

# REVIEWING THE LATEST TRENDS OF IMPLEMENTING BLOCKCHAIN TECHNOLOGY SOLUTIONS IN SEVERAL BUSINESS- RELATED INDUSTRIES

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## Abstract

The current Blockchain notion was first introduced in 2008, along presentation of the first cryptocurrency value, Bitcoin. When blockchain appeared in the very beginning, the focus of the companies implementing the technology was the payment processing. Later, with the extension of the scope of blockchain, new companies from a variety of industries and backgrounds started to emerge in the industry rather than just finance. The idea of decentralized solutions, in order to improve services, seems to have fascinated companies that decided to implement this new technology. This paper will try to elaborate the notion of Blockchain, its way of work, the benefits and disadvantages, but mainly, the focus will be on how blockchain solutions can improve current existing centralized solutions in the finance, government and other industries. We will try to elaborate different blockchain based companies and startups, their scope of action, investments, profit and so on. Blockchain is a very promising technology in many industries, but it is relatively a new one, in its early stages of development and implementation, so there are a lot of obstacles that this technology must overcome in order to operate with its full capacity.

**Keywords:** Blockchain, cryptocurrencies, Smart Contracts.

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## 1. Introduction

Recently, blockchain is a widely used notion, and a big part of credits for this has the other widely used notion – cryptocurrency. With Bitcoin leading, which in the moment of writing this paper has a capital market value over \$140 billion; it is almost impossible to find someone that hasn't at least heard about it. This new technology that started trying to create an evolution of current money system, sooner found its way in other industries. It all started in late 2008, when Satoshi Nakamoto published a paper explaining the new virtual money which should change the way money was known. A few months later, an implementation of this research came to life bringing Bitcoin. Even today, more than 10 years after this invention, most of the governments and international bank institutes don't recognize Bitcoin as a legitimate currency. Even though, there are still some countries that believe in this idea and officially recognize it as a currency. Following is a list of these countries:

**Table 1:** Country ranking by index in 2018

Rank	Country	Index
1	Estonia	7.84
2	Australia	7.82
3	Singapore	7.70
4	United Kingdom	7.31
5	Japan	7.23
6	Swiss	7.13
7	Germany	7.12
8	Sweden	6.93
9	Denmark	6.92
10	R. of Korea	6.73
11	Spain	6.63
12	Canada	6.58
13	Belarus	6.49
14	Iceland	6.30
15	United States	6.04

This list is ranked by the degree of Blockchain business-friendly conditions, according to (Andrei Yahorau, 2019). The list is longer containing more detailed information about more countries, but due to the interest of this paper, only first 15 are represented. Just for the record, our country was not part of that research.

In the first section of the paper, the general blockchain notion, types and characteristics are treated; in the second section, the paper treats the application and the influence of blockchain solutions in several industries, their use cases and the future possible improvements; in the last section, this paper tries to provide a general overview of current companies and startups, their platform impact and their market value.

## **2. Blockchain Notion**

Blockchain as a concept represents a public ledger where transactions are stored as a sequence of blocks. In other words, blockchain is a distributed storage where the blocks of data are recorded in a linear chain, and since it is a distributed system, the transactions are approved in the consensus principle between the nodes in the network. Being distributed also means that the data is stored, distributed and synchronized in several geographically dispersed nodes, which may be different cities, countries or institution.

Each block is consisted of:

- Block header – contains metadata about the block such as the hash value of the parent block or data summarizing the transaction
- Block Identifier – a unique cryptographic hash value which identifies the block

- Merkle Tree – the structure of the transaction in the block.

Blocks are linked with the parent block through its hash value, which represents a cryptographic value unique for each transaction (Nakamoto, 2008).

*2.1. Blockchain Types:* Blockchain is a relatively new technology, and because of its nature, the amount of applications based on top of this framework is continuously growing, demanding the framework itself to be adaptive at a large scale. Because of these demand there have been developed three types of blockchain:

- Public Blockchain – also known as permission-less ledger, allows anyone to contribute data to the ledger with all other participants who have identical copy of the ledger. Since no one is the owner of the ledger, public blockchain is more attractive for applications which are resistant on censorship.
- Private Blockchain – also known as permissioned ledger, is managed or controlled by a single or a group of administrators, allowing only selected participants to join the network. Since the network is “owned”, this type of blockchain is more suitable for applications that require speed and transparency.
- Hybrid Blockchain – as the name suggests, it uses characteristics from both, public and private blockchain. It uses a set of permissions, but the administration is done by a group of organizations agreed to control it. These administrators can restrict user’s access level and only allow trusted nodes to participate in the consensus.

*2.2. Blockchain Characteristics:* Blockchain is a continuously developing technology, therefore understanding the potential of this technology requires understanding the characteristics. Something important to notice is that not all the characteristics always fit in every applicable scenario. Following are listed some of the most important characteristics of Blockchain.

- Consensus – as a notion, it refers to the fair agreement between the involved parties. In blockchain, it means that the nodes of the network agree on the same state making it a self-auditing ecosystem.
- Distributed Computation – this characteristic is one of the main reasons blockchain is so famous nowadays. The data is distributed amongst every node of the network, is constantly updated and every node runs independently.
- Provenance – the biggest difference between traditional banking and blockchain is that, in blockchain, every activity is recorded, tracked and traceable, and most importantly, without the need of third-party intercession.
- Immutability – after a transaction has been approved and recorded, the same cannot, in any way, be changed or modified; if that transaction needs a modification, a new transaction will be generated, which will reference the modified transaction.

### 3. Blockchain Applications

Even if blockchain is still in some kind of trial period, somehow, it managed to bring hope to small businesses for reducing their expenses, and large businesses to accelerate the business operations. Although, blockchain nowadays is mostly known for serving as a base framework for crypto currencies, most notably Bitcoin, the range of application is much wider including almost every traditional and modern industry.

*3.1. Financial Services:* Blockchain technology known as Distributed Ledger Technology (DLT), allows this kind of financial services to optimize the business processes by exchanging data efficiently, securely and transparently.

The most important financial service task which blockchain can improve is reorganizing the area of materializing the services during digital cash transactions. Existing business models seem to be already inefficient and are risking to completely be replaced by modern platforms developed and based on blockchain framework. The efficiency, transparency and security provided by blockchain solutions offer substantial advantage from the regulatory perspective.

The existing capital market infrastructure is far more difficult to serve the demands of modern financial services, which are dynamically getting higher. They are slow, expensive and usually require third party intervention.

To understand the concept of blockchain in financial services, it must be clear how the centralized financial system works.

Having a bank account makes us a participant on the centralized system, where the bank is the “center” and we must use its services to access our funds. In this case, the bank is the 3rd party intermediary layer between the consumer and their funds.

According to (BlockchainTechnologies.com), the banking industry is worth \$134 trillion, thus nowadays it would be almost impossible to survive without a bank account. This dependency on the banking system comes due to some rational reasons; first of all, nobody keeps their money or life savings home, because the money is far safer in the bank. Modern banks also provide web and mobile solutions so the users can always access their funds. Additionally, banks offer loans or debit and credit cards for easier living. Lately, services like PayPal also help on daily transactions. Furthermore, banks provide interest rate for user’s saving accounts, even though the rates are generally low.

In the other hand, decentralized services are a major improvement on the centralized system and many believe that blockchain technology is a real threat to this system.

Using “Blockchain banking model”, the transactions will be processed and validated by all the nodes of the network, which theoretically appears to be more reliable, efficient and secure comparing to a validation through centralized system. The decentralized banking model is even faster due to automatic action of the nodes in the system, which eliminates the need of manual validation and verification of the transaction. The security is improved because the responsibility is beyond human action, and falls over reliable algorithms of the system.

Every day, the interest on investing in digital assets is increasing. Thus, the higher the usage of digital currencies is, the higher the value will be. This results in higher, wider and more efficient DLT platforms. With smart contracts there are no fees or overdrafts, but in contrary there are

enormous hidden fees associated with every transaction using bank systems. Also the public ledger prevents fraud identity theft and other costly legal services.

Using the above mentioned facts, there are implications related to the use cases of blockchain technology in financial services.

- Cross-Border Transactions - When discussed about international payment transactions, we are witness that those transactions take days, sometimes even weeks to process and are ready to use, using centralized banking systems. With the use of blockchain technology, transactions worth millions can be processed in seconds.
- Smart Contracts - Using DLT platforms, contracts can be fully executed without human interaction (Franco, 2014). In other words, Smart Contracts can be defined as an automated transaction protocol executing the terms of a contract (Don Tapscott, 2016).

#### 4. Currencies

The existing monetary systems require third party services to support cross-border transactions, such as Visa or Master. From another perspective governments are obligated to trust authorities that the monetary value will remain stable.

Blockchain gave as a gift – the cryptocurrency: a digital monetary value that does not require a third party intermediary to complete a transaction. To better understand the notion, consider this example: if you need to buy something, the current centralized monetary system forces the buyer to, somehow, ask for permission to use his own money; with the cryptocurrency, the buyer simply transfers the digital funds in the seller's account, transaction which is automatically validated by the nodes of the decentralized system.

A more general definition of cryptocurrency would be that it is a network based Peer-to-Peer transaction without the need of any third-party intermediary entity such as banks (Kshetri, 2017). These transactions then are validated by the blockchain technology and recorded permanently in a public decentralized ledger. In other words, cryptocurrency is an evolution of traditional money. It is digital, decentralized and represents a Peer-to-Peer transfer between users, and validated and verified through an autonomous process based on blockchain technology.

Bitcoin, the most notorious and the most valuable cryptocurrency of the present, is a new successful version of cryptocurrency, invented and proposed by an anonymous entity named Satoshi Nakamoto, in 2009, which solves the issue of double-spend, an issue caused by centralized system, which requires third-party verification, through decentralization. But, this is not the first attempt for a digital currency, since there has been many tries starting from late 1990s such as E-gold (1996), WebMoney (1998), Liberty Reserve (2006) or Perfect Money (2007) (BlockchainTechnologies.com).

Below we give some basic reasons why it is necessary to replace fiat with cryptocurrency:

- The main characteristic of every platform is the speed of completing the transaction. Compared to Web 2.0 financial services, the blockchain technology has more abilities for scalability, and this makes the cryptocurrencies faster than fiat.

- The process of realizing the transactions through decentralized systems and peer-to-peer networks, besides speed, it is cheaper also. It does not require third-party intermediary, no personnel, ATM or central bank, etc.
- Another important characteristic is security. While decentralized systems are harder to hack, as mentioned earlier in this paper, cryptocurrencies use this measure as an advantage. Additionally, the transactions are stored in an immutable, digitally signed chain of blocks in a public ledger.
- The DLT, even though publicly shows all of the transactions, the user information is hidden and protected. While in the other hand, everyone is aware of their data being used for different purposes by current companies. Using the previously mentioned facts related to security provided by DLT, identity fraud or data manipulation is very difficult, if not impossible.
- Cryptocurrencies can be used to buy things, but they can also be converted into fiat. The conversion process is not as easy as drawing cash from an ATM, since most of the banks and governments still does not recognize them as legitimate currency, but in certain places you can also convert it to fiat (Robby Houben, 2018).

*4.1. Use Cases of Blockchain in Cryptocurrencies:* The appearance of Bitcoin opened a myriad possibilities and use cases for blockchain usage in the cryptocurrency industry. At the moment this paper was written, there are more than 500 cryptocurrency values, and that number is surely changed by this time. Following are listed a few of blockchain use cases in cryptocurrency.

- Transferring large sums of money using current banking systems costs a fortune and takes days, maybe weeks to process; with cryptocurrencies, these kinds of transactions might happen within a short time and the cost is minimalistic.
- As mentioned previously, replacing fiat is one of the main use cases of blockchain. In fact, Bitcoin itself was blockchain's biggest promoter.
- The conception by Nick Szabo, who is believed to be Satoshi Nakamoto, that smart contracts actually predate Bitcoin, shows that, similar to Ethereum, Bitcoin too and other cryptocurrencies include some, if not more, functionality from smart contracts (Sedgwick, 2019).

Although, these assumptions are just a few of the possible use cases of blockchain in cryptocurrency, this technology is very young, which means that every day the infrastructure, the shape and usage develops and no one can surely predict what direction the future will give to it.

## **5. Governance**

Blockchain in governance offers safer and more transparent service when talking about the citizen-government relation. The DLT can boost the efforts to optimize the processes through more efficient and secure data sharing.

Besides cryptocurrency, public sector is the sector where blockchain can have the biggest impact. Some simple examples of use cases of blockchain in governance include preventing tax fraud, reduce bureaucracy, improved transparency and numerous other examples.

In the centralized systems, particularly in less developed and less democratic countries, random habitants lack information related to the public services, their status, working progress and even find difficulties accessing their own basic information. Privacy is another issue reported on the current centralized government systems. Rather often is the case of governments miss using public resources for peeking or violating civil rights of privacy for their electoral benefits. Furthermore, maintaining current systems is also expensive, engaging administration personnel for updating the ledgers, every verification process must go through a variety of hierarchy levels, registrations go through multi steps of implementation; all of these are paid on behalf of citizen taxes. Simplifying the processes, billions could be saved annually. With growing managing actors, it only gets more difficult to track the spending.

To have faster, more reliable and transparent processes, governments are already considering the opportunities offered by blockchain technology, in order to be able to solve existing problems. If the process of verification and authentication can be solved without using third party intermediary, it reduces the cost, the time and complexity of information exchanges enhancing the administrative function of governments.

According to (David Allesie, 2019), e-government acknowledged the impact of digitalization in the modernization of public administration. The digital government takes that concept a step further, by focusing on the provision of user-centric and innovative services. Blockchain as a technology appears to be one of the most innovative digital technologies to be considered for the next level government and public service delivery. Generally, the benefits by implementing blockchain in public service delivery are claimed to be:

- Bureaucracy, corruption and discretionary power reduction by using the transparent nature of distributed ledgers and smart contracts.
- Relegating the total control over the processes from the government, by using trusted algorithms and increasing the trust of civil entities in those processes.
- Enhancing the administrative function by reducing costs and complexity in government tasks.

This technology is a combination of existing, distant technologies forming a new infrastructure decentralized-based, which appears to be the core feature that can reshape the interaction between the government and the citizens (Atzori, 2015).

*5.1. Use Cases of Blockchain in Governance:* According to (Mire, 2018), just in 2017 around \$473 billion were spent inadequately, for example \$20.000 were spent on summer art camps or other millions of dollars in ridiculous categories of spending. Considering that the U.S. public national debt is over \$21 trillion, it is rational to say that the government should be more careful with their spending.

Upgrading to a blockchain based solution, seems a promising and reasonable start in assessing how the public sector can be reorganized. Following are only a few from a numerous amount of possible use cases of blockchain based solutions in public relations and services.

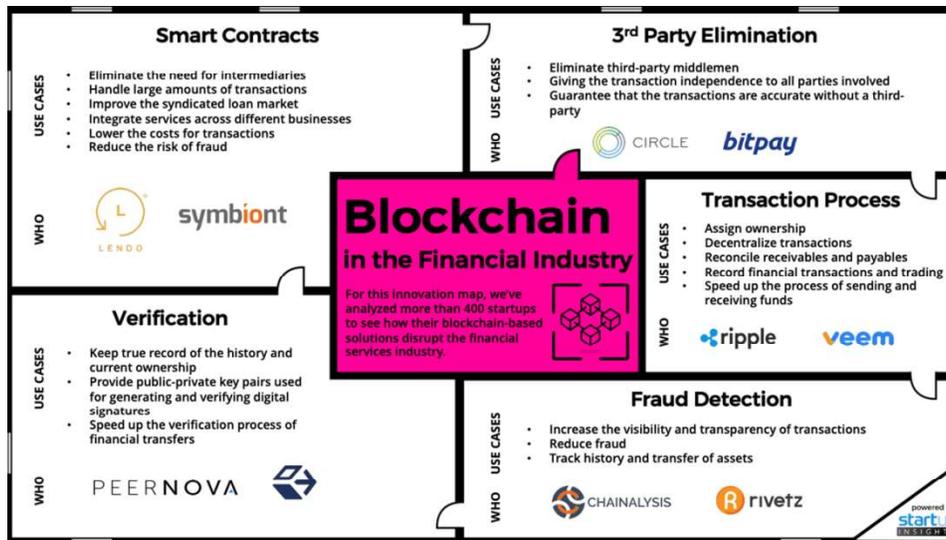
- After the 2016 U.S. elections possible scandal, it is very good example to start thinking for a solution that would prevent such a scenario. According to (Mire, 2018), in 2012, in South Carolina had been announced 953 voting participants, even though they were already dead at the time of the voting. Using blockchain voting solution has a few advantages: people will be able to vote from home, which will help in increasing the number of people participating in voting; the immutable ledger will easily identify persons who are eligible to vote.
- Implementing blockchain in customs and border patrol should provide more reliable provenance about the origin and legitimacy of the shipments, allowing agents to operate more efficiently.
- Blockchain solutions in budget planning would definitely help in preventing \$25 billion spent for unused government properties maintenance; or \$92 billion spent on corporate welfare. These modern impartial solutions would replace the middlemen, most probably the ones responsible for the sky-high budgets and inefficiency.
- Another very important issue is the paper-based system and its cost. It costs more than \$2600 yearly to maintain a five-drawer filing cabinet, including the file clerks 'salary, the file transfer boxes and such indirect costs. Reducing the amount of paperwork associated with federal and/or local processes by digitizing the majority of paperwork that is required to have it, but rarely used, such as marriage licenses or other similar paperwork, by storing it as a permanent, non-space consuming records, would reduce the need for the whole current personnel and storage area.

This paper, and probably, most of the other related researches, by no means requires that blockchain solutions completely replace current centralized political structures and governments; someone has to be on top of the society. No one would trust a digitized computer system to lead a country. Instead, use DLT as help to provide more qualitative public services, with greater transparency. DLT is one of the main, if not the only, solution that could improve the government-citizen relations, increase two-way trust and provide better conditions for competing in the current globalization process.

## **6. Companies/Startups in Financial Industry**

The innovation brought by blockchain technology in the financial service providers industry changes these systems in several application areas.

Several researchers analyzed several startups disrupting existing financial service providers. The following figure represents a map highlighting blockchain application areas in the financial industry.



**Figure 1:** Financial industry blockchain use cases (Franco, 2014)

Following is the list of the startups trying to or already providing a blockchain based solution in the financial service providing industry:

- Synaps – a joint initiative by Symbiont and Ipreo, aiming to provide blockchain-based solution using smart contract oriented on improving the experience in the loan market. According to (Vilar, 2019), Synapse reports more than \$2 billion as automated clearing house and \$40 million payments card transactions for over 100 companies. In total it is reported that a company facilitated more than \$10 billion in transactions.
- Bitpay – payment service allowing businesses to exchange or trade using Bitcoin and Bitcoin Cash, as well as exchange between cryptocurrencies and fiat. The company was founded in 2011, payment processing was the initial target, Venture capitalist invested (bitpay).
- Ripple – cryptocurrency known as XRP. The system serves both private users and organizations, allowing them to transfer money and make payments. Invested by several investment groups and also several known companies such as American Express, Money Gram or other international banks use their services (ripple).

## 7. Conclusions

Blockchain technology has revolutionized centralize-based industries by providing more advanced, secure, faster and cheaper decentralized solutions. Providing these key characteristics, this technology has the abilities to improve the efficiency and increase the productivity of any industries.

A lot of organizations that have a clear vision of their future, are investing in researches and startups providing blockchain solutions, trying to be up-to-date with the latest trends on this industry.

Even though blockchain seems to be very promising in solving currently existing issues, knowing the fact that it is relatively new technology and knowing the human nature always trying to fight

major changes, there are a lot of obstacles that this technology must overcome in order to operate with its full capacity.

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