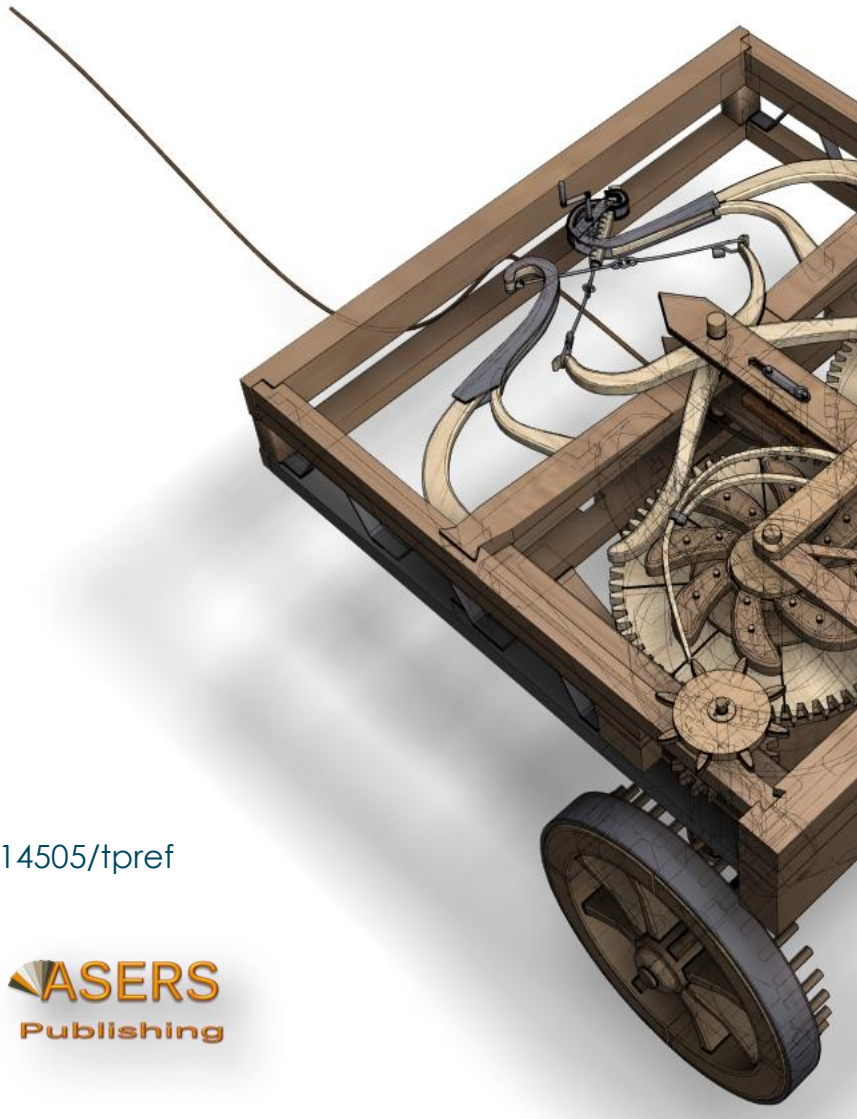
Theoretical and Practical Research in Economic Fields

Special Issue



Quarterly
Volume XV
Issue 2(30)
Summer 2024

ISSN: 2068 – 7710
Journal DOI: https://doi.org/10.14505/tpref

ASERS
Publishing

Volume XV
Issue 2(30)
Summer 2024

ASERS Publishing
ISSN 2068 – 7710
Journal's Issue DOI:
https://doi.org/10.14505/tpref.v15.2(30).00

Table of Contents

Volume XV
Issue 2(30)
Summer 2024

ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7710
Journal's Issue DOI:
https://doi.org/10.14505/tpref.v15.2(30).00

Call for Papers
Fall Issue 2024
Theoretical and Practical Research in Economic Fields

Many economists today are concerned by the proliferation of journals and the concomitant labyrinth of research to be conquered in order to reach the specific information they require. To combat this tendency, **Theoretical and Practical Research in Economic Fields** has been conceived and designed outside the realm of the traditional economics journal. It consists of concise communications that provide a means of rapid and efficient dissemination of new results, models, and methods in all fields of economic research.

Theoretical and Practical Research in Economic Fields publishes original articles in all branches of economics – theoretical and practical, abstract, and applied, providing wide-ranging coverage across the subject area.

Journal promotes research that aim at the unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking. It explores a unique range of topics from the frontier of theoretical developments in many new and important areas, to research on current and applied economic problems, to methodologically innovative, theoretical, and applied studies in economics. The interaction between practical work and economic policy is an important feature of the journal.

Theoretical and Practical Research in Economic Fields is indexed in SCOPUS, RePEC, ProQuest, Cabell Directories and CEEOL databases.

The primary aim of the Journal has been and remains the provision of a forum for the dissemination of a variety of international issues, practical research, and other matters of interest to researchers and practitioners in a diversity of subject areas linked to the broad theme of economic sciences.

At the same time, the journal encourages the interdisciplinary approach within the economic sciences, this being a challenge for all researchers.

The advisory board of the journal includes distinguished scholars who have fruitfully straddled disciplinary boundaries in their academic research.

All the papers will be first considered by the Editors for general relevance, originality, and significance. If accepted for review, papers will then be subject to double blind peer review.

This Special Issue was created at the request of a group of researchers from Ukraine. It is a response to the challenging situation of Ukrainian scholars due to the Russian invasion as well as the growing demand for knowledge on Ukrainian issues.

We would like to express our endless thank to our colleagues, scholars from Ukraine who are working amid the war on topics that are important for all. Also, we thank all our international authors for their valuable contributions to this Issue.

Deadline for submission of proposals:	10th August 2024
Expected publication date:	September 2024
Website:	http://journals.aserspublishing.eu/tpref
E-mail:	tpref@aserspublishing.eu

To prepare your paper for submission, please see full author guidelines in the following file: https://journals.aserspublishing.eu/tpref/Template_for_Authors_TPREF_2024.docx on our site.

DOI: https://doi.org/10.14505/tpref.v15.2(30).20

The Role of Blockchain Technologies in Changing the Structure of the Financial and Credit System

Dmytro BIRIUK
Public Finance Department, State Tax University, Ukraine
ORCID: 0009-0001-0273-9867, Researcher ID: JQW-9723-2023
Dima4@ukr.net

Oleksandr YATSENKO
Educational-Scientific Institute of Economics and Law
Department of Enterprise Economics, Accounting and Audit
Bohdan Khmelnytsky Cherkasy National University, Ukraine
ORCID: 0000-0002-7756-4125, Web of Science Profile G-2304-2019
Allexsan8@ukr.net

Iryna KREKOTEN
Department of Finance, Banking and Taxation
National University 'Yuri Kondratyuk Poltava Polytechnic', Ukraine
ORCID: 0000-0003-0107-2359, ResearcherID: JZE-4621-2024.
irynazvarych@yahoo.com

Halyna ROSSIKHINA
Department of State and Law Disciplines
V.N. Karazin Kharkiv National University, Ukraine
ORCID: 0000-0001-8436-049X, ResearcherID: AAK-7882-2020
Rossikhina.gv14@gmail.com

Iryna CHYCHKALO-KONDRATSKA
Educational and Research Institute of Finance, Economy, Management and Law
International Economic Relations and Tourism Department
National University «Yuri Kondratyuk Poltava polytechnic», Ukraine
ORCID: 0000-0003-3123-841X, ResearcherID: A-6642-2016
Chichkalo.irina1973@gmail.com

Article info: Received 5 April 2024; Received in revised form 17 April 2024; Accepted for publication 20 May 2024; Published 28 June 2024.

Abstract: Purpose of the article is to determine the correlation and influence between the indicators of the development of blockchain-based technologies and the indicators of financial inclusion in countries with different levels of development. The research employed statistical methods, descriptive method, correlation analysis, and regression analysis. The constant transformation of the financial and credit system in the conditions of the rapid development of technologies requires finding ways to adapt to changes. Assessing the impact of blockchain on the development of the financial and credit system allows you to prepare for such changes and use them to your advantage. As a result of the conducted research, it was determined that by 2027 the blockchain market will grow 166 times (compared to 2017). The conducted analysis made it possible to establish that the main advantage of blockchain is to increase financial inclusion to improve access to at least basic financial services for users. It has been confirmed that the lower the level of financial inclusion in the country, the greater the share of the population turns to alternative options for access to credit funds using blockchain-based cryptocurrencies. In particular, it was found that more than 19% of the variation in the indicator of the share of cryptocurrency owners can be explained by the change in the percentage of the population without access to banking services. It was confirmed that the lower the level of financial inclusion in the country, the greater the share of the population turns to alternative options for access to credit funds

using blockchain-based cryptocurrencies. It was also found that more than 19% of the variation in the indicator of the share of cryptocurrency owners can be explained by the change in the percentage of the unbanked population. What is new in the research is the formation of its own approach to assessing the impact of blockchain technology on financial inclusion in countries with different levels of development.

Keywords: finance; potential and financial space; digital space; blockchain; financial inclusion.

JEL Classification: G15; G21; G30.

Introduction

Digitalization has penetrated all spheres of human economy (Lazor *et al.* 2024), but it has a particularly noticeable impact on the financial and credit system (Brandl and Hornuf 2020; Kohtamäki *et al.* 2020; Tay *et al.* 2022). The trend towards the integration of financial and digital spaces is expanding every year, which causes both great hopes for the future development of the system (Lin and Ma 2022) and significant concerns (Alzoubi *et al.* 2022). Researchers wonder how the outlines of the financial and credit system will change in the near future under the influence of rapidly developing new technologies designed to create increasingly new financial instruments and services.

Blockchain is one of the technologies potentially able to significantly transform the modern financial and credit system (Wang *et al.* 2020; Yadav and Bajpai 2020; Choi 2022). This technology is applied in various directions — from optimizing financial services in banks (Chowdhury *et al.* 2021; Dicuonzo *et al.* 2021; Zhang *et al.* 2021) to increasing financial inclusion (Ozili 2022) bypassing the banking system. Some researchers even ask the question, will the need for the traditional financial and credit system exist in the future if it retains the form, it exists today? Will the need for central banks as financial intermediaries disappear due to the emergence of cheaper and more convenient ways of accessing funds?

The aim of this study is to determine the correlation and influence between indicators of blockchain-based technology development and indicators of financial inclusion in countries with different levels of development. In the author's opinion, blockchain technology has the potential to increase financial inclusion that can have the greatest impact on future changes in the financial and credit system as a whole. The aim involved the fulfilment of the following research objectives:

- Conducting a statistical review of blockchain technology development trends;
- Summarizing the benefits and prospects of blockchain implementation in the financial and credit system;
- Identifying the strength, direction of relationship, and influence between the indicators of the development of blockchain-based technologies and the indicators of financial inclusion in countries with different levels of development.

The proposed work contributes to research on the impact of blockchain on the financial and credit system through the formation of its own approach to assessing the impact of blockchain on financial inclusion in countries with different levels of development. A feature of the proposed approach is the ability to quantitatively calculate the extent to which the population's propensity to use cryptocurrencies depends on the general level of financial inclusion.

1. Literature Review

Many researchers dealt with the role of blockchain in the financial and credit system. Some studies expressed doubts about the significant impact of blockchain on financial and credit relations. However, others admit that the role of blockchain can be significant — right up to the replacement of national banks. Panikar (2017) notes that the financial and credit system is based on two assumptions — the state's monopoly on the issuance of money and keeping the majority of money in the banking system. If none of the assumptions are met, the national bank cannot perform its monetary functions. According to the researcher, blockchain-based virtual currencies and decentralized finance may eventually replace national money and question the need for a banking system. Chumak (2021) also mentions the trend towards decentralization in his research. The researcher noted that decentralized applications for financing, or DeFi, continue to be actively developed. Cryptocurrencies are the means in the DeFi system — programmable and unregulated digital money that is accepted by members of the blockchain community. DeFi transforms traditional financial services into disintermediate ones using blockchain-based smart contracts. Chmeruk (2020) characterizes smart contracts as one of the most effective blockchain tools. The conclusion of such contracts is automated and takes place without the participation of intermediaries, which minimizes the possibility of conflicts, risk, increases transparency and control. Regarding the blockchain, the work notes that it can become both a significant threat and an opportunity for financial institutions (intermediaries). It depends on whether such institutions will be able to adapt to the new conditions.

A number of studies revealed the ways in which blockchain can optimize the financial and credit system. Wang *et al.* (2019) are one of the first to analyse the role of blockchain technology and smart contracts in changing the traditional credit system. Scientists propose their own credit model built into the blockchain. The researchers note that the proposed approach can reduce information asymmetry and solve credit rationing problems. Zheng *et al.* (2022) propose to improve the financial lending system by implementing blockchain data exchange and tracking through the improvement of consensus mechanisms. These mechanisms are currently characterized by an insufficient level of security and significant resource consumption. Chang (2020) believes that blockchain can be used to design a credit system. The researcher determined that the implementation of this technology will contribute to solving problems with trust and security thanks to decentralization and autonomy. Mhlanga (2023) believes that blockchain has the potential to not only optimize but also replace the infrastructure that underpins global transfers and payments. In particular, blockchain can be used in financial transactions, to save money, provide credit and insurance.

The researchers paid special attention to blockchain capabilities for increasing financial inclusion. Hoffmann (2021) concludes that blockchain is the best available solution to enable more retail customers to access credit. The use of the blockchain-based microcredit platform proposed in the work will enable investors to receive higher returns thanks to higher interest rates than using traditional savings accounts. Cunha *et al.* (2021) note the importance of new cryptocurrency-based services that allow for the optimization of remittances for expatriates and provide better access to fundraising (initial coin offerings, crowdsourcing, DeFi). Many of these services play a leading role in increasing financial inclusion. The researcher notes that traditional financial systems, exclude the participation of a large part of the population because of the inability to maintain a minimum balance or provide official documents that satisfy the Know Your Client standards.

However, not all works consider blockchain as a technology capable of radically changing the financial and credit system. Vorobets (2020) belongs to the category of researchers who do not consider blockchain technology as a panacea for solving all existing problems. The researcher believes that blockchain is only one of the technologies on which the financial services system will be based in the future. The author identifies several shortcomings related to the implementation of the blockchain, noting that in the future this technology has the potential to increase the efficiency of the financial system. As in many other studies, Abdulhakeem and Hu (2021) recognizes the benefits of using blockchain in the financial system in terms of increasing financial accessibility and transparency. However, the researcher suggests that the blockchain will not necessarily completely change the traditional financial system but will only complement it. This addition will contribute to the financial inclusion of the 1.7 billion unbanked people.

The conducted literature review gives grounds to conclude that the blockchain has a wide potential for optimizing the financial and credit system. Potentially, there is a possibility that this technology can change the structure of the financial and credit system – even replacing national banks. However, researchers do not reach a conclusion about the scale of the future impact of blockchain. Therefore, it is important to assess how blockchain development trends are related to modern trends in the financial and credit system, especially how it affects financial inclusion in countries with different levels of development. Unlike previous studies, the approach proposed in the work considers the influence of the Share of unbanked population indicator on the Share of crypto owners and Crypto adoption index, as well as the influence of the Account ownership at a financial institution or with a mobile-money-service provider indicator on the Share of crypto owners. This allows us to determine how the population's propensity to use cryptocurrencies is related to the overall level of financial inclusion. In other words, the study allows us to assess the ability of blockchain to serve as an alternative source of credit funds for the population that has remained outside of banking services.

2. Methodology

2.1. Research Design

The research design includes three stages. The first stage reveals the scope of blockchain development in the modern world, identifying the main statistical indicators related to this technology. The purpose of this phase is to demonstrate trends in technology development and coverage. The second stage involves summarizing the potential advantages and prospects of blockchain implementation. This deepens understanding of the ways in which technology can optimize/change the traditional financial and credit system. The third stage provided for determining mutual relations and influences between blockchain development and individual financial and credit indicators, in particular, indicators of the level of financial inclusion.

2.2. Sample

Statistical analysis provided for analysing secondary indicators that are publicly available (Statista 2021; Why are Banks Adopting Blockchain Technology 2023; Shewale 2024):

Blockchain market size, billion USD;
Distribution of blockchain market value by sector;
Blockchain technology use cases in organizations worldwide;
Bank initial use cases for blockchain;
Number of blockchain wallet users, million;
Number of daily transactions on the blockchain of bitcoin.

Table 1. Indicators of Financial Inclusion and Adoption of Cryptocurrencies

	Share of unbanked population	Crypto adoption index	Account ownership at a financial institution or with a mobile-money-service provider, %	Share of crypto owners
Morocco	0.71	0.1	44.37	0.16
Vietnam	0.69	1	56.27	0.27
Egypt	0.67	0.05	27.44	0.19
Philippines	0.66	-	-	0.29
Mexico	0.63	0.06	48.97	0.13
Nigeria	0.6	0.26	45.32	0.47
Peru	0.57	0.11	57.5	0.14
Colombia	0.54	0.19	59.72	0.16
Indonesia	0.51	0.1	51.76	0.29
Argentina	0.51	0.19	71.63	0.26
Kenya	0.44	0.28	79.2	0.19
Romania	0.42	0.04	69.12	0.14
Kazakhstan	0.41	0.02	81.11	-
Ukraine	0.37	0.29	83.56	-
Uruguay	0.36	0.02	74.13	-
South Africa	0.31	0.14	85.38	0.22
Turkey	0.31	0.01	74.09	0.47
Brazil	0.3	0.16	84.04	0.28
Bulgaria	0.28	0.09	83.97	-
Chile	0.26	0.06	87.06	0.15
Russia	0.24	0.14	89.72	0.14
India	0.2	0.37	77.53	0.27
Greece	0.15	0.03	94.88	0.18
Poland	0.13	0.07	95.72	0.14
USA	0.07	0.22	94.95	0.16
Spain	0.06	0.06	98.3	0.15
France	0.06	0.08	99.24	0.11
Italy	0.06	0.03	97.29	0.11
South Korea	0.05	0.07	85.38	0.20
UK	0.04	0.13	99.76	0.12
Austria	0.02	0.02	99.95	0.14
Japan	0.02	0.03	98.49	0.06
Germany	0.01	0.06	99.98	0.12
Australia	0	0.07	99.32	0.17
Canada	0	0.09	99.63	0.13
Denmark	0	-	-	0.13
Norway	0	0.03	99.48	0.17

The sample for the study consists of countries with the highest shares of the unbanked population, as well as a number of developed countries where the share of the unbanked population is insignificant (World of Statistics 2023). This composition of countries makes it possible to reveal how the need for blockchain application differs in countries with different levels of development. For the same purpose, the study includes such indicators as Account ownership at a financial institution or with a mobile-money-service provider, %, Crypto adoption index, Share of crypto owners. Table 1 presents countries and indicator values for the study.

2.3. Methods

The research employed the method of statistical analysis for identifying trends in the development of blockchain technology and the scale of its implementation. The descriptive method was applied in order to describe the advantages and outline prospects of blockchain implementation in the financial and credit system. The method of correlation analysis was used to identify the correlation between the adoption rates and the number of owners of blockchain-based cryptocurrencies and financial inclusion rates in countries with different levels of development. The method of regression analysis was applied to establish the influence of financial inclusion indicators on increasing public interest in alternative sources of blockchain-based credit.

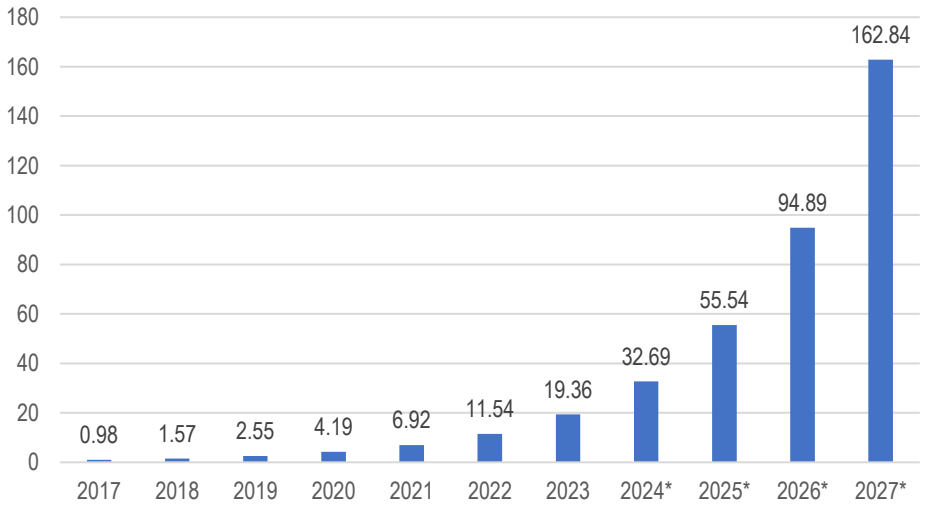
The selected research methodology makes it possible to calculate the degree of influence of financial inclusion indicators on increasing demand for blockchain. The importance of these aspects is emphasized in the works of a number of authors (Abdulhakeem, 2021; Chumak, 2021; Cunha *et al.* 2021) and makes the chosen methodology optimal for data analysis in the study.

3. Results

3.1. Statistical Analysis of Indicators Related to Blockchain Development

To assess the role of blockchain technology in changing the structure of the financial and credit system, it is necessary to have an idea of the current scale of blockchain development. It can be noted that between 2017 and 2023, the size of the blockchain market increased almost 20 times, reaching $19.36 billion. At the same time, it is predicted that the blockchain market will grow 166 times by 2027 compared to 2017 (Figure 1).

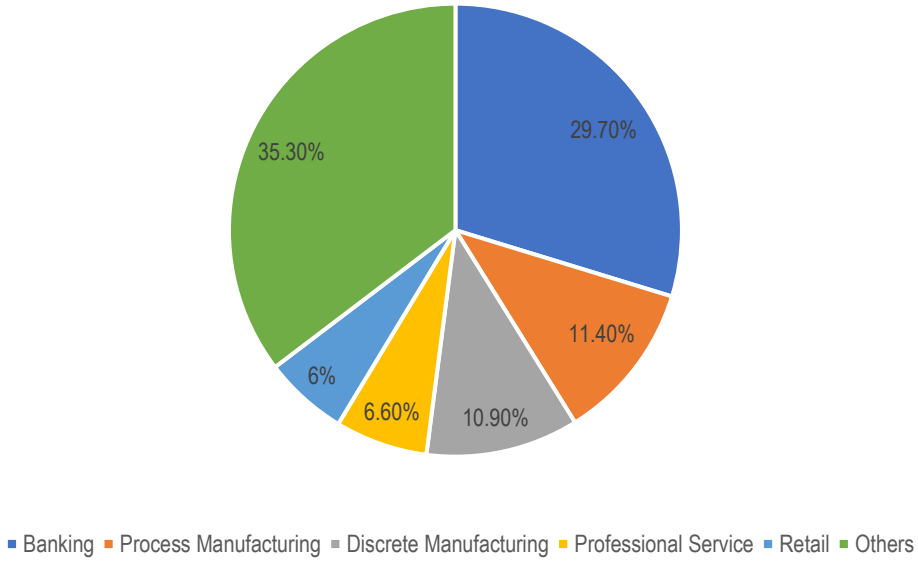
Figure 1. Blockchain Market Size, billion USD



Source: graphed by the author based on Shewale (2024)

Considering the distribution of the blockchain market value by sectors of the economy, it can be noted that the largest share belongs to the banking sector (Figure 2). Some studies have found that more than 90% of US and European banks have launched blockchain-related projects (Shewale 2024).

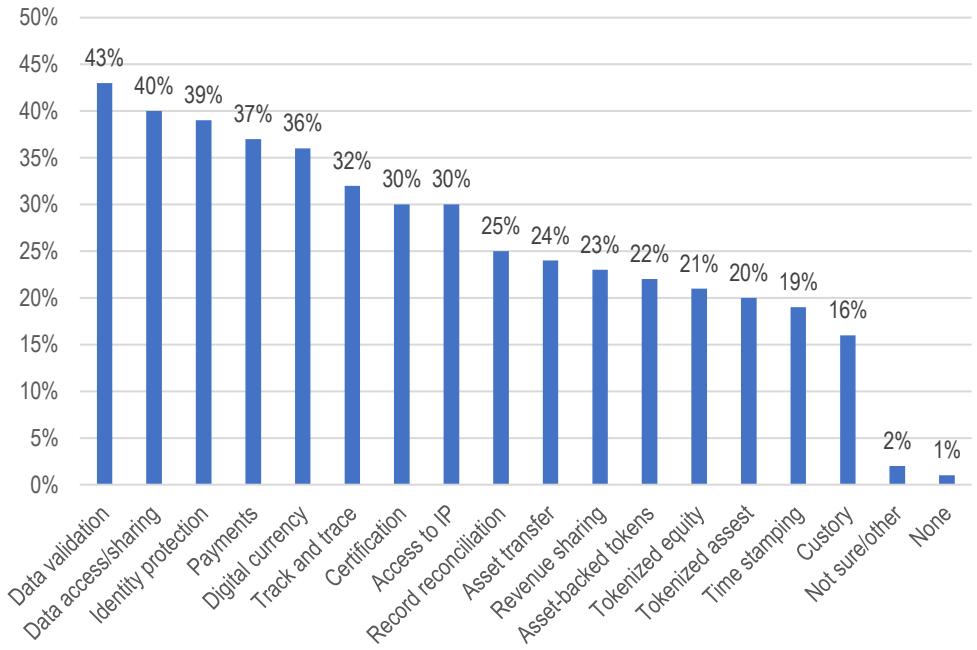
Figure 2. Distribution of Blockchain Market Value by Sector



Source: graphed by the author based on Shewale (2024)

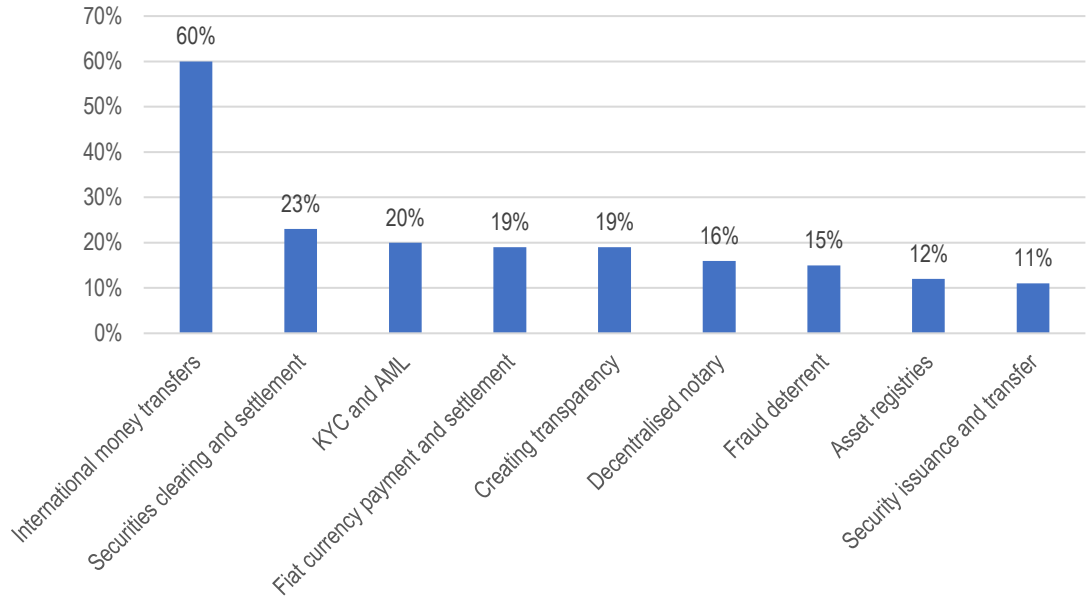
Besides, it is important to understand which areas of blockchain use are the most common today. Figure 3 illustrates the most common areas of blockchain use by organizations, and Figure 4 illustrates areas of application by banks.

Figure 3. Blockchain Technology Use Cases in Organizations Worldwide



Source: graphed by the author based on Statista (2021)

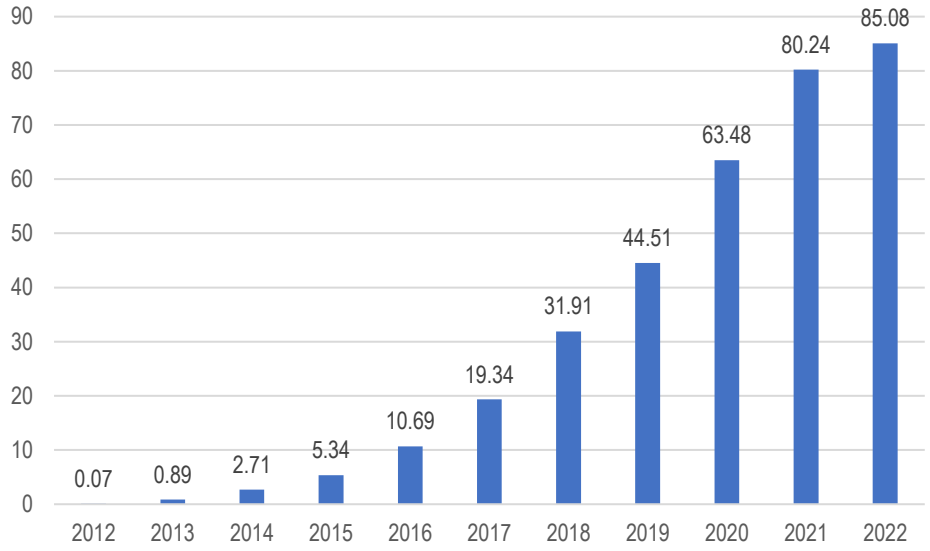
Figure 4. Bank Initial Use Cases for Blockchain



Source: graphed by the author based on Why are Banks Adopting Blockchain Technology (2023)

The information in Figure 3 shows that there are many areas of blockchain use in organizations, the most popular of which are data verification, data access/exchange, identity protection, payments, digital currency, and others. Blockchain is most often used by banking institutions (Figure 4) for international money transfers. The population most often uses blockchain when investing in cryptocurrency, for money transfers, and also when using digital wallets. The number of users of digital wallets increased significantly between 2012 and 2022, and as of 2022 exceeded 85 million (Figure 5).

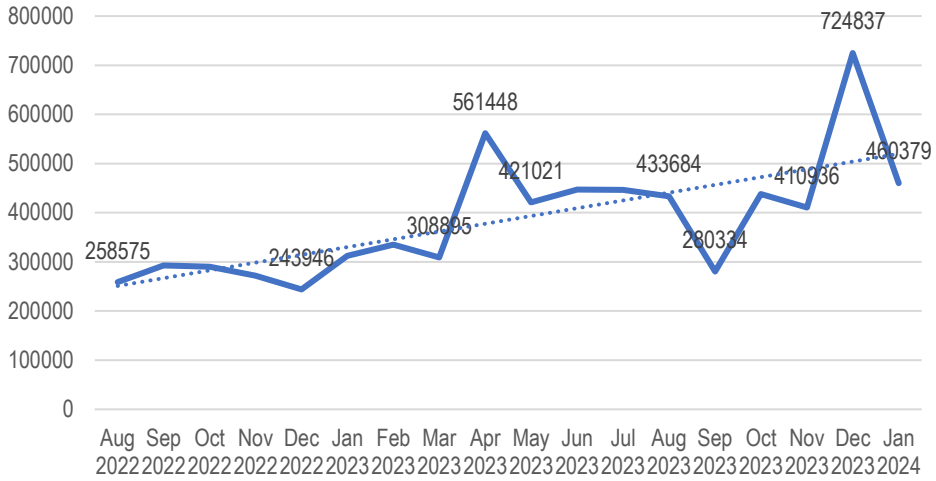
Figure 5. Number of Blockchain Wallet Users, Million



Source: graphed by the author based on Shewale (2024)

The number of transactions using bitcoin undergoes noticeable fluctuations (Figure 6). However, the general trend indicates its increase.

Figure 6. Number of Daily Transactions on the Blockchain of Bitcoin



Source: prepared by the author based on Shewale (2024)

The conducted statistical analysis gives grounds to conclude that the blockchain market is actively developing, and according to forecast data, this trend will only increase. Blockchain is especially important for the financial sector, in particular, for the banking industry. Blockchain is mainly used in the banking industry to optimize various processes. At the same time, its use by such participants of the financial and credit system as blockchain lenders, decentralized credit platforms based on the blockchain, cryptocredit companies leads to more significant transformations of the financial and credit system. These transformations can have a significant impact on banking, because they create competition for traditional financial institutions. Decentralized financing is able to provide financial services outside the banking sphere. Such services may be available to that category of the population that does not have access to traditional banking services due to insufficient collateral, lack of credit history, legal restrictions, etc.

3.2. Prospects and Advantages of Blockchain Implementation in the Financial and Credit System

The generalized approaches to determining the possibilities of blockchain implementation were tabled, outlining its prospects and advantages (Figure 7). The Figure contains both advantages and prospects for banking institutions and for other subjects of the system.

The observed prospects can significantly transform the financial and credit system by shifting the focus to decentralization. At the same time, they can prevent creating an excessive load on intermediaries. In order to adapt to the changes, banks should pay more attention to the introduction of blockchain to optimize their own services, as well as focus on cooperation with providers of decentralized services. For example, they can participate in the financing of startups, integrate separate solutions of decentralized payment systems into their activities, create joint projects to provide new services, etc.

In this context, an example of the Grassroots Economics project is worth noting. Such projects can help to reduce the credit deficit, especially in regions with a low level of development. The organization specializes in microfinance for community development, empowering people to improve their economic future. At the same time, the community can take a loan supported by various real goods or services that can be offered by the community. For example, if funds are not returned on time, the organization has the right to claim part of the harvest. In the context of potential cooperation with banks, such projects can provide banks with access to their technology and infrastructure.

Another project that illustrates the great potential of decentralized finance is the Ajna project. Ajna is based on Ethereum and offers a Web3 interface for lending and borrowing cryptocurrency (Balmer 2024). A feature of Ajna is high accessibility and inclusiveness for a wide category of users who do not have access to traditional banking services, through the use of the permissionless lending pools approach. Ajna's potential to work with banks may also include providing banks with technology solutions, facilitating the development of blockchain-based digital assets, and providing credit risk assessment tools.

So, as noted above, it is important for banks to adapt to the development of blockchain technology. The given examples illustrate only some of the opportunities for banking institutions that will allow them not to lose their competitive advantage along with the development of blockchain-based decentralized finance. The process of

implementing blockchain should be balanced, which is to eliminate the excessive burden on banking institutions, not to eliminate the need for them. In the author's opinion, such a balance can be established with the state intervention, which must establish appropriate regulatory rules.

Figure 7. Prospects and Advantages of Blockchain for the Transformation of the Financial and Credit System

Prospects and advantages of blockchain for the transformation of the financial and credit system	increasing simplicity and efficiency thanks to the creation of a new infrastructure of financial services;
	speed and security of transactions, especially in dangerous or remote regions;
	increasing transparency, in particular, through smart contracts, which also help reduce risk and improve control over payment terms;
	ensuring complete confidentiality;
	stimulating access to finance;
	minimization of the influence of intermediaries;
	reduction of a number of risks of various origins;
	reducing the risk of dishonest behaviour - for example, when unreasonable loans are issued;
	the ability to monitor the emission of virtual money, if the borrower is a state financial institution;
	reduction of operating costs for business entities;
	implementation of a payment system on an international scale;
	a large number of areas of application, each of which has its own advantages

Source: generalized by the author based on Panikar (2017); Vorobets (2020); Chmeruk (2020); Chumak (2021)

3.3. Increasing Financial Inclusion. Correlation Analysis

One of the most important advantages of the blockchain was noted to be the increase in financial inclusion, that is, the availability of at least basic financial services to a wider category of the population. However, it is important to determine to what extent financial inclusion is related to the popularity of blockchain usage. Therefore, it is proposed to conduct an analysis of how financial inclusion indicators are related to the perception of blockchain-based cryptocurrency (Table 1). This will reveal how the use of blockchain technologies differs depending on the level of financial availability in countries. Table 2 presents the conclusions based on the results of the correlation analysis.

Table 2. The results of the Correlation Analysis

	Crypto adoption index	Share of crypto owners
Share of unbanked population	0.396755	0.396717
Account ownership at a financial institution or with a mobile-money-service provider, %	-0.279793	-0.426153

Source: calculated by the author

The results of the correlation analysis give grounds to state that the Share of unbanked population is directly related to the Crypto adoption index, as well as to the Share of cryptocurrency owners. The strength of the correlation is moderate. It follows that with the growth of the population that does not have access to banking services, the number of cryptocurrency owners of and the perception of cryptocurrencies in general also increases.

Moreover, the correlation analysis revealed an inverse correlation with noticeable strength for the Account ownership at a financial institution or with a mobile-money-service provider and the Share of crypto owners. So, the higher the number of people who have an account in a financial institution or a mobile money service, the smaller the number of cryptocurrency owners and vice versa.

The regression analysis makes it possible to determine how much one indicator will change when another changes. Table 3 presents the results of the regression analysis, in which the Share of unbanked population was the independent variable, and the Share of crypto owners – the dependent variable.

Table 3. The Results of the Regression Analysis between the Share of Unbanked Population and the Share of Crypto Owners

	BETA	Standard error	B	Standard error	t(32)	p-value
Constant term			0.014116	0.156580	0.090154	0.928727
Share of unbanked population	0.438791	0.158850	0.417382	0.151099	2.762304	0.009431

Source: calculated by the author

There is a statistically significant correlation between the studied indicators of Share of unbanked population and Share of crypto owners in view of t(32) = 2.762304, p < 0.01. R2 is 0.19253747, which means that more than 19% of the variation in the Share of crypto owners indicator can be explained by the change in the percentage of the unbanked population. The BETA coefficient shows that if the percentage of the unbanked population increases by one unit, the share of cryptocurrency owners will increase by 0.438791. Tables 4 and 5 contain the results of correlation analysis for other pairs of indicators, between which a statistically significant correlation was found.

Table 4. The Results of Regression Analysis between the Share of Unbanked Population and the Crypto Adoption Index

	BETA	Standard error	B	Standard error	t(33)	p-value
Constant term			0.003854	0.158983	0.024239	0.980808
Share of unbanked population	0.376124	0.161295	0.386724	0.165841	2.331900	0.025957

Source: calculated by the author

Table 4. The Results of Regression Analysis between the Account Ownership at a Financial Institution or with a Mobile-Money-Service Provider, % and the Share of Crypto Owners

	Standard error	B	Standard error	t(29)	p-value	Standard error
Constant term			-0.015373	0.166392	-0.09239	0.927024
Account ownership at a financial institution or with a mobile-money-service provider, %	-0.426153	0.167989	-0.404036	0.159271	-2.53679	0.016827

Source: calculated by the author

The results of the regression analysis, presented in Tables 4 and 5, also demonstrate a statistically significant relationship between the Share of unbanked population and the Crypto adoption index (Table 4), as well as between the Account ownership at a financial institution or with a mobile-money- service provider, % and the Share of crypto owners (Table 5).

About 14% of the variation in the Crypto adoption index can be explained by changes in the Share of unbanked population. When the Share of unbanked population percentage increases by one unit, the Crypto adoption index will increase by 0.376124.

More than 18% of the variation in the Share of crypto owners can be explained by changes in the Account ownership at a financial institution or with a mobile-money-service provider, %. In this case, there is an inverse correlation between the indicators, so when Account ownership at a financial institution or with a mobile-money-service provider decreases by 1%, the share of cryptocurrency owners increases by 0.426153.

The identified correlation and influences confirm previous assumptions that the lower the level of financial inclusion in the country, the greater the share of the population seeking alternative ways of accessing credit funds, in particular, using cryptocurrencies. A large share of the unbanked population is observed mostly in developing countries. For example, in Vietnam, the share of the population without access to banking services is 69%, which may also cause a high share of cryptocurrency owners - 27%.

4. Discussion

The conducted quantitative analysis proves that the lower the level of financial inclusion in the country, the higher is the rate of adoption and the number of cryptocurrency owners. This gives grounds to conclude that cryptocurrencies can be an effective tool for expanding access to financing. Cryptocurrencies are especially widespread in developing countries, where there is an objective need for the population to access financing in the absence of access to banking services (Hrytsai 2023). In this case, there is no question of eliminating the need for banking services, but it is possible to note the expansion of the population's capabilities, which, with the use of blockchain technologies, gained access to financial services outside the banking sphere. Such conclusions are somewhat contrary to the results of a study by Panikar (2017), who suggests that blockchain-based virtual money

may significantly reduce the demand for central bank resources in the future. In turn, this affects the monetary policy of banks and its effectiveness. The researcher notes that the outlines of the financial and credit system are undergoing a significant transformation due to globalization and the development of blockchain-based technologies, in particular, cryptocurrencies. This leads to structural changes in the financial and credit system: decentralization takes place and the role of the state and financial intermediaries changes, the financial relations become truly global going beyond national boundaries. The researcher insists on the need for state participation in the above processes and believes that a new form of cooperation should be based on public-private partnership.

The conclusions made in the author's work are consistent with the results of a number of studies on the financial inclusion. Chumak (2021) notes that lending, borrowing, exchange, and deposits are the main services in DeFi systems. Money deposited on special platforms can be used to finance borrowers without significant restrictions. So, one of the main advantages of DeFi is the expansion of access to basic financial services enabled though the blockchain use. Abdulhakeem and Hu (2021) believe that decentralization of the financial and credit system using blockchain has high potential. The functions of services within DeFi, in particular, borrowing, lending, exchange, etc., are the same as in the usual financial system. The most important benefit of DeFi is the financial inclusion of a large population that is currently unbanked. Cunha *et al.* (2021) identify distinct advantages of blockchain as a way to increase financial inclusion. For example, women cannot have an official bank account in some countries, and blockchain can help to overcome this discrimination. In other countries, people do not trust the official financial system, preferring blockchain. In particular, in Nigeria, cryptocurrency is used as an investment tool to insure against inflation and devaluation of the national currency.

Furthermore, cryptocurrencies help to bypass currency restrictions existing in the country. Mhlanga (2023) states that financial inclusion contributes to at least 8 sustainable development goals. At the same time, the researcher established that the increase in financial availability depends significantly on the successful implementation of the blockchain. Therefore, it is concluded that governments in developing countries should pay special attention to investment in this technology.

The correctness of the author's conclusions regarding different blockchain needs for countries with different levels of development was also confirmed in the work of Hoffmann (2021). The researcher notes that there are several ways of accessing consumer loans in developed countries. These include credit card debt, which is the most popular method, but has high interest rates. The second method is a payday loan, which has extremely high fees, and additional fees may be charged if you do not return on the specified date. The third way, identified in the study as optimal, is to create a blockchain-based microcredit platform. For borrowers, the advantage is lower interest rates and easier access to funds, for investors — higher profits from short-term unsecured loans. Timely repayment improves the clients' credit history.

In his work, Chmeruk (2020) confirms the significant impact of blockchain on financial and credit relations. According to the researcher, the main consequences of the development of the blockchain are the increase in controllability and transparency, the reduction of costs, the elimination of intermediaries, the reduction of the number of employees of financial institutions due to digitalization, the reduction of risk, as well as the opportunities provided by the blockchain for the implementation of payment systems on an international scale. However, this list does not include one of the main advantages of blockchain implementation identified in the author's work - a positive impact on increasing financial inclusion.

In contrast to the author's work, where the possibilities of the blockchain are mainly disclosed, Vorobets (2020) also reveals the shortcomings of its implementation on a large scale: uncertainty of the legal aspects, the need to standardize requirements, the high cost of development and the lack of specialists with appropriate qualifications, mistrust of a part of the population in cryptocurrencies. The researcher notes that one of the main obstacles to blockchain development in many countries is the imbalance between market reality and the development of the legal framework.

A number of studies revealed additional opportunities from the introduction of blockchain for the financial and credit system, which were not revealed in the author's research. Wang *et al.* (2019) develop a blockchain-based model that will mitigate information asymmetry and solve credit rationing problems, while creating a risk pool for lending. Such a pool will allow the government, banks, and financial companies to jointly share risks. Furthermore, the researchers found that the model they proposed will contribute to the increase of inclusiveness of small and medium-sized businesses in the financing, even if such companies do not have sufficient collateral. Zheng *et al.* (2022) also propose their model on the blockchain. The purpose of this model is to implement access control and management of shared information about transactions in the supply chain. The researchers note that blockchain can be effective in optimizing credit reporting through increased integrity, transparency, reliability and security, as well as through decentralization. Chang (2020) states that the creation of a credit system faces a

number of problems, in particular, in relation to data security and leakage of personal information. The researcher believes that the implementation of blockchain in the course of creating a credit system will contribute to solving these problems.

Conclusions

The studies on the impact of new technologies on financial and credit relations are of particular importance in view of accelerating digitalization in the financial and credit sector. Blockchain, as one of the technologies capable of making particularly noticeable changes in the traditional financial and credit system, is at the peak of relevance. The significant attention of researchers to this technology is determined by the possibilities of the blockchain for optimizing the financial and credit system, especially its possibilities for increasing financial inclusion.

The quantitative analysis carried out in the study confirms that the lower the level of financial inclusion in the state, the more often the population turns to alternative ways of accessing credit funds. In particular, through the use of blockchain-based cryptocurrencies, as evidenced by the high rates of cryptocurrency adoption and cryptocurrency ownership in countries with a low level of financial inclusion. So, cryptocurrencies can be an important tool for expanding access to finance in developing countries. These countries are often characterized by a high proportion of the population that does not have access to banking services. Therefore, in the author's opinion it is too early, at the current stage, to talk about the possibilities of the blockchain to completely eliminate the need for the traditional banking system. This technology has the potential to address financial inclusion in regions where it is most needed. However, the rapid progress of technologies does not exclude more significant effects from the introduction of blockchain. This determines the need for further research, one of the important directions of which should be the identification and assessment of the probability of realization of risks from the introduction of blockchain in the financial and credit system on a global and national scale. Also, further research should eliminate the main limitations of this study, primarily related to the limited sample of countries for analysis.

In general, the conclusions drawn are useful for financial relations actors in view of highlighting the possibilities of blockchain to increase financial inclusion, especially in developing countries. Also, these results can be applied by representatives of the banking industry in the process of developing their own financial and credit policy. This will provide advantages both for the population in view of wider opportunities of access to credit funds, and for banks in view of the need to adapt to the conditions of rapid technological development.

Credit Authorship Contribution Statement

The authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

References

[1] Abdulhakeem, S. A., and Hu, Q. (2021). Powered by Blockchain technology, DeFi (Decentralized Finance) strives to increase financial inclusion of the unbanked by reshaping the world financial system. *Modern Economy 12*(01): 1. DOI: http://dx.doi.org/10.4236/me.2021.121001

[2] Alzoubi, H. M., *et al.* (2022). Cyber security threats on digital banking. Paper presented at *2022 1st International Conference on AI in Cybersecurity (ICAIC)*, May 2022 (pp. 1-4). IEEE. DOI:https://doi.org/10.1109/ICAIC53980.2022.9896966

[3] Balmer, M. (2024). Blockchain development use cases in industries. *Krusche and Company*. Available at: https://kruschecompany.com/blockchain-development-use-cases/#7_Finance

[4] Brandl, B., and Hornuf, L. (2020). Where did FinTechs come from, and where do they go? The transformation of the financial industry in Germany after digitalization. *Frontiers in Artificial Intelligence 3*: 8. DOI:https://doi.org/10.3389/frai.2020.00008

[5] Chang, Z. (2020). Application of blockchain technology-based credit system for personal financial information. Paper presented at *2020 Asia-Pacific Conference on Image Processing, Electronics and Computers (IPEC)*, April 2022 (pp. 431-433). IEEE. DOI: https://doi.org/10.1109/IPEC49694.2020.9115164

[6] Chmeruk, G. G. (2020). The impact of blockchain technology on the transformation of financial relations of business entities. *Problems of a Systematic Approach in the Economy 2*(76): 104-112. DOI:https://doi.org/10.32782/2520-2200/2020-2-16

[7] Choi, T. M. (2022). Achieving economic sustainability: Operations research for risk analysis and optimization problems in the blockchain era. *Annals of Operations Research* 1-26. DOI: https://doi.org/10.1007/s10479-021-04394-5

[8] Chowdhury, M. U., Suchana, K., Alam, S. M. E., and Khan, M. M. (2021). Blockchain application in banking system. *Journal of Software Engineering and Applications 14*(7): 298-311. DOI:https://doi.org/10.4236/jsea.2021.147018

[9] Chumak, N. (2021). Decentralized financial model for Ethereum-based lending. *Computer-Integrated Technologies: Education, Science, Production, 43:* 152-156. DOI: https://doi.org/10.36910/6775-2524-0560-2021-43-25

[10] Cunha, P. R. D., Soja, P., and Themistocleous, M. (2021). Blockchain for development: A guiding framework. *Information Technology for Development, 27*(3): 417-438. DOI:https://doi.org/10.1080/02681102.2021.1935453

[11] Dicuonzo, G., Donofrio, F., Fusco, A., and Dell'Atti, V. (2021). Blockchain technology: Opportunities and challenges for small and large banks during COVID-19. *International Journal of Innovation and Technology Management 18*(04): 2140001. DOI: https://doi.org/10.1142/S0219877021400010

[12] Hoffmann, H. C. (2021). Blockchain use cases revisited: Micro-lending solutions for retail banking and financial inclusion. *Journal of Systems Science and Information, 9*(1). DOI: 10.21078/JSSI-2021-001-15

[13] Hrytsai, S. (2023). Cryptocurrency in the declarations of government officials: A toolkit for money laundering (trends and experience of counteraction, by the example of Ukraine). *Access to Justice in Eastern Europe 6*(3): 1–27. DOI: https://doi.org/10.33327/AJEE-18-6.3-a000333

[14] Kohtamäki, M., Parida, V., Patel, P. C., and Gebauer, H. (2020). The relationship between digitalization and servitization: The role of servitization in capturing the financial potential of digitalization. *Technological Forecasting and Social Change 151*: 119804. DOI: https://doi.org/10.1016/j.techfore.2019.119804

[15] Lazor, O., Lazor, O., Zubar, I., Zabolotnyi, A., and Yunyk, I. (2024). The impact of digital technologies on ensuring transparency and minimising corruption risks among public authorities. *Pakistan Journal of Criminology, 16*(2): 357-374. DOI: https://doi.org/10.62271/pjc.16.2.357.374

[16] Lin, B., and Ma, R. (2022). How does digital finance influence green technology innovation in China? Evidence from the financing constraints perspective. *Journal of Environmental Management, 320*: 115833. DOI:https://doi.org/10.1016/j.jenvman.2022.115833

[17] Mhlanga, D. (2023). Block chain technology for digital financial inclusion in the industry 4.0, towards sustainable development? *Frontiers in Blockchain, 6*: 1-25. DOI: https://doi.org/10.3389/fbloc.2023.1035405

[18] Ozili, P. K. (2022). CBDC, Fintech and cryptocurrency for financial inclusion and financial stability. *Digital Policy, Regulation and Governance, 25*(1): 40-57. DOI: https://doi.org/10.1108/DPRG-04-2022-0033

[19] Panikar, G. Y. (2017). Transformation of international monetary, financial and credit relations in the context of the spread of blockchain technology and cryptocurrencies. Paper presented at *New Forms of Money and Financial Assets: Formation, Prospects, Risks,* (pp. 80–86). Vadym Hetman Kyiv National Economic University. https://kneu.edu.ua/userfiles/Credit_Economics_Department/news/zbir2018.pdf#page=80

[20] Shewale, R. (2024). Blockchain statistics of 2024 (Market size and users). *Demandsage*. Available at: https://www.demandsage.com/blockchain-statistics/

[21] Tay, L. Y., Tai, H. T., and Tan, G. S. (2022). Digital financial inclusion: A gateway to sustainable development. *Heliyon*, *8*(6). DOI: https://doi.org/10.1016/j.heliyon.2022.e09766

[22] Vorobets, V. (20200. Advantages of using blockchain technology in the conditions of digitization of financial instruments. *World of Finance 2*(63): 49-61. DOI: https://doi.org/10.35774/sf2020.02.049

[23] Wang, R., Lin, Z., and Luo, H. (2019). Blockchain, bank credit and SME financing. *Quality and Quantity 53*: 1127-1140. DOI: https://doi.org/10.1007/s11135-018-0806-6

[24] Wang, Y., Kim, D. K., and Jeong, D. (2020). A survey of the application of blockchain in multiple fields of financial services. *Journal of Information Processing Systems, 16*(4): 935-958. DOI: https://doi.org/10.3745/JIPS.04.0185

[25] Yadav, A. K., and Bajpai, R. K. (2020). KYC optimization using blockchain smart contract technology. *International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE), 4*(3): 669-674. DOI: https://doi.org/10.29027/IJIRASE.v4.i3.2020.669-674

[26] Zhang, J., Tian, R., Cao, Y., Yuan, X., Yu, Z., Yan, X., and Zhang, X. (2021). A hybrid model for central bank digital currency based on blockchain. *IEEE Access*, *9*: 53589-53601. DOI:https://doi.org/10.1109/ACCESS.2021.3071033

[27] Zheng, K., Zheng, L. J., Gauthier, J., Zhou, L., Xu, Y., Behl, A., and Zhang, J. Z. (2022). Blockchain technology for enterprise credit information sharing in supply chain finance. *Journal of Innovation and Knowledge, 7*(4): 1-15. DOI: https://doi.org/10.1016/j.jik.2022.100256

[28] Statista. (2021). Blockchain technology use cases in organizations worldwide as of 2021. Available at: https://www.statista.com/statistics/878732/worldwide-use-cases-blockchain-technology/

[29] Statista. (2023). Share of respondents who indicated they either owned or used cryptocurrencies in 56 countries and territories worldwide from 2019 to 2023. Available at: https://www.statista.com/statistics/1202468/global-cryptocurrency-ownership/

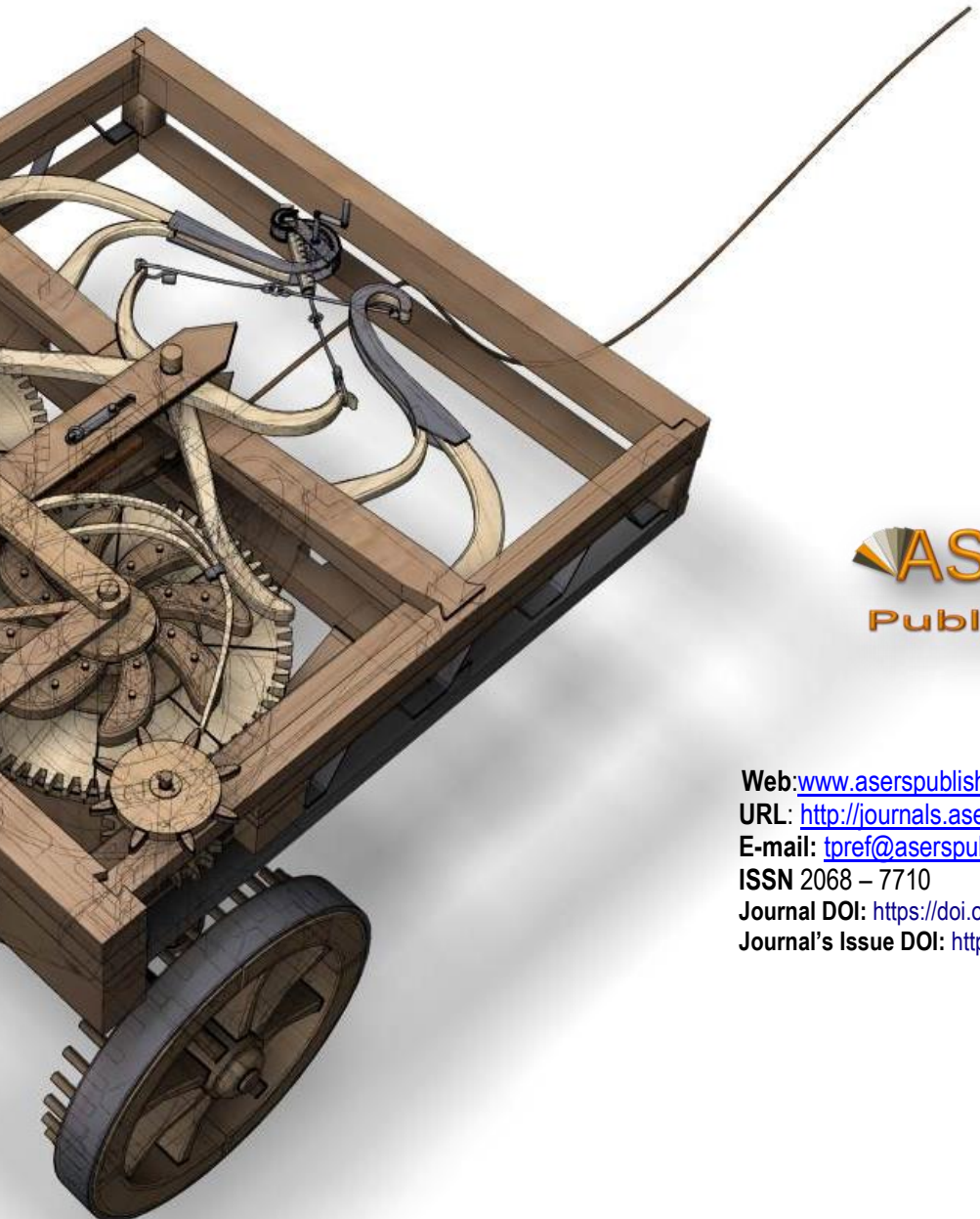
[30] The 2021 Global Crypto Adoption Index: Worldwide Adoption Jumps Over 880% With P2P Platforms Driving Cryptocurrency Usage in Emerging Markets. (2021). Available at: https://www.chainalysis.com/blog/2021-global-crypto-adoption-index/

[31] The World Bank. (2022). Account ownership at a financial institution or with a mobile-money-service provider (% of population ages 15+). Available at: https://data.worldbank.org/indicator/FX.OWN.TOTL.ZS

[32] Why are Banks Adopting Blockchain Technology? (2023). *Appinventiv*. Available at: https://appinventiv.com/blog/blockchain-in-banking/

[33] World of Statistics. (2023). World's most unbanked countries (adult unbanked population). Available at: https://twitter.com/stats_feed/status/1677026071785488386

ASERS



ASERS Publishing

Web:www.aserspublishing.eu
URL: http://journals.aserspublishing.eu/tpref
E-mail: tpref@aserspublishing.eu
ISSN 2068 – 7710
Journal DOI: https://doi.org/10.14505/tpref
Journal's Issue DOI: https://doi.org/10.14505/tpref.v15.2(30).00