UDC 330

APPLICABILITY OF DATA BLOCKCHAIN TECHNOLOGY WITH FOCUS ON BITCOIN NETWORK

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Abstract. This paper focuses on blockchain technology. In recent years, blockchain technology has attracted much attention, primarily due to the great potential it can reach in the economy. The paper presents the main features and characteristics of blockchain technology, briefly describes transactions in the Bitcoin network, examines whether this type of technology is used in different branches, and studies the opinions and expectations within its community. We believe that blockchain technology has a bright future, but it will have to prove its effectiveness. We have only started to implement this technology; many things, therefore, remain unexplored and unexplained.

Key words: Blockchain, Bitcoin network, supply chain, decentralization, community.

ПРИМЕНИМОСТЬ ТЕХНОЛОГИИ БЛОКЧЕЙНА ДАННЫХ С АКЦЕНТОМ НА СЕТЬ БИТКОЙН

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Аннотация. Эта статья посвящена технологии блокчейн. В последние годы технология блокчейн привлекает большое внимание, в первую очередь из-за большого потенциала, которого она может достичь в экономике. В статье представлены основные особенности и характеристики технологии блокчейн, кратко описываются транзакции в сети Биткойн, рассматривается, используется ли этот тип технологии в разных отраслях, а также изучаются мнения и ожидания внутри ее сообщества. Мы считаем, что у технологии блокчейн есть светлое будущее, но ей придется доказать свою эффективность. Мы только начали внедрять эту технологию, поэтому многие вещи остаются неисследованными и необъяснимыми.

Ключевые слова: блокчейн, биткоин-сеть, цепочка поставок, децентрализация, сообщество.

Introduction

The research will be based on the theory of blockchain technology, its applicability in various industries, and research on the opinions and expectations of the so-called "blockchain community." We will also touch on the first cryptocurrency with which Blockchain was used. It is a digital currency called bitcoin.

Blockchain is a relatively new and exciting type of technology to which many (but far from all) professionals attribute much potential. The problem is that the mentioned area is still relatively unexplored and unclear, so we also find many skeptics here. While some believe that this is only a current trend, others think that the chain of blocks can completely change or is already changing the economy (they compare it to the new era of the Internet). However, to get reliable and quality feedback on which side is more right, the

applicability of blockchain technology and the opinions and expectations of people within the community need to be thoroughly researched and analyzed. It should be borne in mind that this invention is slow, user-unfriendly, and far from perfect (the resemblance to the beginning of the Internet age is excellent).

Many people were unaware of the internet boom in the past, and a similar thing is happening today, this time in blockchain technology. There are many reasons for this, but the main one is that blockchain technology is complex, and in general, it is not yet clear why this technology is so unique and essential.

Bitcoin is the first and most well-known cryptocurrency. It is neutral digital money that is decentralized and uses cryptography to achieve security. Bitcoin uses a so-called P2P (peer-to-peer) network, which allows it to operate without a central authority or banks. The main features of the bitcoin network are (First steps with bitcoin, b.l.):

- fast transfers or transactions,
- global payments,
- relatively low transaction costs.

The purpose of the research is to present and describe blockchain technology. We will determine if the mentioned technology has already been introduced or used in any global industry. With the help of a questionnaire, we will research the opinion and expectations of both the Slovenian and global blockchain communities.

The goals we want to achieve in the research are the following:

- present and explain the basics of blockchain technology and the course of the transaction on the bitcoin network;
- research and, based on examples, describe industries in which blockchain technology is already used;
- determine the approximate profile of the person within the blockchain community;
- get feedback from the community on their opinion and expectations of blockchain technology;
- compare the opinions and expectations of the Slovenian community with the global one.

Research question, methods of work, and research approach

Based on the desired results of the research, we decided on the following four statements, which we will verify in the research process:

- Statement 1: Blockchain technology has already started to be used by large global corporations.
- Statement 2: Proponents of blockchain technology are primarily middle-aged men (25–55 years).
- Statement 3: The general community sees a bright future for this technology.
- Statement 4: The Slovenian community has different views and expectations regarding the mentioned technology than the global community.

The research will be based on the fact that Blockchain is still a relatively new type of technology, which due to its complex structure, has not yet convinced all users, but at the same time represents a high potential in various industries. Mainly because the knowledge and use of blockchain technology are only in the initial phase, the latter can present us with many limitations in research. The technology in question is still a relatively new field today, so the resources we will use are pretty limited. The industries we will research in most blockchain technology are still being implemented and tested, so our conclusions over the years may prove to be inaccurate.

We will research with a combination of a descriptive and analytical approach to the study.

In the first part, we will focus on the description method, which will describe the blockchain technology and the course of the transaction on the bitcoin network. We will also touch on the advantages and disadvantages of the technology mentioned above. For the needs of the first part of the research, we will mainly use online literature, as there is not much-printed content on our topic yet. In the second part of the research, we will perform a statistical analysis of the data and argue the results obtained from the online survey.

The survey questionnaire was published online in the Facebook group "Slovenian Blockchain Community," in the Telegram groups "Slovenian Blockchain Community" and "Zilliqa Community" and on the social network Twitter. The survey questionnaire aimed to obtain at least 50 completed surveys from each of the two studied communities. In the end, we obtained 183 solved questionnaires in the ratio of 54.10% (abroad) to 45.90% (Slovenia), thus exceeding our plan in a positive direction. The purpose of the survey was to get to know people within the blockchain community better, explore their opinions and

expectations regarding the current state and future of blockchain technology, and compare both communities' views on this technology. The survey questionnaire was compiled in English to facilitate data processing.

Statistical analysis of the data obtained from the electronic survey questionnaire was performed in IBM SPSS for Windows (version 25, SPSS Inc., Armonk, New York, USA). We calculated the frequency distribution (frequencies and frequency fractions) for the descriptive variables and the measures of the mean value (average) and scattered (standard deviation and standard error of the average) for the numerical ones. Testing the differences between Slovenia and abroad in the selected numerical ordinal variable was calculated with the Mann-Whitney test, and in the selected descriptive variable with the two-way chi-square test (in case the expected frequencies were more significant than 5) or Fisher's exact test (in the case that the expected frequencies were less than 5). All analyzes were evaluated as statistically significant at a risk level of 5%.

Blockchain technology and related terms

Blockchain is a decentralized trust system (without indirect institutions) where devices are not connected to a standard processor. The system contains a list of all records or transactions, called blocks. Each block contains a date stamp and a link to the previous block. Cryptography ensures that users can only edit those parts of the data Blockchain that they own. They need private passwords to access file editing. The advantage of Blockchain is also that all data is public, which means that copies of transactions are available to everyone (Geltar, 2018).

Some key terms related to Blockchain:

- A smart contract can be defined as a contract written in a programming language automatically executed before certain conditions are met. Prerequisites for the use of smart contracts are interconnected databases, such as company registers, land registers, public agency data, bank accounts, etc. (Jadek and Merc, 2018). The most significant advantage of using smart contracts is that the parties do not have to trust each other or meet with them to conclude agreements. The psychological or material preferences we often encounter in negotiations do not exist here. A significant advantage is also that smart contracts can be concluded at virtually no cost. The disadvantage of smart contracts is the lack of legal certainty, as there are no rules in place today to treat a smart contract as a substitute for a paper form of contract. The issue of security and the complex structure can also be included in the list of shortcomings in the use of smart contracts, as smart contracts are written in computer code (Vidrih, 2019).
- The supply chain consists of suppliers, purchasing, manufacturers, distribution channels, and customers. It covers the flow of goods from the supplier to the end-user (through production and distribution channels). Companies are developing supply chains to reduce costs and stay competitive (Kenton, 2020).
- Distributed ledger technology (DLT): is another term for blockchain technology or blockchain technology. This technology covers the technological infrastructure and protocols that allow simultaneous access, validation, and updating of records in a fixed manner over a network spread across multiple entities or locations. Scattered record technology has been introduced with bitcoin, and due to its potential for all industries and sectors, it is currently being talked about more and more in the world of technology. Simply put, diffuse record technology is based on the idea of a decentralized network instead of a conventional centralized mechanism and is expected to have far-reaching implications for sectors and entities that have long relied on a "trusted third party" (Frankenfield, 2018).
- The Proof of Work (PoW) model requires all miners to solve a complex sum, and the winner is the person with the most potent / quantitatively most extensive hardware. Proof of a miner's work rewards for solving complex equations.
- Proof of stake (PoS): a model in which the amount or size of the stake held by the individual who created the next block is essential. Simply put, the share is based on the number of coins a person has within a chain of blocks trying to mine. This model randomly selects a winner based on the amount they have gained (Proof of Work vs. Proof of Stake, 2020).
- Initial coin offering (ICO) is a popular way of raising start-up funds, especially in technology companies. ICO works similarly to the well-known Kickstarter platform, except that in the former, they raise funds for their ideas in cryptocurrencies instead of classic money. Entrepreneurs and innovators try to convince investors with their stories and vision. Projects mainly raise funds in cryptocurrencies such as ether and bitcoin, and in return, send their project coins to investors (Merkač, 2018).

- Ethereum is a decentralized platform based on blockchain technology and uses its currency - ether. Much like miners in the Bitcoin network validate transactions, miners in the Ethereum network, in addition to validating transactions, run code written in smart contracts. At Ethereum, we can look at it as digital money that can be programmed at will using smart contracts. Using a smart contract that can be created in a few lines can significantly simplify different processes. Ethereum is an open-source network so that anyone can build their application on it. More and more programmers are developing new decentralized applications on the said platform. The biggest revolution triggered by Ethereum is certainly a new way of raising funds by companies and teams. If one had an idea in the past and did not have enough start-up funds to implement it, one had to find investors who believed in one's project that they were willing to invest. This process is time-consuming, expensive, and complex. Ethereum turned this upside down (Gubo, 2017).

Experts, entrepreneurs, and innovators from various industries around the world are exploring different ways to use blockchain technology that could transform traditional business models. Many of them have already achieved great business benefits. The main advantages of blockchain technology are the following (Hooper, 2018):

- Transparency: The use of blockchain technology has significantly improved the transparency of transaction history. Because the Blockchain is a kind of distributed log of records, all participants within the network share the same documentation instead of individual copies. This documentation can only be updated with consent, which means that everyone must agree to it. To change one transaction record, all subsequent records should be changed in agreement with the entire network. Thus, the data on the Blockchain is more accurate, consistent, and transparent compared to paper bureaucracy. The advantage is also that it is available to all individuals who have access;
- Security: There are several different ways in which a blockchain is more secure than other record-keeping systems. Before transactions can be recorded, they must be approved. After the transaction is approved, the latter is encrypted and linked to the previous transaction. This, together with the fact that all information is stored on a computer network instead of on a single server, makes it harder for hackers to misuse data within a transaction. Blockchain technology, therefore, has an enormous potential to change the way sensitive data is exchanged in any industry where this data is crucial (finance, government, health, …);
- Traceability: In particular, companies involved in the sale of products traded through a complex supply chain are well aware of how difficult it is to trace a particular product to its origin. In using blockchain technology, each campaign (exchange, sale, transport) is recorded in a block on the Blockchain. In the end, it is possible to find out exactly where the product comes from and every possible stop along the way from the current audit trail. Transaction history data helps verify the authenticity of products and prevent fraud;
- Efficiency and speed: using traditional paper processes, doing anything is time-consuming, and the human error factor can further compromise. The process is significantly shortened and more accurate because the Blockchain allows keeping records within a single "book" (which is shared with other participants). It is also easier to trust each other, and we do not need many intermediaries as everyone present has access to the same information;
- Cost reduction: For most companies, cost reduction is the primary task. The main reason for reducing costs when using blockchain technology is that we avoid third parties or intermediaries. Trust in a business partner is no longer necessary, as all the necessary data and documentation can be checked on the Blockchain.

While blockchain technology has many advantages, it also has quite a few disadvantages or obstacles on the way to adoption. The main obstacles, however, are not just technical. According to many people, the future and existence of blockchain technology are most threatened by politicians and regulators. The fundamental weaknesses or threats of blockchain technology are therefore the following (Reiff, 2020):

- Technological costs: Although using blockchain technology can save much money (through smaller commissions and intermediaries), the mentioned technology is far from free. The "Proof of work" (PoW) system, which confirms transactions on many blockchain platforms, is costly. The power consumed by a million computers to validate transactions can be almost equal to Denmark's total annual electricity consumption;
- Transaction speed: Many different blockchain platforms have problems with transaction processing speed. Current systems (PoW) are quite time-consuming as they take about ten minutes to add a new block to the Blockchain. They can process only seven transactions in one second. It should be

noted, however, that blockchain technology is improving over time and that new, more efficient transaction validation systems have already emerged, such as "shark-proof";

- Illegal activities: The Blockchain has a relatively bad reputation, mainly due to bitcoin, as individuals use the latest currency for illegal trading. The best example of blockchain abuse for illegal trading is "Silk Road" - an online black market that operated from February 2011 to October 2013, when the FBI shut it down. The site allowed users to browse and purchase illegal items over the Internet without anyone revealing their identities. Transactions are visible on the Blockchain but do not reveal the identity of the sender and recipient;
- Banks and regulators: Many central banks (Canadian, English, US State Reserves) have opened investigations against digital currencies. Namely, central banks want to develop a system that would otherwise use blockchain technology, but at the same time, would not jeopardize the control over their currency.

Research discussion

We included 183 individuals in the sample who completely solved the survey questionnaire. Among them, men predominated (94.54%), while only 10 (5.46%) women completed the survey questionnaire (Graph 1). On average, the respondents were 35 ± ten years old. The latter data is critical, as it confirmed our claim that the proponents of blockchain technology are primarily men aged 25-55. However, we were a little surprised by the meager percentage of women in the survey.

A larger share of respondents came from abroad (54.10%), while the rest were Slovenian citizens (45.90%). The percentage difference is not significant, which tells us that Slovenia has more active members in the blockchain community than the entire population.

The majority of respondents were employed (75.96%), followed by still studying (14.21%). The smallest share is represented by the unemployed (9.84%).

Among all respondents, individuals with higher professional education (26.37%) and secondary education (21.98%) predominated, followed by individuals with specialization/master's or doctorate (17.03%) and higher university education (15.38%).). The lowest number of respondents had primary education (2.75%). The positive thing is that many individuals with the highest possible education are involved in the blockchain community, from which we can conclude that the latter have high expectations for this technology.

The countries that we believe most support the development of blockchain technology are as follows. As many as 47.49% of all respondents opted for Singapore, which does not surprise us, as we have already found in the theoretical part that the country is firmly ahead of others in terms of the development of blockchain technology. China (13.41%) and Switzerland (11.17%) also received over 10% in the survey. Estonia (7.26%), Malta (7.26%), and other countries not on the list (5.03%) also received more than 5% of the vote. It is interesting that Slovenia, despite the large number of respondents coming from the country, received only 3.91%. Respondents believe that of the countries on the list, the US (2.23%), Australia (1.68%), and the United Arab Emirates (0.56%) are the least intensively supporting the development of blockchain technology. We were surprised by the low percentage of votes cast for the United Arab Emirates, as we noticed quite a few positive steps of the mentioned country towards the adoption and support of blockchain technology through theoretical work. The low percentage of votes cast for the US can probably be attributed to the strict regulations in that country, of which respondents are more than obviously aware. As already mentioned, only 5% of respondents opted for the "other countries" option, from which we can conclude that we have chosen a good set of countries that support the development of blockchain technology.

The industries in which blockchain technology is expected to be the fastest to establish are, according to respondents, the following. Most of the five options were chosen by the banking sector (48.09%). They are followed by digital advertising with 24.04% and tracking raw materials/materials/shipments with 19.13%. 6.56% of respondents opted for any of the other, not listed industries. The fewest individuals, 2.19%, believe that blockchain technology will be the latest to gain ground in the healthcare sector from the above list. Of particular interest is the high percentage received by the banking sector. Even though we have found and researched an example of blockchain technology in practice within the banking sector (Project Ubin), the number of people who believe that this technology will be the fastest to adopt in banking has exceeded our expectations. We think that blockchain technology certainly has great potential in the banking sector, but its regulators can pose a significant problem on the path to adoption. Almost a quarter of respondents opted for the digital advertising industry, which does not surprise us, as we found two excellent examples of the use of

blockchain technology from practice, in which several different corporations already participate. The same applies to the sector of tracking raw materials or consignments. We have not detected a case of using blockchain technology in practice in the healthcare industry, so we are not surprised by the meager percentage of votes cast.

Respondents' opinion on whether the first steps in adopting blockchain technology are already underway is as follows. Most respondents (59.34%) believe that the first steps in adopting this technology are already underway, but most of them are still in the testing phase. 29.12% of individuals believe that blockchain technology is already used in practice. 9.34% of respondents expect that the first wave of blockchain technology adoption will occur in a few years, while only 2.2% of respondents believe that blockchain technology will not be adopted. Interestingly, a very high proportion of those who believe that blockchain technology is mostly still in the test phase, but the result does not surprise us because, with the help of practical examples, we found that companies are still testing the technology. From the answers to the above question, we can conclude that the blockchain community (respondents) sees a bright future for blockchain technology. As many as 97.80% of respondents believe that the technology will be adopted sooner or later.

The community's opinion on the support of blockchain technology by the country in which they reside is as follows. Most respondents (54.10%) think it could be better. 39.34% of individuals believe that the country they live in supports blockchain technology, while only 6.56% of respondents believe that the country they live in does not support this technology. The latter share is fascinating, as it tells us that there are very few who are not satisfied with the state's support for blockchain technology. This is another of the many positive signs for the future of this technology. However, we should not ignore the answer that it could be better in terms of the support of the countries they live in - more than half of the respondents opted for this answer. From theory, we can conclude that community dissatisfaction stems primarily from the unfavorable tax policies present across many countries around the world.

The main reasons for individuals to join the so-called blockchain community are as follows. 9.84% of respondents joined the blockchain community solely to learn about this technology, while the investment opportunity attracted 30.60%. More than half of all respondents, namely 56.83%, joined the blockchain community for both of the reasons mentioned above. Only 2.73% of respondents joined the community for other reasons. Interestingly, a good third of respondents are included in the community only because of the opportunity to invest in blockchain technology and not because of knowledge acquisition. We can conclude that investing in Blockchain (projects and ideas) is still immature, as many individuals do not know the industry in which they invest money.

The dynamics with which respondents joined the blockchain community are exciting. The year 2017 stands out in particular, during which 36.72% of the surveyed individuals joined the community. 17.51% of respondents joined the blockchain community by 2016, followed by 2018 with 16.95%, 2019 with 9.04%, and 2020 with 7.34%. A large share of participation in 2017 can probably be attributed to the explosive rise in cryptocurrency prices, which are, of course, closely linked to blockchain technology. Most of the digital currencies reached new historical highs in that year, which probably greatly aroused the interest of individuals to become part of the blockchain community. Namely, we have already found that a large proportion of individuals have joined the blockchain community simply because of investment opportunities. In 2018, compared to 2017, more than half of the individuals joined the community less. In 2019, compared to 2018, slightly less than half of the individuals joined the community. In the period 2017-2019, therefore, the association of the community decreased by more than half on average each year. Again, we can draw parallels with the cryptocurrency market, as it was in a downward trend in 2018 and 2019. In 2020, the cryptocurrency market trend turned in a positive direction, and the participation of individuals in the blockchain community after half a year already reaches 7.34% of respondents. If the positive market trend continues and the survey was repeated at the end of 2020, we would probably get an even higher percentage of individuals participating in the blockchain community in 2020.

A comparison between Slovenes and foreigners at the time of joining the blockchain community shows that, on average, Slovenes were statistically significantly longer in the blockchain community for 1.07 years than respondents from abroad ($p < 0.001$). We can conclude that Slovenians very quickly perceived the potential that blockchain technology brings.

A comparison between Slovenes and foreigners in the knowledge of blockchain technology shows no statistically significant differences between the two groups in the level of subjectively assessed knowledge about blockchain technology ($p = 0.325$). The majority of individuals (> 38.38%) in both groups believe that they have much knowledge about blockchain technology, while less than 6% believe that they master blockchain technology and know it in detail. It is interesting that almost 6% more foreigners believe that they do not have or have very little knowledge about blockchain technology compared to Slovenes. The opposite

picture appears in the last answer. Compared to foreigners, almost 2% more Slovenes believe that they master blockchain technology and know it in detail. Based on this, we can conclude that foreigners are more self-critical or that in the Slovenian community, the knowledge of individuals about blockchain technology is more significant.

The difference between Slovenes and foreigners in confidence in the course of transactions on the Blockchain (for example, the Bitcoin network) shows that Slovenes have statistically significantly higher confidence in transactions on the Blockchain ($p = 0.035$). A positive sign is that the average in both communities is greater than 4, which means that both communities trust the course of the transaction on the Bitcoin network.

A comparison between Slovenes and foreigners in the main advantages of blockchain technology shows statistically significant differences between Slovenes and foreigners in the main advantages of blockchain technology ($p = 0.004$). A larger share of respondents coming from abroad believes that the main advantage is the security (27.27%), while Slovenes see more advantages than foreigners in transparency (32.14%) and a network without an intermediary (54.76%).). In both communities, when asked what they consider to be the main advantage of blockchain technology, the most common answer was the network without an intermediary, which on average was chosen by every second respondent (49.73%). Such a large percentage is by no means surprising, as we have already realized in the theoretical part how essential and cost-effective the operation of a network without an intermediary is.

A comparison between Slovenes and foreigners in barriers that can potentially limit the development of data block chaining technologies shows no statistically significant differences between Slovenes and foreigners in barriers that can potentially limit the development of blockchain technology ($p = 0.297$). The majority of respondents from both groups believe that the main obstacles to the development of blockchain technology will be regulators (> 37.35% in both groups) and people's prejudices that equate this technology with cryptocurrencies (> 36.36% in both groups). Interestingly, compared to Slovenes (37.35%), foreigners are more "afraid" of regulators, as, in their community, as many as 50.51% of respondents believe that regulators will be the factor that will most hinder the development of blockchain technology.

A comparison between Slovenes and foreigners in choosing the region where blockchain technology will be adopted the fastest shows statistically significant differences between Slovenes and foreigners in choosing the region where blockchain technology will be adopted the fastest ($p <0.001$). A larger share of Slovenes (35.80%) than respondents from abroad (13.13%) believe that blockchain technology will be adopted faster in Europe, while most respondents from abroad believe that adoption will be faster in North and South America and Asia, and the Middle East. Both communities agree that the regions where blockchain technology will be adopted the fastest are Asia and the Middle East. On average, as many as 66.11% of all respondents chose this answer.

Conclusion

The statements we checked in the research were the following:

1. "Blockchain technology has already started to be used by large global corporations." The statement mentioned above proved correct, as we found that various companies are already embarking on migrating their products to Blockchain. However, it should be noted that most companies are still testing the technology, so it will probably be some time before it is used.
2. "Proponents of blockchain technology are primarily middle-aged men (25-55 years old.") This statement also proved to be correct, as we found with the help of a survey questionnaire that 94.54% of all respondents were men. The mean age of the respondents was 35 ± ten years.
3. "The general community sees a bright future for this technology." The latter statement proved correct, as we can conclude from the answers obtained that most respondents believe that the adoption of blockchain technology will happen sooner or later. Other responses also gave us a sense that the community is optimistic about the future of this technology.
4. "The Slovenian community has different views and expectations regarding blockchain technology compared to the global community." This statement is also true, albeit in part. There are indeed specific differences between the opinions and expectations between the two communities, which is entirely expected. For the most part, however, the communities agree that blockchain technology is the future technology.

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