

NEW OPPORTUNITIES AND PERSPECTIVES OF BLOCKCHAIN TECHNOLOGY

Boban Spasić^{1*}, Nebojša Denić², Ivana Bulut Bogdanović³, Saša Mihajlović⁴, Stefan Milić⁵

¹Faculty of Technical Sciences, University of Priština, Kosovska Mitrovica, Serbia, e-mail: boban.spasic1@pr.ac.rs

²University of Priština, Faculty of Sciences and Mathematics Kosovka Mitrovica, e-mail: nebojsa.denic@pr.ac.rs

³Faculty of Social Sciences, Belgrade, Serbia, e-mail: ivana.bulut@fdn.edu.rs

⁴Faculty of Mathematics and Computer Sciences, Alfa BK University, Belgrade, Serbia, e-mail: sasamihajlovic56@gmail.com

⁵Faculty of Information Technologies, Alfa BK University, Belgrade, Serbia, e-mail: milicmomir153@gmail.com

Abstract: In this research paper, based on a review of relevant recent literature and research conducted in practice, the emergence, development, areas of application and the implementation process of blockchain technology in business will be presented, as well as possible trends and perspectives for future development and how the application of this technology will affect social economic development, environmental protection and sustainable development, which has become one of the main drivers of the modern business world. Blockchain technology is a type of distributed ledger technology. Despite the fact that blockchain technology is gaining increasing importance, because it has enormous application possibilities in many areas of business, there is still a lack of research in this extremely current area in the literature. In this context, the paper represents a contribution and a new comprehensive review of the possibilities of applying Blockchain technology in a modern business environment. The paper, among other things, elaborates on the advantages and disadvantages of this new sophisticated technology, and also points out the safety and security problems that may arise when applying blockchain technology. At the end of the paper, a comparative analysis of new potential opportunities and application trends in various business areas is presented, as well as possible directions for future research.

Keywords: *Blockchain technology, artificial intelligence, industry 4.0.*

Field: Social Sciences (Business and Finance)

1. INTRODUCTION

It can be said that we live in a time when innovative sophisticated technologies and new original approaches to work are changing and upgrading day by day. In this sense, one of the relatively new technologies and increasingly used is the technology of Industry 4.0. so-called Blockchain technology. The literature states that blockchain technology is causing a change in the world in other areas of our lives, not only in finance, and is becoming increasingly interesting for entrepreneurial practice (Shrier, 2020). In essence, blockchain is an innovative protocol for exchanging and storing information. According to the creator of this technology, Satoshi Nakamoto, Blockchain is "a distributed, time-stamped set of records, into which only new data can be entered and which is cryptographically protected from unauthorized access and revision". In the literature, October 31, 2008, is taken as the date of the emergence of this technology, when Satoshi Nakamoto sent an email to several email addresses to people involved in cryptography. In it, he wrote that he was working on a new peer-to-peer electronic cash system and attached a so-called white paper called Bitcoin: A Peer-to-peer Electronic System (MCSweeney, 2021). The term "blockchain" is used to describe distributed ledger technology, where it does not denote a specific solution, but a concept (Denić N, 2025). After that, on January 3, 2009, Satoshi Nakamoto created the first Bitcoin block, and with this action, the first 50 Bitcoins were created (Phillips, 2021).

2. THEORETICAL BACKGROUND OF THE EMERGENCE AND DEVELOPMENT OF BLOCKCHAIN TECHNOLOGY

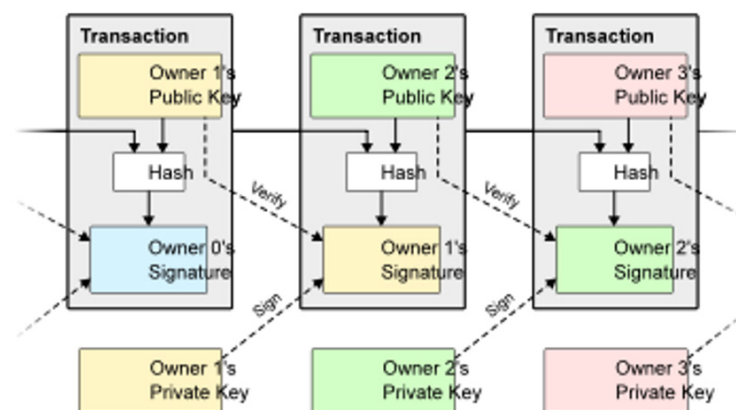
Research shows that Blockchain technology is a relatively new technology, which was developed and is primarily used in payment systems (Bitcoin). In this context, it can be said that Blockchain technology enables secure and transparent inclusion in the environment of known business participants and the execution of transactions between different business entities, which in today's business environment did not have the opportunity for IT and business connections. The Industry 4.0 period, whose main carriers are the Internet of Things, artificial intelligence, big data, cloud computing and blockchain technology, requires great intensity from the individual in terms of education, professional development and training,

*Corresponding author: boban.spasic1@pr.ac.rs



both in private and professional life (Denić N, 2025). This opinion is supported by authors who state that Blockchain technology promises to change the world in other areas of our lives, not only in finance, and is becoming increasingly interesting for entrepreneurial practice (Shrier, 2020). In this regard, some authors point to caution and that insufficient understanding can lead to wrong business decisions and poor assessment of the potential or usefulness of blockchain technology (Hawlitshcek et al., 2020). In general, it can be said that Blockchain serves as an immutable ledger. This ledger allows transactions to take place in a decentralized environment. Blockchain technology enables the maintenance of so-called digital transaction logs, which can be programmed not only to record financial transactions, but also for almost anything that has some value (Shchehliuk, S. D. 2019). Many companies are researching and analyzing the possibilities of applying this technology, and its versatility is confirmed by the fact that it is already used in various industrial sectors (Beck, R., Müller-Bloch, C., & King, J. L. 2018). So it can be said that Blockchain, as a young technology, is gaining momentum in various areas, both in the product manufacturing sector and in the service domain, and they are serviced by modern software solutions (Denić N, 2025). Blockchain has even transformed the traditional financial industry, as about 15% of banks began using it in 2017. It is interesting to note that although there are many promising positive examples of use, research is still in its early stages. On the other hand, some authors state that there is a significant lack of theoretical knowledge, which is why companies, despite implementing this technology, are still not achieving the expected results (Weking et al., 2020). Blockchain is a new, emerging technology that significantly changes the way data is stored and transactions are recorded. In some aspects, it is similar to database technology, but with a key difference - it allows work without the presence of intermediaries (Locher & Pignolet, 2017). Research into this technology is currently most prevalent in four areas: financial services, supply chains, the concept of two-sided business, and the benefits of the technology in the field of social protection (Weking et al., 2020). Blockchain brings greater data transparency in various industries (Koksal, 2019). One of the more significant features of this technology is that due to its distributed architecture, the network is highly resistant to cyber attacks (Vermaak, 2021). Just as the expansion of the Internet and the new business opportunities it made possible, as well as, for example, open-source technology with the most recognizable representative Linux, changed the business of companies and the users themselves, we can predict a bright future for blockchain technology in digital business and the new business models that it predicts. Regarding the structure of blockchain technology itself, the literature states that the basic concept of blockchain technology is based on the feature of a distributed database, which solves the issues of transparency, security and efficiency (Bellini et al., 2016). A blockchain system is a distributed transaction database composed of a series of equal nodes, each of which stores a copy of the transaction ledger. In this regard, it can be said that this revolutionary technology significantly changes the business models of both companies and users, but at the same time it brings certain challenges that, despite all the technological advantages, have not yet been able to be raised to the level of widespread application (Denić N, 2024). Figure 1 clearly shows how and in what way a blockchain is formed, when a system of public and private keys is used

Fig. 1.View of the Blockchains transaction execution scheme (Original scheme published by Satoshi Nakamoto in 2008)



Source: Nakamoto, S. (2008) Bitcoin: A Peer-to-Peer Electronic Cash System. <https://bitcoin.org/bitcoin.pdf>

Blockchain technology therefore works on the basis of a distributed ledger. The literature states that distributed ledger technology (DLT), such as blockchain, offers solutions to many existing problems, but in this context, it also presents new challenges for organizations (Demestichas et al., 2020, p. 2). A distributed ledger is actually an entire chain of blocks, from the first to the last currently known block, which is publicly available to everyone. The essence of the distributed ledger is that there is not just one copy of the blockchain, but many copies (Denić N, 2024). Each individual who downloads the blockchain to their computer is actually just copying the blockchain from existing nodes in the network. Its copy of the blockchain is identical to the blockchain held by other nodes. With this action, the individual joins the network and also becomes a node. Thus, there are as many copies of the blockchain as there are nodes in the network (Feign, 2022).

3. RESEARCH METHODOLOGY

In order to achieve the goals of the research, a methodological research framework was proposed that combines different research methods, which includes quantitative and qualitative research methods. At the beginning of the research, we first briefly defined the basic problem that we are researching or dealing with in the research. In this direction, we defined the blockchain technology and the goals we want to achieve within the research work and predicted the results of the work. We also briefly described the used methods, work techniques and tools. In the theoretical discussion, an overview or presentation of the content of blockchain technologies researched by well-known authors in the country and abroad is given. The research instruments used in the research process and procedure are: different types of questionnaires (intended for observation, content analysis, testing, scaling, sociometric measurement and measurement of business and organizational performance); there are tables, reviews, checks of individual and team abilities and knowledge; numerical chart and scale; special and Internet search questionnaires, etc.

4. RESULTS

Research results show that Blockchain technology, as one of the key elements of today, has attracted the attention of the general public primarily because of the cryptocurrencies based on it (Denić N, 2025). Research shows that the following countries stand out in the implementation of blockchain technology: Japan, China, Lebanon, Switzerland, South Africa, the United Kingdom, Singapore, the Bahamas, the United States and Estonia. In addition, it is estimated that global spending on blockchain technology solutions has increased from \$4.5 billion in 2020 to \$19 billion in 2024. What should be emphasized and what research shows is that new technologies and innovations do not necessarily lead to business success and acceptance in society, but rather the method of implementation and acceptance by key users is very important in this process (Denić N, 2025). According to data from Deloitte (2020), more than 50% of executives in different countries stated that they ranked blockchain technology among the top five priorities in the companies they work for. In this regard, the authors Kandaswamy and Furlonger (2019) predict that investments in blockchain technology will reach \$3.1 billion by 2030. The research results show that between 2015 and 2019, the US was the first in terms of financing blockchain companies, with 51% of the total financing worldwide, while China ranked second with 18% of the financing. According to research by Technology Ireland ICT Skillnet (2021), the wide availability and growing acceptance of blockchain technology and distributed ledgers offer potential solutions to many business activities and problems such as international payments, data management and protection, supply chain management and the like. Blockchain is a relatively new technology, companies in Serbia are increasingly applying it in their work (Denić N, 2024). This is supported by the data that in 2018 there were only 130 blockchain programmers in Serbia, while in 2019 there were already between 700 and 800. The advantage of this technology is also the open nature of the decentralized ledger that can record the transactional activities of two parties without a central intermediary, giving this technology wide application possibilities.

5. DISCUSSION

It is important to note that blockchain technology began to develop in 2008 as a response to the global financial crisis, and it gained the greatest recognition in 2017, primarily due to the high financial gains of cryptocurrencies (e.g. Bitcoin, Ethereum and others). According to an international study, out of 10,000 developers working on blockchain in the world, approximately 400 of them are in Serbia. Research shows that the traditional financial system works well enough for most transactions, but it has an inherent flaw in that every transaction can be reversible and that experts were asked to find a solution to

this phenomenon (Denić N, 2025). It is known that blockchain technology became synonymous with the cryptocurrency bitcoin in the first years of its existence, and it is difficult to avoid mentioning bitcoin when talking about the history and development of this technology, because we can say that blockchain is to bitcoin what the internet is to email. In this sense, it can be said that the most famous role of Blockchain is certainly the creation and transfer of cryptocurrency. Regarding the possibilities of application, if we take into account the complexity of this type of database system, as well as its security in application, Blockchain technology is applied in those activities in which it is desirable to have immutable, clear, and transparent records of certain databases (Denić N, 2025). In relation to the number of inhabitants, Serbia is one of the leading countries in terms of the number of companies, teams, and individuals developing new products based on blockchain technology. Research by well-known authors indicates that today large investments are directed towards the development and application of blockchain technology in various industries such as healthcare, insurance, smart contracts, supply chains, and the automotive industry (Marr, 2018). Automation, flow improvement, exchange, optimization, and information protection – are just some of the areas in which blockchain technology finds its application in Serbia (Denić N, 2025). The results show that blockchain technology has expanded from the field of cryptocurrencies to many other areas of application. However, there are views that despite investments in blockchain technology, there are not many examples in which companies have expressed a desire to use this technology (Toufaily, E., Zalan, T., & Soumaya, B. (2021)). According to a review of the literature on possible applications of blockchain technology, the most frequently mentioned areas are as follows.

Table 1: Areas of application of Blockchain technology

	Application area	Example
1.	Public administration (Zibin Zheng and Shaoan Xie, (2018)	Issuance of documents, (driver's licenses, ID cards, passports, voter registrations) Voting, Notary services, Real estate ownership, Identity management
2.	Public records	Land and property, vehicle registrations, business licenses, marriage certificates, death certificates, It allows you to maintain a database of land and real estate ownership, as well as manage apartment sales without the time and expense of an intermediary.
4.	Electoral system (Reif, 2023).	The electoral system is convenient to use with the help of blockchain technology, because due to a single transaction book shared by many nodes, it is impossible to change the voting results.
3.	General affairs	Contracts, Arbitration, Multi-signature Transactions,
4.	Ownership confirmation	Intellectual Property, Insurance, Anti-Counterfeiting
5.	Transport and Logistics (Reif, 2023).	Blockchain technology can ensure transparency in the agreement between the buyer and the seller, transparency between concluded contracts, as well as shipment and payment data.
5.	Finances (Yang, L. 2019).	Blockchain technology can reduce the costs and complexity of financial institutions' business processes, shorten transaction execution times, provide a higher level of security, reduce intermediary costs, and enable user identification.
6.	Health (Homoliak, I., Venugopalan, S., Hum, Q., PSzalachowski, P.) Morkunas, V., Paschen, J., & Boon, E. (2019).	Health insurance, Monitoring of patient health, Drug consumption, Medical documentation. Blockchain technology will ensure almost continuous functioning of the system, as doctors will have accurate data about patients, as the data will not be able to be changed or falsified.
	Energy (Reif, 2023).	Blockchain technology could solve the problems of organizing the monitoring, management, recording or distribution of energy in a decentralized network. Thus, it could establish an efficient and secure way of identifying the ownership of the source of consumed or delivered energy.
7.	Education (Grech, A. and Camilleri, A. F. (2017)	Registration of certificates - diplomas Registration of student achievements
8.	Business (Rejeb, A., Keogh, J. G., Treiblmaier, H. (2020).	Smart contracts, Supply chain monitoring, HR management, marketing.
	Insurance companies (Reif, 2023).	Blockchain technology helps insurance companies verify the data provided by the consumer and thus ensure that the data received is accurate.
9.	Private records	Loans, contracts, bets, signatures, wills,
10.	Industry (Kahn, M.T.E. (2021).	Design etc.
11.	Data Management (Ethereum Whitepaper, (2023),	Smart multisignature escrow data entry and distribution tracking (guarantees)
12.	<i>Internet of things</i> (T. M. Fernández-Caramés, T.M., Fraga-Lamas, P. (2018)	Network data monitoring, Device management in a distributed network
13.	Security and privacy (Risius, M., Spohrer, K. (2017),	Improving security, Data ownership. Access control, Privacy protection
14.	E-commerce (Ethereum Whitepaper, (2023)	Social networking, Crowdsourcing, Games of chance - online gambling
	Tourism	Blockchain technology could serve as the basis for a rewards program that yields tokens that can be spent in the store of a merchant or participating company. Loyalty programs are a great application for private token issuance.
15.	Physical asset keys	Apartments, Hotel rooms, rental cars, car access

Source: Authors research

6. CONCLUSIONS

Research clearly shows that Blockchain technology appeared in 2008. Since its appearance, the application of this technology in various areas of life has rapidly developed. In this context, the results of this research can lead to a better understanding of blockchain technology and its business aspects, as well as provide a source of current information on the state of the research subject. In this sense, in order to better understand the situation and circumstances of why and how blockchain technology emerged, we must understand the socio-economic context of that time. It is common knowledge that the white paper was published in late 2008 at a time when the global economic crisis caused an economic shock of global proportions. It was then that anger began to spread in one part of society against bankers, against traditional financial institutions, whose individuals identify themselves as the 99%, while expressing dissatisfaction with the remaining 1%, who, according to them, write the rules of an unfair global economy that threatens and denies the future to citizens around the world. Just then, with the advent of blockchain technology, which does not require a third party to work, it represents a novelty that a part of society wants at that moment. Contemporaries at the time said that blockchain technology gives us the freedom to dispose of our assets completely freely for the first time in the history of mankind. Based on all of the above, it can be concluded that the emergence of blockchain technology is essentially a consequence of the global economic crisis in 2008. In our environment, a significant date in the history of blockchain development is June 30, 2021, when the implementation of the Law on Digital Assets began. This is the first law in Serbia that regulates trading in digital assets, such as cryptocurrency trading that uses blockchain technology. The Law on Digital Assets allows the use of smart contracts in the secondary trading of digital assets and obliges providers of services related to digital assets to obtain the consent of users of digital assets for the use of smart contracts. The results of the research conducted by the organization Startup Genome (Startup Genome) place Serbia in the top five world ecosystems in terms of the number of promising blockchain developers. Blockchain has the freedom to innovate without being held back by regulation which is in some ways a great advantage, however the resulting regulatory inconsistency can often complicate the use of digital assets by end users. Considering that Blockchain technology is based on trust, but in a different way than the traditional financial system, research on the topic of business models in the field of blockchain technology, as well as research on appropriate ways of mapping those models with custom components, are extremely appreciated. Research points to caution because the finality and irreversibility of crypto transactions can be a great thing, but inexperienced users and those who are a little less technically savvy, this feature can often be expensive.

REFERENCES

- Bellini, H., Chen, W., Sugiyama, M., Shin, M., Alam, S. and Takayama, D. (2016) 'Virtual & Augmented Reality: Understanding the race for the next computing platform', 1–30. Profiles in Innovation. doi: 10.1017/CBO9781107415324.004.
- Beck, R., Müller-Bloch, C., & King, J. L. (2018). Governance in the Blockchain Economy: A Framework and Research Agenda. *Journal of the Association of Information Systems (JAIS)*. <https://doi.org/10.17705/1jais.00518>
- Demestichas, K., Peppas, N., Alexakis, T., & Adamopoulou, E. (2020). Blockchain in agriculture traceability systems: A review. *Applied Sciences*, 10(12), 1–22.
- Denić, N., Bašćarević, A., Milić, M., Mihajlović, S and Milić S. "Artificial Intelligence and Blockchain Technologies for Sustainable Development" 4th International Conference on Scientific and Innovative Studies April 29-30, 2025: pp 27-32 Konya, Turkey, <https://as-proceeding.com/index.php/icsis/home>
- Denić, N., Milosevic, M., Kamiš, A., Mihajlović, S., and Milić, S "New possibilities and paradigms of applying artificial intelligence in electronic business" 7th International Conference on Applied Engineering and Natural Sciences May 15-16, 2025: pp Konya, Turkey
- Denić, N., Milić, M., Stojanović, K., Petrović, V., and Mihajlović, S. New models for the application of intelligent techniques and OLAP tools, 4th International Conference on Engineering, Natural and Social Sciences October 22-23, 2024 : Konya, Turkey, <https://www.icensos.com/>
- Ethereum Whitepaper, (2023), www.ethereum.org
- Feign, A. (2022, 9. mart). What Is Blockchain Technology?. Coin Desk. Available 25. jul 2025 at <https://www.coindesk.com/learn/what-is-blockchain-technology/>
- Fernández-Caramés, T.M., Fraga-Lamas, P. A Review on the Use of Blockchain for the Internet of Things. *IEEE Access* 2018, 6, 32979–33001.
- Hawlitschek, F., Notheisen, B. in Teubner, T. (2020). A 2020 perspective on "The limits of trust-free systems: A literature review on blockchain technology and trust in the sharing economy". *Electronic Commerce Research and Applications*, 40, 100935.
- Homoliak, I.; Venugopalan, S.; Hum, Q.; Szalachowski, P. A Security Reference Architecture for Blockchains. In *Proceedings of the 2019 IEEE International Conference on Blockchain (Blockchain)*, Atlanta, GA, USA, 14–17 July 2019; pp. 390–397.
- Kahn, M.T.E. (2021). Review of Blockchain Technology: Enhancing the Services of Distributed Energy Systems. *Academia Letters*, Article 4237. <https://doi.org/10.20935/AL4237>.
- Kandaswamy R., & Furlonger, D. (2018). Blockchain Technology Spectrum: A Gartner Theme Insight Report, <https://www.gartner.com/publicationurl/3844444>

- gartner.com/doc/3869696?ref=clientFriendlyURL#a1009885532.(PDF) The Blockchain Cryptocurrency Effect. Available from: https://www.researchgate.net/publication/330638189_The_Blockchain_Cryptocurrency_Effect [accessed Jul 23 2025].
- Koksal, I. (2019). The Benefits Of Applying Blockchain Technology In Any Industry. Available 26. jul 2025 at Forbes:<https://www.forbes.com/sites/ilkerkoksal/2019/10/23/the-benefits-of-applying-blockchain-technology-in-any-industry/?sh=1f3f8d9149a>
- Locher, T., & Pignolet, Y. A. (2017, 20. jun). Blockchain. ABB Review. Springer Fachmedien Wiesbaden. <https://doi.org/10.1007/s12599-017-0467-3>
- Marr, B. (2018) A Very Brief History of Blockchain Technology Everyone Should Read. Forbes Magazine. <https://www.forbes.com/sites/bernardmarr/2018/02/16/a-very-brief-history-of-blockchain-technology-everyone-should-read/?sh=75351c447bc4>
- McSweeney, M. (2021, 31. oktober). Bitcoin's white paper was published 13 years ago today. Available 28. jul 2025 at <https://www.theblockcrypto.com/linked/122703/bitcoins-white-paper-was-published-13-years-ago-today>
- Morkunas, V., Paschen, J., & Boon, E. (2019). How blockchain technologies impact your business model. *Business Horizons*, 62(3), 295–306. Available 25. jul 2025 at <https://doi.org/10.1016/j.bushor.2019.01.009>
- Nakamoto, S. (2008) Bitcoin: A Peer-to-Peer Electronic Cash System. <https://bitcoin.org/bitcoin.pdf>
- Phillips, D. (2021, 10. februar). The Bitcoin Genesis Block: How It All Started. Available 25. jul 2025 at <https://decrypt.co/56934/the-bitcoin-genesis-block-how-it-all-started>
- Reiff, N. (11. februar 2023). Which industries will blockchain technology disrupt next? Available 26. jul 2025 at <https://www.investopedia.com/tech/which-industrieswill-blockchain-disrupt-next/>
- Rejeb, A., Keogh, J. G., Treiblmaier, H. (2020). (How Blockchain Technology Can Benefit Marketing: Six Pending Research Areas , *Frontiers in Blockchain*, Available 25. jul 2025 at : www.frontiersin.org., Volume 3, Article 3
- Risius, M., Spohrer, K. (2017), A Blockchain Research Framework, What We (don't) Know, Where We Go from Here, and How We Will Get There, *Bus Inf Syst Eng*, <https://doi.org/10.1007/s12599-017-0506-0>
- Shchehliuk, S. D. (2019). Institutional support for spatial planning of the amalgamated territorial communities.
- Shrier, D.L. (2020). *Basic Blockchain: What It Is and How It Will Transform the Way We Work and Live*. Robinson, London.
- Toufaily, E., Zalan, T., & Soumaya, B. (2021). A framework of blockchain technology adoption: An investigation of challenges and expected value. *Management & Information*, 58(3). Available 27. jul 2025 at <https://doi.org/10.1016/j.im.2021.103444>
- Vermaak, W. (2022). *Crypto Staking Guide 2022*. Available 28. jul 2025 at Alexandria: <https://coinmarketcap.com/alexandria/article/crypto-staking-guide>
- Weking, J., Hein, A., Hermes, S., & Mandalenakis, M. (2020). The impact of blockchain technology on business models – a taxonomy and archetypal patterns. Available 25. jul 2025 at Researchgate: https://www.researchgate.net/publication/338118210_The_impact_of_blockchain_technology_on_business_models_-_a_taxonomy_and_archetypal_patterns
- Yang, L. (2019). The blockchain: state-of-the-art and research challenges. 15, pp. 80–90. Available 25. jul 2025 at <https://doi.org/10.1016/j.jii.2019.04.002>