



Impact of Blockchain Technology Platform in Changing the Financial Sector and Other Industries

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ABSTRACT

The aim of the paper is to conduct a research on an impact of blockchain technology platform on the financial sector through cryptocurrency, and an impact on other industries.. The subject of research is not only this technology but also its commercial exploitation. In order to understand the platform, the starting point of this research is an analysis of how the technology functions, after that the advantages for business and economic transaction are identified, and finally the paper deals with an impact of new technology on business, above all on financial operations. The basic hypothesis is that blockchain has achieved a great impact on financial sector, also it has the potential to radically change only the financial sector but also the way we buy and sell, our interaction with the authorities as a way of verifying the ownership from the authorship and the organic food production. Using the available data and synthesis of knowledge from the fields of technology, economics, finance, and politics, 4 scenarios were set up for the future of underlying technology. The scenario approach combined with trend analysis in order to prove the starting hypothesis with high reliability. The research results show that the technology being investigated already has a profound impact on the financial sector, that it is in the initial phase of changing many industries, with the likelihood that they will change them significantly in the next five to ten years. Businesses increasingly discover the power of this technology to exploit the benefits of the Fourth Technological Revolution.

INTRODUCTION

During the first 40 years of its existence, the Internet has brought us many positive things. Step by step, it has allowed using: e-mail, the Worldwide Web, various social media platforms, big data, mobile applications, cloud computing, and the Internet of Things. It seems that technological evolution is spectacular. The above listed innovations have shaken the methods of work and consumption (improving trade, culture, changing the company's management and administration, stimulating exchanges, etc.). Despite all its positive influences, the recent technical progress has socially and politically negative effects. For example, the Internet has only deepened the problems of privacy, security, and inclusion. Today many intermediary (often suspicious) parties collect our most sensitive data (which can be both business and private) and thus invade our privacy so that

to profit for themselves. Many attempts were undertaken to overcome this limitations. Many attempts were undertaken to overcome this limitations.

The most promising was in 1993, when a brilliant mathematician named David Chaum came up with eCash, a digital payment system which was technically perfectly suited to sending electronic money safely and anonymously. The problem was that online shoppers didn't care about privacy and security. That endeavour didn't succeed.

In 2008, a person named Satoshi Nakamoto outlined a new protocol for peer-to-peer electronic cash system using a cryptocurrency called bitcoin. It was a great breakthrough. Cryptocurrencies (digital currencies) are not created or controlled by governments. In another words, they are very different from traditional fiat currencies because they are not created or controlled by governments. First of all, distributed computations were allowed by the new protocol which had its own set of rules. Data exchange between billions of various devices does not involve any trusted third party. This type of protocol has become the new blockchain technology, which was foundation for the growing numbers of globally distributed blockchains. The most popular is probably bitcoin. Blockchain technology enables exchange money without intermediaries (any bank, or other financial institution, or even PayPal). Thus, people send money directly and safely at the same time.

By combining the Peer-to-Peer (P2P) network and the distributed server that marks the timeshare transactions, has been created a database that is autonomous and shared among all network participants.

Since the database is not stored at one place or servers, it is decentralized. Instead of everyone in the world having their own special books and keeping a separate record of transactions, the main book is one, it contains all the transactions, it is public and is owned by everyone. When someone sends Bitcoin from one address to another, the transaction is timed and recorded with each system participant.

No one can deceive the system and send something that is not owned because:

- It would not have been synchronized with other system participants and transaction records,
- The rules are defined initially and implemented through the program code.

In this way, Satoshi first proved that the problem of double spending in digital goods can be resolved without a third party or intermediary trusted by both parties. Digital good in this case works like a physical asset - it cannot be in two places at the same time. Two people or two organizations can make a safe, anonymous, and unconscious, one-on-one electronic exchange of value (money or digital good) without any intermediaries.

This is possible because the entire history of all transactions that have ever been performed within a network is preserved by each network participant and must match each of the devices on which it is stored. Also, a certain number of network nodes must validate the transaction whenever it occurs within the network, after which it is permanently cryptographically locked and it is impossible to change it.

Blockchain has been considered as part of the fourth industrial revolution since the invention of steam engine, electricity, and information technology (Chung and Kim, 2016). R. Collins (2016, p. 20) pointed out that *"During the initial stages of its appearance, blockchain technology was not able to draw a lot of attention"*. And explained that the that *"as Bitcoin continues to run safely and steadily over the years, the society has since become aware of the enormous potential of the underlying technology of this invention in its application to not only cryptocurrency but also in many other areas"*.

Most (relevant) high-profile white papers, journals and articles focus on technical and legal issues. This article builds upon the commercial exploitation element of Blockchain technology, assessing the potential and realization of that.

Some of the key white papers, and articles related to Blockchain technology, which the article will refer to are:

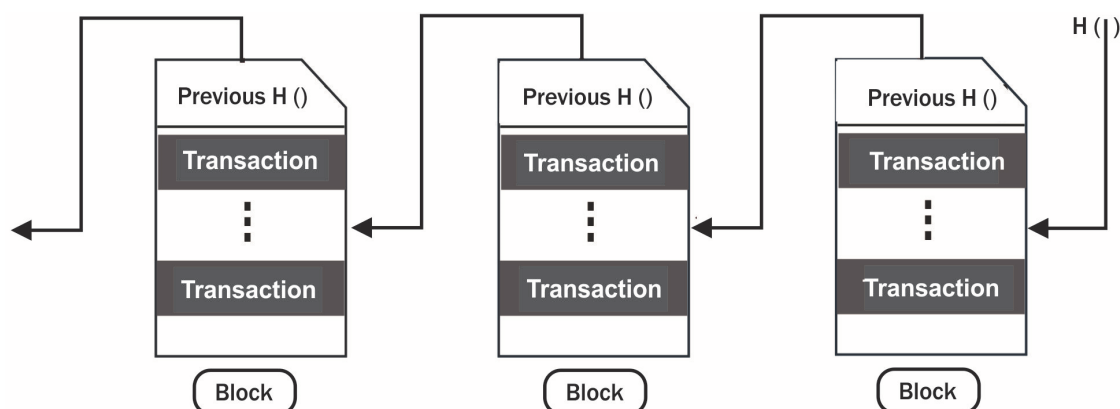
- “Bitcoin: A Peer-to-Peer Electronic Cash System” (S. Nakamoto);
- “The Ripple Protocol Consensus Algorithm” (LabsInc);
- “Practical Byzantine Fault Tolerance” (M. Castro, B. Liskov);
- “MultiChain Private Blockchain” (G. Greenspan);

These papers (and other sources) help to explain how Blockchain works, and how it can be applied. This article extends on the analysis of capacities for changing the financial sector, and other industries. The aim is to contribute solving still unsolved problem: weather blockchain is the only promising technology or technology which will transform business deeply?

1. HOW BLOCKCHAIN WORKS

Blockchains are based on Stoshi's model. F. Tschorsch, and B. Scheuermann (2016, p. 14) describe this mode as follwos “*Bitcoin or other digital currency isn't saved in a file somewhere; it's represent by transactions recorded in blockchain. It is as a kind of spreadsheet or leadger, which leverage the resources of a large peer-to-peer bitcoin network to verify and approve each bitcoin transaction. It allows participants to secure the settlement of transactions, to achieve the transaction, and to transfer the assets at a low-cost*”. S. Herber, and S. Sortnetta (1991, p. 30) wrote that “*the data on the blockchain has a property of time, and the length of the chain is continuously growing. It means that blockchain is a distributed variant that implements the timestamp service*”.

Figure 1. The formation of the Blockchain



Source: author

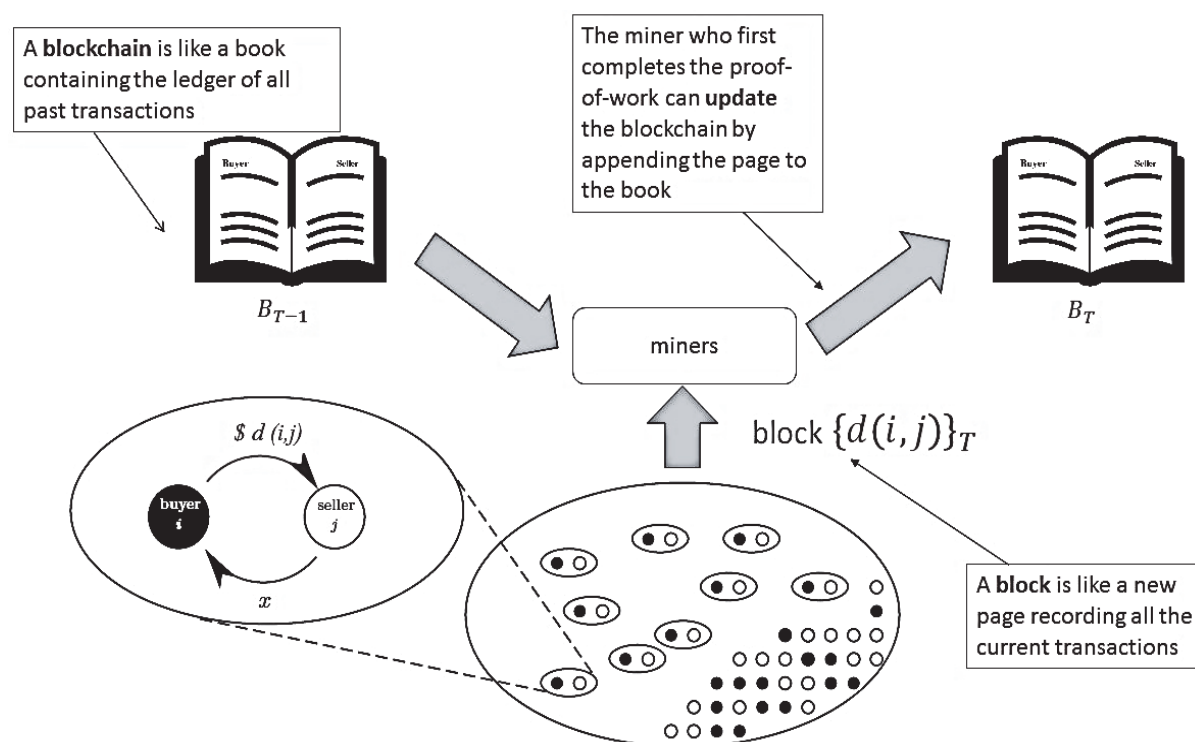
The transaction record is combined with other transactions in one block - as a traditional computer database. Each transaction is timed. When the block is complete, it gets the time stamp. So all the information is sequential to avoid duplication. The completed block is sent through the network where it is added to the chain sequence. Other participants can send their blocks at the same time. But the time stamp ensures that the data is added in the correct order and all participants have access to the latest version. The key to the security of blockchain is something called the hash. Blockchain uses specialized hardware to construct a large number of cryptographic data chains, and SHA-256 hash function is used to prevent tampering of data from third-party users (

Tschorsch and Scheuermann, 2016). It's a piece of cryptographic math that makes the links between the blocks virtually inseparable.

The Hush function uses the benefits in each block and uses them to create HUSH - a unique array of characters. Hush from one block is added to the data in the next block so that when the new block passes through the hush function, the track on the previous one is written to the new HUSH (Figure 1). And so on through the chain sequence. So if someone tried to modify a block, the HUSH entered in the second block would no longer be compatible. This incompatibility would continue through the chain sequence and signalled changes in the sequence.

As all participants have a copy of the integral BC pool, they are able to detect every attempt to manipulate. So when HUSH agrees across the chain, the participants can be confident in the reliability of the transaction.

Figure 2: How is the Blockchain Updated



Source: Chiu and Koepl, 2017, p. 14, adjusted

Figure 2 illustrates how the blockchain is updated. The important characteristic of blockchain is that different blocks are dynamically consistent (transactions taking place in a block). Any attempt of persons to revoke a transaction in the past, requires to solve for an alternative blockchain consistent with his proposal. Rewriting the history of transactions backwards would be very costly if the chain is long. This is important feature because it makes double-spending attacks costly. Also, double spending can be discouraged by introducing a confirmation lag into the transactions. In addition to the above, by waiting for some blocks to complete the transaction (situation when sellers delay to deliver the goods), it becomes impossible (harder) to alter transactions in a sequence of new blocks.

2. ADVANTAGES OF BLOCKCHAIN TECHNOLOGY

To date, many researchers have proved enormous advantages of technological platform blockchain for the financial sector, and many industries. S. Underwood (2016, p 15) wrote that *"Blockchain technology is expected to revolutionize the operating modes of commerce, industry, and education, as well as to promote the rapid development of knowledge-based economy on a global scale. Due to its immutability, transparency, and trustworthiness for all transactions executed in a blockchain network, this innovative technology has many potential applications"*.

Blockchain technology influenced the transforming the current Internet from "The Internet of Information Sharing" to "The Internet of Value Exchange." With new capacity it has become a hot topic for more and more enterprises, institutions, countries, and researchers.

Many authors, such as (Beck et al, 2016; Jung and Lee, 2017; Szetela et al, 2016) have considered that *"blockchain technology has been applied in various fields such as cryptocurrencies in the financial area, which includes Bitcoin, Ethereum, and Zcash, etc"*.

Significant number of organizations and enterprises have been trying to develop platforms based on blockchain technology. Z. Zheng. (2017, p. 9) listed some examples such as "Arcade City, so-called "Uber Killer," ride-sharing company that has integrated its model in Ethereum, including identity and reputation systems. Digital property management company Ubitquity offers secure recording and tracking records built on a blockchain platform.

The potential of blockchain to initiate significant change has been proved, including in changing banks' business models as well as the business models of their clients from a multitude of industries, and the financial services industry. The progress is obvious in the financial service industry, although financial experts still disagree on how much potential blockchain actually has.

Blockchain simplifies all operations within the banking industry. First, it automates the process of matching positions against accounts. That means that clearing and settlement become faster without approval at later stages. Second, this technology is more transparency and that feature allows blockchain fulfil all regulatory requirements more efficiently. Third, since the conditions for every transaction are transparent and fixed, blockchain technology reduces many risks, that is, they are not changing. Fourth, it avoids centralisation data with decentralised register stores the full data pertaining to all transactions as well as the origins of traded assets. And fifth, blockchain technology eliminates interim steps saving many.

Blockchain enhances market efficiency: On financial markets, trade is happening in a fraction of a second. But the actual exchange of goods may hover over days and include more banks and clearinghouses. This can lead to errors, delays, additional costs and unnecessary risks.

Blockchain technology allows smart contracts: A smart contract is a computer code that explains a step-by-step transaction. It can be linked to more diverse blockchains, track different goods so that it can exchange / transfer these goods when needed for a transaction. The broker buys shares on behalf of his/her client. The order is placed, which includes private keys and seller and buyer. That way execution of a smart contract is executed and linked to multiple blockers, which confirms the buying and selling power, and then executes a transaction between the buyer and the seller.

Blockchain can track financial transactions, but it can also serve to keep confidential information (e. g, issued and controlled by government agencies). But a digital ID through blockchain can be a safer mechanism. The international blockchain ID allows individuals to verify their identity, connect to a family, and even exchange money without intermediary banks.

When a fingerprint is taken and this information is linked through blockchain with other information about the individual (name, gender, nationality). When someone wants to verify the identity of that person, the fingerprint unlocks her/his ID blockchain, that is, identity

3. REINVENTING FINANCIAL SERVICES

Blockchain technology promises immense opportunity to bring about profound changes to this industry. The global financial system moves trillions of dollars daily, serves billions of people, and supports economy worth more than \$ 100 trillion (estimates range from \$ 87.5 trillion to \$ 112 trillion, according to IMF). In spite of applying of Internet banking and IT technologies in the financial sector, the old paper model stayed dominant. Vikram Pandit, (a former CEO of Citigroup) said “The advent of technology essentially took paper-based processes and turned them into semiautomated, semielectronic processes but the logic was still paper based”.

Table 1. Blockchain Transformation of Financial Services

<i>Function</i>	<i>Blockchain impact</i>	<i>Stakeholders</i>
Authenticating Identity and Value	Verifiable and robust identities, cryptographically assured	Rating agencies, consumer data analytics, marketing, retail banking, payment card networks, regulators
Moving Value – make a payment, transfer money, and purchase goods and services	Transfer of value in very large and very small increments without intermediary will dramatically reduce cost and speed up the payment	Retail banking, Wholesale banking, Money transfer services, payment card networks, telecommunications, regulators
Storing Value – currencies, commodities, and financial assets are stores of value, Safety deposit box, a savings account etc.	Payment mechanism with a reliable and safe store of value reduces needs for financial services; bank savings and checking accounts will become obsolete	Retail banking, brokerages, investment banking, asset management, telecommunications, Regulators
Lending value – credit card debt, mortgages, corporate bonds, municipal bonds, government bonds, asset backed securities, and other forms of credit	Debt can be issued, traded, and settled on the blockchain; increases efficiency, reduces friction, improves systemic risk. Consumers can use reputation to access loans from peers; significant for the world's unbanked and for entrepreneurs	Wholesales, Commercial, and retail banking, public finance, microlending, crowdfunding, -regulators, credit rating agencies, credit score software companies
Exchanging Value	Enhancing speed dramatically	All industries
Funding and Investing	New models	Investment banking, venture capital, legal, audit, property management, stock, exchange, regulators
Management Risk	Lowering risk	Insurance, risk management, wholesale banking, brokerage, clearinghouses, regulators
Accounting for value	Dramatically improved reporting	Audit, accounting, regulators

Source: D. Tappscott and A. Tapscott, 2017, p. 63, adjusted.

Powerful intermediaries very often impose monopoly, generate outsized benefit for themselves, and slow down the system. Their monopolistic position is an obstacle for improving products, increasing efficiency, better consumer experience. Additional problem is old technology which prevails.

Blockchain technology offering individuals and institutions alike real choice in how to create and manage value. Benefits – attestation, dramatically lower cost, lightning speed, lower risks, great innovation of value, adaptability – have the potential to transform not only payments, but also investment banking, accounting and audit, venture capital, insurance, the securities industries, enterprise risk management, retail banking, and other industries. The Table 1 summarise influence of blockchain to financial services.

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4. REALISING THE POTENTIAL OF BLOCKCHAIN TECHNOLOGY

Based on our research of numerous papers, case studies, and available data from this field, we discovered four possible scenarios regarding the future of underlying technologies.

Scenario 1. Failure of blockchain technology platform. This scenario is possible. According to Mike Hearn, a prominent bitcoin core developer (2015), the important technical standard has gone unanswered and there was a discord and confusion in the ranks of the community. He concluded that these challenges would cause bitcoin to fail.

Still, many questions remain unanswered, and many problems remain unsolved. First of all, the problem of multistakeholders governance is a critical issue. Also, the unanswered question is: how will technology scale, can we scale it without destroying the physical environment? Is it possible to solve controversial standard questions without reverting to hierarchy?

Obviously, these problems are solvable, because a code is just a tool, humans must take the lead. We found the solution in the last research proposal for the global solution networks (GSNs) which will allow to achieve cooperation, social change, and management of underlying technologies (D. Tappsocott, S. Undervood).

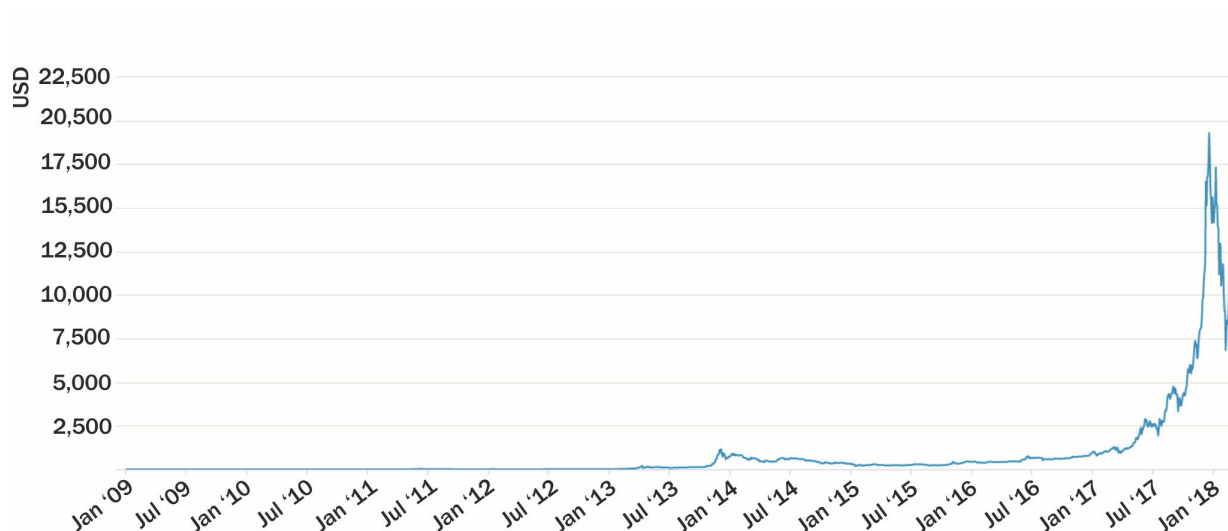
Scenario 2. Deep impact on the financial sector, and very limited impact on other industries.

In 2009, using blockchain technology, Bitcoin was released. In 2017 (8 years later), Blockchain.info, a bitcoin wallet and block explorer service, claim to have already “powered over 100M transactions and empowered users in 130 countries across the globe” (P. Smith, p. 4). Cryptocurrencies have a combined market capitalisation of over \$24,000,000,000 by of late March 2017; Bitcoin makes up over \$16,000,000,000 of this value (Coinmarketcap.com). Cryptocurrencies have a market capitalisation of over \$10 million (Coinmarketcap.com). There have been over 200,000,000 Bitcoin transactions, and over 12,000,000 wallets created (Coinmarketcap.com).

The price of bitcoin price has been increasing to 1 BC = 8.667,50 euro (February 2018) since 2009 (1 BTC = 0.0001) USD (See visual impression on Figure 3). The Bitcoin Volatility Index shows significant progress over the last 6 years, with the Index depicting a downwards trend (See Figure 4).

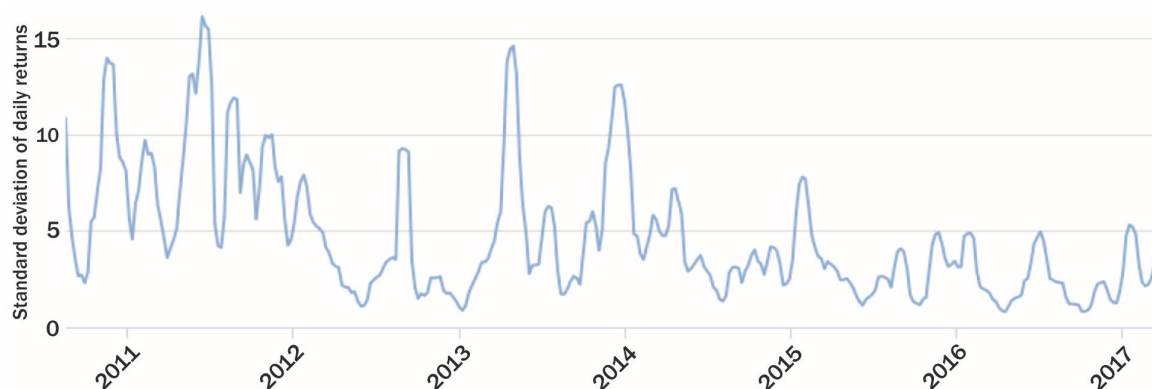
More than \$270 million has been raised in Initial Coin Offerings (ICOs) since 2013, with over half of the top 20 crowdfunded projects being cryptocurrency related (www. *blockchain*, 2017). In spite of a breakthrough in the financial sector, for many this technology for other fields of application still not promising area.

Figure 3. Bitcoin market price for the period 2009–2018.



Source: www.blockchain.info

Figure 4. The Bitcoin Volatility Index for the period 2011–2017.



Source: www.blockchain.com.

Scenario 3. Fast transformation of financial system, and slow transformation of many other industries, education, and health.

This scenario is reality, our research collected countless evidence in favour of this scenario. They are summarised in the next paragraphs. Evidently, a profound impact of underlying technology on the financial sector is underway. CryptoCurrency Market data show the existence of countless blockchain platforms. Also, our research has collected evidence that many of them are still developing. Table 1 shows the top 10 platforms where cryptocurrency represents binoth value and ownership in the platform. Top two platforms with tokens trading on the marketplace are bitcoin and ether.

Table 2. Top 10 Cryptocurrencies, as of 17 June 2017

Rank	Name	US\$ Market Cap	US\$ Price	Circulating Supply
1	Bitcoin	43,630,891,619	2660.98	16,396,550 BTC
2	Ethereum	34,736,739,597	375.25	92,569,593 ETH
3	Ripple	10,215,346,626	0.266787	38,290,271,363 XRP
4	Litecoin	2,428,105,598	47.06	51,592,007 LTC
5	Ethereum Classic	1,950,098,114	21.04	92,694,964 ETC
6	NEM	1,848,834,000	0.205426	8,999,999,999 XEM
7	Dash	1,295,180,283	175.78	7,368,399 DASH
8	IOTA	1,177,470,178	0.423622	2,779,530,283 MIOTA
9	BitShares	888,444,894	0.342215	2,596,160,000 BTS
10	Stratis	766,295,675	7.79	98,428,282 STRAT

Source: CryptoCurrency Market Capitalizations

For achieving of this scenario, it is necessary to solve the problem of governance. Many researchers admit that the ongoing issue of blockchain development is the governance, not the technology itself. Jasse McWaters said *"The platforms that will win will be the ones that can fulfil both the operational and the governance requirements of a range of applications – because you are not going to move equity settlement, for example, to an environment that cannot meet the disclosure requirements of capital markets regulators"* (Tappsocott, 2017, p. 10). Jasse McWaters explained *"that capital markets regulators are not going to change their view on what should and should not be disclosed simply because the process is now occurring on a blockchain"* (Tappsocott, 2017, p. 11). Perianne Boring stated *"At the platform level, efforts to assist with scaling and interoperability are in most high demand."* (Tappsocott, 2017, p. 11). He has over 100 members from the digital asset, blockchain and traditional capital markets industries (he is founder and president of the Chamber of Digital Commerce).

In spite of the problem of governance, blockchain has profound impact to financial sector. Thanks to the serious breakthrough of this technology, bitcoin becomes the largest cryptocurrency and platform by value, volume and hashing rate (a measure of participation). Technology which started as an experiment in the monetary theory has flourished into the ecosystem we know today.

In addition to bitcoin, Ethereum (another public blockchain) is under attention as arguably revolutionary. This application provides functionality in performing the so-called 'Smart Contracts' or peer-to-peer contracts. This contracts execution is based on programs that can verify if a product or service has been sent by a supplier. After verification, the transfer of money can be done.

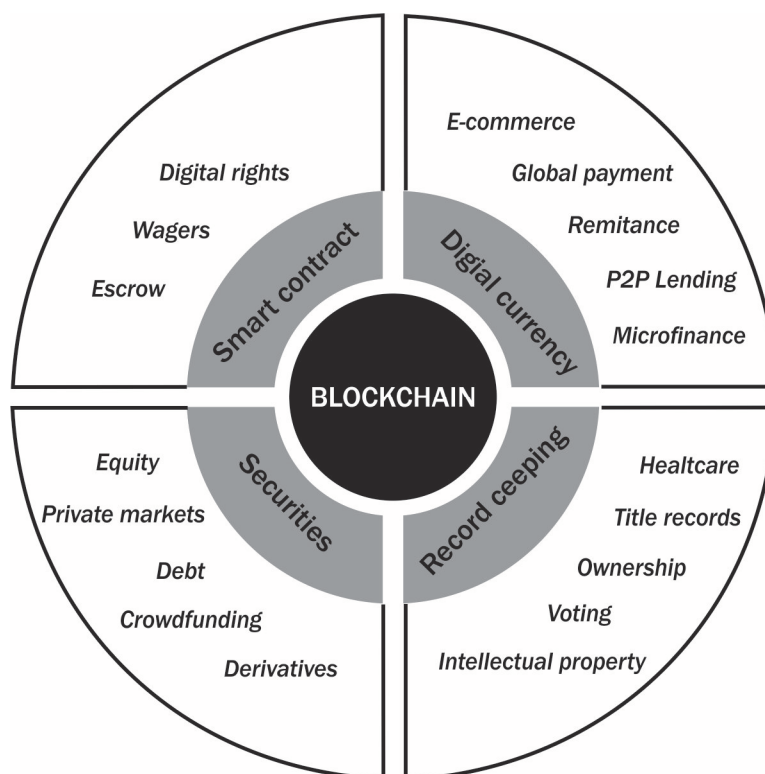
The future may not be clear for blockchain, however it is likely that the technology will have a significant impact in the next few years. PwC's executive claimed that in the first 9 months of 2016, \$1.4 billion was invested globally in blockchain start-ups. It is believed that banks and other financial institutions can save money (potentially billions) through blockchain transparency, security and accuracy. Blockchain technology realize its potential not only in bitcoin but also in other industries. Renowned companies (including IBM, Deloitte and Microsoft) and influential individuals, such as Richard Branson (founder of Virgin Group), have contributed the fast development.

Until 2015, most financial institutions dismissed bitcoin as the speculative tool. Today they are quite literally „all in“. After 2015, Societe Generale, Commonwealth Banke of Australia, Bank of Montreal, CIBC, RBC, State Street, TD Bank, BNY Mellon, Wells Fargo, Nordea, Mizuho Bank, UniCredit, Commerzbank, and dozens of others are investing in the technology and changing opinion of others (Colonel. p. 6). Notable universities such as Princeton, Stanford, New York University, and Duke also teach courses on blockchain, bitcoin, and cryptocurrencies.

Today, a lot of researchers and professionals from all kinds of different industries have agreed that there are so many more potential uses in the following industries: supply chain, asset tracking, trade finance, digital rights, Insurance, corporate filings databases, personal identity, patent filings, forensic evidence, basketball jerseys, blood samples for the MLB, and other major sports leagues.

Recent researches (e. g. D. Tapscott, A. Tapscott, G. Greespen) collected evidences that there are some of already disrupted industries (listed on figure 5). It will likely to disrupt many industries in the coming 5 to 10 years,

Figure 5. The industries are already impacted by blockchain technology



Source: author

Scenario 4. Radial and fast change (in 5 years) of financial sector, and most industries.

The prognosis of radical changes in the financial sector and in all industries exists. We found out the opinions and analysis of influence underlying technologies to fundamental transformation of central banking, disappearance of central banks, and fundamental transformation of financial system (e.g., Robert Shiller, Nobel laureate, Yale University). According to the author of this paper this scenario is not realistic, and the next section explains why.

5. OPEN QUESTION, AND LIMITATION FOR THE FAST IMPLEMENTATION

Technology is still in the early stage of development. Before it becomes generally accepted it will have to overcome a number of challenges. Is global economy ready for BC: In business, BC can initiate a radical abandoning of manual process? New technologies bring new risks and costs, therefore companies can hesitate in implementation.

Is Blockchain Ready for Business: Can technology take on the major scope needed for mainstream business? Even the most developed blockchains, such as bitcoin, can process only 5 to 8 transactions per second. New blockchain software companies are working on solutions that would be competitive with credit card networks that are already processing 10,000 times larger volume.

Setting Boundaries: The transparency of blockchains has great advantages for regulators. However, this is still a new technology that is not standardized. Lawmakers will have to settle questions of reliability and other legal issues.

New Technology, New Threats: Blockchain is secured at business-level security, but no technology is 100% secure. And when large amounts of money are in the game, hackers are always there somewhere. So the issue of security can also slow down the more comprehensive use of blockchain. Big Potential: But is it ready for the prime-time?

All this sounds amazing but there are many limitations involved in the fuller utilization of blockchain. Jeff Stollman, a technology futurist, shared his thoughts on the current limitations of the much-hyped tech. He has been designing blockchain solutions for clients for over three years and has four patents pending in the blockchain area. Here is what he said: *"Blockchain's potential in the enterprise is immense, but major blockchain applications for the enterprise are still years off. There are two reasons for this. First, blockchain technology itself is insufficiently mature to support transactions volumes necessary to support most enterprise-scale applications. Second, enterprise applications that will be used across an industry sector require the establishment of governance rules that will take years to negotiate"*.

CONSLUSION

Blockchain can be revolutionary in the way we will all implement in our work - businesses, governments, organizations and individuals. It provides a unique, secure way to establish trust in potentially any transaction, enabling simplification of money, product, or confidential information anywhere in the world. To understand the fundamentals of how this technology works, blockchain was analysed. First we showed how distributed nodes and cryptographic techniques ensure secured transactions. Furthermore, the section 'How Blockchain Technology Works', provides the basics of blockchain technology from a technical viewpoint. The attempt to go deeper lead focus of analysis not only to questions about technology but to applications of blockchain in different industries, accompanied by discovering the level of realisation of bitcoin technological platform. Due to many factors of influence on the future realisation of underlying platform, and complicity of the problem, the method of scenarios was chosen as suitable for answering the burning questions.

We have seen that the third described scenario is realistic, and that evidences prove this direction. Also, we discarded the first described scenario as pessimistic, in spite of serious warning that it is possible to achieve. The second described scenario is reality, and we discard also the fourth scenario

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