MEST Journal
DOI 10.12709/mest.06.06.02.05

BLOCKCHAIN TECHNOLOGY AND INDUSTRIAL INTERNET OF THINGS IN THE SUPPLY CHAINS

Zoran Cekerevac
Faculty of Business and Law of the "Union – Nikola Tesla" University in Belgrade, Belgrade, Serbia

Lyudmila Prigoda
Maykop State Technological University, Maykop, Russian Federation

Jelena Maletic
Technical School GSP, Belgrade, Serbia

JEL Category: **L86, L87, L91**

Abstract

At the end of the second decade of the 21st century, the blockchain technology and the Internet of Things entered the focus of interest of all Internet users and numerous companies. Since blockchain technology has been proven in the production and trade of crypto-currencies, many potential users have noted that this technology has a potential to be applicable in many areas, practically as an operating system where the Bitcoin was only one application. This paper analyzes a possibility of using blockchain technology and the Industrial Internet of Things to improve supply chains. Particularly they are discussed the impacts of these two technologies on changes in supply chains and the effects that can be achieved by their application, as well as some examples of their use and potential use. It is also analyzed the investment situation concerning applications of the blockchain and the Industrial Internet of Thing in the supply chains. In conclusions, the authors point to the rapid development of blockchain technology and the Internet of Things, but also that their massive application can only be expected in a few years.

Keywords: *IIoT, blockchain, supply chain, distributed ledger*

1 BLOCKCHAIN AND THE IIoT TECHNOLOGY IN SUPPLY CHAIN

Blockchain and Industrial Internet of Things (IIoT) recently become the most studied and developed technologies in supply chains (SC). In practice, a major news in the context of supply chain digitization leveraging blockchain concerned the joint venture between giants Maersk and IBM at the end of January 2018. They have started their collaboration in the mid of 2016. Till now, "several companies, ports and authorities already conducted pilots with the platform and several more are planning to join" (i-SCOOP, 2018). Also,

Address of the corresponding author:
Zoran Čekerevac
zoran@cekerevac.eu

there are many other initiatives in this respect, and although they are smaller, show great ambitions and the tendency of accelerated growth. A good example “is the blockchain smart port case in the port of Antwerp where real challenges in the scope of maritime logistics and especially container release are tackled” (i-SCOOP, 2018).

1.1 Blockchain

The blockchain is created to be a shared, distributed ledger aimed to facilitate the process of transactions recording, and assets tracking in doing business. (Gupta, 2017) Although the blockchain has become known thanks to Bitcoin, to understand it, it is best to consider blockchain as an operating system (like MS Windows or MacOS), and bitcoin as one of the applications that can run on that system.

In his analysis Bauerle (2018) compared blockchain with Wikipedia, underlining that many people can make entries in every information record and that a community controls whether the information is true or false. But, the author knows that Wikipedia’s backbone is a centralized system, like any bank’s system, which is not in line with the basic idea of a blockchain, a distributed ledger. This comparison is not the best way to talk about the blockchain.

A distributed ledger is a database that exists across several locations or among multiple participants. (Belin, 2018) It's not a computer database divided into multiple locations, but it's the same database located in many different locations. Data can be stored in the database only after reaching of consensus by all parties involved. If only two persons, a bank officer, and a client appear in the action when client pays to the bank account, and if the bank officer writes the data into the database, and as a trail leaves only two payment receipts (for the client and for the bank), in case of losing the receipt the client must rely only to trust in the bank. With the distributed ledgers, each connected computer makes their own updated version of the transaction, bringing security to a significantly higher level.

Distributed ledger of a blockchain cannot be compared with torrent files because their purposes are different. The torrent file contains metadata about contents to be distributed, usually together with a list of network locations of trackers. More about torrent files can be found at (Cohen, 2017).

For the explanation, perhaps it is best to use the sending of e-mails within a group using the "Reply All" option. Each address from the original list will receive all answers. While this mode of communication when sending e-mails can be annoying to e-mail recipients, it is essential and under default in the blockchain technology.

The blockchain is one type of distributed ledgers. It is composed of blocks. Each database entry must be confirmed and encrypted, and it is dependent on all its predecessors. The main difference between blockchain and distributed ledger is that all blockchains are distributed ledgers, but not all distributed ledgers are blockchains.

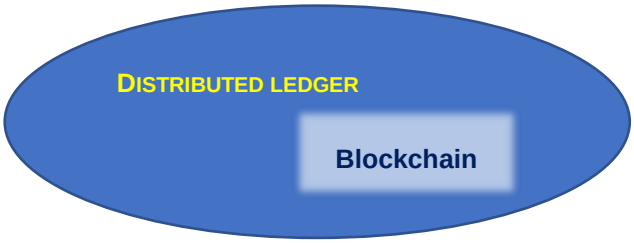

Figure 1 Distributed ledger vs. Blockchain

Blockchain ledger contains a chronological record of every transaction in the form of cryptographically-verifiable chunks referred to as blocks which are chained together.

About the precursors of blockchain technology, Bitcoin, it was much written, including (Nakamoto, 2008), (Cekerevac Z. , Dvorak, Prigoda, & Cekerevac, 2015), (Čekerevac & Čekerevac, 2015), (Prigoda & Cekerevac, 2016), so here it will not be described in detail, but it should be noted that it is based on three technologies: private key cryptography, P2P network, and a protocol governing incentivization (Bauerle, 2018). The blockchain technology is also explained by many authors, and one simple

explanation on the example of Bitcoin is given in (D'Aliessi, 2016).

Blockchain can be realized as a private, consortium and public blockchain. More detailed information of this classification can be found in (Buterin, 2015). Each of the users in the distributed network has a copy of the ledger to prevent possible loss of data and the single point of failure (SPOF). All copies of the transactions are updated and checked at the same time. In 2018, 22 European countries have a signed declaration with the aim of exchanging experience and expertise in Europe, as well as preparing for partnership and application of Blockchain in the EU and beyond. According to (EC, 2018), it is envisaged to finance the new digital program of Europe with over EUR 9.2 billion, out of which 3 billion will be directed to digital connection of infrastructure in the period until 2027, as it is believed that 69% of companies have no basic understanding about their exposure to the risk of cyber-attacks. 60% of companies have never estimated a potential financial loss, and more than 51% of European citizens are not sufficiently informed about the protection against various attacks on their computers. The funds will be directed toward the development of advanced technologies (data analytics, robotics, artificial intelligence, blockchain technology, cybersecurity and high-performance computing).

The application of blockchain technology is connected with issues as interoperability, scalability, and usability, which can cause bottlenecks, and there appeared an idea to form “blockchain of blockchains”. One of the first applications of that kind was FUSION which was founded by D.J. Qian. (n.d., 2018) Such attempts will help to establish of so-called “Internet 2.0” also known as the “Internet of Values”.

1.2 IIoT in the supply chains

The term Internet of Things has become frequently in use and when it is mentioned everyone already has his own picture of it. Therefore, we will not discuss IoT, but to create clear understanding we'll use TechTarget's definition that "the Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction." (Wigmore, 2016)

Within the IoT, a sub-category Industrial Internet of Things (IIoT) is developing rapidly. Although similar, IIoT differs from IoT because it refers to things, equipment, and software that are designed to work in industrial environments and therefore require robustness, reliability, precision and accuracy, security, interoperability and all other which should ensure the quality and reliable and safe operation of industrial plants. A photograph can be made using a smartphone camera, but also using a top-of-the-line digital camera. It is more likely that in the second case, in extreme conditions, better results will be achieved. This little comparison could be transferred to IoT and IIoT.

The IIoT technology that can be applied in SC is extremely heterogeneous in terms of platforms, equipment and connectivity, with many users whose data and communications should be virtualized, stored, planned and managed. Introduction of IIoT technology in SC needs several steps, phases that would realize successively to get the best results. The process should start with obtaining devices connected, and continue with the data monitoring, data analytics, automation, and finally, the Edge Computing. Within the named phases, it is necessary to obtain, respectively: onboard data collecting and their transmitting to cloud databases; data visualization to be monitored in real-time; complex analytics and machine learning, logic rules development and execution to automate activities; and the distribution of analytics and orchestration to the device level.

The IIoT technology, where devices communicate and share information on a network to track and then upgrade the process (M2M - Machine-to-Machine), in transport and logistics, it allows data and information exchange, using a model vehicle-to-anything (V2X), namely: vehicle-to-infrastructure (V2I), autonomous vehicles (AVs) that require vehicle-to-vehicle (V2V), V2P (Vehicle-to-Pedestrian), or V2G (Vehicle-to-grid). (Lyons, 2018) Given the accelerated development of IIoT and in general IoT, it can be expected that devices within the network will

become the target of numerous attacks and that the need for enhanced protection will become more pronounced. Many analyzes have been made on this topic, including (Raggett, 2016), (Liu, Zhao, Li, Zhang, & Trappe, 2017), (Cekerevac Z. , Dvorak, Prigoda, & Cekerevac, 2017) etc.

1.3 What happens in SC when a blockchain and an IIoT are connected?

Given the size of commodity turnover, the number of participants in global trade and transport, and the need to keep end-to-end records, it is easy to explain why the application of blockchain technology in supply chains has become the second most important application of blockchain in general, immediately behind the application in the financial sector.

Blockchain technology transforms the way of looking at IIoT, bringing a typical way of transactions, without fail recording all data and information that require specific usage permissions at different levels, making it a very useful means for regulating of IIoT devices. Blockchain can successfully track sensors and their data measurements. Furthermore, because there is no third party, IIoT sensors can exchange data directly, through the blockchain. The technology allows each participant, based on the license level, to see any aspect of SC and documents status in the real time. No document can be modified or deleted without the consent of the SC user on the network, which ensures automatic verification.

Deployment of IIoT devices can lead to significant costs and challenges, but blockchain technology is well prepared for identification and authentication, and IIoT devices autonomy. Unlike the application of centralized databases, using a blockchain technology network cannot be hacked at acceptable cost and resources, and, also, a double-spending problem is solved. It is possible to synchronize business decisions of the participants in the SC, with previously defined rules of document management that is implemented through program codes, where no one user can change the accepted rules of business. Applications have developed a checks and balances system against any kind of operation in contravention of the agreed. The system of checks and balances is the essence of this technology and therefore a real blockchain system must be open-source, permissionless, non-exclusive, decentralized, and fully secure for data storage and their circulation.

It is not difficult to conclude that “blockchain and IoT are best friends”, as Shaik (2018) said.

2 IMPACTS OF THE IIoT AND BLOCKCHAIN ON THE SUPPLY CHAIN

An ideal supply chain should ensure an end-to-end visibility, flexibility, inferred trust and a control of the process. The IIoT with its transparency can revolutionize the supply chain, and at the same time to give both operational efficiency and revenue opportunity. The companies that understand that supply chain isn’t only a way to keep track of a shipment can gain an edge on their competitors. According to i-SCOOP (2018), a simple moving a container from one point to another often involves over 30 different parties, with an average of 200 interactions between them.

From the aspect of operational efficiency, a company using IIoT can count with asset tracking, better relations with vendors, and more accurate forecasting and inventory. Together with the supply chain grow it grows as an imperative to ensure that all carriers stay connected. The IIoT can do it. What's more, the IIoT with its sensors can help with scheduled maintenance.

Considering revenue opportunities, Daniel Newman (2018) points out that "the chance to know more—and understand more—about our customers, their buying habits, and the trends associated with them is invaluable." Companies with these data can allow customers to access and see "where their product came from, who made it, and the conditions in which those workers lived". That way the company can build a reputation for social responsibility.

Deloitte (2017) summarized blockchains’ effects in four essential influences: fast transaction settlement, low cost, transparency and auditability, and reliability. Using IIoT together with a blockchain, the company gets the opportunity to register each event and every transaction in SC and share this information with other participants in the SC. This information

distribution increases efficiency but also reduces the number of intermediaries and costs.

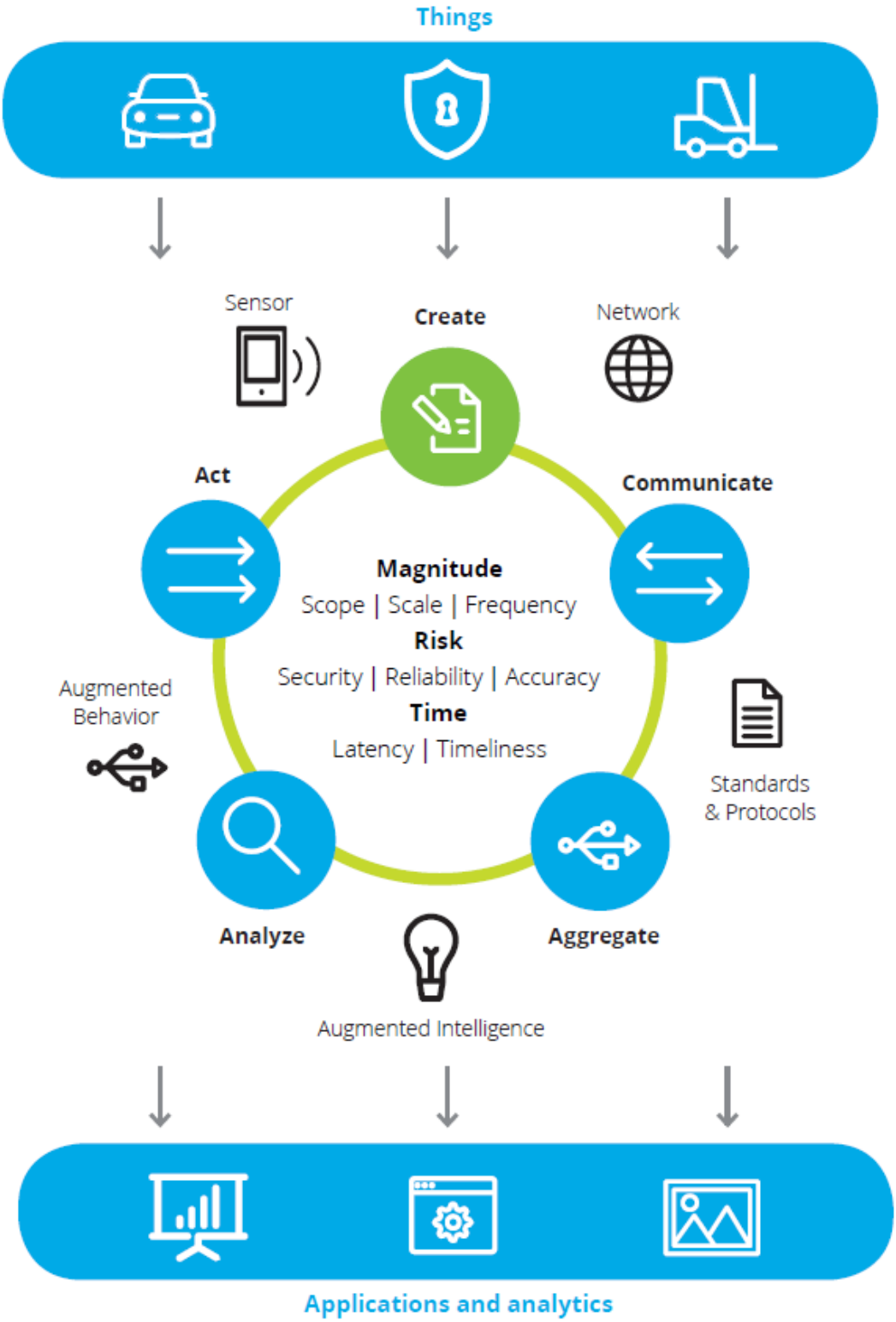

Figure 2 The IoT information loop (Deloitte, 2017)

To be able to be implemented, the SC must implement IoT devices, either built-in or independent, in the form of things (devices, continuously connected to the network, which can collect and exchange intrinsic information) and in the form of sensors or beacons (devices that take

over behavioral and information from the environment). However, it should always be kept in mind that IoT is not just devices. On SC other than devices and sensors, IIoT affects multiple layers:

- Integration layer
- Augmented intelligence layer, and
- Augmented behavior layer

These three layers have a task to manage sensors and network, to aggregate their data and integrate them with data received from external sources and accumulate and process them to create an action without human intervention. The full IoT information loop is shown in Figure 2. The architecture of the system will not be discussed here, but its detailed structure can be found in (Deloitte, 2017).

Blockchains can be of different types. They can be public, where anyone can participate with no permission required. It is the most democratic and transparent way of participation, but it is connected with some risks related to an amount of data flow on the network, and also to the fact that there is no pre-existing trust between participants. In private blockchains, the read function may be public or restricted, but the modify function is restricted to specific users. Somewhere in between, there are consortium blockchains. They are closer to private blockchains, but there are more trusted institutions that enable a high level of pre-existing trust. When one analyzes the data-flow through the blockchain network, it is to expect that the public blockchains are the most demanded because of the number of participants. There may be asked the question if all participants are interested in all transactions. It seems that some kind of restrictions might be useful.

Supply chains are exposed to many challenges, and in terms of organization and security, the information accessibility, continuity, and safety are highlighted. So, it can be said that the information sharing between the stakeholders along the chain is the main task of the information system. Because of their nature, IIoT and blockchain technology can overcome these challenges. Using tags attached to individual packages or to containers allows tracking of shipment during the whole process of transportation, and even more, from the place of packaging of the product to the place of delivery. There is also possible to add additional sensors. For example, in the healthcare and food industry, temperature sensors can be added to shipment to record or transmit data about the shipment and to alarm if the limit temperature is close or exceeded. In some situations, it is possible to use DNA identification to prevent fraud. When receives the shipment, a buyer can identify authenticity using DNA reader.

3 EFFECTS OF AN APPLICATION OF THE IoT AND BLOCKCHAIN IN THE SUPPLY CHAIN

Each production company must manage its supply chain. In production cycles, the company faces the problems of external and internal transport, planning of production, procurement of raw materials and semi-finished goods, storage of parts and finished products, the burden on production machines and personnel, etc. Things become even more complicated when a part of logistics is outsourced. Outsourced activities can bring potential inefficiency and lower visibility. Both risks can be reduced using sensors and cloud platforms. A lot of activities can be automated, including asset tracking and fleet management. But such challenges are a low-hanging fruit because every company needs it, and there are a lot of offered solutions. Much more demanded are solutions of end-to-end supply chains.

IoT and blockchains give a company an opportunity to be more pro-active than before. Using sensors, IoT, and predictive analytics the company has a chance to plan maintenance and supply in the same way as in aeronautics. The supply chain can be leaner. This way the company can provide planned maintenance of machines and transportation means, reduce the need for spare parts, their timely purchase, and reduce the size of spare parts stores, the value of money trapped in spare parts, and bring in savings in this regard.

The use of sensors in warehouses and large stores can enable easier inventory or even avoid the need for inventory, as management can have real-time data on available items. The sensors can be also used against theft, as a security element. Such examples of RFID identifiers use are given in (Čekerevac, Matić, Djurić, Čelebić, & Dvorak, 2010).

Transportation companies, including logistics companies, must count on the fueling of vehicles. IIoT brings an opportunity to automatize recording of this activity using appropriate sensors and devices. A similar example based on the RFID identification is explained in (Čekerevac, Matic, & Djuric, 2006). Further, such records can lead to better maintenance planning and costs reducing.

According to a survey of 600 supply chain decision-makers (eft, 2016) respondents answered that 41% already have an IoT solution in place, and 87% are looking to expand the IoT use. 69% of respondents expected to see ROI within two years, 21% in the third year, and 10% after that period. The main interest for improving operational visibility was shown for land shipments (80%) and air shipments (50%). Only 33% of respondents were looking for visibility improvement in see shipments. According to the same analysis, 59% of respondents were using IoT for alarm purposes and real-time monitoring, and 41% for the optimization and prediction. The analysis showed that most of the respondents, 61%, were analyzing less than half of their collected data. It showed that companies are still not prepared to use their IoT data and that they are predominantly interested in obtaining geolocation data. As the main reason for that, respondents pointed out data management costs (31%) and hardware costs (26%), but 87% of respondents declared that they are looking to expand the use of IoT.

One other survey of 195 responses (eft, 2018) showed that blockchain continues its growth, but that 69% of organizations are still spending its money on understanding the technology. Around 35% of respondents were spending on the technology testing (20%) and implementing (15%). The survey showed that 50% of companies did not spend even $1 on the blockchain and that 33% spent under $100,000. Only 5% spent more than $1m. So, it can be to conclude that 2018 will be only one more step on the road of supply chain transformation. It is to expect that similar situation will be also in the next few years, but that things evolve in the right direction are visible through the titles as:

- "Alibaba and AusPost team up to tackle food fraud with blockchain"
- "Australia Post details plan to use blockchain for voting"
- "IBM Blockchain to help prevent contamination in global food supply chain"
- "5 companies using blockchain to drive their supply chain (TechRepublic)"... (McLean, 2018)

4 CONCLUSIONS

With the advent of globalization, the transportation and logistics have become much more complex and demanding, and the solution of new problems and tasks has led to major changes and many improvements. A large number of stakeholders have led to the need for an increased amount of trust-based information. Everyday experience shows that the existence of centralized institutions of trust is becoming a limiting factor in the further improvement of supply chains and that the application of blockchains is an entirely acceptable solution. The additional quality of the blockchain is obtained in combination with IoT technology.

The blockchain and IIoT are in the early stage of development, but the intensity of their development is so intensive that it can be called a revolution. It would not have happened that the stakeholders were not convinced that the path they were going to was correct, and that were not agreed to develop this technology.

Analyzing which mode of the blockchains has the best chance to be used, it is rather hard to believe that the public, fully decentralized and uncontrolled network have the best chance, because of the amount of data flow. It is most likely that consortium or private blockchains are a better solution.

To further develop supply chains, in addition to the efforts of participants, changes in the legislation at the world level are necessary. The regulation should evolve in terms of supporting change. Of key importance is that all, sensors, device, methods and software platforms stay transparent.

It can be said that the Blockchain and IOT solutions are seen to be the integrator of existing and future IT elements and existing or future operational technology. Thereby two key performance indicators, achieving operational efficiency and better quality of service, can be improved.

Finally, all analyzes show that at the beginning of the third decade of 21st century the vast majority of blockchain initiatives will be still in their early phase of development and that the most people are just talking about the blockchains. But it is for sure that a real blockchain revolution will come in the next phase.

WORKS CITED

Bauerle, N. (2018). *What is Blockchain Technology?* From coindesk: https://www.coindesk.com/information/what-is-blockchain-technology/

Belin, O. (2018, Jan. 30). *The Difference Between Blockchain & Distributed Ledger Technology*. Retrieved from TRADEIX: https://tradeix.com/distributed-ledger-technology/

Buterin, V. (2015, Aug 07). *On Public and Private Blockchains.* Retrieved from Ethereum Blog: https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/

Cekerevac, Z., Dvorak, Z., Prigoda, L., & & Cekerevac, P. (2017). Internet of things and the Man-In-The-Middle attacks – Security and economic risks. *MEST Journal, 5*(2), 15-25. doi:10.12709/mest.05.05.02.03

Cekerevac, Z., Dvorak, Z., Prigoda, L., & Cekerevac, P. (2015). Risks of Bitcoin virtual currency. *Communications*, 93-97.

Cohen, B. (2017, Feb. 04). *The BitTorrent Protocol Specification.* Retrieved from BitTorrent.org: http://www.bittorrent.org/beps/bep_0003.html

Čekerevac, P., & Čekerevac, Z. (2015). Bitcoin - Prednosti i rizici. *FBIM Transactions*, 37-48.

Čekerevac, Z., Matic, S., & Djuric, D. (2006). ITGfdc-1 Fuel Dispenser Control System as the Technical Solution for Preventing of Non-Authorized Fuel Tanking. *11th International Scientific Conference devoted to Crises Situations Solution in Specific Environment* (pp. 81-86). Žilina: FSI UŽ.

Čekerevac, Z., Matić, S., Djurić, D., Čelebić, D., & Dvorak, Z. (2010). SDD ITG 'smart shelf' RFID rešenje za inventarisanje robe na udaljenim policama [Eng. SDD ITG smart shelf RFID solution for the stocktaking of goods on remote shelves]. *IMK-14 - Istraživanje i razvoj*, 47-52.

D'Aliessi, M. (2016, June 01). *How Does the Blockchain Work?* Retrieved from Medium: https://medium.com/@micheledaliessi/how-does-the-blockchain-work-98c8cd01d2ae

Deloitte. (2017). *Continuous interconnected supply chain - Using Blockchain & Internet-of-Things in supply chain traceability.* Luxembourg: MarCom at Deloitte.

EC. (2018, May 2). *EU Budget for the future - Digital transformation.* Retrieved from European Commission.: http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=51942

eft. (2016). *The Internet of Things (IoT) in Supply Chain and Logistics - 2016 Research Findings.* AT&T and EFT. Retrieved from https://events.eft.com/iot/

eft. (2018). *Supply Chain Hot Trends Q1 & Q2 2018.* eft and 3Gtms.

Gupta, M. (2017). *Blockchain For Dummies* (IBM Limited Edition ed.). Hoboken, NJ: John Wiley & Sons, Inc. From https://public.dhe.ibm.com/common/ssi/ecm/xi/en/xim12354usen/XIM12354USEN.PDF

i-SCOOP. (2018, Feb.). *Blockchain, digital trust, and distributed ledger technology – going big business*. Retrieved from i-scoop: https://www.i-scoop.eu/blockchain-distributed-ledger-technology/

Liu, X., Zhao, M., Li, S., Zhang, F., & Trappe, W. (2017). A Security Framework for the Internet of Things in the Future Internet Architecture. *Future Internet*, 28. doi:10.3390/fi9030027

Lyons, A. (2018, Apr. 25). *Connected Vehicles & V2I - The Role of Infrastructure in Connected Vehicle Deployment*. Retrieved from Iteris: https://www.westernite.org/annualmeetings/16_Albuquerque/Presentations/2B_Lyons.pdf

McLean, A. (2018, Apr. 26). *Alibaba pilots blockchain supply chain initiative down under.* Retrieved from ZDNet: https://www.zdnet.com/article/alibaba-pilots-blockchain-supply-chain-initiative-down-under/

n.d. (2018, Feb. 25). *The "Blockchain of Blockchains" is Here...* Retrieved from Live Bitcoin News: http://www.livebitcoinnews.com/the-blockchain-of-blockchains-is-here/

Nakamoto, S. (2008, Aug. 18). *Bitcoin: A Peer-to-Peer Electronic Cash System.* From bitcoin.org: https://bitcoin.org/bitcoin.pdf

Newman, D. (2018, Jan. 9). *How IoT Will Impact The Supply Chain*. Retrieved from Forbes: https://www.forbes.com/sites/danielnewman/2018/01/09/how-iot-will-impact-the-supply-chain/#576448353e37

Prigoda, L., & Cekerevac, Z. (2016). Bitkoyn kak innovatsionnyy instrument raschetov: Tendentsii i ogranicheniya. *Aktual'nyye voprosy sovremennoy finansovoy nauki, tom I: Mezhdunarodnaya nauchno-prakticheskaya konferentsiya* (pp. 200-204). Krasnodar: Krasnodarskiy tsentr nauchno-tekhnicheskoy informatsii (TSNTI).

Raggett, D. (2016, June 14). *Tackling Data Security and Privacy Challenges for the Internet of Things.* Retrieved from W3C: https://www.w3.org/Talks/2016/0614-iot-security.pdf

Shaik, K. (2018, Jan. 12). *Why blockchain and IoT are best friends*. Retrieved from IBM: https://www.ibm.com/blogs/blockchain/2018/01/why-blockchain-and-iot-are-best-friends/

Wigmore, I. (2016, July). *Internet of Things (IoT)*. Retrieved from TechTarget - IoT Agenda: https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

Received for publication: 21.04.2018
Revision received: 31.05.2018
Accepted for publication: 07.06.2018

How to cite this article?

Style – **APA** *Sixth Edition:*

Cekerevac, Z., Prigoda, L., & Maletic, J. (2018, July 15). Blockchain Technology and Industrial Internet of Things in the Supply Chains. (Z. Cekerevac, Ed.) *MEST Journal, 6*(2), 39-47. doi:10.12709/mest.06.06.02.05

Style – **Chicago** *Sixteenth Edition:*

Cekerevac, Zoran, Lyudmila Prigoda, and Jelena Maletic. 2018. "Blockchain Technology and Industrial Internet of Things in the Supply Chains." Edited by Zoran Cekerevac. *MEST Journal* (MESTE) 6 (2): 39-47. doi:10.12709/Mest.06.06.02.05.

Style – **GOST** *Name Sort:*

Cekerevac Zoran, Prigoda Lyudmila and Maletic Jelena Blockchain Technology and Industrial Internet of Things in the Supply Chains [Journal] // MEST Journal / ed. Cekerevac Zoran. - Toronto : MESTE, July 15, 2018. - 2 : Vol. 6. - pp. 39-47.

Style – **Harvard** *Anglia:*

Cekerevac, Z., Prigoda, L. & Maletic, J., 2018. Blockchain Technology and Industrial Internet of Things in the Supply Chains. *MEST Journal,* 15 July, 6(2), pp. 39-47.

Style – **ISO 690** *Numerical Reference:*

Blockchain Technology and Industrial Internet of Things in the Supply Chains. **Cekerevac, Zoran, Prigoda, Lyudmila and Maletic, Jelena.** [ed.] Zoran Cekerevac. 2, Toronto : MESTE, July 15, 2018, MEST Journal, Vol. 6, pp. 39-47.