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ESTONIAN STATE'S APPROACH TO CRYPTOCURRENCY:

THE CASE STUDY OF ESTCOIN PROJECT

Master's thesis

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ABSTRACT

Nowadays cryptocurrencies and blockchain – the technology behind cryptocurrencies - have become a global phenomenon. Since the creation of the Bitcoin, the world most known cryptocurrency, the research on cryptocurrency and blockchain has become widespread and generated an enormous amount of concerns within various countries. The most common concern is how to regulate cryptocurrencies, because of specific nature current rules cannot be applied on them. As an option, some countries propose to issue state-sponsored cryptocurrency, and Estonia is not an exception. In summer 2017 there was published a proposal from official sources that represented the concept of state-backed cryptocurrency named Estcoin. The proposal went viral, and soon was followed by second one outlining the structure of future project.

Based on this, the thesis aims to provide an evaluation of Estonia's state approach on cryptocurrency. To that end, the case study of Estcoin project initiative is conducted, utilizing a model of decision factors for regulation and adoption of cryptocurrency.

Keywords: *blockchain*, *cryptocurrency, Estcoin, regulation and adoption*

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1. INTRODUCTION

1.1 Background

"To see what lies ahead in technology, it helps to look in three places: the past, the present and the imagined future of science fiction" (Standage 2018). This citation perfectly fits the description of revolution of new technologies which is happening right now. Studying the development in various areas of technology and science helps to get a better understanding of the main achievements of the past as well as become aware of existing trends of the present and, finally, help to evaluate and predict the perspectives of future foundational technologies.

One of such foundational technologies that have raised an overwhelming boom all over the world is the technology of blockchain. Without any doubts, blockchain is an ambiguous invention. This technology was launched by Satoshi Nakamoto in November 2008 together with the idea of digital currency called Bitcoin. The concept of the technology of blockchain was the core component for implementation of Bitcoin.

Since the Bitcoin was launched, the research on this innovative technology has been conducted by many people from various domains (Liu 2016). Due to this many research papers emerged with various suggestions about how blockchain can be separated from Bitcoin and become applicable to other technologies which are reshaping the way data transacted, stored and secured nowadays. One of these research suggestions had evolved in a new conception called Initial Coin Offering (ICO). Once ICOs emerged, it became a new industry vertical that gathered a lot of attention worldwide. By its definition, ICO is a new method of crowdfunding. The approach is getting its popularity mostly in startup sphere where inventors are wishing to raise funds without seeking out venture capitalists. Especially, it is getting popular in countries with advanced digital infrastructure. However, despite its promising popularity, it will be important to mention that due to the reason of newness and freshness of the cryptocurrency-related activity there is still no customized regulation concerning it in almost any country in the world what makes investing in ICO project being a risky business for investors (Schwarz 2018). Due to this reason, the cryptocurrency regulation globally is in a state of flux now. Countries are creating their own legal frameworks to regulate ICO, and Estonia is not an exception.

The Republic of Estonia is located in Northern Europe. Estonia is famous for its IT sector which provides high-developed innovative solutions. With the evolvement of blockchain and cryptocurrency in 2008, Estonia has been one of the pioneers in examining the technology.

By conducting a continuous sustainable research in this field supported by a government, Estonia acquired around 6 years of official and almost 10 years of unofficial experience with blockchain technology. Since 2012, Estonia has been using blockchain for data registries through X-Road platform which works as the main communication system of government services (Martinovic, 2017).

In 2017 one of the influential officials of the Republic of Estonia made a suggestion about the implementation of a blockchain-based solution at the state level. This blockchain-based solution is an launch of crypto tokens that can be issued within e-Residency program, profound Estonian platform providing transnational government-issued digital identity service. The proposal went viral and provoked various reactions from both public and private sector not only in Estonia but in other countries as well. This and other developments motivated the current study.

1.2 Aim of the study

In this paper, the author conducts a research for a new project named Estcoin based in Estonia. Before indicating the objective of the research, the author considers important to mention that there is no official launch of Estcoin yet because it is still at the very early stage of development. Therefore, it will be relevant to consider it as an initiative. The first mention about Estcoin was done by Kaspar Korjus, the managing director of Estonia's e-Residency program who published a proposal "to issue crypto tokens would make the Republic of Estonia the first country with an Initial Coin Offering (ICO)" on August 27, 2017 (Korjus, 2017).

Therefore, taking these facts into consideration, the main objective of this research paper is following: to evaluate Estonia's state approach on cryptocurrency. The Estcoin project initiative, in this case, plays a role of a possible accelerator to hasten the transition period.

The research questions are summarized as follows below:

1. What is the Estonian state's approach to cryptocurrency?
2. What are the decision factors for regulation and adaptation of cryptocurrency?

The thesis is structured from general to specific. It moves from general history of technology of blockchain and its common practical applications to a specific case of Initial Coin Offering (ICO) application case in Estonia.

The structure of thesis is divided into two main parts: theoretical and empirical. The theoretical part begins with an academic review of the concept of blockchain technology and its main applications. Further the concept of cryptocurrency as a first initial implementation of this technology will be explained. Finally, the theoretical analysis of state's approach to cryptocurrency-related activities is provided.

The empirical part of the thesis is dedicated to the analysis of case study. Firstly, the history of case of Estcoin is presented. Further, it will be followed by a discussion where the author analyses the Estonian current state's approach to cryptocurrency from the perspective of decision factors applied on the case study of Estcoin. The aim of the analysis is to learn how factors suggested can influence the current Estonian state's approach to cryptocurrency-related activities.

1.3 Methodology

The research method used in this thesis refers to the case study research. This type of research is based on a qualitative type of analysis, where researcher collects, analyses and interprets data which refers to characteristics, definitions, meanings and description of things. The qualitative research is also considered to be subjective, what implies using a wider range of different methods of collecting information. Another specific feature of the qualitative research is its exploratory nature and possibility to establish open end discussions.

The theoretical part of the thesis is based on the books and articles that are recommended by cryptocurrency society. Besides all sources, the next two books should be highlighted: technically oriented book Mastering Bitcoin - Programming the Open Blockchain written by Andreas M. Antonopoulos in 2017, and book *Blockchain Blueprint for a New Economy* written by Melanie Swan in 2015. Both books include updated information and are prepared by academic researchers.

In the empirical part of this thesis, the case study of Estcoin project is analyzed. This case study of Estcoin requires in-depth analysis, but due to limitations factors of research, the analysis will be mostly interpretive. The factors causing limitation are: 1. The current state of Estcoin project. At the present, the Estcoin project is at a stage of development. The author has contacted one representative of the project, who proved this statement. As well, the representative of Estcoin project implied in this statement as the most important cause of inability to provide in-depth analysis of the project from the perspective of its business

model. 2. The current regulatory situation on cryptocurrency-related activities in Estonia and worldwide. Due to this, all information collected by the author came from interviews taken from official web sources.

2. STATE'S APPROACHES TO CRYPTOCURRENCY: THEORETICAL UNDERPINNINGS

2.1 Blockchain Technology

This chapter provides the summary about blockchain technology with a review of technological developments that influenced the implementation of the blockchain technology.

2.1.1 Characteristics of blockchain technology

It was for a long time banks keep track of all the transaction of all parties in a special ledger that is closed to the public. The first version of the ledger was created in the 13th century in Italy in the form of three paper book that collects information about financial accounts of the trading parties involved and money exchanges that occurred between these parties. These books were a ledger, a journal and a memorandum book. It had its own individual stamp and signature, so it was impossible (or at least very hard) to change information inside for the own purpose (Ryan, 2012). Then times had changed and new technologies evolved which to move this paper book into the digital form. However, the functions were still same – now bank checks the balances of all parties and does mediation job for both fiat money exchanges and digital money exchanges which are called electronic financial transactions. Such system refers to central bank system where the bank is a centralized authority with an internal network of computers to verify or reject transactions (Ortiz, 2009). It was like this until a new technological invention appeared – Blockchain. It suggests completely opposite system to trade digital assets where no central authority is needed.

As it was already stated in the introduction chapter, the technology of blockchain was launched in 2008 by the person (or persons, because this information still remains unidentified (Coindesk 2016) named Satoshi Nakamoto. The technology was firstly described in a paper titled "Bitcoin: A Peer to Peer Electronic Cash System" published on 31 October 2008.

The paper provides a descriptive solution for so-called **double spending** problem which occurs when same digital coin can be spent more than once. The reason for this is a specific nature of electronic currency where digital coin represents a digital file that can be

reduplicated (Chohan, 2017). In order to avoid this problem, parties need to rely on special financial institutions acting as trusted third parties to do a mediation job and verify the transaction as well as resolve possible disputes and provide protection from fraud. That actually makes financial transaction relatively expensive because it increases the cost of transaction over the internet as well as puts the limitation for transaction size (Nakamoto, 2008). The suggestion proposed in this document to overcome the double spending problem is following: to use a special digital payment system to be based on cryptography algorithms in order to allow any two willing parties to make transactions directly with each other without relying on a trusted third party like the bank or another financial institution. The name of this electronic payment system is Bitcoin with a technology of blockchain as its core component.

According to Nakamoto (2008), a bitcoin is an electronic coin which is defined as a chain consisting of a list of digital signatures that can be sent from one party to another using an electronic signature (hash). Hash is a function used in cryptography to convert an initial data of numbers and letter into encrypted (secured) outcome with a fixed length (Preneel 1993). Nakamoto (2008) refers the parties (computers included in Blockchain network) to nodes. In order to initiate a transaction, the sender-node transfers the coin by electronically signing the previous transactions and adds the public key of the next owner. Here there can be a risk of double-spending, because the digital currency has a digital nature and that is why it can be duplicated relatively easy in comparison with fiat currency. In order to eliminate this problem, a piece of software named a timestamp server is used to timestamp data when processing a transaction. With every new transaction, the hash is timestamped by the Bitcoin system in order to verify the individual respective timestamp. The electronic signatures from the previous transactions are also included into the history of newly created hash. Also, the timestamp makes the hash publicly available (Nakamoto, 2008). That actually means that all transactions are publicly declared, but public keys of the sender and receiver are anonymous. In more simple words, the Bitcoin system is an open source where transactions are visible for a public inside the network, but without the information indicating transaction to anyone. As well, all computers that receive a transaction data within Bitcoin network agree on the rule of single transaction timeline. In a case when coin was sent to two recipients, the coins will show different time stamps and system will detect this and reject the second transaction as invalid. The history of transactions creates a chronological chain of blocks which consists of the data about transactions including the digital signature of a previous coin, timestamp and

transactional data. This data is recorded into the blocks in a way that requires strong cryptographic encryption (Nakamoto, 2008).

Next figure (see Figure 1) provides the visual description of the process.
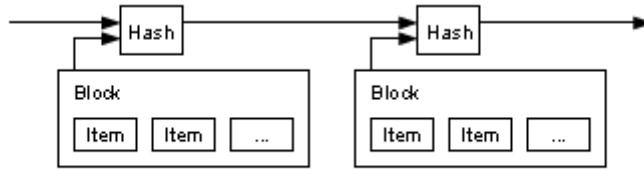

Figure 1. Visual description of connection of timestamping process

Source: Nakamoto (2008, 2)

As it seen from the image, each time a previous block gets completed with a time stamp program, a next new block is created and linked to the previous one. That actually increases the size of the history and, consequently, increases the chain of blocks because each new stamped hash involves the hashes of previous transactions. In order to execute a distributed timestamp server program across the network of computers inside the Bitcoin system, a Proof-of-Work algorithm has to be implemented (Nakamoto, 2008). Proof-of-work is an algorithm which ensures that every new block added to the chain of blocks is authentic meaning that they weren't spent twice (double-spending problem), and confirms the reliability of transaction for all the nodes-parties (Antonopoulos 2017). Nakamoto (2008) compared those nodes which are responsible for verification and record of transactions within the decentralized network with gold miners, therefore, later the implementation of Proof-of-Work algorithm converted in a new term – **mining** (Antonopoulos 2017). In simple words, mining is a process of creating bitcoin. In order to run the system in a smooth, secure and honest way, each first transaction in each block starts new coin that is owned by the creator of the block. That actually means the nodes which creates more blocks gets more coins (Nakamoto, 2008).

That was a short general description of how Bitcoin system works. Nakamoto (2008) described the technology that runs the system as "block" and "chain" separately. Later these two definitions merged into one – blockchain. The document itself provides a more detailed description that includes technical specificities and mathematical formulas that explain the

principle of work of blockchain on the advanced level. Due to the specific purpose of the thesis, the author does not go into technical characteristics.

So, basically, at its core, the blockchain system is a decentralized peer-to-peer public database. The information in the blockchain is accumulated in a chronologically growing chain of blocks, executed in a way that keeps data of all balances secure for all parties involved without the interference of a central intermediator to check transparency and security of digital transactions.

2.1.2   Historical context

Blockchain technology as any other technical innovation was not evolved from the vacuum. Indeed, it is a result of historical chain of previous developments. Bauman et.al (2016) defines next developments in the IT sphere occurred in the second part of 20th century that has an influence on the implementation of blockchain technology (See figure 2).
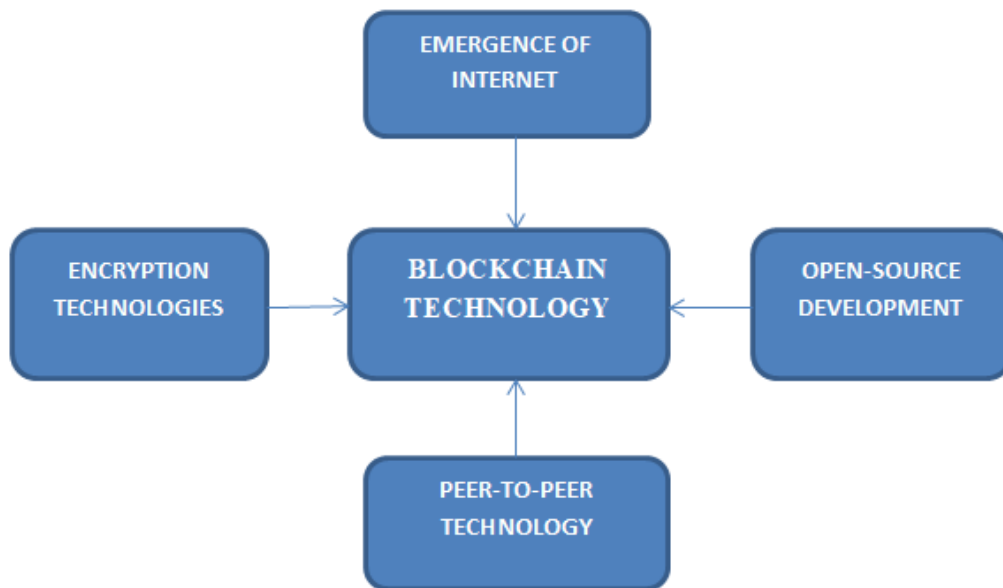

Figure 2. Technological developments that influenced the implementation of blockchain technology

Source: Bauman et.al (2016)

As is seen from the figure, the factors include developments in internet technology, the emergence of strong encryption techniques, open source development and creation of peer-to-peer file-sharing technology. So basically these factors were laid in the foundation for blockchain technology as we know it today (Bauman et.al, 2016).

To begin with the developments in Internet technology, the emergence of specific software called protocols allowed communication between computers through the system of the Internet in the 20th century. The protocols include the e-mail protocol SMTP (Simple Mail Transfer Protocol) and internet protocol TCP/IP (Transmission Control Protocol/Internet protocol). These two protocols are considered to be milestones of the Internet as a distributed global computer network of interconnected networks of various natures: from private to government (Bauman et.al, 2016).

Second important development which contributes to the creation of blockchain was an introducing of the open source software (OSS) (Bauman et.al 2016). Open-source software is publicly accessible computer software which is distributed under the license what allows to do a modification of the software to suit user's needs. This software usually doesn't require a license fee. The most famous example of open source software was a release of a freely modifiable operating system named Linux in 1991. Starting from this remarkable data, the open-source software has become a phenomenon known as The Open Source Movement which lasts due to the current time (Singh, 2018).

The third development was a shift of advanced encryption techniques from military and intelligence organization in the more public use. An invention of symmetric encryption algorithm called the Data Encryption Standard (DES) by IBM in 1975 encouraged various enthusiasts to conduct researches and develop newer and more comprehensive researches in cryptography studies. One of the most famous developments in the sphere of cryptography was a creation of RSA algorithm in 1977 (Bauman et.al, 2016). The RSA algorithm encryption scheme was suggested by three computer scientists Ron Rivest, Adi Shamir and Leonard Adleman in a research paper that propose a method for implementation of cryptographic system that will solve two main problems related to security: privacy and authentication (Diffie, Hellman 1976, 645). Based on these two concepts the idea of public key cryptography was suggested (nowadays known as asymmetric encryption) where the message can be encrypted (secured) by two computer codes - public key (the code which can be distributed publicly) and private key (the code which is not distributed and known only to

the owner). Such system enables a secure communication between two parties over the public channel (Diffie, Hellman 1976, 646). So, basically, the RSA encryption scheme was an implementation method suggested for the idea of secure communication as a central issue of public key cryptography which later was used by Nakamoto for development of Bitcoin system.

Fourth development is creating peer-to-peer (P2P) technology. In peer-to-peer technology, the network is established in the way where each computer acts both as a server for files stored in it and node to share files within the network. In a more basic sense, peer-to-peer decentralized network excludes hierarchy of central services because each node (computer) can act as a client and as a server (Schollmeier 2001). There are many decentralized networks have been created since the development of the Internet, but the most known peer-to-peer application, which has become "the grandfather of today's new peer-to-peer applications", is Usenet system, established in 1979. The most interesting thing about Usenet is that was the first system which provided a possibility to copy files between the computers freely without central control (Minar, Hedlund 2001, p.9).

2.1.3 Applications of blockchain technology

As it was mentioned before, the Blockchain technology was firstly implemented together with the idea of digital currency named Bitcoin. Since the first Bitcoin was mined, there is a non-stop research on blockchain technology all over the world (Zhao et al. 2016; Yli-Huumo et al. 2016). This is due to the reason that blockchain by itself provides much wider opportunities than Bitcoin. Therefore, this section will be dedicated to the description of application areas of blockchain technology. Swan (2015) provides the description of applications of blockchain (see Table 1) by proving three main development stages of technology.

Table 1. Applications of blockchain technology

Type	Description	Examples
Blockchain 1.0	Currency	Currency transfer, remittance and digital payment systems
Blockchain 2.0	Contracts	Financial services that can be implemented with blockchain technology: stocks, bonds, loans, mortgages, smart property, smart contracts
Blockchain 3.0	Application beyond currency, economics and markets	Distributed censorship-resistant organizational models, digital identity verification, blockchain attestation services and blockchain government

Source: Applications of blockchain technology (Swan, 2015); designed by the author

As it seen from the table, Blockchain 1.0 is referred to all cryptocurrency transactions. At this level blockchain is used for an implementation of digital payment system which allows financial transactions as in its initial application of Bitcoin system. Swan (2015) considers that blockchain-based transactions may become the "Internet of Money" what means that in future financial activities will be connected in the way the Internet of Things connects machines – in a decentralized manner.

Blockchain 2.0 is next stage of development of blockchain technology. While Blockchain 1.0 relates to the decentralization of money and payments, Blockchain 2.0 is not limited to transactions and goes much more beyond cryptocurrency. The most distinguishing feature of this stage is a creation of smart contracts. Swan (2015) defines smart contract as blockchain transaction that has more comprehensive instructions included into them what actually creates the wider spectre of features. The distinguishing feature of smart contracts is that they are defined by the code and executed by the code what enables autonomy, self-sufficiency and decentralization. The applications of smart contracts include: financial services (where blockchain technology can interact with traditional banking and financial markets); crowdfunding (blockchain-based crowdfunding platforms); smart property (where

blockchain technology can be implemented to form agreements (or contracts) between people in a way that there will be no need for a trust feature between parties), DAOs and DACs (decentralized autonomous organizations and decentralized autonomous corporations) (Swan, 2015).

Blockchain 3.0 creates a new model of organizing activity. At this stage of development, the blockchain technology goes more extensive in its concepts meaning that it can be applied not only in finance and markets but in more global areas like government, health, science, culture. Swan (2015) suggests four areas for application: distributed censorship-resistant organizational models, digital identity verification, digital art (blockchain attestation services) and blockchain government. In the first case blockchain technology can be used for a creation of decentralized network models promoting freedom and transfer of knowledge to countries with emerging markets. In the second case of digital identity verification service, blockchain technology allows increasing the security of performance this service through the use of cryptographic keys and digital signature. In the third case, digital art relates to intellectual property issues, where blockchain technology additional security by using of timestamping function. The final implication is blockchain government where blockchain technology can be used in government apparatus to make more transparent and efficient (Swan, 2015).

2.2 Cryptocurrency

This chapter provides information about cryptocurrency as main application of blockchain technology.

2.2.1   Definition and essence of cryptocurrency

To begin with a short historical introduction, the development of cryptocurrency as it is known today, started when American computer scientist and cryptographer David Chaum provided the concept of the new cryptographic feature named blind signature the main aim of which is to "blind" (disguise) the content of the message before the transaction occurs. Chaum (1983) provides two examples where blind signatures schemes can be applied: cryptographic election systems and digital cash schemes. In case of digital cash schemes the

blind signature allows to realize the untraceable payment system which offers increased personal privacy and improved audibility. After creation of this protocol, Chaum created and implemented first digital currency system in 1983. So basically his invention was the first step to the implementation of the concept decentralized digital currency as we know it today.

Since this time the sustainable research had been done on the topic of decentralized digital currencies. Once a white paper about Bitcoin was published in 2008 and the first bitcoin was mined in 2009 (Nakamoto 2009), many other cryptocurrencies had been created due to the reason that software is publicly available what makes it easy to copy the code, modify it based on own preferences and create its own cryptocurrency. By its definition, cryptocurrency refers to a decentralized digital currency that uses cryptographic algorithms to exclude the dependence from a central authority like bank or government (Sharma *et.al* 2017). Due to this reason, blockchain is often referred to Bitcoin and other cryptocurrencies as a mechanism invented to make it possible.

2.2.2   Categorization of cryptocurrencies

As it seen from the definition of cryptocurrency, Bitcoin was created as an alternative type of digital currency and online payment system together (Swan 2015; Grinberg 2012). Sometimes Bitcoin is called as virtual currency (Dodge, Dixon, 2017, 5), however, it is not accurate enough because of the next reason. The reason lays, in fact, that there are some similarities and differences between digital (or virtual) and cryptocurrency because the last one is considered to be a separate category of digital currency. The similarity is that both a digital currency and cryptocurrency have no physical value while in comparison with flat money like banknotes and coins (McLeay *et.al*. 2014). The difference is that cryptocurrencies are a type of virtual currency and it doesn't have all possibilities that digital have. In order to make it more clear, European Banking Authority (EBA) provides definition of virtual currency as a digital representation of value that is not issued by public or financial authority like central bank; but it can be accepted by natural and/or legal persons as method of payment to receive goods and/or services and can be stored, transferred and traded electronically. EBA emphasizes that "digital representation of value" refers to the monetary concept of "unit of account" what gives a possibility to consider virtual currency as private money or a commodity (EBA…2014). However, it will be important to highlight that European Central Bank (2015) does not consider virtual currencies (refers to

cryptocurrencies) as "full forms of money as defined in economic literature" because of its "a digital representation of value" nature which is not issued by central bank or a credit institution, so it cannot be considered as money from legal perspective. Therefore, Bitcoin and related cryptocurrencies can partially be considered as virtual currency because it does not have all the properties the virtual currency has. This due to the reason that they exist only in virtual place, it will not be possible to get the tangible equivalent of the Bitcoin in terms of banknotes and/or coins.

So basically bitcoin is a decentralized open-source digital currency which uses the technology of blockchain for the transactions inside of the Bitcoin network. The innovation of Bitcoin as a combination of open-source software, sophisticated encryption techniques to provide security of transactions and distributed network approach was an inspiration for the creation of other cryptocurrencies. Medium (2018) provides the most common categorization of cryptocurrencies which include cryptocurrency as alternative coins, or altcoins, and cryptocurrency as a token. Altcoin is a type of cryptocurrency which operates on the original Blockchain platform. Such alternative coins are considered to be variants, or forks, of Bitcoin, with emphasizing on its cryptocurrency features. Another type of altcoins is received not from Bitcoin's original open-source protocol, but from a modified version of it. According to Cryptocurrency Market Capitalization (2018), there are 1568 cryptocurrencies introduced on the global market for a current moment, where Bitcoin is at first place by market capitalization, what makes it the most popular and demanded cryptocurrency on the global market. From other successful cryptocurrencies, it is possible to define Ethereum (2nd place), Ripple (3rd place), Bitcoin Cash (4th place), Litecoin (5th place).

The second type of cryptocurrency, token, is completely different. The token is a type of cryptocurrency with a much wider range of functions. Bauman *et al.* (2016) explain token as an alternative name for a native digital asset on a blockchain. In simple words, it can represent many other values besides the cryptocurrency field. The most common functions the token can fulfil are: (crypto) currency (to use it as payment system like Bitcoin); a digital asset; a means for accounting; a share in a start-up; a way of preventing attacks. (Medium) Currently, there are many sources suggesting their classification of crypto tokens because no common division is provided. For this thesis, the author uses classification provided by ICOscoring platform. According to ICOscoring (2018), there are three types of tokens: security tokens, utility tokens and payment tokens (so-called "real cryptocurrencies"). Security token represents assets like bonds, derivatives or equities; consequently, it refers to

real monetary basics of companies. Utility tokens refer to goods and/or services that will be received from the future launch of the project. Payment tokens refer to initial cryptocurrency function that was designed to enable financial transaction in a decentralized network.

Having provided the definitions of tokens and altcoins, the following section will be dedicated to the description of threats and benefits of using cryptocurrencies by businesses and institutions.

2.2.3 Threats and benefits from using cryptocurrency

Cryptocurrencies had developed an enormous interest for the field of decentralized digital cash schemes worldwide, and many companies and institutions across a various set of businesses became very interested in ways of adaptation of cryptocurrency technology. Therefore, it will be relevant to provide examples of potential economic benefits as well as threats from using cryptocurrencies by businesses and governments.

To start with global economic advantages, EBA lists potential benefits of using cryptocurrency cash schemes. At first using cryptocurrency transactions like Bitcoin, for example, provides lower transaction costs in comparison with traditional methods of payment due to the absence of intermediaries such as banks or other related financial institutions. Due to this feature, cryptocurrency transactions are conducted in a much cheaper way, what also creates an opportunity for micropayments. That is the first and absolute advantage of using cryptocurrency cash scheme, because in traditional methods of payment there is a fixed fee for the transaction, usually quite high (2%-4% of the transaction amount). Secondly, processing virtual currency transactions take less time in comparison traditional payment system due to their decentralized nature where transactions are verified by many miners on 24/7 basis. Such characteristics of virtual currency transactions allowed establishing new types of businesses opportunities for financial service and IT sectors what actually provides a positive contribution to economic growth. (EBA…2014)

As every financial regulator, the EBA identified the potential risks arising from using cryptocurrencies. There are 70 numerous risks identified from using of cryptocurrencies, divided into several groups These are risks related to users; risks related to market participants; risks related to financial integrity; risks related to payment systems in flat currency; risks related to regulators. In this paper, the author views the risks related to

regulatory authorities and financial integrity of the state. The first risk is related to such features as open source nature of the technology and anonymity of transactions within the decentralized virtual cash scheme. Due to the fact that anyone anywhere in the world can anonymously establish a new cryptocurrency scheme and make changes to its protocol, it becomes relatively easy to do suspicious transactions like money laundering and illegal traffic of coins, if a majority of miners within created cash scheme agree on it. The second risk is related to vague regulation on a state level and on a corporate level. These two risk drivers are interconnected, because unclear regulatory approach creates uncertainty for business participants, and as a result, last ones may suffer from inadequate governance and corporate capacity within their organizational structures. The third risk is related to an absence of regulatory body for virtual currency schemes, what means that financial transactions are not audited with common reliable standards and thus cannot be reported. (EBA…2014)

This document has influenced on the relation of various states to cryptocurrency related activities within the European area because it was issued by the authorized authority. That is why next chapter will be dedicated to relationships between state and cryptocurrency.

2.2.4   Initial Coin Offering

Initial Coin Offering (ICO) is a relatively new phenomenon in the field of fundraising methods. By its definition, ICO is a crowdfunding approach to raise financial support for a new cryptocurrency venture (Zetzsche *et.al.* 2018, 2). In a more difficult sense, through ICO project sell their underlying cryptocurrency in exchange for other cryptocurrency or legal tender (fiat money).

Sometimes ICO is mistakenly assumed to have the same meaning as another method called Initial Public Offering (IPO). There are some similarities between ICO and IPO where investors buy shares of a company (Bitcoin Magazine). However, there is a significant difference between these two methods. In case of IPO, many requirements are met by entrepreneurs including documentation, regulations and approval in advance. This has to be done beforehand a company starts offering its shares to potential investors in order to check the diligence of the company by overseeing their track of records. This method is regulated; consequently, it takes a longer time to proceed with all regulations (Maasdorp, 2017).

ICO has different approach. The difference is that whereas IPO attracts their investors having already gained maturity proven by a track of records, ICO usually does not have such maturity and states at the level of so-called infancy (Maasdorp, 2017). Basically, it offers a fraction of underlying assets in the form of a fraction of digital currency (refers to crypto tokens) because the aim is to get funds at a very early stage of development (Dell'Erba, 2017). As well, ICO provides a faster process of preparation of company as a method in comparison with IPO because there is no common regulation on ICO at the current moment. The regulation of ICO is performed differently in different countries (Bitcoin Magazine).

2.3 State and cryptocurrency

This chapter provides the description of relation between public (meaning state) authorities to cryptocurrency related activities. It based on the paper "State approaches on cryptocurrency" published by Jan Lansky.

2.3.1   State's approaches on cryptocurrencies

The growth of cryptocurrencies has enforced countries to provide regulatory and legislative responses. In this article Lansky (2018) provides a classification of the types of public authorities' approaches to regulation to cryptocurrencies by countries. For the creation of this classification Lansky (2018) used the list of international actions and regulations in countries that deal with digital currencies (referred to virtual currencies) published by J. Dax Hansen, the partner of Perkins Coie LLP's Blockchain Technology & Digital Currency industry group. The list is regularly updated, that is why the information collected by Lansky (2018) in his research in 2017 is considered to be old right now. However, that is not a serious hazard for this work, because the author aims to use only the classification framework developed by Lansky (2018).

The classification includes 5 levels of public authorities' approaches to cryptocurrencies. Some levels include more dimensions (2nd level, 3rd level and 5th level respectively), therefore they are distributed to the groups.

Table 2: Classification of government authorities to cryptocurrencies

Level	Group	State approach
0		Ignoring
1		Monitoring
2		Recommendation
	2A	Warning against risks
	2B	Presentation of cryptocurrency potential
3		Guidance
	3A	AML
	3B	Not a subject of VAT (Value added tax)
	3C	Assets
	3D	Subject of VAT (Value added tax)
	3E	Tax from mining
	3F	Tax from gambling
4		Regulation
5		Ban or integration
	5A	Ban for banking institutions
	5B	Complete ban
	5C	Integration

Source: J.Lansky (2018); designed by the author

Level 0: Ignoring.

At the level of ignoring the state is not interested in dealing with cryptocurrency's activities. Lansky (2018) assumes that the reason for such attitude can be caused by low importance of cryptocurrency activities for the state.

Level 1: Monitoring.

At the level of monitoring the government asks for public authority which is responsible for supervising other financial institutions within the country, to provide a assertion that describes the state position about the cryptocurrency. It does not include the recommendation

for an approach to cryptocurrency; rather the document is issued to explain that state is familiar with it and will proceed with them in the future.

Level 2: Recommendation.

At this level the government authority which is responsible for supervising financial institutions releases the statement describing a recommendation for an approach to use cryptocurrency for its citizens. This level includes 2 groups:

Group 2A: Warning against risks.

The government authority responsible for supervising financial activities issues an assertion which describes the summary of risks of using cryptocurrencies. The document is aimed to identify risks arising from using cryptocurrency activities and provide possible mitigation actions.

Group 2B: Presentation of cryptocurrency potential.

The government authority responsible for supervising financial activities issues an assertion which describes the potential of using cryptocurrencies.

Level 3: Guidance.

At this level the government authority that is responsible for supervision over financial institutions within a state, issues guidance to control the method of using cryptocurrencies. This level includes 5 groups structured by the level of importance:

Group 3A: Cryptocurrencies are subjects of Anti-Money Laundering (AML).

The government authority that is responsible for supervision over financial institutions within a state, issues statement where it identifies cryptocurrency transactions being the subject of AML laws.

Group 3B: Cryptocurrencies are not subject of value-added tax (VAT).

The government authority that is responsible for supervision over financial institutions within a state, issues statement where it identifies cryptocurrencies being not goods and due to this reason does not apply VAT on them.

Group 3C: Cryptocurrencies are assets.

The government authority that is responsible for supervision over financial institutions within a state, issues statement where it considers cryptocurrencies to be assets and applies tax applicable to assets according to existing tax legislation.

Group 3D: Cryptocurrencies are subject of value-added tax (VAT).

The government authority that is responsible for supervision over financial institutions within a state, issues statement where it considers cryptocurrencies to be assets and applies VAT on them.

Group 3E: Cryptocurrency mining is a subject of tax.

The government authority that is responsible for supervision over financial institutions within a state, issues statement where it considers cryptocurrency mining process to be a subject for income tax.

Group 3F: Cryptocurrencies are subject to gambling tax.

The government authority that is responsible for supervision over financial institutions within a state, issues statement where it considers cryptocurrency to be a subject of gambling tax.

Level 4: Regulation.

At this level the government authority that is responsible for supervision over financial institutions within a state, agrees that cryptocurrency activities can be authorized and issues a document which provides an appropriate regulation framework.

Level 5: Ban or integration.

At this level the government implements a decision towards refusal or complete adoption of cryptocurrency related activities. This level includes 3 groups:

Group 5A: Ban for banking institutions.

The government issues document which implies complete prohibition for banking institutions to provide cryptocurrency related services. The prohibition is especially related to services which provide exchange of cryptocurrency for flat currency.

Group 5B: Complete ban.

The government issues document which implies complete ban where the execution of cryptocurrency related activities is prohibited for people as well. The prohibition can be additionally imposed upon the threat of imprisonment.

Group 5C: Integration.

The government issues the regulation where it enables usage of cryptocurrency for both financial institutions and people. At this stage the cryptocurrency can be used as: a national cryptocurrency created by the state; as technology implemented to run state administration services.

This framework was created to examine state attitude towards cryptocurrency in individual countries of the world. (Lansky 2018) As it seen, the most important actors are government and state authority responsible for supervising financial institutions. State authority responsible for supervision provides monitor and control function over the financial sector within a country, while the government has a legislative power to establish laws the supervision authority is obliged to follow.

Different countries have different state approaches on cryptocurrency. However, the prevailing number of countries has a positive attitude towards cryptocurrency. (Bloomberg, 2018) Therefore, it will be necessary to discover the decision factors for regulation and adoption of cryptocurrency. Next chapter will provide more open and comprehensive explanation.

2.3.2 Decision factors for adoption and regulation cryptocurrency

Currently many countries have different attitude towards cryptocurrency. Davies (2018) provides a list of the most common reasons for governments to restrict and/or absolutely ban cryptocurrency:

1. Cryptocurrency facilitates a global tax evasion

2. Cryptocurrency contributes criminal activity

3. Cryptocurrency encourages citizens to lose faith in their government

4. Cryptocurrency provides negative intervention in state's ability to control its own monetary and fiscal policy

5. Cryptocurrency encourages decrease of liquidity of national currency

6. Cryptocurrency causes deflation

Based on these concerns, the author of this thesis extracts main key factors in each statement. These factors are: tax evasion, criminal activity, public trust, monetary and fiscal policies, national currency liquidity, and deflation. Next, the analysis of each key factor is provided.

- Widespread tax evasion

Tax evasion is a practice where a natural person (meaning physical person) or juridical person (meaning organization or corporation) deliberately decides to avoid their paying tax liability (Alm 2011). Srokosz (2015) defines few factors influencing tax evasion from the perspective of cryptocurrency-related activities. First factor is a blockchain technology as key technical feature which enables anonymous peer-to-peer transactions without including financial mediators. Second factor is possibility to exchange cryptocurrency for legal tender (money like dollars or euros). Due to this using of cryptocurrency can commit to intentional tax evasion in relation to income taxes (case when company sells goods or provides services using cryptocurrency technology) and value-added-tax (because there is still vague regulation it is problematic for tax authorities to qualify the payment in cryptocurrency based on common system of VAT).

Can tax factor taken from this restriction be key driver for regulation an adoption of cryptocurrency? Yes, it can, if country will consider cryptocurrency to be sort of assets, what actually makes them being to existing tax legislation. In that case country gets gains from taxation of cryptocurrency. (Lansky, 2018)

- Facilitation of criminal activity

In relation to criminal activity cryptocurrencies had posed some financial crime risks. Carlisle (2017) highlights main risk drivers: anonymity/pseudonymity, rapid international transaction settlement and decentralization. Anonymity/ pseudonymity relates to privacy concerns, where cryptocurrency transactions are considered to be anonymous, while in reality they are not, because users use public key technology to perform transactions. That is why cryptocurrency transactions will be relevant to consider pseudonymous. Fast

international transaction settlement is related to lower transaction fees in comparison with traditional payment methods, what gives an opportunity for quick transactions and micropayments on global level. Decentralization is related to the decentralized network with absence of central authority in open source internet environment (Carlisle, 2017).

Bloomberg (2017) defines four main areas of criminal activity that can be facilitated by using cryptocurrencies: money laundering, contraband transactions, tax fraud and extortion. Anonymity/pseudonymity together with near real time transaction settlement are a serious risk for anti-money-laundering laws, because it allows performing quick transactions without providing identification and verification of participant, what actually creates an environment for illicit behavior and contraband transactions within the network (Carlisle, 2017). Even though it is possible to trail transactions now, actors involved in criminal activities are driven to create completely anonymous variant of cryptocurrency (Bloomberg, 2017). Decentralization creates a difficult situation for law enforcement and regulatory bodies when accessing cryptocurrency transactions in terms of tax regulation. As well, it still poses the risks of opacity within the virtual currency ecosystems what leads to speculative transactions with the theft of cryptocurrency by actors within the virtual currency scheme (Carlisle, 2017).

Can criminal activity factor taken from this restriction be key driver for regulation and adoption of cryptocurrency? Yes, if country will consider cryptocurrency transactions to be subject to limitations corresponding to those which are applicable to traditional financial transactions in terms of anti-money laundering laws specific to this particular country. (Lansky, 2018)

- Loose of trust in the government from its own citizens

According to the definition provided by OECD (2018), trust in government means that citizens expect from government to reduce the level of uncertainty in the political, economic and social environments. OECD (2018) also defines six main features for government to maintain in order to get trust from their society, and these are: reliability (citizens expect trustworthy and secure policymaking for public sector in a long-term perspective), responsiveness (citizens expects to have interaction with state in order to share their thoughts on innovation solutions in public sector), openness (citizens expect open government policies which includes citizen involvement and better access to the information), better regulation (citizens expect regulation system work properly at business and public levels), integrity and

fairness (citizens expect public policies to be promoting high standards of behavior and excluding the level of corruption), and inclusive policy making (citizens expect public policy-making process to be based on public interest). When government maintains stability in all above dimensions, public trust increases.

Stability is a key for public trust in government, while cryptocurrency is quite volatile in terms of price unpredictability what makes its adoption being a risky business for government. This risk evolved because cryptocurrency has a lot to offer as well as poses all kinds of intriguing questions. How cryptocurrency should be regulated and are traditional regulative approaches relevant now? Can it facilitate governments to provide better regulation? Does decentralized nature of cryptocurrency can contribute to establishment of responsive, integrated and fair type of government?

Can public trust in government factor taken from this restriction be key driver for regulation and adoption of cryptocurrency? Yes, regulation and adoption of cryptocurrency can suggest benefits for society of the country which priority is to use cryptocurrency technology for running state administration services. (Lansky, 2018)

- Negative intervention in nation's ability to control its monetary and fiscal policies

According to Investopedia (2018), monetary policy relates to the framework of actions taken by central banks to achieve macroeconomic policy goals by management of interest rates and overall supply of money, while fiscal policy refers to the taxing and spending actions of the governments. Proper implementation of these two policies provides a positive impact on nation's economic activity.

As it was already mentioned, cryptocurrency is a type of digital currency with limited (for now) properties (European Central Bank, 2015), driven by encryption techniques to regulate the formation and transfer of currency units (coins) without involvement of third party. That is why cryptocurrency cannot be considered as money from legal perspective because they represent only digital representation of value (EBA…2014). Consequently, taking into consideration these facts, it will be logical to claim that due to decentralized nature cryptocurrencies bypass the monetary channels applicable for traditional transactions.

Can intervention in monetary and fiscal policy factor taken from this restriction be key driver for regulation and adoption of cryptocurrency? Yes, if country will review its monetary and fiscal policies to make them more globally coordinated in order to avoid possible

cryptocurrency dominance. One option is adopt central bank cryptocurrency, however, that will actually mean that central banks have to face existential challenges. The challenge is related to the situation that if central banks accept the cryptocurrency technology (meaning blockchain) to change existing banking services, it means that banks have to change substantially existing ledgers which have limited access. Cryptocurrency technology in this way can suggest a possibility of distributed bookkeeping technology.

• Decrease of national currency liquidity

Currency liquidity is key factor for nation's economic activity because it describes the degree of speed of asset convertibility into other assets without influencing the asset's price (Investopedia 2018).

Currency liquidity directly depends from country's fiscal and monetary policy framework. As it known, some cryptocurrencies have high value what makes them highly convertible into cash. Therefore, it is possible to assume that cryptocurrencies with high value can be cause in decrease of national currency liquidity.

Can national currency liquidity factor taken from this restriction be key driver for regulation and/ adoption of cryptocurrency? Yes, if country's national currency has high liquid ratio too. In that case investing in the cryptocurrency with high value together with implementation of proper monetary and fiscal policies can have positive impact on economic activity.

• Creation of deflationary economic situation within the state

Deflation occurs when the general prices for goods and services declines. At the same time deflation is characterized by high wages and increasing the value of national currency (Humphrey, 2003).

Deflation has a negative affect for traditional financial ecosystem (Humphrey 2003), but from the cryptocurrency perspective things are different. In order to understand the issue, the one has to take a view on the meaning of inflation. Inflation is an opposite for deflation, when price for goods and services increase and at the same time the value of national currency decreases. There is an idea developed by few economists explaining that small inflation may be useful for increasing production (Ross 2018), in the long run it becomes a serious problem because the value of national currency falls what leads to economic

stagnation. Taking this fact into consideration, there is a question posed: how cryptocurrencies can cause deflation if it is not considered as a currency? The answer lays in the opportunity of convertibility, meaning providing exchange of cryptocurrencies for legal tender at an exchange rate (Srokosz, 2015). This actually means that there is demand for some cryptocurrencies which have high value what causes increased supply. Consequently, some cryptocurrencies are able to cause deflation within an economy.

Can deflation factor taken from this restriction be key driver for regulation and/or adoption of cryptocurrency? Yes, it can. As it was already mentioned, deflation is negative fact by itself, but it goes different way when relates to cryptocurrency economy. Adoption and regulation of deflective currencies can have a positive impact on traditional money, because when it rises in value – state's economy gets positive economic activity.

Having provided the analysis of key factors, it is possible to claim that main causes of government restrictions on cryptocurrencies can be turned into decision factors under specific circumstances.

2.3.3   Concluding remarks

To summarize, the theoretical part of this thesis provides general comprehensive description of cryptocurrency development. Starting from general overview of blockchain technology, the author provided the description of its main application with later emphasis on cryptocurrency as its initial application.

As it seen, different states have different reaction on cryptocurrency. Some of them prefer ignoring cryptocurrency potential, while another do monitoring actions in order to move to regulation level later. Due to the volatile nature of cryptocurrency market and its relative immaturity it becomes clear why many countries issue warnings and sometimes complete restrictions. Having analyzed the main causes of state restrictions and overall state approach to cryptocurrencies in theory, the author applies these theoretical frameworks on specific case of Estonia.

3. CASE STUDY: THE ESTCOIN PROJECT

3.1 Case history

This chapter provides the description of Estcoin initiative. It is divided in two subchapters.

First subchapter is dedicated to the topic of Estcoin initiative and it is divided in three more parts. First part provides the background information about development of the Estcoin project. Second part is dedicated to the description of the Estcoin idea. Third part describes the reactions on Estcoin from local and global perspectives. Local perspective includes responses from public authorities that are involved in the process of regulation of cryptocurrencies in Estonia. Global perspective includes responses from institution responsible for administration and monetary policy in the European Union.

3.1.1 Background

The Estcoin project was initiated in the era of rapid development of digital technologies in Estonia. Indeed, Estonia has achieved a prominent success in designing and promoting technology-based information society (Kalvet, 2012). The country started its strategy for the information society in 1998 (Kitsing, 2011). During next years, Estonia had managed to develop and enhance its digital infrastructure with many technological innovations what lead to the establishment of new services. The most prominent dates are: December 2001 – the year when the first version of platform allowing government databases to communicate in digital environment called "X-Road" is established; January 2002 – electronic ID cards which can be used for business, government and private communications are introduced; March 2003 – first version of eGovernment portal as the main platform for various government services is launched; October 2005 – Internet voting website was launched; November 2014 – e-Residency program that allows to get secured digital identity is launched (eGovernment in Estonia factsheet, 2016). Once E-Residency was launched, it became a case for wide discussions around the world. Due to the reason that Estcoin project has a direct relation to E-Residency program (Korjus 2017), it will be relevant to provide a more comprehensive description of the program.

The concept of e-Residency program initially evolved from the document "Digital Agenda for Estonia 2020" issued in November 2013 by the Ministry of Economic Affairs (Tammpuu,

Masso 2018). The main principle of this document was to enhance international recognition of Estonia in digital affairs. In order to solve this issue, the inspiring idea of recruiting "10 millions of e-Estonians" was suggested in spring 2014 by three people: Taavi Kotka, Siim Sikkut and Ruth Annus (Kotka et. al 2016). After the idea developed into a comprehensive concept, it was submitted for approval to the Estonian Parliament and got an absolute support. Having government support, the project was funded by Estonian Development Fund and implemented under the coordination of Enterprise Estonia in May 2015 (Kotka *et al.* 2016). Enterprise Estonia is a government organization established in 2000 with a strategic goal to promote business and regional policy in Estonia. Its main activities are aimed to support national entrepreneurship system in a long-term perspective (EAS, 2018).

Nowadays the e-Residency is a governmental program that provides government-issued digital identity. The digital identity is transnational that is why anyone in the world can apply for it (Korjus et al. 2017). Meanwhile, it will be important to mention that e-Residency is a completely digital service which was designed in a way to generate statistics without human assistance. It means that when person applies for e-residency, all information related to e-resident facts is automatically stored in next statistical indicators: e-resident facts (number of applicants and e-residents, rate of growth per week), demographics and location (nationality, age, and sex), behavior (motivation to apply, cooperation with Estonian companies, creation of new companies by e-residents and areas of their economic activity (LeapIN, 2017).

According to the latest statistics (e-Residence statistics chart 2018), there is a sustainable growth in a number of new e-residents since its launch in 2014. At the moment of the last update (which was April 2, 2018), the overall number is 35 453 e-residents. The highest amount from this number consist people who have motivation for establishing location independent international business and/or bring their own business to Estonia. By economic activity of companies, the most common activities for around 70% of e-residents are business and management consultancy activities, computer programming services, non-specialized wholesale trade and computer consultancy services. As it seen from the official statistic indicators, the e-Residency project is performing relatively well, with a continuously increasing growth rate of e-residents and newly established companies.

Kaspar Korjus is a Team Lead and Managing Director of e-Residency project since its launch in 2014 up to present. Korjus (2017) emphasizes that with the rise of blockchain and cryptocurrencies more and more e-residents have an interest in establishing blockchain-

related businesses. By giving examples of countries which have raised the topic of an introduction of their own digital currency, Korjus (2017) highlights that Estonia can succeed in this area as well due to its e-Residency program with transnational digital identity service and overall progressive digital infrastructure enhanced by modern legal frameworks. By providing these reasons, Korjus (2017) suggests the proposal to issue crypto-tokes which will be called estcoins and launched through Initial Coin Offering (ICO).

3.1.2 Description of Estcoin project (Initiation and development)

The Estcoin is an initiative of a possible project suggested by Kaspar Korjus, the managing director of Estonia's e-Residency program. The goal of this project is to launch Estonia's own crypto tokens with an Initial Coin Offering (ICO). New tokens are aimed to be an extension of e-Residency program which will provide the platform for disseminating and trading them globally.

First article

The first appearance of Estcoin concept was presented in the article "Estonia could offer 'estcoins' to e-residents" published by Kaspar Korjus on August 22, 2017, in platform Medium. This article provides introductory information about the idea without going into details. It divided into three parts. The first part of the article is started it with a next sentence – "What would happen if a country, such as Estonia, issued its own crypto tokens?". The following answer is provided for this question: "'Estcoins' could be managed by the Republic of Estonia, but accessed by anyone in the world through its e-Residency programme and launched through an Initial Coin Offerings (ICO)". With such an announcement, an explanation of background for Estcoin project is provided. As it was already mentioned in the previous part, e-Residency program with its secure digital identity service is the main premise. The second premise is a development and rapid rise of cryptocurrency and ICO which is described in the second part of the article. Here it stated that cryptocurrency has merged from niche area and, by this statement, conducts parallel with the e-Residency program as another example of niche-type development. Korjus (2017a) highlight that Estonia can succeed in cryptocurrency-related activities due to the reason that it has developed a comprehensive digital infrastructure and legal framework to maintain it. In addition, Korjus (2017a) provides investment in a country as the main reason why

government authorities should invest in cryptocurrency and ICO. The final third part of the article is devoted to preliminary thoughts about the opportunities from the launch of Estcoin project for investors and Estonia in particular. As well, it includes the feedback from Vitalik Buterin, founder of Ethereum project, who says Estcoin project inside the e-Residency system can increase the connection between the e-residents and establish more community type of environment. Finally, Korjus (2017a) invites readers to share their thoughts about Estcoin initiative in social media.

Second article

The second article about Estcoin project was published almost four months later, on December 19, 2017, by Kaspar Korjus using platform Medium as well. This article provides more comprehensive and detailed information about Estcoin project. Before moving on to the details, it will be important to mention that starting from this article Korjus (2017b) states that all the announcement and updates concerning the topic of Estcoin project will be provided in the blog posted on the Medium platform.

To begin with, this article basically provides a business idea for the project. The title of the article is following: "We're planning to launch estcoin—and that's only the start". After this statement, the other one follows providing information that the e-Residency team is working with an incentive to make their project the most attractive option for entrepreneurs to launch a trusted ICO. Further, the article is divided into three parts. In first part, Korjus (2017b) shares the information about the first article published in August. This information is mostly descriptive and provides the statistics about the reactions of people who read the first article. The most interesting thing about that article has been read by about 200 million of people around the world in almost four months (Korjus 2017b). For the purpose of this thesis, the author provides information about the reactions on Estcoin in next part of this chapter. In the second part Korjus (2017b) presents short information about the outcome of meeting organized by him inside the Estonian Parliament with the involvement of both public and private sector of Estonia after the publishment of the first proposal. The event was attended by participants of the e-Residency team and their advisory committee, Estonian Parliamentarians, the Bank of Estonia (Eesti Pank), Ministry of Finance, some companies managing ICOs together with law firms that consult them. The main topic of the meeting was "how Estonia could better embrace blockchain and the use of crypto tokens in a way that supports legitimate entrepreneurs and helps grow our digital nation while protecting our

public interest and minimizing risks to our state and business environment"(Korjus, 2017b). The author does not go into the description of every concern raised through the meeting but highlights the outcome which is following: Estonia has to establish the e-Residency program in a way to become the best platform globally for setting off trusted ICOs. By this way, Korjus (2017b) considers using e-Residency digital service as a check-tool for attracting only rightful ICO in a meaning that investors who give their money in the development of such type of project will have enough knowledge about entrepreneurs and correspond to the standards of trusted ICO (Korjus, 2017b).

The third and final part of the article is dedicated to the description of how estcoin will function. Korjus (2017b) defines three models of estcoins and highlights that it may be possible to meet multiple purposes by using more than one model at the same time. With every model there Korjus (2017b) provides an overview of main functions estcoin will perform and connects its activity with functions of e-Residency program. For the purpose of this thesis, the author provides shortened general description of each model.

First variant is community estcoin. This type of cryptocurrency refers to the utility tokens. In this model, Estcoin would be created with an aim to provide support to the objective of enhancing and promoting e-Residency program what can be done in a way to encourage investors and entrepreneurs to use e-Residency as the main service platform. Estcoins can boost the development and increase the value of that platform through the network effect. Funds raised from investment in estcoins can be used for both enhancements of e-Residency platform and other companies operating in Estonian business ecosystem (Korjus, 2017b).

The second variant is identity estcoin. This type of cryptocurrency refers to blockchain-based tokens. According to a classification of tokens provided in theoretical part, it is possible to claim that identity estcoin also refers to utility token, but modified one. In this model, Estcoin would be created with an aim to be used for activities within digital society, meaning it will perform maintenance function and enhance the e-Residency network. In this model, estcoins are personal because they will be bound to the digital identity of the users. Therefore, it will not be possible to sell or exchange estcoins outside of e-Residency program. Funds raised through identity estcoins will be used to improve the current business environment in Estonia by providing better transparency, security and reliability of services (Korjus, 2017b).

The third variant is euro estcoin. This type of cryptocurrency refers to alternative coins. In this model, the estcoin value will be pegged to fiat currency (i.e euro). Korjus (2017b) states that there is no suggestion to provide "an alternative currency to the euro, but it's possible that we could combine some of the decentralised advantages of crypto with the stability and trust of fiat currency…". By this scheme, banks would be asked to change existing financial system and add a function where it is possible to convert money in and out of euro estcoins. As well, in this case the traditional common approach of executing transactions will be changed in a way to use blockchain technology (Korjus, 2017b).

Having provided the classification of future estcoins, in the conclusion part of the Korjus (2017b) emphasizes on the continuation of work on Estcoin project with both public and the private sector.

At the time of writing this thesis, no other updates were published.

3.1.3 Reactions

As it was already mentioned, the Estcoin project proposal has generated a large amount of responses on both regional and global dimensions. For the purpose of this thesis the author has collected responses taken from reliable sources such as official websites of public authorities and sources they refer to. The author divides public authorities by area of their economic activity: financial sector and political sector.

Financial sector perspective

Financial sector perspective includes information from two important public authorities in Estonia and one European public authority. Public authorities in Estonia include Estonian Financial Supervisory Authority and Bank of Estonia. European public authority is European Central Bank from The European System of Central Banks.

I.   Estonian Financial Supervisory Authority

The Financial Supervision Authority is an institution established for financial supervision and resolution in Estonia. The organization has autonomous competence and separate budget what enables independency in its decisions from Estonian state. The Financial Supervision Authority acts on the behalf of Estonian state (EFSA).

Once the first proposal was published (August 22), the EFSA gave few responses. First response was immediate (23 August) in the article published in Postimees by Pau (2017). In this article, the EFSA defines Estcoin as an Initial Coin Offering (ICO) project and provides the explanation of key concepts as well as risks for investors important to know. Similar statement was published 5 days later on the official website of EFSA (2017).

Later, on September 12, 2017, the EFSA posted an article providing explanation concerning the legal status of the ICO projects in Estonia. According to the information provided, the EFSA (2017) defines crypto tokens to be securities "whose owners have a reasonable expectation of future cash flows or are acquired for a comparable purpose for other investments". That actually means that there is no consensus on the legal status on ICO, and that is why it is possible to claim that there will be changes in the future. Due to this reason the EFSA agrees that each specific ICO project has to be individually valued, and provides an opportunity of legal analysis.

II. Bank of Estonia

Bank of Estonia is the central bank of the Estonia and a member of European System of Central Banks (Eesti Pank). The author collected responses from two the most important persons: the head of bank and the deputy governor. The president of Bank of Estonia is Ardo Hansson. The Deputy Governor of Eesti Pank is Madis Müller.

A) Ardo Hansson

His main thought corresponds with the thoughts of Madis Muller, emphasizing on the statement that there is no option for euro estcoin. As well, his answer on a question about future for Estcoin and other cryptocurrencies is following: "It is a misunderstanding. There's no minister that says Estonia is going this way. I think that the idea that we would have a kind of parallel currency won't happen." As well, he found very skeptical the idea that some private-sector solution can change the equilibrium of financial system inside the country (Treeck, 2017).

 B) Madis Muller

The response from Madis Muller is even more skeptical and critical then response from Ardo Hansson. His message is next: "I think that there may be any solutions that could work, but our main message is that we cannot, as an Estonian state, create any other kind of money as

long as we are in the euro area," As it seen from Muller's statement, he emphasizes that there is no option for euro estcoin due to the reason that Estonia is a member of European Union. However, he does not deny two other options. His thought is if it brings benefits to Estonian state and economy. His main concern is that cryptocurrency can jeopardize the traditional financial system (Aripaev, 2018).

III. European Central Bank

Mario Draghi is a president of European Central Bank. He commented the Estcoin proposal during press conference taking place at Frankfurt am Main in 7 September, 2017. (ECB website) His answer is next: "No member state can introduce its own currency; the currency of the eurozone is the euro." (Mario Draghi, 2017) By this answer, it becomes clear that ECB does not tolerate the idea of euro estcoin (third variant).

Political perspective

In this thesis the main political reaction identified was from Jüri Ratas who is current Prime Minister of Estonian Parliament. The author collected information from two articles published on Bloomberg platform and CNBC platform.

The article on Bloomberg was published by Ummelas (2018) and it was the first one. It provides more general information identifying that Juri Ratas urges caution about the idea to establish a crypto currency. However, he admits that the Cabinet of Ministers has not yet considered the idea of Estcoin seriously.

The article on CNBC was published by Sedgwick and Cutmore (2018) 3 days after, in January 26, 2018 and it provides more detailed information about the opinions of Juri Ratas concerning Estcoin. He admits that Parliament is doing a lot for development of digital society and thus he considers the idea of Estcoin to be a good challenge for Estonia. As well, he issued a concern about the security of such project.

3.2 Discussion

Second chapter is a dedicated to a discussion. It is divided into two parts.

First part provides an analysis of Estonian state approach to cryptocurrency based on the theoretical framework of state approaches. Second part provides analysis for adoption of Estcoin in Estonia based on the decision factors theoretical framework.

3.2.1 Estonian state's approach to cryptocurrency

This part provides an evolution of development of Estonian state approach to cryptocurrency using Lansky (2018) classification framework provided in a theoretical part of this thesis. The state approach means the attitude of public authorities to cryptocurrencies. According to the framework developed by Lansky (2018) there are two most important actors that have an influence on the attitude of the state towards cryptocurrency related activities. These are government and public authority that is responsible for supervision over financial institutions within a state. In the case of Estonia, these two are defined as Government of Estonia and Estonian Financial Supervisory Authority (EFSA) respectively. The EFSA performs official financial regulation function approved by the Financial Supervision Authority Act document issued by the Government of Estonia.

To begin with, the EFSA was established on 1 January 2002. Before this date, the financial regulation over Estonian financial institutions had been taken by three institutions called the Banking Supervision Authority of Eesti Pank (BSA), the Insurance Supervision Authority (ISA) and the Securities Authority. The Banking Supervisory Authority institution was launched in December 1991 and started to perform its regulative functions from spring 1992. The main task of BSA was to provide stability of the banking system within a state and maintain solidity of Estonian monetary system in particular. The Insurance Supervision Authority (ISA) and the Securities Authority were established on 1 January 1993 and on 1 January 1994 respectively in the domain of Ministry of Finance of that time. The main task of the ISA was to provide supervision in the field of insurance and security activities for the banking sector (EFSA, 2018).

As it seen, the financial regulation in Estonia was distributed between three actors. During the next ten years of work these institutions had been performing their functions with a good degree of performance; however, it became essential to review the situation because of an overall integrative confluence of financial markets and services in Estonia. Due to this reason the committee that was composed of the representatives of three institutions mentioned and

Eesti Pank (Bank of Estonia) presented the draft of the Act providing information about establishing single supervision authority on 16 October 2000. Eventually, the Parliament has approved the draft and the Financial Supervision Authority Act was adopted on 9 May 2001, and an appropriate institution was established. (EFSA)

Nowadays the EFSA performs a state supervision over the financial sector in Estonia. All financial actors from banks, investment firms, pension funds to payment service providers and electronic money institutions operating in Estonia are authorized by the EFSA. Its main field of activities includes areas related to preventing money laundering cases, controlling e-money institutions, securities market and insurance mediation, supervising banking and consulting over virtual currency activities. Due to a specific topic of this thesis the author analyses the relation of the EFSA to virtual currencies (refers to cryptocurrency) only.

Starting from the emergence of virtual currencies, the EFSA has been performing analyzing and warning functions only. According to the information taken from the official website, the first warning came up on 5 February of 2014 where the EFSA officially states that does not provide the supervision over virtual currency schemes such as Bitcoin and related cryptocurrencies. The EFSA identifies its awareness of virtual currencies (refers to cryptocurrencies) and provides a reference on warnings issued in 2014 by the European Banking Authority about the risks and benefits from using cryptocurrencies (EFSA 2014). Later, on 24 August 2017 the EFSA provides an explanation of key concepts in the area ICO and issues recommendations concerning possible risks for investors. These risks are fraud, speculative investments, permits of high yields and international scope of ICO activity (EFSA 2017b).

The last official statement was published on 12 September 2017, where the EFSA presents an explanation about the legal status of the ICO and provides comprehensive detailed guidance for cryptographic traders and ICO entrepreneurs (EFSA 2017a).

Based on this information the author provides an evolution of Estonian state approach to cryptocurrency based on the framework suggested by Lansky (2018).

Level 0: Ignoring.

Estonia skipped this level.

Level 1: Monitoring.

Estonia had been on this level from 5 February 2014. On this date, the EFSA issued a statement that it aware of cryptocurrency existence and does not provide any regulation on this due to the reason of absence of legal framework.

Level 2: Recommendation

Estonia had been on this level from 24 August 2017. On this date the EFSA posted comprehensive summary of warnings against risks (Group 2A) and in the same statement presented cryptocurrency potential (Group 2B).

Level 3: Guidance

Estonia has been on this level from 12 September 2017 up to the present. During this time the EFSA issued a comprehensive guidance which posed that cryptocurrency is subject of AML (Group 3A). As well, cryptocurrencies are considered to be assets and therefore profits from holding or selling them is taxed according the rules of Tax and Customs Board (Group 3C). As well, there is a tax applied from cryptocurrency mining (Group 3E). Cryptocurrencies in Estonia are not subject of VAT (Value Added Tax) (Group 3B) and gambling tax (Group 3F).

As it seen, currently Estonia remains at the level of guidance (3) starting from 2017, because the EFSA does not provide official license for cryptocurrency-related type of business. Contrary to Lansky (2018) who ranked Estonia in this category (3) in 2016, the research provided by the author of this thesis rather shows that Estonia moved to the category of guidance only on 12 September 2017. Indeed, on this date the EFSA issued a comprehensive guidance on how to govern cryptocurrency. Therefore, it would be reasonable to assume that emergence of Estcoin can become a catalyst in fastening the process of moving Estonia to the level of regulation. Therefore, next part of empirical part of the thesis will be devoted to the discussion for adoption of Estcoin in Estonia.

3.2.2 Decision factors for regulation and adoption of Estcoin in Estonia

This part is dedicated to the discussion on how next decision factors suggested by Davies (2018) can accelerate the movement of Estonia from the stage of guidance to the stage of regulation and adoption of cryptocurrency at state level. It also provides more detailed

description of regulatory situation in Estonia at the present time from the perspective of taxation, criminal behavior and monetary policy.

- Tax factor

It is common fact that different countries have different guidelines and regulations. Currently, the tax policy in Estonia is considered to be favorable for companies involved in cryptocurrency-related activities. At the year 2018 private income tax rate and corporate income tax rate is 20% (Tax rates 2017). According to the Income Tax Act issued by Estonian Supreme Court in May 1, 2018, cryptocurrency is considered to sort of asset and therefore, cryptocurrency transactions are treated as traditional financial transactions in terms of taxation.

Taking into consideration these facts, it will be relevant to conclude that Estonia has developed a reliable tax policy which eliminates tax evasion as a common risk in cryptocurrency related activities. Current tax regulation on cryptocurrency in Estonia provides gains for state in terms of corporate income tax (if it is a company that performs cryptocurrency activities) and private income tax as well. The launch of Estcoin project will provide an additional source of tax payments and facilitate the trend of taxing digital transactions in Estonia.

- Crime factor

Estonia aims to provide the most reliable and safe business environment for cryptocurrency related activities and that is why law enforcement is required to provide continuous updates in existing regulation framework. At the present time, cryptocurrency transactions are considered to be a legitimate business activity in Estonia, because they are subject to Anti-Money Laundering and Terrorism Finance laws (EFSA 2017a). That actually means that Estonian law system provides a clear verification of cryptocurrency-related activities and eliminates the possibility of commitment to criminal activity such as money laundering and contraband transactions. According to last updated version of the Anti-Money Laundering Act and Terrorism Finance Act issued by Estonian Supreme Court on 01.01.2018, cryptocurrency transactions are defined as "services of exchanging a virtual currency against a fiat currency" in Estonia. Due to this reason, companies that aim to provide this type of activities are considered to be a "providers of alternative method of payments" and are

lawfully required to proceed with authorization procedure done by Financial Intelligence Unit (EFSA 2017a).

Taking into consideration these facts, it will be relevant to conclude that Estonia already has a relevant state authority responsible for authorization of companies aimed to provide cryptocurrency related services. However, it is not possible to dispute that Lansky (2018) was mistaken when put Estonia under the level of guidance. This is due to the reason that virtual money (refers to cryptocurrency) are not the subject of supervision by main financial supervisory authority in Estonia. Financial Intelligence Unit is an independent unit of Estonian Police and Border Guard Board exclusively, and it does not perform supervision function (FIU 2018). The launch of Estcoin project in that case will facilitate the movement of Estonia from the level of guidance of cryptocurrency to the level of its regulation and possible integration at state level. As well it will be continuous accelerator for law enforcement to update and enhance its own technological innovation in terms of identifying criminal behavior in Estonia. (Lansky, 2018)

- Public trust factor

Public trust is an important factor when is related to cryptocurrency-related activities. As it was already mentioned, cryptocurrencies provide a certain degree of instability and uncertainty due to their specific nature. Therefore, the main task of government that wants to give permission for businesses to provide cryptocurrency services is to establish a regulation framework in a way to save a trust of its society.

Estonia is famous for its tech-friendly and innovative startup culture. Starting from the time when e-Residency program was launched, Estonian government put a lot of efforts in order to make the country attractive for opening a business. According to Startup Estonia statistics, in 2017 there was substantial growth of people employed by startups, what actually means that young generation does not afraid to work in this innovative but still unstable field. By this, it is possible to assert that Estonians have a high level of public trust to their government even though they know about the risks. The launch of Estcoin project has good potential to enhance the public trust of Estonian people by giving them opportunity to make their own impact in the project.

- Monetary and fiscal policy factor

Monetary and fiscal policies are important vehicles of economic activity of any country. Once Estonia joined the European Union in 2011, it became a part of the Eurosystem which provides the establishment of the single monetary policy over all countries-participants (Eesti Pank 2018). The Estonian monetary and fiscal policies are aimed to provide price stability and support a well-developed economic environment and high employment in order to ensure competitiveness of the economy at global level.

Cryptocurrencies, due to their decentralized nature does not apply under the Estonian and European monetary and fiscal policies and that why are not considered as money. That is why they can bypass existing monetary channels what can have a negative influence on economic situation of the country. In order to solve this problem, government should think on how to unite existing monetary and fiscal policies with benefits of cryptocurrency technology. The launch of Estcoin can be an accelerator of this process. However traditional institutions like Bank of Estonia are having a lot of criticism towards such decision what can slower the possible implementation of the project.

• National currency liquidity factor

National currency liquidity plays an important role in maintaining of economic activity. Since Estonia joined the EU, the country has been put a lot of efforts to keep its financial sector well capitalized and stable in order to provide attractive environment for both local and foreign investors. According to the Baltic Times (2018), Estonia uses both regional and global approaches when developing its capital market what actually means that regional banks approached to find financings from local deposits as well instead of only relying on funding from their partners like Swedbank and LHV Bank. Such measures contribute to increase of liquidity of euro in Estonia.

As it was already mentioned, due to their volatility and uncertainty cryptocurrencies can create a negative effect on economic activity of a country, influencing currency liquidity as well. However, there may not be a case with Estcoin due to few reasons. First reason is laying in the fact that Estcoin is going to represent not that much of digital currency, rather digital token, what actually means higher stability and wider specter of opportunities. Second reason is laying in the fact that estcoins are going to be traded from the e-Residency platform that already has an enormous influence on Estonian financial sector. Therefore, if the launch of Estcoin project will be successful in terms of investments so investors will be convinced in

its utility, then estcoins can get a high value, what consequently means the positive effect on national currency liquidity and overall Estonian economic activity.

• Deflation factor

Deflation either as inflation creates economic problems in the long term perspective. According to the Ministry of Finance of Estonia (2017), the ratio of GDP deflator had decreased what actually means that current macroeconomic and microeconomic situation stabilized to its desired equilibrium.

The successful launch of Estcoin has to provide estcoins with value that increases over the time. There are two options how to manage with cryptocurrencies with increasing value: after the purchase one can reserve the coins or continue spend them at the present or future time. In the first case estcoins can function as a store of value where supply will be limited because demand does increase slowly. In second case esctoins will function as active medium of exchange with supply that be adjusted to demand.

3.2.3   Concluding remarks

To summarize, the empirical part of this thesis provides analysis of case study of Estcoin project. The author used two frameworks, one was aimed to provide the definition of Estonian state approach on cryptocurrency related activities whereas second was aimed to examine Estcoin project from the perspective of possible catalyst to move state to the level of regulation.

As it seen, the decision factor analysis shows that current regulatory situation can be considered as favorable for implementation of Estcoin. Being at the level of guidance, Estonia manages to support innovation activities within private and public sector by clever regulative framework. Even though financial institutions pose some critics, there is no absolutely negative reaction on Estcoin as a project.

CONCLUSION

To sum up, it is important to provide the answer to the research aim posed in this research paper. At the moment Estonian state approach to cryptocurrency is at a level of guidance what means that there is still no stable regulation framework for controlling the activity of cryptocurrency market. However, Estonia has favorable regulation trends due to the fact that its business and legal framework is constructed in a way to support and enhance developments in its digital infrastructure.

What is about Estcoin project initiative, it is necessary to admit that if implemented it has good potential to move Estonia from the level of guidance to regulation. After providing decision factor analysis in the empirical part of this study, the author can claim that it has all chances to be launched. The Estonian government has a good attitude towards startup ecosystem what can be proven by an implementation of e-Residency program on a state level and its continuous promotion.

To provide a more comprehensive summary of the Estcoin project, the author uses a method of SWOT (strengths, weaknesses, opportunities and threats) analysis in order to outline main key points at the present time. At this stage SWOT analysis provides more recommendation type of analysis due to the limitation in information sources available. The short version of SWOT analysis is presented in Appendices section.

Strengths

The main strength of the Estcoin project is its innovative business idea that has very good potential to become next successful startup sponsored by a state. The development team has solid experience in blockchain technology startups, because their previous startup e-Residency established a digital identity service which enables easy and secure access to electronic public services and business environment. Therefore, using this platform as a base for the launch of estcoins provides a clear advantage. As well, advanced IT infrastructure enables the idea that launch of estcoins will be technically possible to implement. What is about competition, it will be possible to claim that there are no competitors at regional level right now because there is no other startup team who implemented a program like e-Residency. What is about the competition on a global level, it is also possible to say that there are no competitors because there is no country in the world that already launched the ICO.

Weaknesses

The most important weakness of Estcoin project is that is going to be the first cryptocurrency startup of such level ever. If Estonian government will support it, it has to accept the risk of failure. And if Estcoin project will be a failure, there will be a strong strike on Estonian reputation as digital heaven country. The second concern is related to the fact that there is still unclear how money raised will be spent. Korjus (2017) highlights some possibilities but there is still no concrete answer.

Opportunities

One of the most promising opportunities of Estcoin project is its possibility to attract investors on both regional and global level. Due to the reason of comprehensive novelty of the project, it is possible to gain increasing spread of scalability on a global level for both Estcoin and e-Residency programs. As well, Estcoin project can facilitate the popularity of e-Residency program and provide higher international recognition of Estonia as a digital nation and "heaven for trusted ICO" (Korjus 2017a).

Threats

The most obvious threat for any cryptocurrency project is volatility of cryptocurrency market. At the present moment, capitalization is slowly growing; but its decline or any other negative occasion on cryptocurrency market can have a negative effect on Estcoin future value. The cryptocurrency market is a relatively untested market and assumptions are still main drivers of direction. The second threat is related to government reaction on Estcoin. As it was already mentioned, financial institutions have a skeptical view on this proposition, while parliament stays neutral. Due to the reason of relation of Estcoin to cryptocurrency, the banks can not apply the monetary and fiscal policy on future Estcoin transactions, what actually means that it will be impossible to control them. Third threat relates to security issues. Estcoin project will be implemented via Internet-based platform, what can create security problems and provoke possible hacker attacks like the one that happened in 2007.

By summing up, a future research on Estcoin project should definitely be conducted. It will be possible to conduct a research once there will be an official statement informing about the launch of the project. In order to do so, special paper informing about technical specificities of Estcoin has to be issued. In that case, it will be possible to narrow the course and conduct more precise and comprehensive research on the topic of ICO in Estonia in particular.

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APPENDICES

Appendix 1. SWOT analysis of Estcoin project

STRENGHS	WEAKNESSES
• Innovative business idea • Team with solid blockchain technology experience • e-Residency program as trusted service platform • Advanced digital infrastructure in Estonia • Absence of competitors	• A first start-up of such level ever • Unclear how money raised from ICO will be spent
OPPORTUBITIES	THREATS
• Investment in a country • Internalization • Scalability • Making Estonia "heaven" for trusted ICO projects	• Unwillingness of government institutions to support the project (by changing regulatory environment) • Volatility of cryptocurrency market can influence the value of estcoins • A relatively untested market where assumptions are still main drivers of direction • Security issues (refers to the internet dependence) • Program can provoke hacker attacks