up businesses. The annual turnover (at least for three reporting periods), the amount of income, profit, assets, number of employees, and last but not least, a good credit history are taken into account. In this case, blockchain technologies aim to overcome this problem and provide free working capital and support small innovative start-ups. Blockchain can achieve a significant change in trade *financing*:

- Transactions will be carried out without intermediaries – import and export documents can be accessible to everyone and reviewed and approved in real time;
- The risk of duplicating invoices and bills of lading is minimal;
- Blockchain technology allows the shipment of goods to be carried out faster, thus reducing costs, including customs;
- Transactions are distinguished by high security, as their authenticity is guaranteed by complex cryptographic algorithms;
- The introduction of so-called smart contracts eliminates dependence on banking services – which is also reflected in low transaction fees, etc.

Summarizing what has been said so far, we can point out that in general, the services based on blockchain technologies that fintech companies offer have their advantages: they are much more flexible and cost-effective, blockchain technology helps to increase financial stability and security of transactions, facilitates access to financing and obtaining loans, compared to traditional bank loans, and the payments and transfers made are made faster and cheaper. Of course, they are also associated with some risks for the credit sector, as banking institutions lose their monopoly and market share, reduce their profits and increase operational risk, both due to the complexity of the technologies used and the limited experience of banking institutions, as well as the threat of cyber attacks, the risk of fraud and abuse and the possibility of data leakage (Varga, 2017).

*Blockchain technology is set to revolutionize the financial sector, especially in the area of cross-border payments, clearing and settlement, and the main*

*problem with this financial expansion is likely to be its regulation.* This is a problem of any new financial innovation, which will probably be resolved in a timely manner and blockchain technology will find its wide application in the banking industry. And as Prof. Bozhinov points out, the impact that electronic money can have on the monetary system is not limited only to changing the role of banks and the banking system - they will inevitably affect the money supply, change in the velocity of circulation, the impact on the price levels of goods, inflationary processes, changes in monetary aggregates, etc., which in turn requires answering the question: To what extent will the existing regulatory instruments prove to be effective in new conditions. (Bozhinov, 2000, pp. 95-96)

### **Embedded payments and innovative solutions in the fintech sector**

The goal of embedded finance is to provide easier and cheaper access to financial processes for consumers. The rise of embedded payments marks the beginning of a new progress not only for banking transactions, but also for how consumers and businesses build and manage relationships with financial services more broadly. Thus, after the rise of the fintech sector, embedded finance is the next revolutionary stage in the unification of software and commercial business models.

The concept of embedded finance is not unknown to financial circles. These financial services include lending, payment processing, insurance services, various types of investing. Their popularity is growing rapidly, driven by the desire of consumers to increasingly bypass traditional banking institutions. According to a report by M. Harris, A. Davis, B. Adams and J. Tijssen (M. Harris, A. Davis, B. Adams and J. Tijssen, 2022), financial services embedded in various software applications will exceed \$7 trillion by 2026. Lending and payments will account for the largest share of embedded financial services. The increased demand for digitalization is putting pressure on financial institutions. They are looking for innovative ways to offer better services to their customers through more efficient digital operations. The demand for these services will continue to grow because it facilitates consumers' access to financial services, while on the other hand, it reduces costs and risks for companies.

Some venture capitalists share the view that embedded financing is key to monetizing their companies, turning them into fintech companies (Townsend, 2021).

In recent years, companies from various fields, as well as retailers, telecommunications companies, software companies, car manufacturers, etc., have been planning and preparing to launch embedded financial services in order to serve their customers in a quality manner.

The goal of embedded financing is to provide easier and cheaper access to financial processes for consumers. Until years ago, consumers with large

purchases had to go to a physical bank branch to apply for credit. Now, with embedded financing, they can make a purchase and receive credit on the spot.

With everything said so far, we can summarize as *conclusion that embedded payments are associated with using banking as a way to manage API banking and payment services to integrate financial services into other environments and ecosystems.*

Businesses “rent” access to tools and services offered by embedded payment providers and use them to build financial products without the associated development and compliance costs. This allows any brand and any application to offer financial service integrations into their existing products and quickly and cost-effectively develop entirely new ones (What is Embedded Finance? OUR THINKING ON EMBEDDED FINANCE, 2021).

Embedded finance can provide much better value. Customers get additional benefits from contextual, seamless experiences; platforms can unlock new additional perks and often use customers’ own data to improve financial access while reducing costs for their end customers.

The traditional, bank-driven value chain is transforming into a new ecosystem that typically requires four key players: the end customer, platforms that own the customer relationship, software tools that help meet complex regulatory and technological requirements, and a regulatory services or licensing provider.

The market is large and growing. According to an estimate by Bain Capital, the US market for platforms and enablers will have \$22 billion in total payments, lending, banking and cards revenues in 2021. This market is expected to more than double to \$51 billion by 2026. The transaction value of embedded finance will also grow from \$2.6 trillion to \$7 trillion in 2026. (Parkes, September 2021)

Different sectors and services are evolving at different rates. Adoption curves vary, with retail and e-commerce platforms currently the primary use cases for embedded financial payments. While payments and lending will continue to be the largest segments of embedded finance, growth is expected in insurance, tax, accounting and other services.

Embedded finance has the potential to be beneficial for everyone, both businesses and consumers. Consumers can benefit from a simplified banking and payment experience, for example by using the tools and interfaces they are used to from their favorite existing brands, instead of the cumbersome apps and web services currently offered by legacy banks.

Meanwhile, brands now have access to a whole new world: the world of finance. Until recently, launching a financial product was a nightmare to develop and achieve compliance. With embedded payments, brands simply “rent” access to different parts of the banking service (including licenses), leaving them to do

what they do best: build great customer experiences. (What is Embedded Finance? OUR THINKING ON EMBEDDED FINANCE, 2021)

There are already many examples of embedded payments and embedded finance applications in the financial world. From the model of „*buy now, pay later*“ (BNPL), which is one of the most significant fintech trends right now, to providing insurance, there are numerous examples of embedded financing:

- *Point-of-service lending* is a financial instrument that businesses can use to finance larger purchases. It is a convenient borrowing option that allows consumers to make purchases with increasing payments over time. On-site lending can be offered by traditional banks, credit unions, or online lenders.

- *Integrated insurance services* – „helps customers be sure that their money will not be wasted on a product if something goes wrong“. “The integration of banking and insurance products and their distribution through a common network is an exceptional opportunity to expand the market share of both insurance and banking institutions. In the era of globalization and increasing competition between market players, the formation of strategic alliances is a way to survive and grow a business”. (Bozhinov, 2004)

Embedded financial tools in investment apps allow users to connect with their bank to invest in a way that suits their current financial situation and spending habits. This is an example of a different type of financial service provider using embedded finance. Fintech as a Service – From invoicing to customer acquisition and everything in between, fintech as a service tools are increasingly being added to companies’ offerings.

The growing need for convenient financial services and the increasing number of online transactions are fueling the growth of platform ecosystems — just as the entire concept of embedded finance is growing.

In terms of awareness, security, and trust, two important themes emerge that merchants need to address. 44% of consumers say security is the most important factor when choosing an online payment method, but only 27% say that integrated payments are more secure than traditional payments for them, while 3 in 5 (59%) of those who have heard of integrated payments fear being charged the wrong amount when using them (Integrated Payments – Uncharted Territory for Consumers, 2022).

There are many broad areas where integrated financing can be applied, offering businesses new revenue opportunities, fostering greater trust in innovative financial services, increasing demand for integrated experiences and driving adoption of new technological advances.

Overall, here are the trends you can expect from embedded finance in the short to medium term: Increased customer demand for integrated experiences; Easier diversification of customer experiences and offerings; Search for new fintech technologies; Rise of a more open culture; Search for new and diverse revenue models; Adoption of technological opportunities; Changing levels of trust in financial services; The role of big data will become increasingly

important; Artificial intelligence is likely to take center stage; Evolution of the overall market.

What was once the preserve of banks is now imperceptibly becoming an integral part of many companies around the world. However, the lack of fintech knowledge and capabilities, as well as regulatory constraints, are challenges that brands must overcome to succeed in embedded payments.

Although the term "blockchain" implies a basic concept that underlies the projects based on it, depending on the technological solution, we can distinguish (S. Panda, A., A. Elngar, V. E. Balas, and M. Kayed, 2020, p. 67):

➤ *Public Blockchain* – This network has no restrictions and anyone can join and contribute (by validating transactions, using proof-of-work, or otherwise) to the growth of the blockchain. A public blockchain is completely decentralized, with permission to read and write data shared equally by all connected users. This type of blockchain is mainly used for cryptocurrencies such as Bitcoin (also Ethereum and Litecoin<sup>21</sup>), which allow users to use a platform to make transactions directly with each other. The incentive for authentication on public networks is the nominal fees for mining cryptocurrency, i.e. miners who authenticate transactions with it receive a portion of that cryptocurrency as a fee.

➤ *Private Blockchain* – in this type of blockchain network, an invitation from administrators is required, and each new member can be granted full or partial access. Full access would mean that the new participant can not only view the information, but can also verify subsequent information and add new blocks to the process. In a private blockchain network, the level of access of new participants is determined by the owners of this network as the controlling organization, has the power to change the rules of the blockchain and, in addition, can refuse transactions based on the established regulations. This type of networks are mainly used in private organizations to store sensitive information that should be accessible only to authorized employees. (S. Panda, A., A. Elngar, V. E. Balas, and M. Kayed, 2020, p. 67)

➤ *Consortium Blockchains* – is a semi-decentralized type and can be considered as an intermediate model, due to the low trust offered by the public blockchain network and the unified model of the private one. In it, multiple organizations participate in the management of the network through a permissioned platform. This type of blockchain can be used when organizations are willing to share this network, but limit access to their data and keep it from free access. The main advantage of this blockchain is that it offers a collaborative environment to provide greater exposure and innovation to enterprises. Unlike public blockchain networks, consortium blockchains do not focus on

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<sup>21</sup> **Litecoin** – It is a decentralized, open-source cryptocurrency, an alternative to Bitcoin. In use since 2011.



cryptocurrencies. Since only pre-selected participants are allowed to participate, no direct financial incentives are needed. Participants will be pre-screened and excluded in case of malicious behavior towards others. This type of blockchain is used primarily by banking and financial institutions as well as government organizations.

When adding a new block or changing an existing one, different approval methods are used. This method is called consensus (agreement) between network participants and is a type of voting by network users to reach agreement on changes to the ledger. Consensus is crucial for blockchain systems. A blockchain system needs a reliable consensus mechanism to ensure that each node has its original version of the complete transaction history, which is maintained together with other peers at all times. (P. Tasca, C. Tessone, 2019)

*There are many different variants of the consensus mechanism. The purpose of consensus agreements is to define a set of rules so that the network can be well protected and secure. Consensus protocols, like blockchain technologies, are evolving to meet the challenges that the growth of the decentralized network brings. The choice of an appropriate consensus mechanism should be made depending on the prerequisites of the project.*

Another important element in the structure of the blockchain is the so-called node, each participant in the chain is called a node. They store the entire block chain and validate transactions. The main types of nodes are: full nodes and light nodes. Each node stores a full or partial copy of the blockchain, with full nodes storing it locally, and partial nodes accessing it online. The total number of nodes in the Bitcoin network is 9,783.

Currently, in all blockchain protocols, each node processes all transactions and carries all information about account balances, contract codes, etc. This is a prerequisite for a fairly high level of security, which, however, reduces the scale of the blockchain (no more transactions can be processed by a blockchain than one node). This multi-layered nature of blockchain technology is probably the reason why cryptocurrencies are not widely and widely distributed. In the financial world, this problem is known as the “Blockchain Trilemma” (or the so-called decentralization trilemma). According to this trilemma, blockchain technology can be a carrier of two of the following three qualities: security, scalability, and decentralization.

Based on the research conducted, we can conclude that blockchain technology is a decentralized system that carries high security, the purpose of which is to ensure higher trust, transparency, and integrity of transactions, and is distinguished by the *following qualities*:

➤ *Persistence* is a very important and key quality of blockchain for providing immutable registers. In the centralized database structures that have

been in operation so far, there had to be coordination with the third party in order to be able to provide a guarantee of the integrity of the information. In blockchain, each block of the chain of blocks in the distributed register is contained in the previous block. In this way, the blocks are preserved permanently and are never changed, and blocks that contain invalid transactions can be immediately detected. The presence of a distributed ledger is a key advantage of blockchain technology. All changes to this ledger must be verified. The inability to change transactions makes it difficult to manipulate, change or replace data that is stored in the network.

➤ *Decentralization* – in traditional centralized transaction systems, each transaction is approved by a central authority, which leads to higher transaction costs and delays. The absence of centralized control helps achieve scalability and security. Blockchain uses a decentralized and distributed ledger to ensure data consistency across the distributed network (Single point of failure – SPOF)<sup>22</sup>, thus removing the single control from the central authority and delegating rights to all members in the network. Decentralized networks are based on trust, as participants in them must reach an agreement on the validation of transactions. (M. Samaniego and R. Deters, 2016) Each member of the network owns a copy of a record of information. When one of the participants changes a record, it will not be recognized by the majority of people in the network. Decentralization also significantly reduces administrative costs.

➤ *Transparency* – blockchain provides a high degree of transparency of transactions between all users who participate in its execution by distributing database records among the different participants who are in the network. This distribution provides greater visibility when checking the records that are stored in the database.

➤ *Higher security* – security has always been a big issue with new technologies. Blockchain can significantly reduce security threats and prevent database leaks. It has been used quite successfully for decentralized identity applications (credit or health records), which helps to return control of personal data to the user. Blockchain can build a secure network even in the case of using quite diverse devices.

➤ *Capacity increase* – this is one of the essential characteristics of blockchain, that it can significantly increase the capacity of an entire network. The unity of thousands of computers working together is much more powerful than a few centralized servers.

➤ *Publicity* – each participant can see the transactions of others in the network. The content of the transaction is protected by the participant's personal

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<sup>22</sup> Single Point of Failure (SPOF) – is a potential hazard that can arise from a defect in the design, implementation, or configuration of a circuit or system. A single point of failure can cause the entire system to shut down.

data, users can easily track the history of each transaction because it is digitally stamped.

➤ *Sustainability* – blockchain stores information in blocks arranged in chronological order. Each block has its own copy, which carries information about all transactions that have ever been made on the network. This guarantees the stability of blockchain technologies from hacker attacks. Even if a node is changed, the blockchain will be preserved. That is why blockchain technology is extremely better for preserving financial or other data, since every change is recorded and can be traced.

➤ *Speed* – transactions are processed significantly faster and at any time of the day.

➤ *Saves costs* – centralized networks are quite expensive to maintain and require a lot of expenses to carry out transactions. Anonymity – in a transaction, the buyer and seller can use numbers instead of personal data, thus keeping their identities secret. This advantage of blockchain technology has many critics, who believe that anonymity allows cryptocurrencies to be used on the illegal online market, but it is an advantage in electronic voting, for example. (H. F. Atlam, A. Alenezi, M. O. Alassafi, G. B. Wills, 2018, p. 45)

Along with all the advantages, blockchain technologies also face **a number of challenges**. Participants in the network verify transactions using certificates, property rights, etc. But in the event that a transaction needs to be reversed, this is impossible, even if both parties to it have agreed to do so.

Another major problem with blockchain is the need for too much energy, which energy is used to maintain the register in real time. Signature verification is also a major challenge for blockchain technology. This is because a complex cryptographic code is required to validate a transaction, and a large amount of energy is used to achieve accuracy in this process.

In a distributed database such as blockchain technology, it takes a lot of effort for nodes in the network to reach consensus. Depending on the type of consensus mechanism used, this can involve significant communication between participants. Centralized databases also have a lot of disputed or aborted transactions, but overall there are far fewer of them, unlike blockchain transactions, which are queued and processed in one place.

Successful transactions occur when all nodes in the blockchain are verified, which is a rather slow process. The implementation of the Lightning Network protocol<sup>23</sup> is a likely solution to this problem. (Sarmah, 2018, p. 27) Another

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<sup>23</sup> Bitcoin Lightning Network – this is a blockchain technology developed by J. Poon and T. Dryjain in 2017, which is currently being successfully applied to the management of cryptocurrencies. It creates fast transactions that do not need to be confirmed.

equally significant problem with blockchain technology is its complexity. It contains numerous processes and concepts that are difficult to explain to the public and cannot yet be widely used. (Sarmah, 2018, p. 27) This new technology requires a lot of skills that are not available to a limited number of people, especially in banking. Therefore, mass adoption will require widespread public awareness. (H. F. Atlam, A. Alenezi, M. O. Alassafi, G. B. Wills, 2018, p. 45)

The constant addition of blocks leads to an increase in the size of the blockchain. The size of the Ethereum blockchain has already exceeded 1 TB, and the Bitcoin ledger is expected to reach 6.5 TB in early 2025. The rapid growth of the blockchain can be a serious problem for its stability, which depends on the number of nodes in the network. Another important advantage of the blockchain is its big challenge, namely the *publicity of the data*. This is quite responsible when distributed ledgers are to be used when working with government or medical data. This requires the ledgers themselves to be changed and access to them to be restricted. (Sarmah, 2018, p. 27)

In recent years, companies from various fields, as well as retailers, telecommunications companies, software companies, car manufacturers, etc., have been planning and preparing to launch embedded financial services in order to serve their customers better. The goal of embedded financing is to provide easier and cheaper access to financial processes for consumers. Until years ago, consumers of large purchases had to go to a physical bank branch to apply for credit. Now, with embedded financing, they can make a purchase and receive credit on the spot.

The data obtained from systematized responses and processed results (according to the NSI classifier of economic activities - KID 2008) from the questionnaire survey conducted by us <sup>24</sup> on the topic: „*Assessment of the impact of blockchain technologies on financial institutions in Bulgaria – problems, trends and solutions*“ – complement our research and confirm our conclusions related to the complex nature of blockchain technology, which, despite the software complexity in development and maintenance, will give financial institutions a chance to maintain their leading positions in the economy. The full analysis of the responses from the survey is presented in graphical form, after processing 100% of the responses received.

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<sup>24</sup> <https://forms.gle/dDdXz9UFFggeQafF8>

## **CONCLUSION**

By examining the leading theoretical propositions in the dissertation and studying the main challenges for the implementation of blockchain technologies, we can conclude that the introduction of blockchain technologies into the financial sector in Bulgaria will provide higher transparency, efficiency and security at a lower cost for financial institutions and will lead to a revolution in payment processing by providing easy access to rational financial services, under effective regulations.

## **IV. DIRECTIONS FOR FUTURE RESEARCH ON THE TOPIC OF THESIS**

The important results obtained and scientific and applied contributions from the conducted dissertation research provide the author with grounds for conducting additional studies related to the mass introduction of blockchain technologies in the financial sector to improve the transparency, security and speed of financial services, in order to maintain the leading position of financial institutions in the economy.

## **V. REFERENCE ON THE MAIN CONTRIBUTIONS IN THE DISSERTATION THESIS**

The following scientific and applied scientific contributions can be highlighted in the dissertation work:

First. Based on a thorough scientific analysis, the author offers an argumentative complex systematization of the theoretical aspects in the field of blockchain technologies and crypto-assets, and their significance for the activities of financial institutions. The presented policies to promote the use of innovative blockchain technologies will provide fundamental changes in the financial sector, which will help financial institutions achieve better financial sustainability.

Second. The author presents a current theoretical and practical analysis that justifies the relationship and role of fintech companies in the implementation of blockchain technologies, in the context of applicable specifics and regulations in the fintech sector.

Third. The presented survey and the correct comparative analysis of global

and national practice support the author's view of the future state and development trends in the fintech sector and applicable blockchain technologies in financial institutions, by assessing the adequacy of the modern regulatory regime. The construction of effective sandbox-type regulations will facilitate the successful development of fintech companies and blockchain technologies in a controlled environment.

Fourth. The author justifies the need to build important regulatory mechanisms to support the set goals such as: further promotion of innovation and competition, increasing convenience for consumers and strengthening financial stability.

Fifth. By using prospective analysis, the author tests possibilities for compiling specific forecasts and effects for optimizing the process of implementing blockchain technology in various sectors of the economy and public administration, taking into account new market realities.

## **VI. LIST OF PUBLICATIONS ON THE TOPIC OF THE DISSERTATION**

### **Articles:**

1. *„The challenges of financing fintech companies through alternative methods“*, 20.11.2020г. Annual Almanac "Scientific Research of Doctoral Students" AI Tsenov, ISSN: 1313-6542
2. *„New opportunities for the development of the fintech sector through the regulatory sandbox regime“*- issue 4/2021 in the magazine "Dialog", AI Tsenov- Svishtov.

### **Scientific reports**

1. *„Blockchain technologies – the big benefits for small banks“* - International Scientific and Practical Conference "Sustainable Development and Socio-Economic Cohesion in the 21st Century - Trends and Challenges", Svishtov, November 8-9, 2021. Vol. 1, ISBN: 978-954-23-2067-8 (print) and ISBN: 978-954-23-2068-5 (online).
2. *„Embedded payments and revolutionary solutions in the fintech sector“* - International scientific and practical conference dedicated to the Circular Economy in the context of the relationship industry 4.0 - society 5.0 - October 21-22, 2022, pp. 592-599, D. A. Tsenov Academy of Economics. Collection of reports, ISBN 978- 954-23-2249-8, ISBN (online) 978-954-23-2250-4

## **VII. PARTICIPATION OF THE DOCTORAL STUDENT IN SCIENTIFIC FORUMS**

1. Participation in the Doctoral Scientific Session - 20.11.2020, SA "D.A. TSENOV" Svishtov, and presentation of the Annual Almanac "Scientific Research of Doctoral Students" AI TSENOV, ISSN: 1313-6542
2. Participation in a seminar "Research Methodology", held at 09.10.-11.10.2020г.
3. Participation in national forums - International Scientific and Practical Conference "Sustainable Development and Socio-Economic Cohesion in the 21st Century - Trends and Challenges" November 8-9, 2021 and presentation of a report entitled "Blockchain Technologies - the Great Benefits for Small Banks“
4. Participation in the doctoral scientific session 2022 as a listener.

## **VIII. COMPLIANCE WITH THE REQUIREMENTS OF THE REGULATIONS FOR THE IMPLEMENTATION OF THE LAW ON THE DEVELOPMENT OF THE SCIENTIFIC STRUCTURE IN THE REPUBLIC OF BULGARIA**

**Articles: 2 independent**

**Scientific reports: 2 independent ones**

Achieved number of points under Indicator 7 (Articles and reports published in non-refereed journals with scientific review or published in edited collective volumes), according to the Annex to Art. 1a, para. 1 of the Regulations for the Implementation of the Law on the Development of the Scientific Staff in the Republic of Bulgaria with Minimum National Requirements for the Scientific, Teaching and/or Artistic or Sports Activities of Candidates for Acquisition of a Scientific Degree and for Occupying the Academic Positions "Senior Assistant", "Associate Professor" and "Professor" in Scientific Fields and/or Professional Fields in Area 3. Social, Economic and Legal Sciences, Professional Field 3.1. Sociology, Anthropology and Cultural Sciences, 3.2. Psychology, 3.3. Political Sciences, 3.4. Social Activities, 3.5. Public Communications and Information Sciences, 3.6. Law, 3.7. Administration and Management, 3.8. Economics, 3.9. Tourism

**4 articles and scientific reports x 10 т. = 40 т.**

## IX. DECLARATION OF ORIGINALITY AND AUTHENTICITY OF THE DISSERTATION

from  
MARINA iVANOVA

In connection with the conduct of a procedure for acquiring an educational and scientific degree "Doctor" in the scientific specialty 05.02.05 Finance, monetary circulation, credit and insurance (finance) I declare:

a. The results and contributions in the dissertation on the topic: **"Assessment of the impact of blockchain technologies on financial institutions in Bulgaria - problems, trends and solutions"** are original and are not borrowed from research and publications in which the author has no participation.

b. The information presented by the author in the form of copies of documents, publications and references corresponds to the objective truth.

c. Results that have been obtained, described and/or published by other authors are duly and comprehensively cited in the bibliography.

Svishtov,  
2024 г.

DECLARATOR .....  
/Marina Ivanova/