INDEPENDENT JOURNAL OF MANAGEMENT & PRODUCTION (IJM&P)
http://www.ijmp.jor.br v. 12, n. 3, Special Edition ISE, S&P - May 2021
ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

BLOCKHAIN IMPACT ON ECONOMIC SECURITY

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Submission: 11/17/2020
Revision: 1/5/2021
Accept:1/28/2021

ABSTRACT

The aim of this paper is to review impact of the one of the most modern cutting edge technologies‘, namely Blockchain on Economic Security. First of all article describes concept - technological background of Blockchain technology nature, emphasizing main features that have most significant and even disruptive impact on separate industries and even whole Economy including Economic Security. Secondly contemporary challenges of this technology are provided. Thirdly multifaced concept of Economic security is explained, followed by importance of this phenomenon specifically within modern mega trends such as Globalization and Information Society. Blockhain impact has been researched through three main industries/functions – eCommerce, Payments and Logistics. Finally conclusions of the paper suggest to use Blockhain with another Industry 4.0 technologies (such as Big Data and Internet of Thing) to reach maximum possible synergy.

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

Keywords: Blockchain; Economic security; Industry 4.0; Digital technologies digitalization

1. INTRODUCTION

Economic security is the topic which among other economic disciplines gains more and more popularity, interest and even priority if we speak about that phenomenon at state level. The reasons are quite straightforward and shall be found from the very definition of this object. Before speaking about exact definitions it should be also noted, that Economic security can be analyzed at different levels: – *micro level* (as outcome of microeconomy) that analyzes *economic security of household and individual resident*, some representatives of such approach are Parthasarathy et al. (2014) which examined economic security of citizens with focus on financial stability, Mutchler et al. (2015) describe indexes, assessing economic security of senior people, Muller (2015) analyzes impact of households' debts level on economic security.

Deprez (2013) focuses research on economic security of USA women of working age. Cahill (2016) works on impact of set of different economic vulnerabilities to economic security. Another group of scientists working within same *micro level* highlight *economic security of business units – commercial companies*. Large number of scientists see economic security as predominantly security of financial markets Spketi et al. (2014), Rogers, Felther (2013 and 2015), Boggerr (2016), Bugratti et al. (2014) etc. Baldzhy (2017) emphasizes importance of economic risks management.

Endovickaja, Volkova (2015) analyze financial stability of the company as factor of companies' economic security. Another significant portion of insights are oriented toward *macro or state level*. Significant contribution to that level was made by Brigugli, that created model of economic security taking into account economic vulnerability and capacity that can resist economic crises. Quite often - just like at micro level economic security is being analyzed thru associated risks (Knutsen, 2011; Hipp, 2016; Angulo-Guerrero, 2017).

One of the most proper and relevant view in perspective of this project is position that poor level of technological advancement constitutes a significant threat to economic security (Johnstone et al., 2013; Sternberg, 2009; Rosser & Taylor, 2008). So even scientists within same level of the scale deliver quite different definitions of Economic security, like Huber thinks that Economic security can be treated as State economic status readiness to ensure proper conditions of wellbeing and personal development, social and economic stability as well as political ability of society and state to eliminate internal and external threats (Huber, 2010).

ISSN: 2236-269X
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Other scientists define safe business as state resources and business opportunities to effectively use them for productive work and dynamic scientific, technological and social development. (Vivchar, 2016). Panel of Lithuanian scientists has made exhaustive overview of majority of definitions of economic security and produced the following statement: conducted analysis of scientific economic security definitions demonstrates that in all cases such elements as economic development and stability are being assessed. Therefore, this approach allows to define economic security as economic and state status capable to ensure defense of national interests, state development in whole, sufficient potential of defense (Zuzevičiūtė et al., 2018).

Despite these differences in definitions to authors' opinion essential joint points can be found – all of these are talking in essence about threats and risks. And that's why economic security comes into play – nowadays threats and risks are increasingly growing due to globalization, increased level of competition and market players, introduction of new types of data driven economy and technology associated with it (Bid data, IoT - Internet of Things), continuing global economic crises, huge amount of fraud and shadow economy, etc.

To authors' opinion one of the most efficient way to contribute and strengthen economic security is technological approach, which is human error free and cost-efficient solution to majority of the challenges. This project is focused on one of the most famous in recent time – Blockchain. Despite the fact that Blockchain technology is incredibly popular and quite well known in IT world, to authors' opinion it is still worth providing general description of its technological roots to economic society (provided in Chapter 1). In simple terms Blockchain is a technology which empowers creating distributed or decentralized in economic and legal world ledger (in IT world log) to record the transaction. As a relatively new technology, Blockchain is designed to achieve decentralization, real-time peer-to-peer operation, anonymity, transparency, irreversibility and integrity in a widely applicable manner (Tijan, et al., 2019).

When talking about exact tangible deliverables - impact of Blockchain technology on Economic security, author suggests reviewing it in the course of impact on separate economic areas/sectors, as such impact will vary. It shall be said that this approach - relationship or impact between economic security and separate sectors is already employed by some scientists. Broad circle of researchers emphasizes connection between energy market and economic security (Franki & Viškovič, 2015; Umbach, 2010; Popescu, 2014; Augutis et al., 2016).

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Another branch of scientists put focus on technology and innovations – analyzing impact of innovations on economic and national security (Mitjakov et al., 2013; Bagariakov & Nikulina 2012). Hovewer it shall be noted that due to the absense of single methodology it is impossible nowadays to answer precisely which industries affect economic security in both positive and negative sense the most.

2. LITERATURE REVIEW

2.1. Blockchain concept

In simple terms Blockchain is a technology which empowers creating distributed or decentralized in economic and legal world ledger (in IT world log) to record the transaction. As a relatively new technology, Blockchain is designed to achieve decentralization, real-time peer-to-peer operation, anonymity, transparency, irreversibility and integrity in a widely applicable manner (Tijan et al., 2019).

Even literal analysis of this technology allows to draw a conclusion that we are speaking about chain of blocks - or blocks of information within one logical chain. The changes made by the various parties are assembled and stored in the database at regular intervals as bundled packets called ‘blocks’. When new blocks are added to the original database, they form a Blockchain, or an up-to-date database containing all the changes made (Mattila & Seppälä, 2015).

Blocks contain the useful data (initiated by the owner – or node) and technical information for encryption, so called hash. The block after initiated by one participant is sent to all participating nodes and their content and hashes will be accordingly verified by all participating nodes. This creates a block interdependency accessing up to a chain–the Blockchain (Hackius & Petersen 2017).

The origins and the purpose of the transactions could vary, but for economic sciences main priority is the value – capturing value and registering any modifications - tracking it (like owner, quantity, price, etc.). We ‘d like to elaborate 3 main features that describe Blockchain technology the best:

Distributed or decentralized ledger. This feature implies that there is no one single authority controlling the database, as it is based on peer to peer principle. We have proposed a system for electronic transactions without relying on trust. To solve this, we proposed a peer-to-peer network using proof-of-work to record a public history of transactions that quickly becomes computationally impractical for an attacker to change if honest nodes control a

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

majority of CPU power (Nakamoto, 2008). This feature gives us incredible flexibility (avoiding time and effort costs associated with one - registrar, filling complex procedures, registration lags, paying additional verification and registering fees etc.) which is of great demand in multifaced environment;

Public, transparent and verifiable. When it comes to publicity – Blockchain can be realized in different ways, but the main principle that it is based on well known in IT security Public and Private key infrastructure. Regarding transparency – as we already mentioned before all participants have the same full database - full amount of the same information (that was before verified together as well), therefore there is no room for data misinterpretation. Overall, I wish to provide a system such that users can be guaranteed that no matter with which other individuals, systems or organizations they interact, they can do so with absolute confidence in the possible outcomes and how those outcomes might come about (Wood, 2014);

Immutable and reliable. Under Blockchain technology new data do not replace old blocks, instead of this new blocks being put „on top“ of the current blocks thereby representing complete and exhaustive log or register possessing also historical records with proper time marks of the transactions, which allows to have a big picture with all details of respective facts‘ alterations. Consequently, the Blockchain technology is extremely reliable as a distributed method of data storage (Mattila & Seppälä, 2015). Thus, data on a Blockchain is more accurate, consistent and transparent than when it is pushed through paper-heavy processes. It is also available to all participants who have permissioned access. To change a single transaction record would require the alteration of all subsequent records and the collusion of the entire network (Hooper, 2018).

As a conclusion – Blockchain technology is extremely useful when we do speak about variety of market players involved in multiple transactions among them. Above mentioned features ultimately result in trust - trust in transaction‘s participants (who is who), its amount, time and overall integrity (Genuity). In this manner, as it is easy to verify the origin and accuracy of the information whatever its source, no external intermediary (such as a central server) trusted by all the parties is required to validate the data (Mattila & Seppälä, 2015). Moreover, some scientists have also found mathematical proof of economic advantages of Blockchain application: From the equilibrium analysis, we first show that a platform offers a higher QoS (Quality of Service) can set a higher equilibrium price and get a larger revenue (Lee, Sung & Min, 2018).

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

2.2. Blockchain challenges

Despite clear advantages, Blockchain also faces certain number of challenges. Below poll reveals the straightforward set of reasons why Blockchain is not so widely used so far.

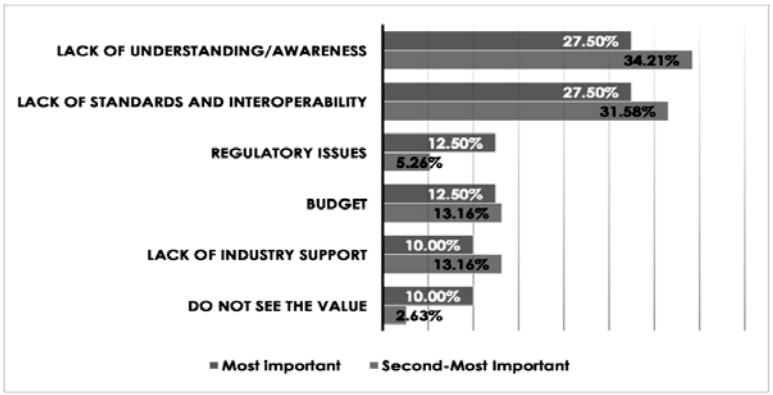

Figure 1: Obstacles to adopt Blockchain

To authors' opinion most important problems depicted in that pole are:

- **Lack of standards/interoperability.** This problem leads to the fact that majority of currently implemented Blockchains are mainly standalone technologies, that are unable to communicate within global interoperable network. Main negative consequence is that such separate Blockchain implementations solve only temporarily local efficiency issues but will fail gaining absolute P2P intercommunication advantage (in terms of data transmission, security, etc.) simply because they have been made by different algorithms. Vice versa presence of universal standards would allow different networks to communicate with each other.

- **Regulatory issues.** It shall be admitted that regulation always following technological progress, not vice versa – therefore there is always a delay in proper regulation, same applies to Blockchain. Several obstacles can be considered. First of all, it's unclear to what extent Blockchain can be used in regulated industries such as Banking/Payment. Another example is smart contracts – to which extent parties can rely on smart contract provisions in litigation or concluding such a contract with public administration? Last but not least is privacy and personal data protection – to what extent customers can share their personal data and who would be data controller/processor according data protection legislation in that Blockchain case?

- **Implementation costs.** It goes without any saying that Blockchain implementation costs (as any IT integration) and costs are both explicit and implicit (changing organizational policies and business processes). Explicit costs would be transition

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

project – actually Blockchain implementation into current IT infrastructure (aligning Blockchain with ERPs in place) and maintenance of this new hybrid formation. It shall be noted that both such activities most likely would be outsourced, as hiring and maintaining Blockchain developing capacity within the company is not an option unless this is core business.

- **Permissionless vs permissioned Blockchain.** Nowadays Blockchain has evolved into 2 different types, which is essentially affected by the implementation purpose or objectives. **Permissionless** Blockchain - the brightest example is same cryptocurrency Bitcoin can be described as feature ‘‘shared by all network users, updated by miners, monitored by everyone, and owned and controlled by no one’’ (Swan, 2015). In other words, **permission less** Blockchain is absolutely open for users that have access to the devices as they can simply joint this pure decentralized network. Therefore privacy is an issue. As system is open to everyone in case of extremely sensitive data company owners may be indeed reluctant to implement such model. On another hand **permissioned** Blockchain also has issues to consider. This type of implementation – practical example would be for instance Ripple has clear user administration system in place – e.g. it is able to define user’s rights and permissions to work in, starting from the very admission. As in this case Blockchain has a certain administrator, it shall be considered as partially decentralized with all respective consequences. “On one hand, with appropriate deployment of access-control layers, a permissioned Blockchain has a greater potential to maintain privacy and fit business governance needs than a permission less. On the other hand, a centralized agency with override privileges is allowed in a permissioned Blockchain and might undermine the credibility of the Blockchain” (Liu, Wu & Xu, 2019).

3. ECONOMIC SECURITY

The purpose of this chapter is to reveal the concept of Economic Security which is based on analysis of scientific sources, providing different paradigms of this multifaced phenomenon. On top of that importance of Economic security is described.

3.1. Concept of Economic Security

As was already mentioned before it’s essential to start defining Economic security from risks perspective, as in general Security is absence of any risks. All human beings need a sense of security, to give a sense of belonging, a sense of stability and a sense of direction. People

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

who lack basic security in themselves, in their families, in their workplaces and in their community tend to become socially irresponsible (Ilo, 2004).

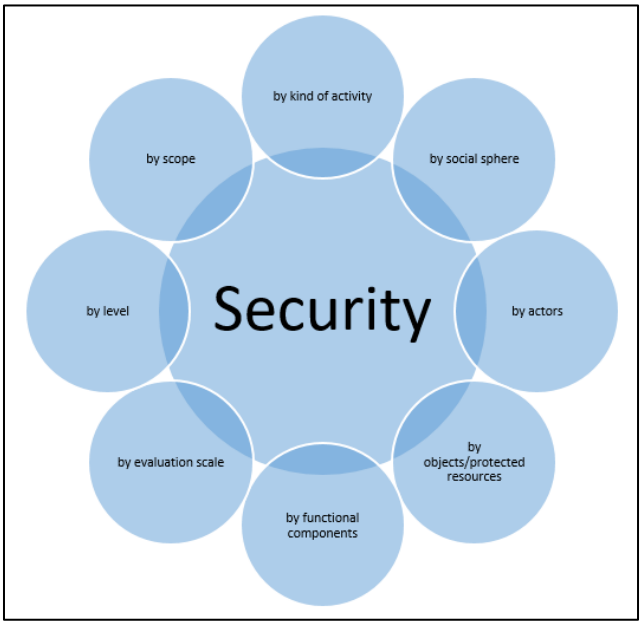

Figure 2: Types of Security

The country's economic security is a complex socio-economic idea that reflects the enormous range of production, external and internal threats to the country's ever-changing conditions (SENCHAGOV, 2011).

Lithuanian researches KREMER and CERNIUS have prepared comprehensive graphical definition of Country's economic security concept (see figure 3).

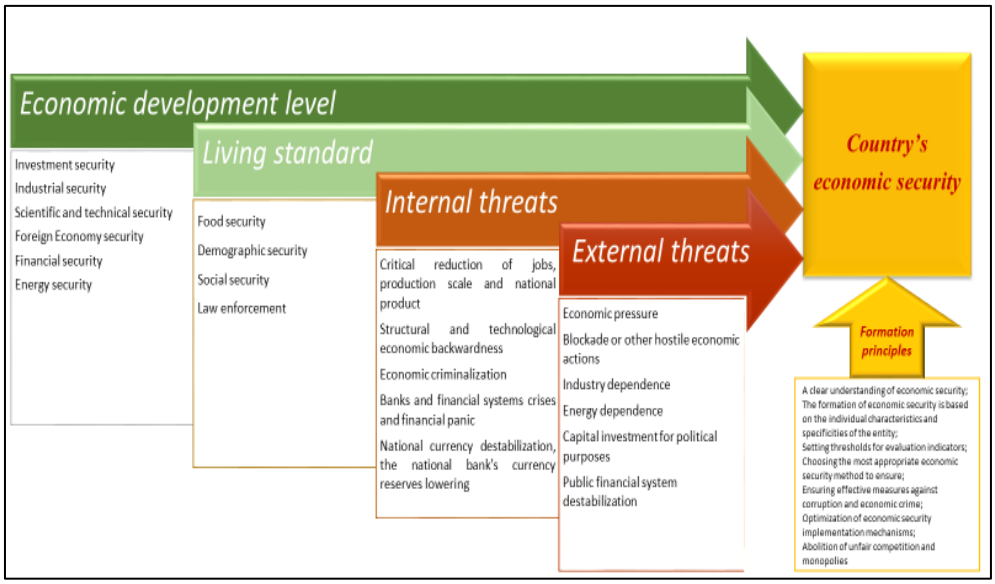

Figure 3: Country's economic security concept

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

3.2. The importance of Economic Security

Economic security as a concept, its value, importance and practical implications shall be considered within wider context of current circumstances, especially within 2 major contemporary trends – Information society and globalization.

Importance of Economic security in Information society. Information society is one of the dominating trends in modern economy nowadays. The importance of this sector may be seen in the countries like USA, Japan, China and even India (which due to cost efficient labor able to suggest favorable conditions to establish global delivery centers for technology companies like IBM, Microsoft, DXC Technology, etc.). Under these conditions the priority task of ensuring economic security, especially noticeable in the rapidly changing conditions of the modern global world, is the forecasting of challenges and threats, the implementation of which must be prepared today. The universal digitalization is the most important global challenge today (Popov & Semiachkov, 2018). In order to address these threats first of all specific features of this digital economy shall be defined. Popov and Semiachkov emphasize the following features of digital economy:

- *Priority of intelectual property over material*. Companies like Google, Facebook, Airbnb, Uber have proved their vitality and interest for investors despite the fact that they do not possess material tangible assets, their main property is digital network and despite that their capitalization is higher than the one of the industrial giants of real sector;
- *Importance of data*. In these ecosystems business models heavily dependant on data in wider sence – database, software products, etc. One of the modern trends - increasing part of so called cloud technologies, which replaces traditional hosting/co-location. Main idea here is that hosting of all IT services – computing power is outsourced to third party supplier (like Amazon, Microsoft). After transition project these services can be accessed through secured network and customer can benefit flexible connection, scalability (near instatnt increase of computing power on demand) and also flexible pricing which usually takes the form of PAYG (Pay As You Go) – so customer can focus on its core business if all security aspects are properly handled;
- *Matrix vs hierarchy*. This model also leads to domination of matrix structure in organisations rather than hierarchical. As innovation business constitutes multifunctional effort, open matrix structure can better address these new challenges by

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

efficiently onboarding different functions from horizontal layers on project based activity (with predetermined duration and scope of effort);

- *Internet as predominant search engine*. Practise shows that usage of web sites, messengers, digital platforms is the most effective way, therefore huge variety of different gadgets are still being produced and developed to accomodate the need of connection;
- *Global data transmission*. The nature of internet and network is multinational, and agents that are limited only to one region‘s resources are facing failure in glbal competition;
- *Decentralization and shared sconomy*. Availability of resources results in setup of decentralized and flexible „bottom up“ organizations with no bureaucracy. Another aspect is shared economy designed to efficiently use resources on sharing principle (as a service without property right) and therefore applying same PAYG principle with no capital investments. Derivatives of shared economy are croudfunding and croudsourcing. Crowdsourcing is an example of mobilizing people’s resources using digital technology to solve the challenges facing business, government and society as a whole (Chizov, 2015). Crowdsourcing is designed to attract any kind of resources in questions, not only monetary. Crowdsourcing essentially is P2P (Peer to Peer) platform designed to attract capital to specific, publicly stated purpose (donation). These specific features lead to specific economic security problems of information society:

Table 1: Economic security problems of information society

Problem type	Explanation, examples
System	Problems affecting whole economy or its significant part (dependance on digital technology, digital unequality, absence of own elements, etc.)
Structure	Structural problems caused by digitalization (significant changes in labor markets and unemployment, etc.)
Industry	Absence of digital solutions for specif industries (absense of National payment gateway, etc.)
Specific company	Industrial espionage, data theft, hackers‘ attacks, lack of IT competency, etc.
Specific person	Identity and personal data theft

Based on the findings above economic security shall essentially contribute to the sustanable development of new generation economy, timely and properly forecasting and estimating challenges and threats of global digitalization and suggesting suitable instruments.

Importance of Economic security in context of globalization. Globalization is undeniable trend which essentially disrupts single markets and world economy in general. That implies that this trend has both positive features and also contains residual risks – risks

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

associated with the nature of globalization. Essentially globalizations means merge or integration and as a consequence interdependence of previously separate and independent markets.

KUBAIENKO assessed impact of potential integration of Ukraine to EU – e.g. globalization impact (both positive and negative) at regional level (please check the figure below).

Figure 4: Determination of the European integration effects for the Ukrainian economy

Kahler (2004) analyzing relationship between economic security and globalization in Asia has made 3 main outcomes:

- Globalization is attractive trend to national Asian Governments as through the connection to global facilities these Governments have positive gains to national economies, technological novelties and even military power. Those that rejected expanded international economic exchange risked conventional military inferiority;
- Globalization had a second and more direct effect: reduction in vulnerability through diversification of suppliers and markets;
- Finally, some of the states in the Asia - Pacific region began to accept that economic interdependence and integration might be promoted because of its positive security effects.

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

The last statement confirms direct and positive impact of globalization on Economic security.

4. RESULTS AND DISCUSSIONS

Following chapter describes impact of Blockchain implementation on Economic Security. As Economic Security is multifaced phenomenon, impact is being analyzed on industries/functions where Blockchain has the biggest impact nowadays.

4.1. Impact on e-commerce

Nowadays Digital economy or so-called e-commerce represents a significant part of whole economy, and as shows recent COVID 19 lockdown it can be the only way to maintain trade. If we look to the future - global ecommerce market is predicted to grow to 4.9 trillion US dollars by 2021. E-commerce starts with digital authentication – or digital identity management.

However identity management (identification, authentication and authorization) even given that it is digital (access managed by the passwords) is already outdated compared to today realities due to the following reasons: First traditionally digital means that identity is managed by centralized server, which serves as a perfect target for hackers. Thus, identification of security related requirements, vulnerabilities, and threats are keys to the development of a trustworthy system (Habib, Torjusen & Leister, 2015).

Federal Trade Commission reports that in Fraud related to Identity theft resulted in $1.48 billion loss in 2018 (Siciliano, 2019). Second traditional digital identity management systems heavily dependent on personal data processing, which impose additional risks of non - compliance with GDPR (Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data).

As of January 21st, 2020, amount of EU wide fines of GDPR non – conformity resulted in $126 million loss (IP, 2020) (since GDPR came into force 25 May 2018). Last but not least even digital identity management is still static – that means that persons shall maintain their actual records (validity of passport and its ID, position, email address and phone number, etc.) manually.

Blockchain eliminates all these problems, offering trusted decentralized (near impossible to hack), verified by relationships identity solution which doesn’t require personal

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

data at all, and which is dynamic in nature. This feature accompanied with market realities – e-commerce organization's demand to deal with great variety of reliable partners and customers in order to find best quality vs price ratio and provider's demand to penetrate new markets makes Blockchain application highly attractive.

On top of that strict KYC (Know Your Customer) and KYS (Know Your Supplier) procedures imposed on majority of regulated industries, therefore trusted and transparent identity management with Blockchain enables to ensure great global companies 'compliance function.

4.2. Impact on Payments

First of all, Blockchain derived from payment sphere as it was and is predominant technology supporting Bitcoin cryptocurrency. Blockchain was first invented in 1991 by Haber and Stornetta as a mean to avoid document's timestamp tamper, in 2008 Nakamoto described how a network of users could engage in secure peer-to-peer financial transactions, eliminating the need for financial intermediaries and reducing the cost of overseas payments (Peters & Panayi 2015) and soon after it gained real worldwide application with commercial launch in January 2009.

In 2015 the number of retailers accepting the cryptocurrency bitcoin has passed 100,000 (Cuthbertson, 2015), while according to the Cambridge Centre for Alternative Finance study (Hileman & Rauchs 2017) in 2017 there were already 5.9 million Bitcoin (and consequently Blockchain) users. Since it (Bitcoin) allows payments to be finalized without any bank or intermediary, Blockchain can be used in various financial services such as digital assets, remittance and online payments (Adams et al., 2017).

Speaking about Blockchain impact on payment industry first thing which comes to the mind is hacker – proof reliable system (Fraud security. Blockchain is "unhackable". It decreases the probability of any kind of fraud. Furthermore, it does not work on patches, which makes Blockchain the securest in the market of cybersecurity initiatives (Robinson, 2016), Bitcoin has never been hacked (Banker, 2016) which allows to eliminate or at least significantly reduce fraud in this industry.

Moreover, it is a cryptographically secure electronic payment system, and it enables transactions involving virtual currency in the form of digital tokens called Bitcoin (Conti et al., 2018). According to European Central Bank 2018 Fifth report on card fraud: The total value of

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

fraudulent transactions conducted using cards issued within SEPA and acquired worldwide amounted to €1.8 billion in 2016 (ECB, 2018).

Another major banking and finance European player is UK market on which UK banking and finance industry association – „UK Finance“in its 2019 report (finance, 2019) revealed, that Unauthorized financial fraud losses across payment cards, remote banking and cheques totaled £844.8 million in 2018, an increase of 16 per cent compared to 2017. In addition to this, in 2018 UK Finance members reported 84,624 incidents of authorized push payment scams with gross losses of £354.3 million.

Table 2: Value of Card Fraud losses in Europe

	2012	2013	2014	2015	2016	GR 15/16	CAGR 5Y
Total card fraud losses with SEPA acquired worldwide (BEUR)	1.330	1.436	1.656	1.808	1800	-0,4%	9,2%
-thereof CNP fraud losses (BEUR)	0.794	0.958	1.031	1.292	1.320	2.2%	15.2%
Value of card fraud losses as a share of value of transactions	0.038%	0.039%	0.038%	0.042%	0.041%	-2.4%	2.6%
-thereof ATM fraud in %	17%	14%	12%	9%	8%	-11.1%	-15.9%
-thereof CNP fraud in %	60%	67%	69%	71%	73%	2.8%	5.4%
-thereof POS fraud in %	23%	19%	19%	20%	19%	-5.0%	-5.3%
Volume of card fraud losses as a share of number of transactions	0.017%	0.020%	0.020%	0.020%	0.023%	15.0%	7.5%
-thereof ATM fraud in %	11%	9%	7%	5%	3%	-40.0%	-22.9%
-thereof CNP fraud in %	63%	71%	75%	76%	77%	1.3%	7.8%
-thereof POS fraud in %	26%	20%	18%	19%	20%	5.3%	-11.1%
NOTE: the total number of cases of card fraud using cards issued in SEPA amounted to 17.3 million in 2016. The total number of card transactions using cards issued in SEPA amounted to 74.9 billion in 2016.							

Another distinct advantage is its efficiency and cost saving. Blockchain technology is uniquely positioned to tackle the problems of both speed and cost. In sum, Blockchain technology solves an important problem in electronic value transfers. The Blockchain does not only move value; it also integrates several components of the trading-clearing settlement value chain in an elegant, efficient, and mathematical way (Kiviat, 2015).

Consumer of typical banking or financial institution usually is being charged commission for any type of operation, and a lot of these operations (like opening account) can be fulfilled only during standard working hours. In a like manner with location, cost is significantly reduced with Blockchain technology in a supply chain system. Mainly due to large distance transactions being slower through banks than with cryptocurrency technology, Blockchain provides an economic solution for the supply chain (Litke, Anagnostopoulos & Varvarigou 2019).

On top of that consumer shall often be in front of the bank agent who will verify face to face Genuity of such application. In contrast Blockchain operates 24/7, as it is decentralized there is almost no commission fees, it is remotely from its origin and average operation lasts

ISSN: 2236-269X
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about 10 minutes – time needed to form the block and put it into the chain. Bitcoin payment services are only of the order of 0.01%-0.05%, largely due to the lower cost of not needing to process or perform disputes in transactions (Peters & Panayi, 2015:30). European Bank – Santander estimates that Blockchain could reduce banks' infrastructural costs by $15-20 billion a year by 2022 (Perez, 2015). French consultancy giant – Capgemini predicts that consumers 'wallets could save up to $16 billion in banking and insurance fees also per year (Capgeminy, 2016).

4.3. Impact on Logistics

According to US biggest logistics and supply chain association – MHI „The 2019 MHI Annual Industry Report - Elevating Supply Chain Digital Consciousness" (MHI, 2020) in 2018 usage of Blockchain technology in inventory management was at about 5 % level but it is forecasted to grow at 54 % within next five years.

The advantages are quite straight forward – with Blockchain companies are able to track movement of goods proactively in real time mode, which is crucial, especially for big retailers and logistics companies running huge stocks and variety of products 'movements flows. Tracking goods through Blockchain can improve the decision-making process with end result being a more satisfying service for the end user (Tijan et al., 2019).

Blockchain introduction allows the companies to synchronize the data between different supply chain players like suppliers, distribution centers, transportation companies, retail partners and their different stock locations establishing single time saving working procedure (as each of these potentially uses their own different data processing methods and tools – which could result in delay for market needs and consequent financial loss) and therefore to increase time to market criteria and avoid under/over stocking.

On another hand it also leads to human error, fraud (according to PwC 2018 report 47 % of respondents experienced a fraud in past 24 months with overall loss of $ 42 billion for the same time period (PWC, 2018)) and general workforce costs reduction through efficient digital automation, which also contributes to competitive advantage. According to 2013 World Economic Forum's Report. Enabling Trade. Valuing Growth Opportunities (FORUM, 2013): Blockchain can help all parties involved in shipping to increase sustainability, reduce or eliminate fraud and errors, improve inventory management, minimize courier costs, reduce delays caused by paperwork, waste and identify issues faster. This could increase worldwide GDP by almost 5% and total trade volume by 15%.

ISSN: 2236-269X
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However, it also should be noted that maximum advantage of the Blockchain can be achieved in conjunction with another cutting-edge technology such as Internet of Things (IoT). IoT is supposed to connect the different smart objects vis Internet (things having sensors connected to the Internet) and to provide that management tools of that to authorized users. Concrete usage example can be seen from below statement: Sensors and the Internet of Things (IoT) are enabling goods container store port when a value limit has been exceeded, e.g., temperature, tilt or incoming light intensity. The freight being forwarded remains in clear view across the entire supply chain (Tijan et al., 2019).

5. CONCLUSIONS AND RECOMMENDATIONS

During the conduction of research, it was noticed the following most significant statements and assumptions:

a) Analysis of Blockchain technology with focus on Economic security has shown, that Blockchain is the key technology of Industry 4.0 - e.g. new generation production (smart factories) and economy. Derived from cryptocurrencies it may have broad usage in modern economy and can significantly contribute to Economic Security due to its technological features – decentralized ledger (ledger that has no single authority to manage its records), immutability and reliability (which is ensured by the very technological nature) and also publicity and transparency (e.g. public access of general public for verification purposes). In other words, Blockchain can be applicable in any industry which requires to capture the fact (payment, property, product delivery, etc.). It is worth mentioning that nowadays business sees one of the most applicability option in logistics (together with other Industry 4.0 trends like IoT and Big data). Blockchain shall gain even greater popularity in globalization context – e.g. multiple players with multiple and constantly growing transactions, as in this case role of different intermediaries will decrease;

b) Research of Blockchain implementation revealed that despite great Blockchain benefits it also has some challenges. Lack of standards and interoperability may lead to the prevention of synchronized Blockchain systems, therefore companies would be blocked with Blockchain operating only at company level. Another similar problem is lack of regulation. As was already mentioned Blockchain is perfectly suits for regulated industries to capture legal facts, however this shall be explicitly allowed by according industry regulations, otherwise it creates misunderstanding on usage's scope and boundaries. It also shall be noted that Blockchain implementation costs – both in terms

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

of technical integration (with mentioned ERP) and also in terms of effort which company shall dedicate (revision of current ERP, definition of Blockchain processes and scope, etc.). Finally, company shall define the balance between publicity and sensitivity of data processed by Blockchain. Classic Blockchain implementation is Permission less - that means self-organized, open to general public. However, it is not suitable to process sensitive data. Permissioned handles that issue but then it becomes manageable by single administrator – which contradicts to the very nature of Blockchain.

c) Analysis of various scientific studies and researches has shown that the concept of economic security is multifaced and ambiguous, and its research as a separate field of economic science is still developing. Economic security is understood on two levels (micro and macro). Economic security at the micro level is analyzed according to the presented Anglo-Saxon assessment methodology, at the macro level - according to the categories: economic, commercial, financial and social security assessment indicators. Economic security is usually studied at the micro level, to which the economic security of a household or individual and business belongs. At the macro level, economic security is examined by analyzing internal and external economic security threats using BRIGUGLI model. Taking into account the definitions of economic security of various foreign and Lithuanian countries, it has been clarified that economic security is a field of science that provides a high and stable growth trend of economic indicators, combats poverty and unemployment, develops social security and prevents competitiveness, economic needs are effectively addressed, threats are responded to in a timely manner, neutralized and anticipated, and national security is formed.

d) Plenty of scientific reviews and researches also provide insights about importance of Economic security and its value, while practical implications shall be considered in wider context of current circumstances, especially within 2 major contemporary trends – Information society and globalization. Under conditions of Information society (data and internet driven economy, decentralized and shared economy) the priority task of ensuring economic security, especially noticeable in the rapidly changing conditions of the modern global world, is the forecasting of challenges and threats, the implementation of which must be prepared today. On another hand globalization has direct impact on Economic security through access to new markets and technology,

ISSN: 2236-269X
DOI: 10.14807/ijmp.v12i3.1493

diversification of products, vendors and suppliers and also because of interdependency of national single markets.

e) Analysis of Blockchain impact on economic security allowed to identify economic activity/industry/function that could be affected the most. Impact on identity management which is key in Information society is huge due to extremely reliability of Blockchain which means that identity becomes indeed purely digital – dynamic and online. Companies can handle compliance to KYS and KYC in much greater efficiency than before. Derived from cryptocurrencies Blockchain is perfect solution for payments (subject to proper regulation) in terms of reliability (Bitcoin never been hacked) – therefore eliminates fraud, time and cost efficiency. Worth to remind that in fully integrated environment there is no more need to have banks as intermediaries – which positively disrupts whole market. One of the most suitable application is logistics – products' delivery. Accompanied with other technologies such as IoT and Big data it helps to predict demand (storage management) and to organize product delivery in fully online manageable and also fraud-free manner.

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