

ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES

ISSN 2345-0282 (online) <http://jssidoi.org/jesi/>

2019 Volume 6 Number 4 (June)

[http://doi.org/10.9770/jesi.2019.6.4\(36\)](http://doi.org/10.9770/jesi.2019.6.4(36))

Publisher

<http://jssidoi.org/esc/home>

CRYPTOCURRENCY AS DISRUPTIVE TECHNOLOGY: THEORETICAL INSIGHTS

Tadas Limba¹, Andrius Stankevičius², Antanas Andrulevičius³^{1,2,3} Mykolas Romeris University, Ateities str. 20, Vilnius, LithuaniaEmails: ¹tlimba@mruni.eu; ²stankevicius@mruni.eu; ³antanas@fin.lt

Received 15 February 2019; accepted 20 May 2019; published 30 June 2019

Abstract. Bitcoin, Cryptocurrencies and Blockchain technologies are widely discussed nowadays. The Bitcoin market value is discussed in top magazines, the names of people who earned money from cryptocurrencies are on the Richest People list. The Blockchain technology is said to be a one of disruption pioneers on the one hand, and cryptocurrency is said to be an illegal phenomenon on the other hand. The Fourth Industrial Revolution, which is based on digitalized industry is changing the power centres. Will cryptocurrency disrupt the financial sector? Or perhaps it will disrupt the retail market or global monetary policy. Disruptive technologies together with the Internet, Mobile Internet and Internet of Things are changing our world. While society has gained simple and reachable comfort for a cheaper price on the one hand, many people have lost their jobs on the other. Consequently, the authors presuppose discussion about the phenomenon of cryptocurrency through the context of social phenomena and legal regulation: divulge definitions, principles, relating to the topic; identify possible tendencies according to legal regulation and its practical realization.

Keywords: bitcoin; blockchain; cryptocurrency; disruptive technology; fourth industrial revolution; national security

Reference to this paper should be made as follows: Limba, T.; Stankevičius, A.; Andrulevičius A. 2019. Cryptocurrency as disruptive technology: theoretical insights, *Entrepreneurship and Sustainability Issues* 6(4): 2068-20680. [http://doi.org/10.9770/jesi.2019.6.4\(36\)](http://doi.org/10.9770/jesi.2019.6.4(36))

JEL Classifications: O33

Additional disciplines law; sociology

1. Introduction

The new cryptocurrency – Bitcoin made its first appearance with the publication of the white paper by the mysterious Satoshi Nakamoto (hereinafter – Nakamoto) in 2008. The Nakamoto payment model is based on “payments to be sent directly from one party to another without going through a financial institution” (Nakamoto 2008).

Initially Bitcoin seemed to be a game (in early 2008 and 2009). Not many looked at it seriously. Currently according to Kaplanov - "Bitcoin is the world's first digital, private cryptocurrency exchanged over the internet through the use of a peer-to-peer network" (auth. – Blockchain). How has this happened? How did the game turn into a currency? (Kaplanov 2012).

Furthermore, the World Economic Forum identified Bitcoin-based Blockchain technology as among the top 10 emerging technologies, together, with the Internet of Nano things, Autonomous Vehicles, open Artificial Intelligence ecosystem (World Economic Forum 2016). It is therefore expected to increase its weight further for the global society.

The magic lies in its simplicity. The Bitcoin is based on Blockchain technology, which allows a transaction to be completed between parties without a financial institution intermediary. Simplicity is the magic that has turned Bitcoin from a game into powerful tool. Within ten years the number of Bitcoin users has increased dramatically. It had reached 1 mln. unique addresses at December 2017 (Blockchain Charts 2017). Total coin market capitalization was 71 billion USD in December 2018 and at the beginning of 2018 the level was 326 billion USD (Blockchain Charts 2018). In November 2017, it was ranked 30th of all currencies worldwide (Coinstaker 2017). The World Bank launched 110 mln. USD i-Bond stake, which is totally managed, using blockchain technology (World Bank 2018).

Standing on the threshold of the Fourth Industrial Revolution (4.0) Bitcoin might be one of its engines. During industrial revolution 4.0, technology drivers will have a profound impact on the nature of state relationships and international security, changing the character of security threats while also influencing shifts of power, which are occurring both geographically, and from state to non-state actors (Schwab 2016).

Christensen (2001) who invented the definition of disruptive technology (hereinafter – DT), states, "disruptive innovations were technologically straightforward; consisting of off-the-shelf components put together in a product architecture that was often simpler than previous approach methods". Christensen states that disruptive innovation is – an innovation, employing a "technology" in management, marketing activities and investment policy which transforms information, labour, capital, and materials into products or services of greater value, which becomes the main goal of a company, and, as a consequence, fundamentally changes the established "rules of the game" in many industries. If a certain technology plays a critical role in a disruptive innovation, it could be defined as "disruptive technology" (DT) (Christensen, Bower, 1996). Christensen also states that DT should "Beat competitors with functionality" and "Beat competitors with speed, responsiveness and customization" (Christensen 2001). Nakamoto has raised both attributes in his white paper as a priority. He wrote, "payments to be sent directly from one party to another without going through a financial institution". Glaser Folian et. al. defines that Bitcoin is used to "cheaply execute financial (cross-border) transactions".

Bitcoin brings us a financial democracy which is often discussed as playing an important role for the shadow economy. According to Teivāns-Treinovskis (2016) it is "the economic processes which come into conflict with legal rules". As the disruption of the technology can also have a negative impact, there is a lack of international consensus on Bitcoin as a threat for society.

There is no question that cryptocurrency will impact global and national economies; the only question is on what scale?. Despite the potential big impact on the global economy, cryptocurrency still does not have unified legal regulation. There are misleading national legal and political approaches towards cryptocurrencies. Will a country miss the opportunity for economy growth if it were not to accept cryptocurrency or would it bring unforeseen risks leaving the cryptocurrency market liberal and unregulated? From wide perspective, it is possible to discuss, that DT are factor, which influence the concept of national security in various vectors. With the changing global security situation, increase in external threats or emergence of new ones (cyberattacks, on-conventional warfare

models, etc.), countries must feel concern regarding consolidation of their security (Novikovas et al., 2017). Even the technological development of business sectors, such as energy or waste management, can be influencing argument for political decisions in the context of national security (Tvarovaničienė 2012; Tvaronavičienė 2016; Novikovas et al., 2019). The impact of changes, to security, based on DT, can occur in various aspects: for a specific business model, specifically for infrastructure or for a specific investment. The effect may be the creation of a new economic activity, existing modification or destruction. The strategy of security must ensure prevention, detection and response to possible treats in these aspects. The main challenge for governments is timely adoption law norms and principles, solving these problems (Limba et al., 2019).

The object of the paper– phenomenon of cryptocurrency as a currency, manifested in an unregulated, disruptive nature.

The aim of the paper – to reveal possible problematic features of cryptocurrency, as social phenomenon.

Methodology – document analysis, critical-analytical, systematic, linguistic, statistical data and comparative analysis methods were applied.

2. Background and Literature review

2.1. Cryptocurrency brings disruption?

Scientists also identify the potential of disruption in analysing cryptocurrencies. Baiyre et al. (2015) in their researches states that “Instead of trusting a single custodian, system-wide consensus is reached by an ever-growing proof of computational work. Arguably, this technology has the potential for disintermediation and disruption.”

Duggar et al. (2016) defines Blockchain technology as a key element for fast transactions, while Deloitte (2016) identifies technology, which is a source of democratic trust, as the system operates within it and is not controlled by external financial institutions.

According to Bucherer et al. (2012) “The purpose of an innovation process could be to change or improve products as well as entire business models”. Bitcoin has brought a Blockchain, which changes the process of the banking sector. It is changing the system as follows:

- Elimination of financial intermediary;
- Object of trust is a system instead of a financial institution;
- Speed of international transactions;
- Cost of transaction.

The World Economic Forum (2016) emphasized the potential of Blockchain, which Bitcoin is based on, stating that it might be the future of financial infrastructure. The World Economic Forum identifies the following value drivers of Blockchain technology:

- Potential to drive simplicity and efficiency;
- Will form the foundation of next generation financial services infrastructure;
- Can leverage the technology in different ways.

Analysts at Santander InnoVentures, have estimated that by 2022, Blockchain technology could save banks more than 20 USD billion annually in costs (World Economic Forum 2016).

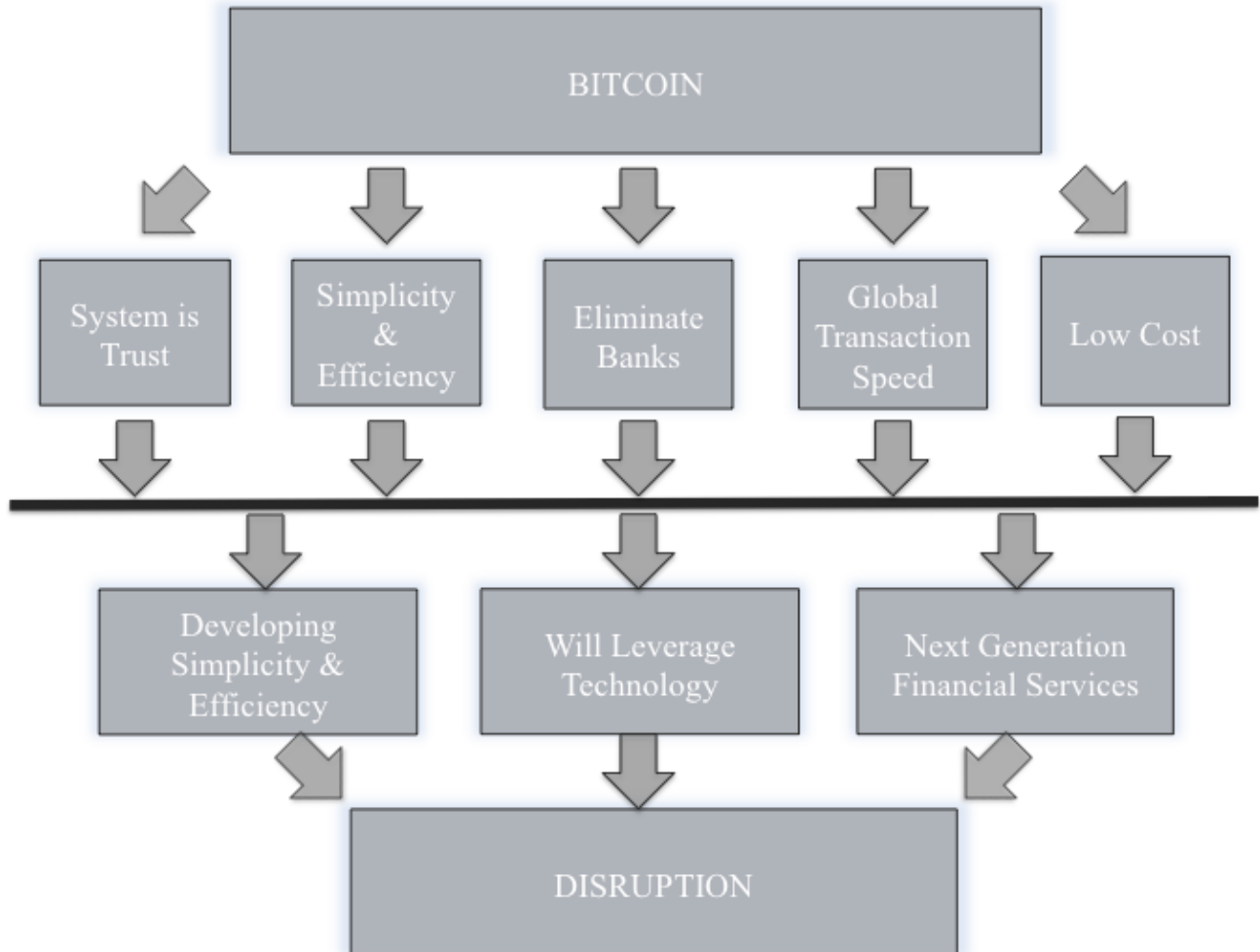


Chart No. 1. Bitcoin Value Drivers Interaction with Disruption Technology Value drivers.

Source: Compiled by the authors.

The Chart No 1 above shows how Bitcoin value drivers interact with Disruption value drivers. Therefore, cryptocurrency as a possible object of disruption is highly expected. Currently, more than 2,000 cryptocurrencies are listed (Coinmarketcap, 2019).

2.2. Legal aspect

According to TFEU Article 3 "The Union shall establish an economic and monetary union whose currency is the euro."

For example, the national currency of all three Baltics states is the euro:

- By decision 2010/416/EU⁹ the Council decided that Estonia fulfilled the necessary conditions for adopting the euro.
- Council Decision of the EU (Further – CD) 2013/0190 (NLE) rules: "Latvia fulfils the necessary conditions for the adoption of the euro. The derogation in favour of Latvia referred to in Article 4 of the 2003 Act of Accession is abrogated with effect from 1 January 2014."
- According to Council Decision of the EU, (2014/509/EU) "Lithuania fulfils the necessary conditions for the adoption of the euro. The derogation in favour of Lithuania referred to in Article 4 of the 2003 Act of Accession is abrogated with effect from 1 January 2015".

It is however more problematic to discuss the status of cryptocurrency in these countries. On November 27, 2017, Estonia enacted amendments to its anti-money laundering legislation. According to § 3 "virtual currency" means a value represented in the digital form, which is digitally transferable, preservable or tradable and which natural persons or legal persons accept as a payment instrument, but that is not the legal tender of any country or funds for the purposes of Article 4(25) of Directive (EU) 2015/2366 of the European Parliament and of the Council on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC (OJ L 337, 23.12.2015, pp. 35–127) or a payment transaction for the purposes of points (k) and (l) of Article 3 of the same Directive. Furthermore, Estonian money laundering prevention acts foresee, that virtual currency service providers are required to have a license.

CNBC (2017) mentions that Estonia wanted to issue its own virtual currency. The cryptocurrency, called "estcoin," could be launched via the digital coin community's version of crowdfunding – an initial coin offering (ICO). However, the European Central Bank (ECB) has been highly critical of Estonia's plan (Perkinscoie 2018) and indicated that it would not allow any Member State to launch its own digital currency.

Latvian anti-money law regulation establishes: "virtual currency" – a digital representation of a value that may be digitally transmitted, stored or traded and function as an exchange medium but not recognized as a legal tender, shall not be considered a banknote and a coin, non-cash and electronic money, and shall not be monetary accrued in the payment instrument used in the cases referred to in Article 3 (10) and (11) of the Payment Services and Electronic Money Act; The same act reveals a definition of virtual currency service provider: "a person providing virtual currency services, including a provider of virtual currency exchange services issued by other persons, which allows users to exchange virtual currency for another virtual currency upon receiving a commission, or offers to buy and buy virtual currency through a recognized legal tender;"

The Bank of Lithuania stated that "financial services must be clearly dissociated from activities related with virtual currencies. Banks, payment institutions and other financial market participants should not provide services associated with virtual currencies or participate in their release". The Bank of Lithuania also mentioned that "although the implementation of the ICO is not regulated by specific legislation, nevertheless, taking into account, different ICO models and different features of the coins, the Bank of Lithuania seeks to draw the attention of ICOs and its distributors to the fact that in some cases this activity may be subject to obligatory requirements of Lithuanian law: depending on the nature of the offering, legal acts regulating crowdfunding, collective investment, provision of investment services, etc. must be applied.

Analysis of cryptocurrency in the Baltic States shows that none of the Baltic states regulate cryptocurrency as a currency, however, there have been initiatives to make an ICO at national level (Estonian Estcoin initiative) or

digital coin for collectors as was done by the Lithuanian bank. It is the opinion of the authors that cryptocurrency is more likely rhetorical – political initiatives rather than long-term strategies of the countries.

Lithuanian anti-money law regulation does not reveal a definition of cryptocurrency, but establishes a wide meaning term of *assets*: “objects, money, securities, other financial instruments, other assets and property rights, results of intellectual activity, information, actions and results of actions, other property and non-property values, as well as any other physical or non-physical, movable or immovable property, tangible or intangible assets and in any form, including electronic or digital, legal instruments or instruments proving ownership of or rights in such property.”

While cryptocurrency is becoming more popular, there is, however, no clear legal regulation, which helps to indicate a loophole. National police institutions reveal negative opinions. For example, Financial Crime Investigation Service under The Ministry of the Interior of the Republic of Lithuania states, that “The total turnover of major operations in the Lithuanian cryptographic market since the beginning of 2017 was about 660 million EUR. This market is often seen as decentralized and anonymous”.

3. Cryptocurrency = (non) currency

To define Cryptocurrency as a currency is very complicated. The opinions of scientists are many and they are divided. There are many definitions delivered from the point of view of mathematics, cryptographs and IT scientists. The number of definitions delivered from the management or legal point of view is relatively smaller. Following our analysis of the scientific bibliography we have established two different cryptocurrency definition approaches from the perspective of science:

- a) as a social phenomenon;
- b) as a legal situation

3.1. Cryptocurrency as a social phenomenon

Scientists supporting Bitcoin as a currency

Paul Ehlog states that “currency is any agreed upon means of exchanges of goods and services, so you could have some small stones, as used in history, and if it’s accepted by a sufficiently large population” (Bloomberg 2014).

Scot Bret in his researches analysis Bitcoin as a cryptocurrency. He defines Bitcoin as “... a digital token that can be moved between parties”. In addition, Bret states, that “the token has market value in terms of major national currencies”. He also says, “it is sporadically used – albeit often in small amounts –in exchange for real world goods and services (Bret 2016).

Facts that support Bitcoin as a currency (Chart No 2):

- i) it is used by a wide range of people – > 1 mln. unique addresses (Blockchain Charts 2017).
- ii) it can be easily exchanged for goods.
- iii) it can be easily exchanged for different currencies throughout 72 exchanges worldwide (Bitcoin.org 2018).
- iv) it can be easily exchanged and withdrawn in small amounts throughout 3,930 ATM’s world-wide (Statista 2018).
- v) Bitcoin is traded on futures markets, including a few USA heavily regulated exchanges (CNBC 2018).

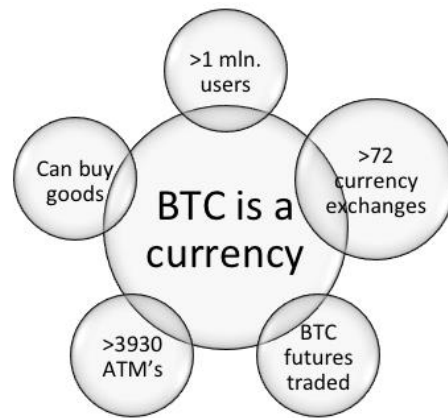


Chart No 2. Facts supporting Bitcoin as a currency

Source: Compiled by the Authors.

In between currency and non-currency

According to “electronic money is a deposit of funds that is accessed electronically through a computer, a card or other device to pay for goods and services or debt” (Bishop 2012).

Riksbank defines virtual currency as digital money. “A virtual currency is a means of payment; that is, units of the virtual currency represent a value. It is intended for use in payments within a specific virtual community... This type of virtual community can thus be said to resemble a voluntary agreement to use a specific item as a means of payment.” (Riksbank 2017).

Kaplanov identifies a big number of currency signs, however finally he comes to a conclusion that Bitcoin is mostly a community currency. It should be noted, however, that since Kaplanov did his research, Bitcoin has evolved a lot (number of users, improved exchangeability, purchase of goods and Bitcoin futures). Taking into consideration that further cryptocurrency development is likely to proceed rapidly, Bitcoin would achieve more currency attributes.

One interesting fact disclosed by Broome et al. (2011) is that there is historical precedent of legitimisation of internationally unrecognized currencies. For example, in the early years of the United States, “the United States experimented with privately issued currency for a number of years”. “While state-chartered banks, which existed during the operations of the First and Second Banks (firsts attempts to create central banking – authors) of the United States, did issue private paper, the notes issued by the Banks of the United States were the predominant currency during the early years of the United States” (Broome et al. 2011). If there is historic precedent of a “predominant currency” in the US, we can theoretically assume that cryptocurrency might be transformed into another currency and become legitimate.

The European Banking Authority (EBA) and the European Central Bank (ECB) apply the term virtual currency (European Central Bank, 2012; European Banking Authority, 2013).

3.2. Is Bitcoin democracy a threat?

The main idea of Satoshi, the inventor of Bitcoin and the father of cryptocurrency is that cryptocurrency is not regulated by any institutions or legal intermediaries. The scientists who have analysed cryptocurrencies agree with this.

Grinberg (2012) in his research states “Bitcoin is a digital, decentralized, partially anonymous currency”. Mc Kinsey (2017) maintains the same position – “A blockchain is an encoded digital ledger that is stored on multiple computers in a public or private network.” Riksbank (2014) says “In a decentralised virtual currency scheme, like Bitcoin, the transactions are verified and executed via the network of users” as well as “The right to register activities is thus delegated to the network’s participants.”

Blundell-Wignall (2014) raises two main policy issues:

1. Lack of consumer protection (keeping value, theft prevention and arbitrage);
2. Anonymity brings socially unacceptable activities.

The main driver behind Anti Money Laundering (hereafter – AML) investment decisions are regulatory requirements, which oblige financial institutions and certain non-financial businesses to comply with AML legislation (KMPG 2014). There was however, no emittance of Bitcoin; therefore no one is obliged to adhere to AML procedures.

The analysis of the Basel Committee on Banking Supervision (2014) shows that the risk of unmonitored international money flow is increasing. “National borders nevertheless constitute a danger of being discovered, be it whether while smuggling large sums of cash through border controls or because of increasing reporting obligations of transnational capital flows.” The major disruptor of the increasing international money flows is considered to be cryptocurrencies.

The US Treasury’s Financial Crimes Enforcement Network identifies a three-step process of making “illegally-gained proceeds appear legal, by:

- 1) placing dirty money in the legitimate financial system;
- 2) layering it within additional transactions to obfuscate its origins;
- 3) integrating it into the financial system with more transactions so the funds appear legitimate.

In Chart No. 3. Potential threats from Bitcoin as a financial system are presented.

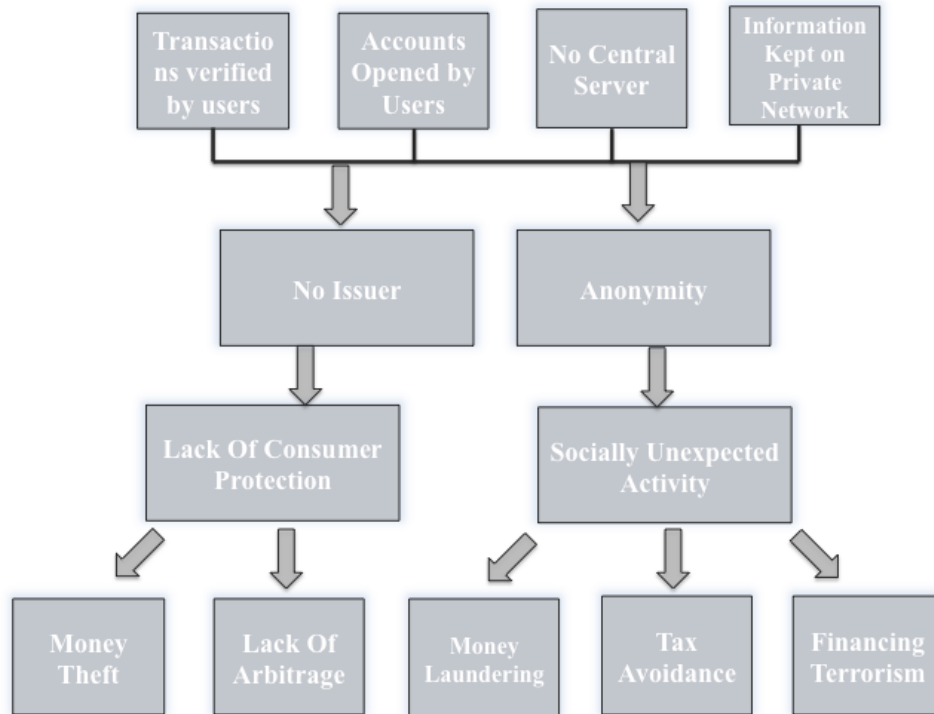


Chart No. 3. Potential threats from Bitcoin as a financial system.

Source: Compiled by the authors.

The uniqueness and democracy of Bitcoin brings high potential for money laundering. According to Masciandaro (1999) money laundering “shares two key-characteristics: illegality and concealment”. As mentioned in the US Treasury’s Financial Crimes Enforcement Network, money laundering needs a financial system. Therefore, the more legitimate Bitcoin becomes the greater the risk of money laundering for society.

Despite the different approaches of countries to the legitimization of Bitcoin, once Bitcoin is recognized as legitimate it will bring additional risk globally as a money laundering tool (infrastructure).

Conclusion

According to the literature which analyses cryptocurrencies (including Bitcoin), the following attributes are common: a) there is no financial intermediary; b) transactions are instant; c) low cost; d) the system is an object of trust itself (replaces the financial institution). Therefore, these attributes lead to a more efficient and simpler financial system, having in mind cryptocurrency value drivers, which can leverage various technologies in different ways. It has formed the foundation for the next generation financial services. There is a consistent opinion in the Cryptocurrency and Disruptive Technology literature that cryptocurrency will lead to a disruption.

Reviewing the legal environment of cryptocurrencies in the Baltic countries, we conclude, that the boundary between cryptocurrency and virtual money is unclear: the definitions are identical in one case and in all others they are different. The authors of this article argue, that this is a consequence the lack of legal regulation. Lack of legal regulation can affect negative aspects. It can bring additional risks such as tax evasion, fraud activity or virtual currency, which can be used in the shadow economy. The European Commission has also issued an opinion indicating that there are plans to regulate cryptocurrency transactions, among which it proposes to distinguish between cryptocurrency and virtual money. The authors argue that this lack of definition is a loophole in the legal regulation.

Based on the analysis of the legislation of the Baltic states, it is possible to identify cryptocurrency regulatory initiatives, but those initiatives are more of a declarative nature: no clear position of parliaments; no clear definitions of what cryptocurrency is according to legal regulation; the nature of cryptocurrency is disclosed indirectly through anti-money laundering and regulation of the financing of terrorism.

As regards whether Bitcoin was the first cryptocurrency, we noted that it has the major attributes of a currency. From the historical point of view there were precedents when countries issued notes (non-recognized currencies), which after some time became legitimate. Therefore, we can conclude, that further development of Bitcoin or other cryptocurrency can theoretically be recognized as a currency.

While the new technology brings opportunities to the market, it also brings many threats. Democracy (system operates without a third party) and anonymity are the main factors that increase the risk of money laundering, terrorist attacks, tax avoidance and money theft. These factors together bring high risk for national security.

The scale and details of the regulation will determine the scope and scale of further cryptocurrency development as a disruption technology.

References

- Baiyere, A. & Donnellan, B. & Hevner, A. & Smith, C., & Stikeleather, J. (2015). Disruptive Innovations and IT - Wicked yet Empowering combination. In: Proceedings Thirty Sixth International Conference on Information Systems. Available at: https://pdfs.semanticscholar.org/b118/a9d1975093243a8db1061e0e2a0290486a53.pdf?_ga=2.41975010.679614516.1553350098-1846347052.1553350098
- Bank of Lithuania (2017). Bank of Lithuania announces its position on virtual currencies and ICO. Available at: <https://www.lb.lt/en/news/bank-of-lithuania-announces-its-position-on-virtual-currencies-and-ico>
- Bank of Lithuania (2017). Board of the Bank of Lithuania. 2017 October 10 meeting. (Protocol 01-32) Available at: <http://savadai.savadai.lt/document.php?id=15630&PHPSESSID=5c89a8a8fcd0b25bdaae76c93ba71e>
- Bank of Lithuania (2018). Lithuania's central bank to issue the world's first digital collector coin. Available at: <https://www.lb.lt/en/news/lithuania-s-central-bank-to-issue-the-world-s-first-digital-collector-coin>
- Brenig C. & Accorsi R, & Müller, G. (2015). Economic Analysis of Cryptocurrency Backed Money Laundering. Available at: https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1019&context=ecis2015_cr
- Bishop T. (2012). Money, Money, Banking and Monetary Policy. ISBN: 1105502627 P. 27-29
- Blockchain Charts (2017). Number Of Unique Addresses Used. Available at: <https://www.blockchain.com/charts/n-unique-addresses>
- Blockchain Charts (2018). Market Capitalization. Available at: <https://www.blockchain.com/charts/market-cap?timespan=2years>
- Bloomberg (2013). Bitcoins Fail Currency Test in Scandinavia's Richest Nation. Available at: <https://www.bloomberg.com/news/articles/2013-12-12/bitcoins-fail-real-money-test-in-scandinavia-s-wealthiest-nation>
- Blundell-Wignall A. (2014). The Bitcoin Question. Available at: <https://www.oecd.org/daf/fin/financial-markets/The-Bitcoin-Question-2014.pdf>
- Broome L.L. & Markham J.W. (2011). Regulation of Bank Financial Service Activities: Cases and Materials. ISBN 9780314266088 P. 9-11.
- Bucherer E. & Eisert U. & Gassmann O. (2012). Towards Systematic Business Model Innovation: Lessons from Product Innovation

ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES

ISSN 2345-0282 (online) <http://jssidoi.org/jesi/>

2019 Volume 6 Number 4 (June)

[http://doi.org/10.9770/jesi.2019.6.4\(36\)](http://doi.org/10.9770/jesi.2019.6.4(36))

Management. Creativity and Innovation Management 21. Available at: https://s3.amazonaws.com/academia.edu.documents/39824425/Towards_Systematic_Business_Model_Innova20151109-30004-9v5ccw.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1553438244&Signature=XGaprleQ46gXaptyfFK1t%2Fo%2FHvA%3D&response-content-disposition=inline%3B%20filename%3DTowards_Systematic_Business_Model_Innova.pdf

CoinMarketCap. (2019). All Crypto Currencies. Available at: <https://coinmarketcap.com/all/views/all/>

Council Decision of 13 July 2010 in accordance with Article 140(2) of the Treaty on the adoption by Estonia of the euro on 1 January 2011. (2011). Available at: <http://eurx.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:196:0024:0026:EN:PDF>

Council Decision of the EU (Further- CD) on the adoption by Latvia of the euro on 1 January 2014 2013/0190 (NLE) Article 1. (2013). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013PC0345&from=en>

Council Decision of the EU, of 23 July 2014 on the adoption by Lithuania of the Euro on 1 January 2015. (2014/509/EU). (2014). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0509&from=LT>

Digital Currencies: International Actions and Regulations (2018). Perkins Coie. Available at: <https://www.perkinscoie.com/en/news-insights/digital-currencies-international-actions-and-regulations.html#Estonia>

Deloitte (2016). Blockchain: Democratized trust. Innovation in the digital era, Deloitte University Press. Available at: <https://www2.deloitte.com/insights/us/en/focus/tech-trends/2016/blockchain-applications-and-trust-in-a-global-economy.html>

Duggar E. H &. Bauer G. W. & Williams R. & Caes N., (2016). Robust Cost-effective Applications Key to Unlocking Blockchain's Potential Credit Benefits, Moody's Investors Service, Moody's. Available at: <https://www.scribd.com/document/319012770/Robust-Cost-effective-Applications-Key-to-Unlocking-Blockchain-s-Potential-Credit-Benefits>

Bitcoin.org (2018). Bitcoin Exchanges. Available at: <https://bitcoin.org/en/exchanges#australia>

Brett S. (2016). How can cryptocurrency and blockchain technology play a role in building social and solidarity finance? United Nations Research Institute for Social Development (UNRISD), Geneva. Available at: <http://www.unrisd.org/brett-scott>

Christensen C. M. (2001). The Opportunity and Threat of Disruptive Technologies. Harvard Business School. Available at: <https://www.cambridge.org/core/services/aop-cambridge-core/content/view/S0883769400020571>

CNBC (2018). For brave investors there's two ways to bet on bitcoin. Available at: <https://www.cnn.com/2018/06/11/the-big-bitcoin-investing-decision-coin-or-futures-contract.html>

CNBC (2017). Estonia wants to launch its own government-backed cryptocurrency called 'estcoin' (2017). CNBC. Available at: <https://www.cnn.com/2017/08/23/estonia-cryptocurrency-called-estcoin.html>

Coinstaker.com (2017). Bitcoin Becomes World's 30th Largest Currency. Available at: <https://www.coinstaker.com/bitcoin-becomes-worlds-30th-largest-currency>

European Central Bank (2019). Electronic Money. Available at: https://www.ecb.europa.eu/stats/money_credit_banking/electronic_money/html/index.en.html

Financial Crime Investigation Service. (2018). FNTT su kitais teisėsaugos atstovais aptarė virtualių valiutų keliamą pavojų valstybei. Available at: <http://fntt.lt/lt/naujienos/fntt-su-kitais-teisesaugos-atstovais-aptare-virtualiu-valiutu-keliama-pavoju-valstybei/3676>

Grinberg R. (2012). Bitcoin: An Innovative Alternative Digital Currency. Hastings Science and Technology Law Journal. Available at: https://repository.uchastings.edu/cgi/viewcontent.cgi?article=1063&context=hastings_sci_tech_law_journal&redir=1&referer=https%253A%252F%252Fscholar.google.lt%252Fscholar%253Fhl%253Dlt%2526as_sdt%253D0%25252C5%2526q%253Dbitcoin%252Bas%252Bdigital%252Bcurrency%2526btnG%253D#search=%22bitcoin%20as%20digital%20currency%22

Glaser F., & Zimmermann K., & Haferkorn M. & Weber M. C. & Siering M. (2014). Bitcoin – Asset or Currency? Revealing Users' Hidden Intentions. Available at: <http://ssrn.com/abstract=2425247>

Kaplanov N. M. (2012). Nerdy Money: Bitcoin, the Private Digital Currency, and the Case Against its Regulation. Available at: https://lawcommons.luc.edu/cgi/viewcontent.cgi?referer=https://scholar.google.lt/scholar?hl=lt&as_sdt=0%2C5&q=Kaplanov+bitcoin&btnG=&httpsredir=1&article=1920&context=lclr

KPMG (2014). Global Anti-Money Laundering Survey. Available at: <http://www.kpmg.com/KY/en/IssuesAndInsights/ArticlesPublications/PublishingImages/global-anti-money-laundering-survey-v3.pdf>

Latvijas Vestnesis (2017). Amendments to the Law on Prevention of Money Laundering and Terrorist Financing, No. 222 (6049) of Nov. 8, 2017, Official Gazette No. 2017/222.7. Available at: <https://www.vestnesis.lv/op/2017/222.7>

Lietuvos Respublikos Seimas (1997). Law on the Prevention of Money Laundering and Terrorist Financing of the Republic of Lithuania. Official gazette 1997-07-04, Nr. 64-1502. Available at: <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.41300/WFwjVAGMLz>

Limba T. & Stankevičius A. & Andrulevičius A. (2019). Industry 4.0 and national security: the phenomenon of disruptive technology, Entrepreneurship and Sustainability Issues 6(3): 1528-1535. Available at: [https://doi.org/10.9770/jesi.2019.6.3\(33\)](https://doi.org/10.9770/jesi.2019.6.3(33))

Masciandaro D. (1999). "Money Laundering: the Economics of Regulation." European Journal of Law and Economics 7. Available at: [http://www.urosario.edu.co/observatorio-de-lavado-de-activos/imagenes/Masciandaro-\(1999\).pdf](http://www.urosario.edu.co/observatorio-de-lavado-de-activos/imagenes/Masciandaro-(1999).pdf)

McKinsey (2017). Using blockchain to improve data management in the public sector. Available at: <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/using-blockchain-to-improve-data-management-in-the-public-sector>

Money Laundering and Terrorist Financing Prevention Act (2017). Riigi Teataja Available at: <https://www.riigiteataja.ee/en/eli/517112017003/consolide>

Nakamoto S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Available at: <https://bitcoin.org/bitcoin.pdf>.

Novikovas, A. & Novikovienė, L. & Shapoval, R. & Solntseva, K. (2017). The peculiarities of motivation and organization of civil defence service in Lithuania and Ukraine. Journal of Security and Sustainability Issues, 7(2), 369-380. Available at [http://dx.doi.org/10.9770/jssi.2017.7.2\(16\)](http://dx.doi.org/10.9770/jssi.2017.7.2(16))

Novikovas, A. & Stankevičius, A. (2018). Municipal waste, as critical infrastructure, management: case of Lithuania, Journal Security and Sustainability Issues, 8(2): 257–265. Available at: [http://doi.org/10.9770/jssi.2018.8.2\(12\)](http://doi.org/10.9770/jssi.2018.8.2(12))

Statista (2016). Number of Bitcoin ATMs worldwide from January 2016 to November 2018. Available at: <https://www.statista.com/statistics/343127/number-bitcoin-atms>

Schwab, K. (2016). The Fourth Industrial Revolution. Geneva: World Economic Forum. ISBN 1944835008.

Sveriges Riksbank (2017). Available at: <https://www.riksbank.se/globalassets/media/rapporter/pov/filer-fore-2017/artiklar/rapportartikel41400918eng.pdf>

Sveriges Riksbank. (2014) Have virtual currencies affected the retail payments market? Economic commentaries No 2. Available at: http://archive.riksbank.se/Documents/Rapporter/Ekonomiska_kommentarer/2014/rap_ek_kom_nr_02_140617_eng.pdf

Swan M. (2015). Blockchain: Blueprint for a New Economy. O'Reilly Media, Inc. ISBN-10: 9781491920497 P. 11.

Teivāns-Treinovskis J. & Amosova, J. 2016. Some aspects of criminal environment impact on sustainable entrepreneurship activities, Entrepreneurship and Sustainability Issues 4(1): 17-24. [http://dx.doi.org/10.9770/jesi.2016.4.1\(2\)](http://dx.doi.org/10.9770/jesi.2016.4.1(2))

The World Bank (2018). World Bank Prices First Global Blockchain Bond, Raising A\$110 Million. Available at: <https://www.worldbank.org/en/news/press-release/2018/08/23/world-bank-prices-first-global-blockchain-bond-raising-a110-million>

Treaty on the Functioning of the European Union, Article 3 (2012). Official Journal of the European Union C 202. Available at <https://www.ecb.europa.eu/>

Tvaronavičienė, M. (2012). Contemporary perceptions of energy security: policy implications, Journal of Security and Sustainability Issues 1(4): 235–247. [http://dx.doi.org/10.9770/jssi.2012.1.4\(1\)](http://dx.doi.org/10.9770/jssi.2012.1.4(1))

Tvaronavičienė, M. (2016). Entrepreneurship and energy consumption patterns: case of households in selected countries, Entrepreneurship

and Sustainability Issues 4(1): 74-82. [https://doi.org/10.9770/jesi.2016.4.1\(7\)](https://doi.org/10.9770/jesi.2016.4.1(7))

World Economic Forum (2016). Blockchain: what it is, how it really can change the world. Available at: <https://www.weforum.org/agenda/2016/06/the-blockchain>

World Economic Forum (2016). These are the top 10 emerging technologies of 2016. Available at: <https://www.weforum.org/agenda/2016/06/top-10-emerging-technologies-2016>

World Economic Forum (2016). The future of financial infrastructure, World Economic Forum. Available at: <https://www.weforum.org/reports/the-future-of-financial-infrastructure-an-ambitious-look-at-how-blockchain-can-reshape-financial-services>

Tadas LIMBA is associate professor at Mykolas Romeris University (email: tlimba@mruni.eu). He obtained a PhD degree in Management from Mykolas Romeris University in 2009. He is the head of Joint Study Programs "Informatics and Digital Contents" with Dongseo University in South Korea, which is taught in English at Mykolas Romeris University. His research interests include over than 15 Years of experience in the fields of E-Government, E-Business, IT application for the organizational change and Digital Contents. He is actively developing and expanding the relations for the future prospective of the common activities with Dongseo University. Tadas Limba has over 30 scientific publications on different topics related with New Public Management, E-Government, E-Signature, E-Time Stamping, E-Business, E-Marketing, IT and Patent Law, Biotechnology Strategies. He is also an international expert in the field of E-Government and trained faculty members of the Public Administration Academy of the Republic of Armenia and Eurasian International University in Armenia in 2014. Tadas Limba visited Communication University of China in 2014 and had research internships at Arizona State University, USA and at Dongseo University, South Korea in 2015.

ORCID ID: orcid.org/0000-0003-2330-8684

Andrius STANKEVIČIUS, Mykolas Romeris University, Faculty of Public security, Department of Law, lector. Research interests: public security, interest groups, lobbying.

ORCID ID: orcid.org/0000-0002-2528-0497

Antanas ANDRULEVIČIUS, JSC "Financial Figures", consultant. Research interests: disruptive technologies, crypto currency, national security, Industry 4.0.

ORCID ID: orcid.org/0000-0002-5531-5267

Copyright © 2019 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>

