University of Economics, Prague

Master’s Thesis

2019 Barbora Havelková

University of Economics, Prague

Faculty of Business Administration

Master´s Field: International management

Title of the Master´s Thesis:

How the Specifics of Blockchain Start-ups and their Funding Influence their Performance

Author: Barbora Havelková

Supervisor: doc. Ing. Mgr. Martin Lukeš, Ph.D.

D e c l a r a t i o n o f A u t h e n t i c i t y

I hereby declare that the Master´s Thesis presented herein is my own work, or fully and specifically acknowledged wherever adapted from other sources. This work has not been published or submitted elsewhere for the requirement of a degree programme.

Prague, May 13, 2019 Signature

Title of the Master´s Thesis:

How the Specifics of Blockchain Start-ups and their Funding Influence their Performance

Abstract:

Within the novel environment of blockchain-enabled fundraising, this thesis aims to extend the ICO literature by focusing on the post-ICO performance of the projects that get funded through a token sale. In the first part, the main specifics of this funding method were identified: lack of regulatory framework, unique technology utilization and a broad investor base. These specifics have the potential to be both beneficial and challenging in influencing the performance of start-ups funded via a token sale. To gain insight into how exactly they affect the success of the start-ups, a dataset of three hundred projects from the past four years was collected. In the scope of the empirical part, these projects were analyzed through regression models. In conclusion, the results suggested that this form of funding is more suited for projects that utilize blockchain in their own business models. It also facilitates funding of open source projects and projects in an early stage; however, the stage of the project should be carefully considered as it impacts the performance to a great extent. These and further findings from the empirical part can serve as a guide for entrepreneurs that consider blockchain-enabled funding to raise funds for their projects.

Key words: Blockchain, ICO, token sale, start-up, funding

Acknowledgements

I would like to use this opportunity to express my gratitude to my supervisor, doc. Ing. Mgr. Martin Lukeš, Ph.D., for providing me with the necessary guidance throughout the writing of this Thesis, for his valuable advices and suggestions.

At the same time, I would like to thank Tom Counsell for his counselling, support and encouragement that enabled me to finish the thesis.

List of Abbreviations

ICO	Initial Coin Offering
IPO	Initial Public Offering
VC	Venture Capital
P2P	Peer-to-Peer
SEC	Securities and Exchange Commodities
ETH	Ethereum Token
BTC	Bitcoin Cash Token
UT	Utility Token
ST	Security Token
ROI	Return on Investment
MVP	Minimum Viable Product
KYC	Know Your Customer
STO	Security Token Offering
IEO	Initial Exchange Offering

Table of Content

1. Introduction 1
2. Overview of the capital market landscape 4
   2.1. Financial market context 4
   2.2. Crowdfunding 6
   2.3. ICOs and other forms 7
3. Mechanics of ICOs 10
   3.1. Technology 11
      3.1.1. Smart contracts 12
      3.1.2. Ethereum smart contracts 13
      3.1.3. Tokens 14
      3.1.4. ICO technical process 15
   3.2. Economic principles 17
      3.2.1. The Token role 17
      3.2.2. Utility and Security Tokens 20
      3.2.3. Scarcity and valuation in token sales 23
4. Specifics of blockchain-enabled funding 26
   4.1. Comparison 26
   4.2. Benefits and challenges of ICOs 28
      4.2.1. Potential benefits 28
      4.2.2. Potential risks and challenges 31
5. Methods 34
   5.1. Research question and hypotheses 34
   5.2 Data collection and analysis 39
      5.2.1. Variables 39
      5.2.2. Sample construction 41
   5.3 Statistical Summary 42
6. Empirical Analysis 46
   6.1. Financial Measures 46
   6.2. Operational Measures 50
      6.2.1 External Rating 50
      6.2.2. Exchange listing 52
      6.2.3 Community 54
   6.3. Discussion 55
      6.3.1. Key findings and hypotheses evaluation 55
      6.3.2 Implications for start-ups 57
      6.3.3 Study limitations 59
7. Conclusion 60

Bibliography 62

List of Appendices 67

List of Tables

Table 1: Utility and Security Tokens Comparison 23
Table 2: Token sales models and their properties 25
Table 3: Comparison of Blockchain Funding and other Alternatives 27
Table 4: Benefits and Challenges of Blockchain-based funding 34
Table 5: Summary Statistics 43
Table 6: Correlation Matrix 45
Table 7: Financial Measurement in 6 Months 46
Table 8: Financial Measurement in a Year 49
Table 9: External Rating in 6 Months and in a Year 51
Table 10: Exchange Listing 53
Table 11: Community in 6 Months and in a Year 55

List of Figures

Figure 1: The Capital Formation Strategic Pyramid 5
Figure 2: Phases of ICO History in Numbers 9
Figure 3: Phase Six in Numbers 10
Figure 4: ICO Process and Actors 15
Figure 5: The Investment Cycle 36
Figure 6: Blockchain Relevance Flowchart 37

1. Introduction

The problematic of blockchain technology is in the center of attention for the past few years. It first caught the interest of a group of cryptography enthusiasts when it was introduced in the year 2009 as the foundation for Bitcoin, the decentralized currency with a trust system based on computing algorithm. It took several years for the technology to get broader recognition.

With the growing price of cryptocurrencies led by Bitcoin[1], the general public noticed this novel phenomenon of decentralized digital money. At the same time, companies started looking into the commercial applications of the underlying technology, blockchain, and how it can be used instead of existing centralized solutions.

To this day, the proven use cases for blockchain utilization are limited. However, one specific application is undoubtedly noteworthy. It is the use of blockchain as the means of capital transfer, an immutable record of ownership with potential for superior tracking and tracing.

Bob Greifeld, the CEO of the second-largest stock exchange in the world Nasdaq said in an interview for Forbes that "*[Blockchain] is the biggest opportunity set we can think of over the next decade.*" (Greifeld, 2015, para. 9)

The interview took place in 2015 and three years later, Nasdaq published their blockchain strategy (Nasdaq, 2018), focused on ways to incorporate blockchain technology in their current model of investing. The question stands, what are the implications for the purely blockchain based funding models. Those are currently the most prominent example of how blockchain is used in the capital market.

[1] First attempt to assign a value to Bitcoin was noted in 2010 when Lazlo Hanyecz offered on Bitcointalk's forum 10 thousand Bitcoins for two pizzas. After the emergence of so called altcoins (alternative coins) such as Litecoin or Ethereum, the price of Bitcoin saw a steep increase, especially in 2017, followed by even steeper fall.

The subject in the matter is the blockchain enabled funding, decentralized finance and its most frequently discussed form, Initial Coin Offerings (ICO). The resemblance with the term Initial Public Offering (IPO) signals the main purpose of ICOs: to serve as a mechanism for funding a start-up or a project in a public sale.

From January 2017, ICOs and other means of blockchain enabled funding exploded with the total amount raised annually reaching billions in both 2017 and 2018.[2]

Despite attracting notable attention from the capital market players, investors, and policymakers, there is still a gap in research mapping the dynamics of ICOs. Due to the novelty of the industry, there is not sufficient coverage of the topic in academic papers. Especially on how ICOs differ from the traditional ways of funding and subsequently, how these differentiations influence the start-ups originating from them.

The blockchain-based models challenge the traditional funding models, pledging to shift the power and open the capital markets to a broader audience. At the same time, the grey zone bears risks to all parties involved. Investors are less protected against their funds being stolen or lost and regulatory authorities are lacking a framework for their operations and means of monitoring the market. The primary focus of this paper would be taking the perspective of the last key party involved, the entrepreneur seeking funding.

Blockchain technology and its applications are often compared to the early days of the internet, with the shift of paradigm and disruptive potential. Similar to the hype around the internet start-ups at the beginning of the year 2000, there is probably a significant share of companies now originating from the ICOs that will fail in the near future. Starting a company in this environment is thus inherently risky business.

This paper aims to offer some clarity to the ambiguous early stage of the blockchain start-ups. The main goal of this paper is to find an answer to the research question:

[2] The exact numbers vary on different publicly available sites (ICOrating, ICObench), however, the general consensus is that the total amount raised was around ten billion in 2017 and 15% higher in 2018, reaching over 11 billion.

How the blockchain-enabled funding differs from the traditional funding forms and how these differences influence the performance of start-ups originating from ICOs.

Based on the answer, the paper will provide a recommendation for the entrepreneurs on how to leverage the specifics of blockchain based funding. This paper does not intend to provide instructions on how to succeed in raising funds through the token sale. Rather it focuses on the post-ICO performance and practices that ensure sustainable development in the future performance of start-ups.

The theoretical part of the paper is dedicated to providing a base for answering the first part of the questions. Through literature research and analysis of the technology and its economic aspects, the first part will serve for identifying the specifics of ICOs and other alternative forms of funding, facilitate through blockchain.

The empirical section will be building on the theory-based findings to formulate hypothesis answering the second part of the research question. The strive for transparency in the blockchain industry enables access to data on the start-ups fundraising process and their further performance. Even though their quality can be questionable, through triangulation and additional cleaning, a representative dataset can be constructed. This will be utilized for building regression models for testing the hypothesis.

Even though the targeted audience of this thesis are the entrepreneurs, the paper can potentially provide a base for further research, beneficial also for the regulatory authorities and investors looking into new investment opportunities.

2. Overview of the capital market landscape

In the early stage of their life cycles, the vast majority of the companies is not able to finance their operations internally. In order to build a self-sufficient venture with a sustainable revenue stream, entrepreneurs seek financial support from external parties. The capital or financial market is a place where the entrepreneurs meet with individuals and institutions offering their savings.

The capital market went through several ups and downs and as it matured, new models of fundraising originated. Up until recently, all the forms could be divided into two main groups, debt and equity financing.

2.1. Financial market context

In his book, *Raising Capital,* Andrew Sherman describes the evolution and the forms of fundraising. He starts with the origins of equity financing provided by institutional investors, Venture Capital, in the late 80s (Sherman, 2012).

Some of the basic principles of VCs are still valid today. The VC funds typically work as managers of a pooled external capital, collected from institutions such as pension funds or insurance companies. Venture capital is raised in a series of rounds, the most relevant in the context of this paper will be the Start-up stage and Seed or Early stage. In exchange for the capital, the VC fund acquire an ownership stake in the funded company.

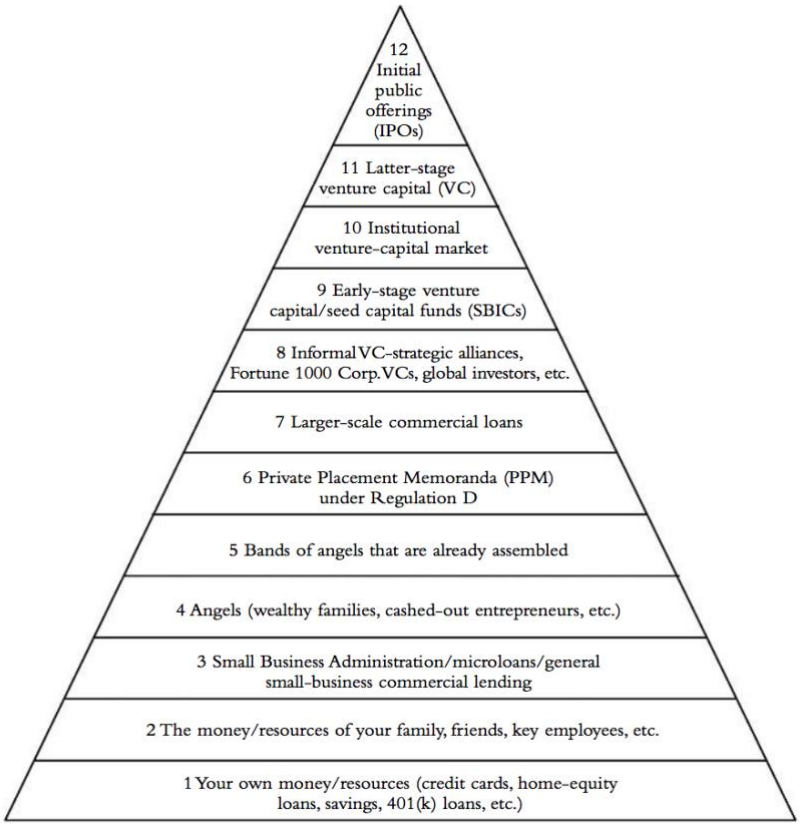
Another form of equity financing is Angel investors, wealthy individuals who unlike VCs invest their own capital but similar to VCs, require an ownership stake in the exchange. Angel investors typically invest $US 1 million or less and participate in the very early stage of financing and unlike seed stage funds, they typically cannot provide follow-on capital for the growth stage and late stage financing rounds.

Proceeding with describing the capital market landscape, the next party playing an important role are banks, offering start-ups loans through the other source of funding, debt financing. Unlike VC funds, banks do not require the entrepreneurs to give up any controlling interests in their business.

Due to the differences in the key aspects, the debt financing will be left out of the comparison and the paper will focus on the models as described by Sherman (2012).

Figure 1 presents the conventional ways of raising capital, ordered by how difficult it is to meet criteria to qualify for the funding. The list starts with companies financed by their own capital, followed with investments from friends and family and then covering different forms of the financing models.

Figure 1: The Capital Formation Strategic Pyramid



reprinted from *Raising Capital*, p.7, by Andrew J. Sherman, 2012

Banks and VCs still play a significant role in funding new ventures. However, after the global financial crisis in the first decade of the second millennium, the international financial system was affected to great extent. The crisis started by the US banks offering subprime mortgages at excessive risk and eventually spanning to the international banking crisis and global economic downturn. To avoid a rerun of the economic crisis, financial regulations were tightened, increasing the regulatory barriers for funding.

This situation was calling for new forms of financing for start-ups. And thanks to the increasing penetrations of new technologies, namely the internet, new forms were able to develop. Online platforms organized by private actors connected the supply and demand in the financial market in a new way, redistributing the power in the capital market.

As an alternative to debt financing, peer to peer (P2P) online lending platforms emerged[3], connecting directly the side of borrowers with lenders and narrowing the role of financial institutions to mere intermediates required by law.

The response from the equity financing perspective was even more revolutionary, opening the capital market to the broader public with the development of crowdfunding.

2.2. Crowdfunding

The origins of crowdfunding as a form of crowdsourcing can be tracked to the donation-based and reward-based crowdfunding organized as support for artistic projects directly from their fans (Ordanini et al., 2011). Later on, online platforms allowed for greater organization of the crowdfunding process. They facilitated the formation of new types of crowdfunding, among other the equity crowdfunding (Brandford, 2012), allowing entrepreneurs to advertise their projects, attract investors and raise funds.

Financial institutions still play a role in the whole process as banks or micropayment providers are in charge of clearing the transactions (Hemer et al., 2011), but the central facilitator is the online platform. Platform enables decrease of the transaction costs, simplify the search for investors and even provide a certain level of due diligence on the investability of projects on the platform.

The online platform helps the involved parties to overcome the issue of asymmetric information and thus enables expansion of the investor base, introducing the "Crowd" as the primary source of investment. The crowd consists of individuals or companies that engage in the crowdfunding campaign with an expectation of either future products

[3] The first lending platform was established in 2005 in the UK under the name Zoopa (Bachman et. al, 2011)

(reward-crowdfunding) or ownership (equity-crowdfunding). The crowd does not only provide the capital but also due to the sense of responsibility connected with financial commitment (Ordanini et al., 2011) an engaged community around the project, serving as a free source of promotion and feedback.

The equity-crowdfunding is the most sophisticated form, as the crowd has entitled a share of the venture and hence must be in compliance with security laws and regulations. The investors are entitled to receive information on the performance of the start-up, financial statements and quarterly reports. The complex conditions lead to restrictions to the originally opened crowdfunding environment and reintroduce intermediaries to the crowdfunding platforms.

For example, under the Regulation Crowdfunding, effective from May 2016, entrepreneurs can disclose their project details only on a password-protected part of just one approved platform of their choice. This reduces the reach of the promotional plans, restricting the communication on social media and the company's website to very general information. The investors are also limited in the amount they can invest annually, based on their income.

This may be the reason why are crowdfunding platforms recently looking into a new form of financing[4], a model that shares some aspects with their fundamental idea and introduces new concepts enabled by advancements in technology.

2.3. ICOs and other forms

The first utilization of the blockchain technology in fundraising, later labeled by the term ICO, was in 2013 in a project called Mastercoin[5]. The project itself was not very successful, what caught the attention of the market was how the funds for its origination were raised.

[4] One of the first crowdfunding platforms Indigo announced partnership with MicroVentures in order to be able to offer services to projects that want to use the blockchain based funding model.

[5] MasterCoin was first introduced in Bitcointalk thread in 2012, where its creator offered an improvement to the Bitcoin whitepaper. A year and a half later, he did the first ever ICO, calling it the "initial distribution".

Soon others followed, with the most notable within a year being Ethereum, raising in 2014 the equivalent of $US 2.3 million at the time in token pre-sales in its first 12 hours.

In the upcoming years, the number of ICOs grew exponentially. Boreiko and Sahdev identify in their paper five distinctive phases of ICOs, starting at the inception in August 2013 and ending in March 2018 (Boreiko & Sahdev, 2018) The phases are defined as:

1. "Prototypes" from August 2013 to August 2014
   In this first phase, there was only a small number of projects, one of them being the already mentioned Ethereum. In general, this phase is distinctive due to very low involvement of regulatory authorities. The investors were coming mostly from the communities of crypto enthusiasts.

2. "Early start-up" from September 2014 to May 2016
   In 2015, the first smart contract was executed on the Ethereum blockchain[6]. The term will be described in detail in the next section, however, it is crucial to mention it here, as it has paved the way for blockchain enabled funding.

3. "Late start-up" from June 2016 to May 2017
   The Ethereum network enabled projects to be built on top of its blockchain. The use of smart contracts within the new projects enabled the first fast increase in ICOs numbers. The regulatory authorities intensified efforts to establish regulatory frameworks, led by the US Securities and Exchange Commodities (SEC).

4. "Early growth" from June 2017 to September 2017
   The increased interest from regulators begun to affect the ICOs landscape, with some countries formulating limitations for investors and entrepreneurs, others banning the ICOs as a form of funding altogether. New forms of blockchain based funding emerged, attempting higher transparency and legal compliance.

[6] The first traceable smart contract was written for automatic fund distribution based on predefined rules in August 2015.

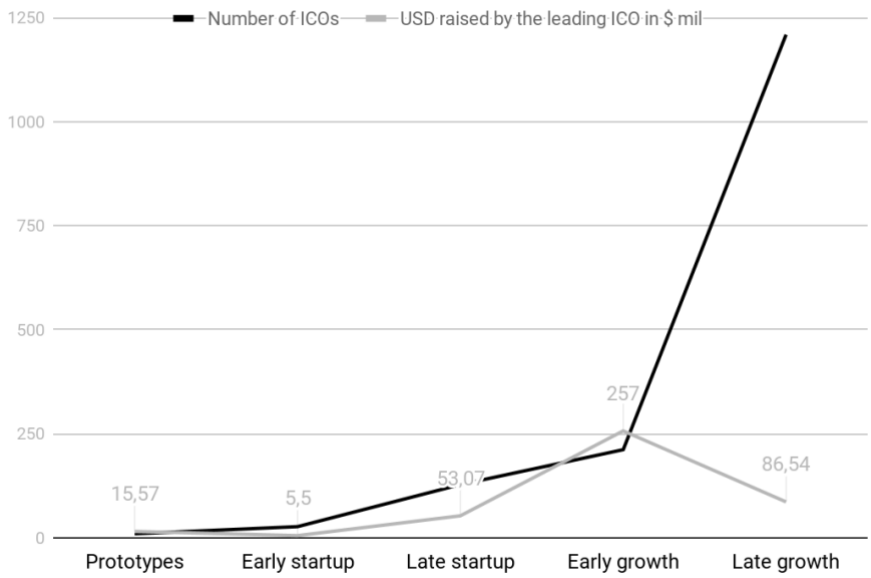
5. “Late growth” from September 2017 to March 2018

   In what Boreiko and Sahdev described as the final stage (Boreiko & Sahdev, 2018), the ICOs market saw the steepest increase in the number of ICOs and investors participating in token sales. There were more than a thousand new projects added in the quarter of 2018, drawing increased regulatory attention and raising questions about the legal character of the sold tokens.

Figure 2 illustrates the development of ICOs through the phases one to five. From the inception in summer of 2013 to the end of 2017, there was a steady increase in the number of ICOs followed by steep growth after September 2017.

To add a context to the numbers, the leading ICO of each stage was added to the chart, showing the maximum funds raised by that one ICO in every phase of the timeline. After the Ethereum outlier, there was also a growth in each phase, till the sudden drop in the last phase, even more significant considering the total of number of ICOs in that period. This drop can be considered a signal of how the next phase of the timeline will look like.

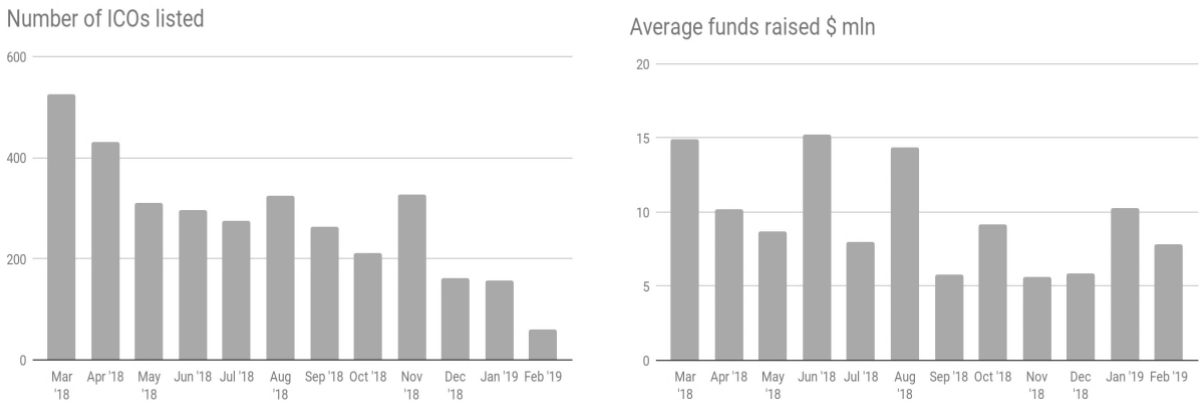
Figure 2: Phases of ICO History in Numbers



source: Boreiko & Sahdev, 2018; icodata.io, icobench.com

Adding a six stage to Boreiko's and Sahdev's timeline extends it from April 2018 till February 2019, the last complete month as of the time of writing this paper. This phase can be called "Maturing industry" as there are some signs of slowing down the blown-up growth trend, higher scrutiny from the ICO publishing sites and also increased effort from both regulators and market participants to create a regulatory framework for the market. Figure 3 presents phase six in numbers, the chart on the left showing the number of projects that applied for an ICO, the chart on right the average funds raised in each month of the phase.

Figure 3: Phase Six in Numbers



source: ICObech annual report 2018, monthly report January 2019 and February 2019

In the first chart, a decreasing tendency is evident, with fewer and fewer projects each month with few exemptions in August and November. The trend in "Average funds raised" is less apparent, however, even the best performing months are well below the average from the previous year, $US 24,4 million in 2017 (ICObench, 2018).

To be able to understand what the development of a new form of funding means for the entrepreneurs, it is key to understand the mechanics and implications of token sale.

3. Mechanics of ICOs

When talking about the blockchain enabled funding, there are two main areas that needs to be described in order to move further with the analysis.

Firstly, the basics of the technology enabling this form of funding. Secondly, the economic principles of token sales.

3.1. Technology

To describe the technological principles behind ICOs, it is necessary to briefly outline the fundamentals of the underlying blockchain technology.

This paper does not aim to describe how the computing algorithm works in detail, nor the technical limitations and requirements of different mining mechanisms and types of consensuses. There has been significant effort in the work of others to provide comprehensive description and analysis of the distributed ledger technology. Among others, "*Blockchain Basics"* introduces the topic to beginners without any prior knowledge (Drescher, 2017). "*Mastering Bitcoin: Programming the Open Blockchain"* proceed with instructions for more experienced readers who want to create their own blockchain (Antonopoulos, 2017) and highly technical description of the main concepts in "*The Science of the Blockchain"* is intended for already advanced readers (Wattenhofer, 2016).

For the purpose of this paper, it is sufficient to say that blockchain is a utilization of the distributed ledger technology. It is, essentially, a digital database of records, distributed across a network of nodes or miners who maintain the network security. Everybody in the network has a copy of the ledger which is constantly being updated with every transaction.

The transactions create a block, which is time-stamped and sealed by a hash, linking it to the previous block of transactions in the ledger. With every new transaction added, it becomes more complicated to attack and rewrite the chain of verified blocks (Nakamoto, 2009). The public ledgers are open and transparent for everyone to see the transaction flow, but the identities of senders and receivers are obfuscated.

The network participants are incentivized by block rewards and optional transaction fees to maintain the system, verify the transaction and provide the computing power to secure the decentralized network. The system permits low verification costs and hence enables

the network to verify single attributes and pieces of information, which was previously not cost effective. This facilitates features such as timestamping of transactions, proof of identity etc. (Catalini & Gans, 2016).

The book "*Blockchain, Blueprint for a New Economy*" introduced the concept of generation of blockchain (Swan, 2015), similar to the idea of generation of internet (DiNucci, 1999). The first generation, Blockchain 1.0 was using the decentralized ledger technology as an accounting tool for cryptocurrencies such as Bitcoin, verifying, recording, and facilitating transactions.

In what was defined as the "Early start-up stage" earlier in this paper, Blockchain 2.0 was introduced. It came with the idea of programmable money and self-executed contracts, called the smart contracts.

3.1.1. Smart contracts

The idea of automatically executed contracts triggered by predefined action has been proposed already in 1994, in the form of transactions executed by computerized protocols (Christidis & Devetsitiokis, 2016). A cryptographer Nick Szabo defined it a smart contract as "*a set of promises, specified in digital form, including protocols within which the parties perform on these promises*" (Szabo, 1996, Introduction section, para. 5).

Szabo identifies four main objectives of every contract. First is *observability*, the ability of the parties to observe if the conditions stated in the contracts are met. The second objective is *verifiability*, meaning that the parties are able to verify to each other that they fulfilled the contract. The third is *privity* of the parties ensured by the software, providing privacy and confidentiality of the contract. The last, fourth aspect, is *enforceability* of the contracts and its conditions (Szabo, 1996).

Traditionally, there are intermediaries ensuring that all four objectives are met, and the contract is carried out. With the transparency of blockchain protocol, its unbreachability, ability to timestamp every transaction and trustless character of the technology, the foundation for smart contracts on blockchain was laid out. These blockchain-enabled smart contracts then replaced the intermediaries with computing algorithm. And with Ethereum open platform, their broader adoption was ready to begin.

3.1.2. Ethereum smart contracts

Ethereum project built on the Bitcoin whitepaper but unlike Bitcoin blockchain, it enables developers to write their own programs on top of the Ethereum blockchain. By providing superior processing capability, Ethereum was able to build the foundational layer for smart contracts development.

Ethereum blockchain allows the developers to use Turing-complete virtual machine, called the Ethereum Virtual Machine, which executes the smart contracts. The open sourced programming language created especially for Ethereum, Solidity, provides the developers with a set of tools to build and deploy smart contracts and issue their own tokens directly on Ethereum blockchain (Buterin, 2013).

Currently, more than 80% of all new projects in the blockchain environment are based on the Ethereum blockchain.[7] The developers do not have to build their own blockchain when creating a new project, they can directly use the Ethereum blockchain. This simplifies and speeds up the whole process and also enables developers to take advantage of the decentralized character of already established blockchain. The security is ensured by thousands of nodes spread around the globe[8], maintaining the network and protecting it against malicious actors.

Another advantage of using Ethereum blockchain to build a new project is compatibility. Since the vast majority of current blockchain start-ups is developed using the Ethereum's Solidity programming language, most of the infrastructure is built to support it, starting with exchanges, through wallet solutions and additional applications deploying smart contracts.

---

[7] ICObench report mentions 88% market share of Ethereum as the ICO platform, ICOwatchlist states 82,46%. Bloxy shows the statistics for the Ethereum network, stating the total amount of ETH in crowdsales of 30,91 million. With the current prices (as of 12.3.2019), this account for circa $US 4 billion in funding for Ethereum based ICOs and crowdsales.

[8] According to etherscan.io, the Ethereum block explorer, there is over 7,5 thousand nodes as of time of writing (12.3.2019). The highest concentration is in the US, with around 33% of all nodes, second in Germany with 13% and third in China, controlling around 8% of all nodes.

Ethereum provides a list of standards, currently the most prominent being ERC-20 standard, that provides the developers with a common set of rules. These technical guidelines and specifications have to be met in order to create a token that is supposed to function within the Ethereum environment.

3.1.3. Tokens

To better understand the ecosystem of blockchain start-ups, it is necessary to know what the term "Token" represents and what is the role of tokens in the funding process.

In general, tokens represent a scarce digital asset that can be transferred over the internet. From a technical point of view, tokens can represent any fungible and tradable asset (Buterin, 2013). In the mechanism of ICOs, tokes serve as the fuel and medium of exchange.

Tokens can be built on new blockchain as its native token. A prominent example is the Ethereum token (ETH) that serve as a tool for drawing the services on Ethereum platform. In order to deploy a smart contract on Ethereum blockchain and create a token, the developers need to pay a fee in ETH.

Another option is to create a token from existing blockchain through a fork of that blockchain. Example here could be Ethereum Classic or Bitcoin Cash (BTC), both originated from a hard fork of the well-known blockchains. This means that a part of the community around BTC or ETH decides to deploy some changes to the monetary policies of the currency. They then continue a different path of the main chain and create a different version of the original coin.

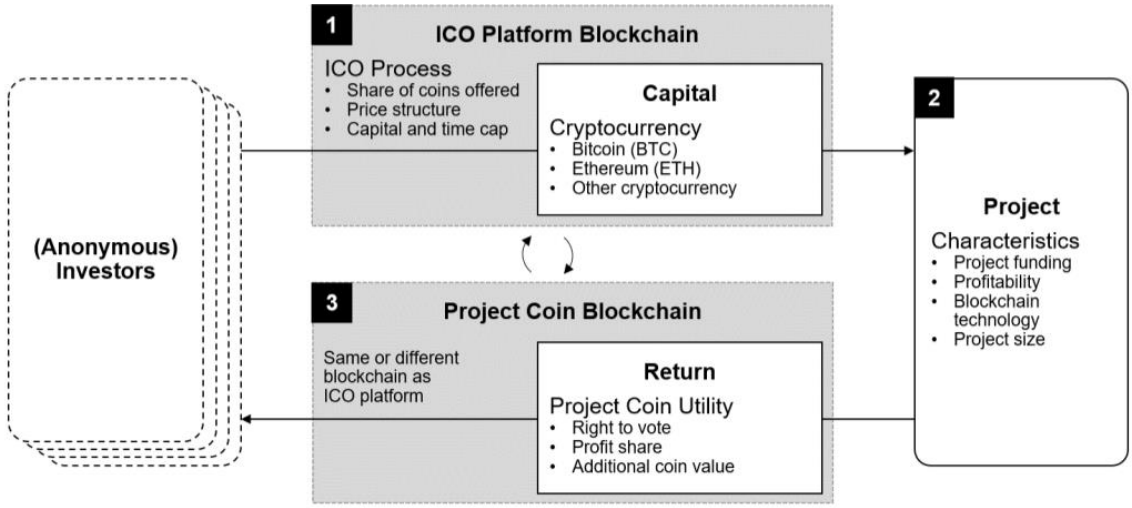
The third option is to create a token build on top of an existing blockchain. These are the already mentioned ERC-20 tokens, the prevailing majority of tokens going through an ICO. Those tokens are in their initial phase not created by mining. As the underlying blockchain is Ethereum, with already established distributed network, the mining is not necessary for maintaining the blockchain security. Those tokens are "pre-mined" or created in a fixed amount and then typically sold in the open campaign, ICO.

The token exists only in a digital form and the buyers, in fact, buy a private key. By a private key it is understood 256-bit number granting the owner access to the fungible digital asset (or token) that is stored on the underlying blockchain. These keys are tradable and can be sent without the content of an issuer, if not specified otherwise.

3.1.4. ICO technical process

Now that the terms smart contract and tokens have been established, the ICO process can be described. Figure 4 maps the essential parties involved in the ICO process. Starting 1. on the *issuance platform* where in exchange for initial capital, the 2. *project* is created with distinguish characteristics and proceeding to step 3. in which the *project-specific coins* are sold to (anonymous) investors. The newly issued tokens can bare specific characteristics determining its utility, as represented by the box "Return". These will be discussed below in the economic section.

Figure 4: ICO Process and Actors



reprinted from *Initial Coin Offerings (ICOs): An Introduction to the Novel Funding Mechanism Based on Blockchain Technology*, p.2, by Chanson et al., 2018

There can be additional players involved, such as ICO listing sites that support the marketing campaign for an ICO and communicates the event, or advisors and companies providing support services for the project. However, the parties illustrated in Figure 4 represent the basic minimum necessary for blockchain based funding.

There is no need for any intermediary or a clearing service involved, and the process can be fully automated with the deployment of smart contracts.

Meanwhile, in the crowdfunding process, there is an additional player in the form of a centralized platform, such as Kickstarter. This intermediary requires trust from all involved parties, as well as fees for the services of ensuring the fulfillment of the terms of a contract between the crowdfunders and the capital seeking venture.

The smart contract, once set up correctly, can ensure that as well, without any trust or additional capital required. The technological process from sending ETH, through writing the token and ICO smart contract to launching the crowdsale can be conducted in a matter of a few hours (see Appendix 1).

However, this is without any tests of the code or security audits. The smart contract is controlling the price of the tokens during the whole ICO process, as well as the mechanics of funding. It can be programmed to stop accepting the funds after a certain maximum goal (hard cap) or to automatically return donations in case that a minimum goal is not reached within a certain period. Holding such a crucial role, there should be appropriate time allocated to testing the code.

Ethereum based smart contracts are deployed on the widely distributed network and when done correctly, they are tamper-proof, secure and stored in the blockchain forever. Nevertheless, with the evolving demand and increased capital involved in smart contracts, the means to attack[9] them evolved as well, so the proper auditing is necessary.

[9] An example of crypto-attack was the DAO, an experiment in algorithmic governance run by a smart contract on the Ethereum blockchain. The ultimate goal for it was to become a decentralized venture capital fund for crypto-projects. In June 2016, The DAO was hacked, and the attacker stole 3.6 million ETH. The address of the attacker was identified, but the identity not, and the funds could not be retrieved.

3.2. Economic principles

Without going into details, the description of the technological background of blockchain based funding resulted in three main findings regarding its characteristics. The underlying technology has the potential to make the blockchain based funding:

4. Automated: Thanks to the smart contract, the intermediary can be eliminated and the whole process can be conducted in a completely automated manner.

5. Secure: The transparency and temper proofed nature of blockchain holds the potential to make the funding process more secure. When done properly and on an established blockchain with a robust network of nodes, the distributed technology can provide an improved level of security.

6. Easy to execute: The current infrastructure offers a solution to carry out the whole technological process in fast and straightforward manner. Additional time and effort can improve the security or add more sophisticated features to the smart contract but is not essential for the process.

The prevailing platform for issuing an ICO and/or creating a token is Ethereum with a protocol that enables writing smart contracts, is secure due to its extensive network and provides simple step by step guidance through the whole process.

However, the underlying technology is only a part of the whole process and when considering blockchain utilization in the funding process of start-ups, it is necessary to take into consideration the economic principles and mechanism.

3.2.1. The Token role

In the description of the underlying technology, the term Token was introduced. When describing its role in the ICO process, the token's utility was mentioned. This refers to special characteristic that can be baked into a token and that further extend its functions within the project.

At this point, it is crucial to distinguish between coin and token. Coin in terms of a cryptocurrency coin is a digital currency, encrypted using cryptography and typically issued on top of a native blockchain. The purpose of a coin is to act as a monetary unit, medium of transfer, store of value and a unit of account. There can be some specifics to different coins, for example, increased privacy of transactions as in Monero, or speed and scalability as in Litecoin, but the purpose stays the same.

The token, as introduced in the technology section, has broader functionality. In general, a token can be described from the business perspective as a unit of value created by organizations with the purpose of self-govern their business model. Tokens can be used by the users/customers to interact with the organization's' products and services. It can also facilitate revenue sharing and distribution to the stakeholders.

In the context of blockchain enabled funding, tokens play a central role, as well as in the later life cycle of the blockchain start-up. Based on the research in the business models and the available literature, six different roles of a token can be distinguished, each with its own purpose and features. These are:

1. Token as a Currency

The scope of the first role restricts the token to what was described as the coin. Some authorities distinguish tokens with the sole role of serving as a currency and assign it its own category, Payment tokens (FINMA, 2018). The token features are to be used as a payment or transactions unit, potentially enhanced by additional features. The costless verification opens opportunities for microtransactions and the decentralized trustless nature of blockchain enables frictionless payments with a low barrier for end-to-end transactions.

2. Token as a Value Exchange Unit

Tokens inside of a specific environment (market, platform, application) can allow users to earn value by either co-creating the ecosystem with fulfilling active tasks (searching for a bug in an application) or by growing its community on social networks. The desired purpose of this token-based bounty systems is to create an internal economy that supports the token valuation.

3. Token as a Pre-paid Subscription

A popular role for a token is to serve as a toll for services on the blockchain infrastructure. Ethereum is one of the examples when in order to create a smart contract, you need to deposit an amount of ETH (see Appendix 1). The additional purpose is to involve users by granting them a personal stake in the ecosystem.

4. Token as a Part of the Product

The fact that token is a digital asset and can be programmed opens possibilities for assigning it a function in scope of the product or a service offered by the start-up. The best example are non-fungible tokens that are used as collectibles.[10] The purpose of the token is to enrich the user experience.

5. Token as a Right

Blockchain architecture enables digital identity verification and with this, there can be rights tied to the token ownership. These rights can have various forms, from access rights (granting physical access to real estate, entrance to exclusive events or access to discounts and special offers) to governance or voting rights. The purpose of the token as a right is to bootstrap the engagement of token owners.

6. Token as a Source of Earnings

The last possible role of the token is to serve as a tool for redistribution of revenue. This can be in the form of profit sharing, dividends for token holders or redistribution of the income resulting from an increase in the token value.

One token can hold more than one role from the list above. There can be several features enabled in a company token and at the same time, a company can be constituted on a two-token model, where each token has a different role.

[10] Most prominent example is the Ethereum based game Cryptokitties, in which each token represent unique digital character. New tokens can be created by "breeding" two tokens, each token has its special characteristics that determines its virtual avatar and each action (breeding, selling new generation of tokens etc) require certain amount of Ether to be paid to miners to process the transaction.

It is crucial to understand the role of the token and its actual purpose, as it has several implications for start-up future performance. What is more, the nature of the token is crucial for the regulatory authorities.

Even though some authorities group the tokens into three groups, Utility, Payment and Asset tokens (FINMA, 2018), vast majority of the existing sources identify two groups, Utility tokens (UT) and Security tokens (ST) (among others Gritz, 2018; Li, Man, 2018; Amsden, Schweizer 2018; Lyandres, Berardino Palazzo, Daniel Rabetti, 2018).

3.2.2. Utility and Security Tokens

The fundamental principles from the financial market can be applied to help understand the difference between both models. Independently from the underlying technology, the determination of whether an asset is or is not security boils down to a test that is used in the capital market for decades.

Howey test

The Howey test was articulated in 1946 by the Securities and Exchange Commission in the US and consist of four main conditions. Once all these are fulfilled, the transaction under consideration is evaluated as an investment contract. As such, it is a subject to securities registration, which should be designed to protect the involved parties.

The conditions are:

1. The contract is an investment of money
2. The investment of money is in a common enterprise
3. There is an expectation of profits from the investment
4. The expected profit comes from the efforts of others

The four-part test was further specified in later cases. The first condition was expanded to cover an investment of other assets. The second condition was discussed by several authors (Monaghan, 1995; Bordeman, 2005; Gordon III, 2011) due to the ambiguity of the term common enterprise. However, the first three conditions remained to be defined in broader terms and the final determinant remained the fourth condition.

There are two aspects to the fourth condition that need to be specified. First, the fact that the profit is generated by human effort and second, the prerequisite of the effort being outside of the investor's control.

To use an example, purchasing a collectable asset such as a painting by Picasso can eventually mean realizing a profit from that investment. However, that does not mean that the painting is security. Applying the fourth condition, it is clear that the asset did not generate profit due to the extra effort invested by a third party. An increase in demand for the painting increased its price at the market.

Equity crowdfunding platform (Crowdcube, AngelList, Equity Net, FundedByMe) and reward-based platform (Indiegogo, Kickstarter) can be used to illustrate all four conditions of the Howey Test. Even though both first and second conditions are met for both types of platforms, the third condition is the breaking point. Whereas in the reward-based platform, the money is invested in a campaign without expectation of money back from that campaign, investment crowdfunding campaign comes with a clear expectancy of profit. The reward-based platform thus should not be considered securities. In the case of equity-based platform, the fourth condition is applied and when met, the investment is deemed security.

Generally speaking, the Howey Test aims to assess the nature of transactions not by its name or form, but rather by the economic realities, thus if and how the profit is realized. That is why the test is so relevant for assessing the nature of crypto-tokens. This novel environment is still lacking standardization and unified terminology that would assure clear signaling of the type of investment scheme represented by the token. The basic framework of the Howey test can offer a balance of efficiency and accuracy (Gritz, 2018).

The main takeaway for the blockchain based funding process is, that pure tokenization does not turn the underlying asset to security. There are four conditions to be met and the key condition to consider is whether the profit comes from the work of others.

The Howey Test is used by the regulatory authorities to assess the nature of the token, which then determines how the token should be handled in relation to security regulations.

To determine the role of the token in the business model, this paper proposes one more point of view.

The nature of the tokens can be determined based on their intended (and realized) position in two parts of the market: capital and product. In the capital market, the tokens are used to fund a project and the investor is buying the token hoping for a return. The central theme in the capital market is the Return on Investment (ROI). In the product market, buyers participate in the token sale in order to consume the product/service, without an expectation of a profit.

This distinction should in theory be sufficient to divide tokens to Utility and Security tokens, the first operating in product market, second in capital. This would then have clear implications for both parties regarding the expectation from the token sale.

From the *entrepreneurs'* point of view, demand for a Utility token would help verify the future demand for the product and create a built-in customer base. Demand for a Security token would then mean trust demonstrated in the team, technology and the business model, access to capital without sacrificing equity. The projects are selling tokens in the hope to create an engaged community, one that is aligned with the project's goals and incentivized by a share in its growth.

From the *investors'* point of view, they buy a Utility token in the case that they fancy the product and want to be granted access to it, once it is on the market. In the case of the Security tokens, investors buy them because they expect a future profit. They offer their capital and in return, they anticipate the token price to increase through the effort of the team.

However, in the current environment, the distinction is not so clear. Some investors are buying utility tokens and analyze their investment as if they were security tokens. Meanwhile, some companies are advertising their security tokens as utility tokens. And even when the terminology is initially correct, the fact that utility tokens can be traded on a secondary market causes capital and product market to intersect. The tokens are bought in order to make speculations on their price and their initial purpose is lost.

As mentioned previously, the industry calls for standardization of the terminology, for the sake of all parties involved. For the purpose of further analysis, the table below summarizes what was described in the previous chapters about the token role, nature of the token and its position at the product or capital market.

Table 1: Utility and Security Tokens Comparison

	Utility Token	**Security Token**
Purpose	Value-exchange-unit, Currency, Pre-paid subscription, Part of the product	(Ownership) Right, Source of Earnings
Market	Product market	Capital market
Token Issuer Expectation	Demand verification, Built-in customer base	Capital, Engaged community of investors
Token Buyer Expectation	Access to product	Future profit
Derives Value from	Usability of the product, Valued as a product	Underlying tradable asset, Valued as an investment
Regulatory Implications	Unregulated token sales	Same regulations as for Securities

source: *Author*

3.2.3. Scarcity and valuation in token sales

With the role of the token and the basic categorization to utility and security tokens covered, the pricing and valuation of tokens can be addressed. In Table 1, the base of valuation of both types was outlined. It is the usability of the product for utility tokens and underlying asset to which the tokens grant ownership for security tokens.

Proceeding further with the economic principles behind the token sales, the last section is focused on the way the token price is affected by the perceived scarcity and the model token sale models. Since this paper is not intended as a guideline on how to structure a successful (in terms of raising funds) ICO, the section on token sale models is just a brief summary of the principles of token sales.

Token sale models

When considering the specifics of token distribution, sale and ownership structure, there are several aspects that can be defined within the smart contract. These can be combined for different phases of the sale or enriched with specific functions, but the core decision is the same for each token sale.

The first decision is whether to have capped or uncapped sales. This essentially means that the seller determines the number of tokens being sold or leave it up to the demand. The second decision can be the price of the token. It can be either fixed or determined in an auction-like model of the bid and spend. There are other factors, as the maximum number of tokens to be sold to each address, the duration of the token sale, the percentage of tokens sold to the public and left for the founder team or the timing of when the tokens can be traded on the secondary market. Through the short history of token sales, there have been three main models:

The first example is the **uncapped** model with a set price. This model was used mostly with the first wave of ICOs with the most prominent example being Ethereum. Even though this enabled the certainty of participation, it came with high uncertainty about the valuation, with the buyers not knowing if the number of tokens they are buying at a certain price represents a huge or small percentage of the total token supply at the end of the sale.

The **capped** sale with a fixed price, popular through 2016 and early 2017 (Buterin, 2017) is based on the first-come-first-served principle set the maximum number of tokens that will be sold for that price. This allows for certainty in valuation for the buyers but does not assure that everyone who wants to can buy the token. Both models also bear the risk of deadweight losses due to the artificially set price.

When it comes to **auction-like** models, with the price determined by the market, there can also be both types, capped and uncapped, with the same implications for the first and second property. In the same time, with the price determined by the market in the capped auction, the total percentage of tokens cannot be fixed, so there is the risk that token issuer will hold a controlling number of tokens in the end. With an uncapped auction-like model, the third condition cannot be satisfied.

Table 2 summarize the benefits properties of each variation of the token sale structure. The characteristics on the left represent five main goals each token sale strives to achieve according to the founder of Ethereum (Buterin, 2017). The fact that they cannot be satisfied simultaneously is known as the token sale dilemma and trilemma (see Appendix 2).

Table 2: Token sales models and their properties

	Price per token set by issuer		Price per token set by the market	
	Uncapped	**Capped**	**Uncapped**	**Capped**
Certainty of valuation	No	Yes	No	Yes
Certainty of participation	Yes	No	Yes	No
Capping the raised amount	No	Yes	No	Yes
Avoid issuer holding majority	Yes	Yes	Yes	No
Efficiency of token sale	No	No	Yes	Yes

source: *Author*

4. Specifics of blockchain-enabled funding

In previous chapters, the technology enabling the blockchain based funding process set a frame for the economic opportunities and challenges of different token sale models. This chapter is dedicated to analyzing the knowledge and context of previous chapters to detect how the specific characteristics can potentially influence the performance of the start-up.

4.1. Comparison

Now that the blockchain based funding was described in more details, it can be compared with the other methods from the capital market context.

The banks as a capital provider will be omitted from the comparison and the focus will be on the equity-based forms. Three forms will be compared in bigger details: the public sales, venture capital and crowdsourcing.

ICOs have been compared to public offerings from the very beginning when the term Initial Coin Offerings was coined. However, there are significant differences between the two models and as outlined previously, ICOs share more similarities with the equity and reward-based crowdfunding campaigns. In the same time, the venture capital is considered due to the increasing interest of VC funds in blockchain based companies and the unique insights VC model can provide.

The table below compares all three forms with token sales (ICOs). The first group of characteristics will be concerned with the sale process, that is the Marketing channels, Intermediation, Funding currency and Start-up stage. The second group is focusing on the actors in the process and their interests, namely the Investor base and Investors' stake. The third group analyze security mechanisms and risks through Regulations, Asymmetric Information and Investor Protection, and the last fourth group is concerned with post-funding characteristics such as the Lock-up, Secondary Trading and Liquidity.

Table 3: Comparison of Blockchain Funding and other Alternatives

	IPOs	**Venture Capital**	**Equity crowdfunding**	**Token sales (ICOs)**
Funding currency	Fiat	Fiat	Fiat	Crypto/fiat
Typical business stage	Growth to Expansion stage	First customer to Growth stage	Seed Stage	Idea to Prototype Stage
Intermediation	Syndicates	VCs	Online platforms	No
Marketing and signaling channels	Underwriters	Private negotiations	Online platforms	Social media and ICO platforms
Investor Base	Exclusive, Local	Partners	Exclusive, Local	Inclusive, Global
Investor Stake	Ownership stake	Ownership stake	Product/ ownership	Access to future service (UT)/ Ownership (ST)
Investor Protection	Courts, regional jurisdictions	Based on the deal, covenants	Courts, regional jurisdictions	Very limited
Regulations	Standardized	Standardized	Country specific	Not finalized
Asymmetric information	Average	Low	Above average	High
Lockups	Owners	No	Unclear	Developers
Secondary trading	Free in public market	n/a	Unclear	Free in public market
Liquidity	High	n/a	Low	High

source: Boreiko, Sahdev, 2018; Kiska Jr. 2015; Sherman, 2012; Author

When looking at the comparison, the novelty of ICOs as a funding scheme is obvious in the lack of regulations and standardization in the whole industry. The absence of intermediary may speed the process up but also makes it more complicated for regulatory authorities to impose any restrictive measurements that can help protect the investors and mitigate the risks for all actors involved.

The utilization of technologies in marketing and the role of the token as opposed to the shares are also main features differentiating blockchain funding from the rest of the methods, opening opportunities for new interactions between the investors and founders.

ICOs mean huge democratization in terms of who and how can participate in an investment, both at primary and at the secondary market. This is partially thanks to the technology enabling global reach and partially due to the regulatory arbitrage. What do those specifics mean for the start-up lifecycle?

4.2. Benefits and challenges of ICOs

The comparison of ICOs with other forms of fundraising identified three main specifics of blockchain based funding: 1. Lack of regulations; 2. Unique utilization of technology; 3. Global reach and broad investor base. The following section, which concludes the theoretical part, analyze how these three specifics can influence the start-up in both positive and negative way

4.2.1. Potential benefits

Each of the specific characteristics can have potential benefits for an entrepreneur who is considering utilizing blockchain and decentralized finance for the fundraising process. With the understanding of each concept from previous chapters, those benefits can be examined in detail.

Lack of Regulations

The analysis starts with the factor which is the most questionable in terms of sustainability. In comparison to legal requirements for VC funding deals which can delay the process by months or years, ICOs requirements are minimal. However, the absence of regulations can represent only a temporary and short-sighted benefit.

Rather than complete lack of regulations, the transparency and costless verification enabled by blockchain technology can potentially streamline the regulation process and automatize a huge part of it

This can enable small and medium-sized enterprises to participate in the capital market in a previously impossible way. The automatization potentially allows for regulatory compliance without the need to involve rent-seeking intermediaries. Therefore, use the existing regulatory environment while making it easier to comply with.

The actual ownership of a token purchased in an ICO can be easily verified on the distributed database, bypassing the need for institutionalized centralizes registry. Secondary market transactions and transfers of the token after the ICO can be also done in a trustless manner. The original token issuer does not need to provide additional consent for the transactions. This is closely connected with the benefits brought by the utilization of blockchain technology.

Technology

Apart from the ownership verification, the underlying blockchain technology in the form of tokens and smart contracts enables numerous benefits. A start-up funded through ICO can utilize the token to generate a positive network effect.[11]

The token sold to fund the development of a platform or an app gives all the buyers an incentive to use the services or products from the start. It represents a stake in the network and aligns the incentives of the development team and the users.

According to Li and Mann (2018), token-based platforms can eliminate the coordination problem. The problem occurs when service is provided between users on a platform with incurring utility costs. This condition leads to prisoner-dilemma-type equilibrium when no exchange of services happens, even if it would be valuable for the users as a group.

[11] The network effect is stating that the value of a good or a service is increased with the increased number of users. Described by Metcalf Law on the example of Ethernet, it is still valid and represent an issue for business models that rely on network of users. Those are struggling with getting the user to start using their network when there is low number of users in the beginning, thus fail to create the value for the network.

Token as a coordination medium can solve this, since the smart contract is transparent, and the purchase of token can be publicly observed. The purchase of the token can serve as a clear signaling mechanism of an intention to use the platform.

This built-in customer base can turn out to be a great benefit for start-ups that would not be able to monetize their products in a different way. Some experts[12] from the venture capital scene have already pointed out a blind spot in financing a certain type of software companies. The software in the question is a protocol, a system of rules within a standardized language that allows for data to be exchanged between devices.

From the beginnings of the internet, there is a group of protocols such as HTTP (information transmission over the web), SMTP (sending and receiving emails) or SSL (secure data transfer) which are still used in various applications, without the original developers being rewarded for their work. For example, SMTP was created as open source and monetized only later by companies such as Google or Outlook.

Today, with applications such as Github or Stack Overflow, open source is even more popular and due to the principles of transparency and decentralization prevailing in the blockchain environment, is frequently seen in blockchain projects and start-ups. One example is Ethereum, essentially decentralized software protocol. With native tokens such as ETH, the development team can be incentivized by holding the token and using it for funding future development of the project. If what the developers create is useful, the token demand increases and with it the value of the token.

Global reach and broad investors base

The technology plays a certain role in the expanded reach to the investors as well. First, through the potential to utilize the social networks for the media campaign conducting the wholesale online and borderless, ICOs are aiming at the worldwide pool of investors. Second, the ease of token transactions enables ICOs to offers significantly easier exit for the investors than a VC fund.

[12] Nadia Eghbal mentioned that she spotted missing peace in equity fundraising in January 2016, shortly after she left her career at Collaborative Fund. Albert Wenger wrote about the issue in his post later in the same year.

The third factor is connected with the process of funding. VCs require meetings with the start-ups as a part of the due diligence process, thus prefer start-ups in geographical proximity. This creates a hub of start-ups located in one place, like Silicon Valley. ICO investors conduct much more limited due diligence mostly without personally meeting the start-ups, hence they can invest from all over the world.

The increased investor base, democratization of the capital market and fractional ownership enabled the start-ups to attract investors globally and raise funds in a very early stage of their lifecycle. Through token sales, a start-up can raise funds without stakeholders who would prioritize high and fast returns over the value of a product or service the start-up is developing.

4.2.2. Potential risks and challenges

However, this all comes at a price. The current state of the majority of post-ICO companies in red numbers[13] signals that blockchain based funding is facing considerable risks and challenges.

Lack of Regulations

The regulations in the capital market play an important role in mitigating the risk exposure for investors. The amount of information that the start-ups are obligated to share in order to seal a deal with venture investors enables VCs to perform rigorous due diligence.

In the ecosystem of very limited regulations, ICOs are less motivated to honestly disclose the state of the company and provide well thought through business plan. In order to get funded by a VC, the fund-seeking individuals need to: demonstrate that they have a strong team with balanced skill set and experience, describe the product attributes and the market fit, prove potential market growth and reasonable market size and show that there are expected returns for the investors (Hall and Hofer, 1993; Simic, 2015; Gompers et al., 2016).

[13] As of the time of writing (29.3.2019): ICOdata.io lists over two thousands of announced ICO, only circa 360 of them report positive return based on the coin price at ICO and post ICO. Deadcoins.com lists all project that are no longer traded for various reasons, and there is over fifteen hundred dead coins.

The information asymmetry in unregulated ICOs market leads to two negative implications. From the investors' point of view, the lack of provided information creates substantial risk. Together with the fact that blockchain start-ups are mostly seeking funding in a very early and experimental stage, the default risk may be too high to attract credible investors (Chod, Lyandres, 2018).

The second implication for the entrepreneurs is that they are not forced by external factors to consider the market fit and opportunities for their project. The verification from the demand for utility token can turn out to be false and lead the entrepreneur in a trap of creating a venture that does not answer a real need or add any value.

The actors in the market are realizing the risks of lack of standardized regulations.[14] Apart from what was already mentioned above, regulatory uncertainty creates tension in the market. Both businesses and consumers are waiting with the adoption of blockchain technology partly because of a fear of violating laws that are not suited for the novel environment.

Technology

Even though there are certain benefits of token as an incentive and medium between stakeholder and entrepreneur, the token-based models are facing some challenges as well. With the high correlation of the underlying token with the Bitcoin and Ethereum price, the valuation of the company is extremely dependent on the current market state.

The entrepreneurs that choose to raise funds through selling their company tokens need to deal with the exchange rate risk. With the volatile market, they can raise funds in the hype and then lose a significant portion of it with the market downturn, if they are not able to monetize or hedge the capital raised.

[14] Chamber of Digital Commerce, American based advocacy group promoting blockchain technology and its applications published a call for action in February 2019. In the *National Action Plan for Blockchain*, the group is addressing the issue of the "lack of a predictable legal environment" (p. 3). According to them, this is one of the main drawbacks hindering the development an innovation in the blockchain ecosystem.

An additional risk of utility tokens is that the company will be committed to delivering a product without a market fit. When the funds are raised for a certain product and the utility token is tailored to fit the product specifics, the founders are obliged to use the funds to develop the product. Even though this can serve as a security mechanism of some sort, when the product is poorly designed, it makes it difficult for the team to change the course of a company. The token buyers are expecting the product they helped to fund and if it is not delivered, they can affect the value of the company by promptly selling their tokens.

Global reach and broad investors base

The broad investor base and its influence on the company performance is the last but a crucial factor the entrepreneur needs to consider. The initial promise of the decentralized funding was not only to provide a wide pool of investors but also to create a loyal community and an open ecosystem fostering rapid growth.

However, the current state has the entrepreneurs wondering about the motives of the investor base. Especially those funded during the phase of "Late growth" in the end of 2017 and beginning of 2018 (Boreiko & Sahdev, 2018) realized that vast majority of the investors were more interested in the speculative value of the token. Those "creditors" cared mostly about the token price and the hype around a project and were the first to sell the tokens with the market downturn.

Even the investors that have interest and trust in the core technology of the project they helped to fund can later fall short in comparison to some of the benefits experienced VC investors can deliver. The distributed investor base provides much more freedom to experiment with a new business model, but also more freedom to fail and to lose the direction. What should the entrepreneurs consider in order to capture the benefits of blockchain funding and mitigate the risks and challenges of this novel fundraising model?

5. Methods

5.1. Research question and hypotheses

RQ: How the blockchain-enabled funding differs from the traditional funding forms and how those differences influence the start-ups originating from ICOs.

In the theoretical part, we have answered the first part of the research question and identified the main differences to be 1. the lack of regulations, 2. unique utilization of technology and 3. global reach and broad investor base.

For each of these specifics, associated benefits and challenges were identified. These can be summarized in the table below:

Table 4: Benefits and Challenges of Blockchain-based funding

	Benefits	Challenges
Lack of regulations	Allow smaller companies to afford regulatory compliance previously available only to the big companies	Lesser incentives to provide honest information leading to information asymmetry
Technology utilization	Creating built-in customer base that helps to fund platforms (protocols) which would otherwise fail to reward its contributors	False demand with Utility tokens locking-up the company development and huge dependency on ETH price
Broad investor base	Ability to attract investors globally and raise funds in a very early stage of the project lifecycle	The investors lack experiences and cannot provide guidance and support

source: Author

Based on the specifications, three main hypotheses were formalized. It was already established that the goal of this paper is not to provide guidance on how to design an ICO in a way to raise funds. This was already covered in papers before (e.g. Momtaz (2018), Adhami, (2018), Bourveau et al (2018), de Jong et al (2018), Amsden et al (2018), Benedetti and Kostovetsky (2018), Lee et al (2018)). This paper rather analyzes the performance of projects after the token sale, and test whether the blockchain funding challenges are a real risk for the projects. The Research question is thus divided based on the specifics of blockchain based funding to three sub-questions.

RQ.1: How does the lack of regulations influence the further success of the start-up

In the scope of this specific, the analysis will focus on the challenges of a less regulated environment for the success of the project. With the unregulated space, the start-ups do not have to provide information that would be otherwise required by the institutional investors. Two hypotheses will be tested to examine the effect of providing more information and accommodating to the standards of requirements of traditional markets.

H1.a

"The higher availability of information before ICO increase the success after the ICO."

H1.b

"Adapting and meeting the measurement as in VC decision process increases the success after the ICO."

The decisive criteria were narrowed down based on the paper *Investment Criteria Set By Venture Capitalists.* In an extensive summary of the majority of the papers on this topic, Marija Simic depicts the key criteria to be "*team characteristics, characteristics of the product/service, market characteristics, financial characteristics and othe*r" (Simic, 2015, p.461). The sub-hypotheses are addressing each of the mentioned criteria.

H1.b.1 Team

"A higher number of members in the team increases the success after the ICO"

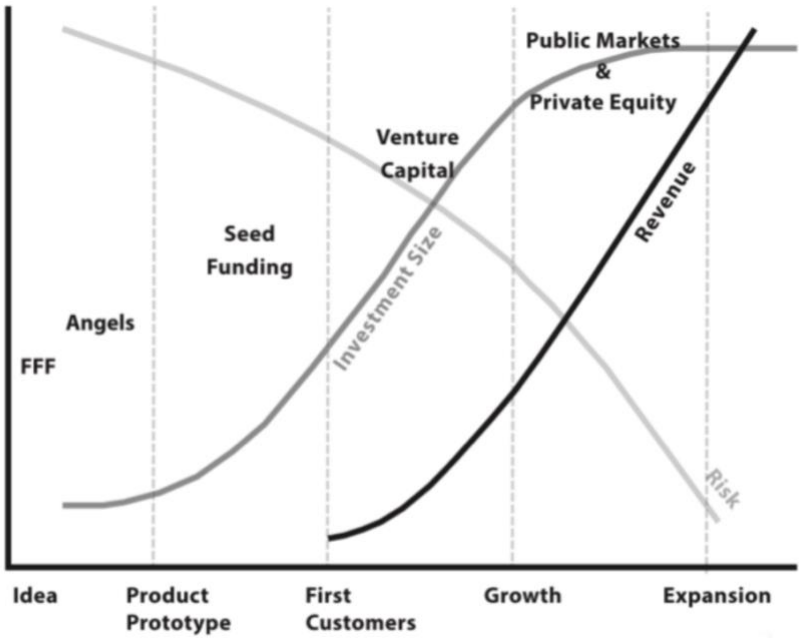
This hypothesis was created as a simplification of the assessment of the quality of the team, due to the limited information provided on the professional history of the team

members. The number of team members[15] is also a criterion used by cryptocurrency exchanges and ICO rating websites as a signaling mechanism of the soundness of the project.

H1.b.2 Product

"Advancement in the phase of development increases the success after the ICO"
The criterion of product, the analysis will be looking at the phase of development of the product or services when entering the ICO. The phases were based on the phases of The Investment Cycle (Kiska, 2015) starting with "Idea" as the first phase and "Expansion as the last phase".

Figure 5: The Investment Cycle



reprinted from *Central European Start-up Guide*, p.15, by Andrej Kiska Jr., 2015

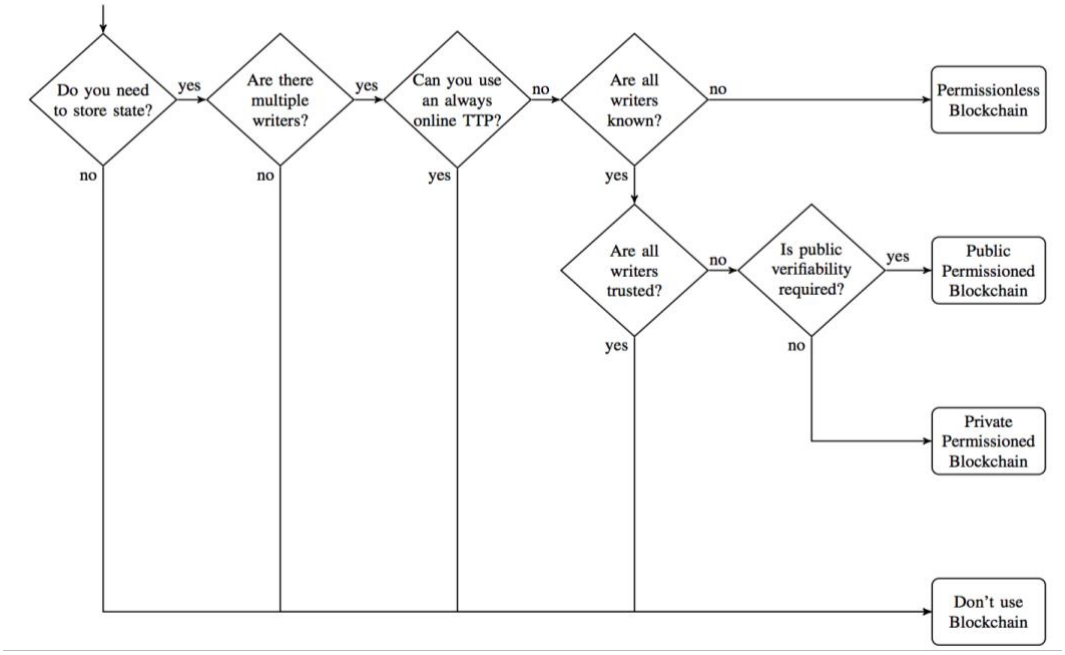
H1.b.3 Market

"When the industry is suited for blockchain it increases the success after the ICO"

[15] In the analysis, the risk of having "too many members" was tested by adding a squared value of the variable in the regression model to check for an optimal size effect. However, the variable "Team members squared" did not turn out to be significant in influencing any of the dependent variables, hence was omitted from the model.

The market potential is in the analysis represented by the industry of project and specifically by the fact whether the blockchain application in that specific industry is necessary or not. To determine this, the paper by Wüst & Gervais was consulted and the decision based on the flowchart below.

Figure 6: Blockchain Relevance Flowchart



reprinted from *Do you need a Blockchain?*, p.3, by Wüst & Gervais, 2017

H1.b.4 Financials (Expected Returns)

"Security tokens with revenue sharing increase the success after the ICO."
As depicted in the chapter *Utility and Security Tokens*, the security tokens bare specific functions as a representation of ownership and revenue sharing rights. This means a prospect of expected return, which was identified as one of the main criteria for VCs decision process (Macmillan et al., 1987; and Hall and Hofer, 1993). Thus, in the analysis, the token type will be used for the criteria financials.

Since there is general confusion in how to classify the token type, especially in the early phase of ICOs, the information provided by the project is not credible or accurate.

The token type was determined independently based on the project description and the token role in the business model. For the analysis, a framework by SEC is used, based on the Howey test. For further detail on the decision process see Appendix 3.

RQ.2: How does the utilization of technology influence the further success of the start-up

H2.a:

"Choosing Utility token as the token type decreases the success after the ICO"

The token type is also relevant in the scope of technology utilization. The hypothesis is based on the risk that utility tokens create a false sense of demand for the product and thus does not serve its original purpose, to create a built-in customer base. Eventually, this would mean that the demand for the token is no proof of the demand for the end product.

H2.b:

"The success of a start-up is strongly connected with the Ethereum price"

Since the projects in the dataset are built on the Ethereum blockchain, the price of ETH serves not only as an indicator of the overall market situation. If the hypothesis is validated, it would mean that the success of the start-up is to an extent determined by an external factor, the price of ETH, which the start-ups cannot influence.

RQ.3: How does the broader investor base influence the further success of the start-up

H3:

"Bigger investors base influences the success after the ICO."

The last hypothesis to test is the effect of a bigger number of investors on the further success of start-ups.

For summary of the hypothesis, see the Appendix 4.

5.2 Data collection and analysis

To validate the assumptions about blockchain based funding specifics and effects, there are two groups of data that need to be gathered. These are the data that inform on the performance and success of the project and the data on the project at the time of ICO.

Due to the novelty of this funding method, the time period after the ICO is limited. In order to achieve representative results, the time span was set to two periods: six months after ICO and a year after ICO.

5.2.1. Variables

Two levels of success can be identified in the scope of the blockchain based funding process. The first level is the very ability to raise fund through the token sale process. The second level is the ability to perform well after the fundraising.

Some of the frequently mentioned variables influencing whether ICO will raise funds were the profile on **external rating sites** (Momtaz et al (2018), de Jong et al (2018)), **large team size** (Amsden et al (2018), de Jong et al (2018), more **information disclosure** (Adhami et al (2018), Bourveau at al (2018), de Jong et al (2018), Amsden et al (2018)) and the **token role** (Adhami et al (2018)).

As already outlined above, the first level is not in the scope of this paper. We will, however, build on the previous research and use the variables identified as determinants for the level one success. This enables us to narrow down our database to the successful (went through ICO and raised funds) projects.

When looking at the second level of success, the performance after the token sale, two aspects can be identified: financial performance and operational performance.

The financial performance is closely tied to the price of the company's tokens. In order to assess the performance in both periods, the change in the price of the token is considered as one of the dependent variables. The second variable used to track financial performance is the MarketCap Rank, the ranking of the project based on the total market

capitalization. This serves as a logarithmic transformation of the otherwise highly skewed values of market capitalization.

In order to avoid the bias of equaling the total performance of a project with the token performance, three additional success measurements were considered. The first one, whether a token is listed on an exchange, is the most common success measurement present in the existing literature.

The exchange listing is crucial for two reasons: 1. the presence of the exchange is a condition for token liquidity and tradability and 2. exchanges do their own due diligence on the project they list. It can be therefore concluded that when the token is not listed on an exchange, not only it cannot be easily traded, but also it is very likely not attractive for the market.

The number of exchanges was not considered in the analysis, even though the increase in liquidity can potentially positively influence the financial performance and lead to an increase in ICO return (Lyandres et al, 2018). With the increasing number of exchanges, the number of untrustworthy exchanges increases as well. These are exchanges with very low volume and primary revenue from listing fees. They do not conduct any due diligence on the projects and thus do not provide new information on the project success. That is why the variable was reduced to a binary factor coded as "Listed (1)/Not listed (0)".

Second success factor that does not directly dependent on the token is the external rating, as generated by several rating sites. These theoretically exist to provide guidance for the investors; however, the objectivity of the rating can be questionable. There is a risk of a biased ranking of projects that pay for the rating site services. In order to avoid biases, the final value consists of ratings from three different sites chosen based on historical Alexa Traffic Rank.

The last variable used to track the post-ICO performance is a community, measured by the number of subscribers on social networks. Based on the number of followers, the community was categorized as Small, Medium or Big.

The determinants of the success, independent variables, are chosen based on what was identified in the existing literature and what is publicly available in the sources. In order to test the hypothesis, data were gathered on:

> Presence and number of pages of the white paper (document published prior ICO, similar to a business plan), Number of team members, Phase of the product, Industry and blockchain application, Token type (UT(0)/ST(1)), ETH price change, Number of investors (token buyers)

5.2.2. Sample construction

The specifics of the blockchain ecosystem identified in this paper influenced the sample construction and sourcing as well. The technology enables great transparency but at the same time, the lack of regulations leads to compromised quality of the reported information or complete lack of certain data.

The novelty of the industry also resulted in issues with data continuity. Most of the ICO listing websites start gathering data from 2017 when the blockchain industry started to generate a significant amount of funding. There are also differences in what projects are listed on what site and the date of information gathering is often missing.

The subsequent issue is the identification of the project. Some projects are sharing the same ticker (abbreviation used for the token) and the ICO sites are often missing a Unique ID of projects. This leads to confusion and projects being listed multiple times.

To mitigate these issues, Ethereum blockchain directly was used as the base for data gathering. The information was gathered via API calls through the software bloxy. The smart contract address was used as a unique identifier of the project.

Additional information on the price of the token, exchanges listing, and the market capitalization was sourced from the website www.coinmarketcap.com, the main source of post-ICO price and volume data for tokens traded on exchanges. Detail information on the project specifics was obtained from the project's website, whitepapers and social media profiles.

The Ethereum blockchain contained the total number of over 20 thousand applications for ICO in the form of smart contracts. In this sample, however, there were also trial projects, to test the smart contract, and projects that did not raise any funds. Percentage of successful projects that were able to raise funds through ICOs was less than 20%. From these successful projects, a random sample of one thousand projects was selected.

This initial sample contained the following data: token address, symbol, type, transactions, eth amount, token amount, token buyers. After triangulation with information from ICO listing websites, coinmarketcap and project websites, the final sample arrived at 301 entries from 2016 till 2018.

This sample included variables from external databases:

> Token address, Symbol, Project name, Transactions, Eth amount raised, USD raised, Token amount, Token buyers, Price per token, Start, End, Days duration of ICO, Country, Rank Cryptocompare, Rank ICObench, Rank ICOMarket, Rank CoinmarketCap, Price after six months, Price after a year

And variables from companies' websites, white papers and official social networks:

> Listed on an exchange, Social network community, Whitepaper presence and number of pages, Number of team members, Product phase when ICO, Industry and blockchain relevance (Wüst & Gervais, 2018), Token role (based on the Howey test framework).

5.3 Statistical Summary

The final sample consisting of 301 entries spanning from the year of ICO 2016 till 2019. Table 5 presents the summary statistics for the key dimensions of the projects and their performance. The typical ICO in our sample was able to raise $US 14.4 million and the highest amount was $US 157 million. The number of token-buyers varies from three to over sixty-five thousand. The typical price for which the tokens were sold during the ICO was $US 0.672. The mean price after six months is slightly lower, $US 0.629, however, some projects' tokens price increased as much as 416 times. Change in price in a year after ICO was lower and the mean price was higher after a year. The typical market capitalization was in the first quarter of the total market, represented by the market rank.

In terms of external success measures, the statistical summary offers insight in the variable "Exchange listing" in its original form, the total number of exchange listing per project. The typical exchange listing was five and maximum as high as 109 exchanges. However, due to reasons already explained above, further analysis considers "Exchange listing" as 'Listed (1)' and 'Not listed (0)'. In the category 'Not listed', there was over a hundred projects (102), so approximately a third of the total sample. As for the community, in general, the number of subscribers increased with time. The projects varied in the number of team members as well as in the presence and number of pages of white paper.

Table 5: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
USD Raised	301	14,371,057.000	22,400,106.000	2,095.573	1,800,000.000	16,000,000.000	157,885,825.000
token_buyers	301	2,401.993	4,921.281	3	254	2,719	65,077
Price per token when ICO	301	0.672	2.698	0.00001	0.043	0.490	32.419
Year	301	2,017.478	0.533	2,016	2,017	2,018	2,019
Price change in 6 Months	298	2.940	26.221	-1.000	-1.000	0.249	415.967
Price change in a Year	220	1.555	15.475	-1.000	-0.991	-0.574	192.634
MarketCap Rank in 6 Months	292	917.390	730.078	14.000	280.500	2,000.000	2,016.000
MarketCap Rank in a Year	221	913.733	694.905	5.000	294.000	1,424.000	2,000.000
ETH % Price change in Year	301	0.123	4.355	-0.916	-0.813	-0.314	58.983
ETH % Price change in 6 Months	301	0.604	2.414	-0.846	-0.631	1.256	26.127
Exchanges listing	301	5.020	9.801	0	0	5	109
External rating	301	3.186	0.551	1.700	2.900	3.550	4.600
Twitter in 6 months	301	15,074.150	47,286.820	0	1,681	15,504	760,023
Twitter in year	270	17,205.090	54,097.760	0.000	1,418.000	16,542.250	813,158.000
Team members	301	8.432	5.049	0	5	11	31
WP pages	301	25.096	19.009	0	12	35	98

As for other project-specifics characteristics, both token types were presented in the sample, with Utility tokens representing a majority, 72% of the total sample. Security tokens made up 28% of the sample.

The geographical information was available for 76% of the projects in our sample. Majority of the projects registered in a certain location was from South East Asia, namely Singapore. The second biggest group were projects from the USA, making up almost 11% of the total sample.

Regarding the industry focus, the biggest proportion of projects (over 16%) is operating in software development. Fintech and Business Services are on second and third place.

Projects from the Entertainment, Gaming and Gambling industry, are also a significant group with almost 10% (for additional details see Appendix 5).

However, almost one-third of the projects do not have an application scenario particularly intended for blockchain technology. There is a possibility that some of these projects use blockchain solely as a tokenized security, however, with the low number of security tokens, this does not cover all the cases. The most typical utilization of blockchain in the sample is for Trading and fair exchange. The high representation of this application (nearly 17%) is aligned with what was described by Wüst and Gervais:

"As fair exchange inherently assumes mutually mistrusting parties that may even be anonymous, blockchain technology immediately seems reasonable. In some cases, trading parties may be able to use a trusted third party, but in others, they may not."

(Wüst and Gervais, 2018, p. 9)

The second biggest group of sample projects utilize the blockchain to build a Protocol. This support the benefit identified as unique technology utilization in the scope of blockchain funding. The group that was mentioned as a prominent example of blockchain application in the study quoted above (Wüst and Gervais, 2018), Supply chain management, is represented only by 1,99% of the sample.

Lastly, the sample summary also confirms the benefit of broader reach in the ability to raise funds in an early stage of the start-up lifecycle. None of the projects went through the token sale during the expansion stage and only four from the total sample were already in the growth stage when entering the ICO.

The highest number of projects were in the Prototype stage, almost 30% and another 35% were in Idea and Concept stage. In the analysis, these two stages were considered separate. Due to the character of the market, the projects were able to raise funds even without a short whitepaper. The Idea stage was thus basically just a proposal of a product, not supported by any data and in some cases, not even properly formalized. The projects assigned to the category Concept were able to provide leastwise the business plan outline and a branding strategy.

To analyze the data sample, several regression models were built. In order to assess the correct model for the analysis, the data were tested in terms of normality of distribution, linearity and correlation.

Table 6 exhibits the correlation matrix (for visualization see Appendix 6). The table shows that the level of correlation between independent variables is low, and all variables can be used in further analysis. There is a strong correlation between the set of variables in six months and in a year, which is expected, although it is weaker for the Market Cap rank measurement than for the Price Change. From the independent variables, some degree of correlation between the community and the change in the price of the token can be observed.

Table 6: Correlation Matrix

	USD Raised	token_buyers	Price per token when ICO	Year	Price change in 6 Months	Price change in a Year	MarketCap Rank in 6 Months	MarketCap Rank in a Year	ETH % Price change in Year	ETH % Price change in 6 Months	Exchanges listing	External rating	Twitter in 6 months	Twitter in year	Team members	WP pages
USD Raised	1.00															
token_buyers	0.45***	1.00														
Price per token when ICO	0.26***	0.00	1.00													
Year	-0.12*	-0.13*	-0.12*	1.00												
Price change in 6 Months	-0.01	0.00	-0.03	-0.01	1.00											
Price change in a Year	-0.01	0.02	-0.03	0.01	0.96***	1.00										
MarketCap Rank in 6 Months	-0.35***	-0.33***	0.14*	0.35***	-0.13*	-0.14*	1.00									
MarketCap Rank in a Year	-0.32***	-0.32***	0.18**	0.16*	-0.12*	-0.15*	0.88***	1.00								
ETH % Price change in Year	-0.04	-0.04	-0.02	-0.25***	0.15*	0.19***	-0.19***	-0.19***	1.00							
ETH % Price change in 6 Months	0.02	0.03	0.01	-0.49***	0.16***	0.19***	-0.30***	-0.21***	0.73***	1.00						
Exchanges listing	0.43***	0.67***	-0.04	-0.24***	0.11*	0.17*	-0.44***	-0.46***	0.13*	0.15***	1.00					
External rating	0.10*	0.18***	-0.08	0.17***	-0.03	0.01	-0.11*	-0.36***	-0.11*	-0.17***	0.24***	1.00				
Twitter in 6 months	0.14*	0.22***	-0.01	-0.14*	0.29***	0.49***	-0.24***	-0.27***	0.07	0.16***	0.42***	0.15***	1.00			
Twitter in year	0.13*	0.22***	-0.01	-0.13*	0.29***	0.48***	-0.25***	-0.28***	0.07	0.16***	0.44***	0.18***	0.99***	1.00		
Team members	0.21***	0.16***	-0.07	-0.07	0.16***	0.21***	-0.31***	-0.34***	-0.08	-0.01	0.24***	0.25***	0.31***	0.34***	1.00	
WP pages	0.23***	0.17***	-0.07	-0.03	0.05	0.05	-0.48***	-0.49***	-0.01	0.00	0.23***	0.19***	0.12*	0.13*	0.34***	1.00

Note: *p<0.1; **p<0.05; ***p<0.01

The analysis of the distribution of variable and the residuals determined the methods used for each variable. The models are as follows: linear regression for "External rating", transformed "Price change" and "MarketCap Rank". Binomial logistic regression for "Exchange listing". Ordinal logistic regression for "Community".

6. Empirical Analysis

6.1. Financial Measures

The first set of regression models is focusing on financial measurements, thus the change in the price of the token and the change in total market capitalization rank. For the market capitalization, the lower the rank is, the bigger the total market capitalization in relation to the rest of the crypto market, thus the regression coefficients should be interpreted conversely.

In order to perform linear regression analysis, both variables needed to be transformed using log transformation. In the case of Price change, the variable contains both negative and positive values, so the approach of adding a constant value to the data prior to applying log transformation was adopted (Little & Hills, 1978).

7: Financial Measurements in 6 Months

	Dependent variable:					
	Token Price Change			MarketCap Rank		
	(1)	(2)	(3)	(4)	(5)	(6)
`ETH Price % change in 6 months`	0.334***	0.308***	0.289***	-0.191***	-0.170***	-0.155***
	(0.033)	(0.032)	(0.029)	(0.025)	(0.022)	(0.018)
`WP pages`			0.004			-0.011***
			(0.004)			(0.003)
`Product phase`First Customers			0.898***			-0.870***
			(0.274)			(0.172)
`Product phase`Growth			1.668***			-1.337***
			(0.641)			(0.401)
`Product phase`Idea			-0.234			0.274*
			(0.254)			(0.158)
`Product phase`MVP			0.675***			-0.542***
			(0.235)			(0.147)
`Product phase`Prototype			0.125			-0.221*
			(0.202)			(0.126)
token_buyers		0.0001***	0.00002		-0.0001***	-0.0001***
		(0.00002)	(0.00001)		(0.00001)	(0.00001)
`Token Type`UT		-0.832***	-0.429***		0.618***	0.233**
		(0.171)	(0.162)		(0.118)	(0.101)
`Blockchain relevance`Yes			0.436**			-0.257**
			(0.183)			(0.114)
`Team members`			0.032**			-0.011
			(0.015)			(0.009)
Constant	-0.918***	-0.448***	-1.617***	6.494***	6.248***	7.266***
	(0.083)	(0.152)	(0.245)	(0.062)	(0.105)	(0.152)
Observations	298	298	298	299	299	299
R^2	0.254	0.339	0.482	0.165	0.365	0.595
Adjusted R^2	0.251	0.332	0.462	0.163	0.359	0.580
Residual Std. Error	1.393 (df = 296)	1.315 (df = 294)	1.181 (df = 286)	1.042 (df = 297)	0.912 (df = 295)	0.738 (df = 287)
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 6 shows the summary of the results of hierarchical regression analysis for both success measurements. The first three models are for the dependent variable "Price change in 6 months after ICO", last three are for "MarketCap Rank in 6 months after ICO". As both these variables are based on the performance of the projects' tokens, high dependence on the Ethereum price can be expected. In order to test this and the predictivity of the model, the first model for each dependent variable was estimated with only ETH price change as the independent variable.

In the second models, the other token-related variables were added, namely the number of token-buyers and the token type. The third models are the complete models with all variables. The predictive ability of the models was higher with each added variable (illustrated with increasing R^2 value of each model).

Starting with the Price change as the dependent variable, the assumption of the importance of change in ETH price was confirmed in all models, on the highest significance level. The sensitivity of token price change to ETH price change is almost 30%. The finding that the post-ICO financial performance is related to simultaneous Ethereum results is consistent with empirical evidence from existing literature (Benedetti and Kostovetsky (2018), Lee et al. (2018), and Lyandres et al. (2018)).

Apart from ETH price, the phase in which the project was when it did the ICO is significantly influencing the token performance. The further the product gets in development before the token sale, the greater is the positive relationship. The Growth product phase, which is the highest level of product development in our sample, has a positive coefficient value of 1.7.

Significantly positive loading is also on Blockchain relevance indicator, associated with a positive 44% increase in a token price change. Team members indicator is also significant, however, with considerably low coefficient values. Interesting results are presented for the Token type variable, for which the coefficient is significantly negative, indicating over 40% negative impact for Utility tokens. This would suggest that the hypothesis about the negative influence of Utility token on the success of start-ups holds.

In the models with “MarketCap rank” as the dependent variable, practically all predictors are significant, but the number of team members. The results are similar to those recorded the Price change, however, the ETH price change turned out to have much smaller effects. This is likely because the MarketCap takes into account the whole market, influenced by the ETH price, and rank the project in relation to other tokens. The impact of the product phase is very similar for the “MarketCap Rank” and the negative impact of the Concept phase is amplified, with coefficient value as high as 7.3.

The number of pages in whitepaper did not prove to have a strong effect on neither of two dependent variables. For the price change, it is not significant and for the Market Cap rank, the effect is a loading of just 0.01, suggesting that either the amount of information is not relevant for the post-ICO financial performance, or that the information is provided in different forms. Taking into account the significance of the project lifecycle phase, it is possible that the more developed products have been sharing information through different channels prior to the token sale.

The number of investors shows similar results, with a very low value for "MarketCap rank", 0.001, and no significance for complete regression model of "Token Price change".

In order to evaluate the financial measurements in the longer term, Table 8 on the next page is looking at the regressions in a year after ICO. For more consistent analysis, a longer period would be appropriate, however, the current state of the market prevents it, thus the longer term is the period of one year after the token sale.

For the "Price change" variable, the regression results are similar in the one-year period to what was observed in the 6 months period. However, the effect of ETH price change in the longer period is less relevant, with loading slightly above 0.13 for all three models. It is possible that with a longer period of time, the projects are able to create a stronger community for their services and products. The community could then be able to support the project independently on the ETH price.

The impact of the project phase, on the other hand, increases. In the year-long period, the projects that entered fundraising in the later stage of their lifecycle have strongly positive

coefficients. Products in the Growth phase now enjoy token price change that is 2.87 higher than for projects in other phases, ceteris paribus.

"MarketCap rank" measurement record similar trend regarding ETH price, its effect is in longer period only 0.054, and corresponding with the token price change, the intensity of the Product phase effect on "MarketCap rank" also increased.

The main change in the second period influencing the "MarketCap rank" was that the blockchain relevance in the projects is no longer significant predictor of "MarketCap rank". This can mean that in the year after ICO, the projects need to prove more than the potential for the technology in order to compete with the rest of the market.

Table 8: Financial Measurement in a Year

	Dependent variable:					
	Token Price Change			MarketCap Rank		
	(1)	(2)	(3)	(4)	(5)	(6)
`ETH Price % change in a year`	0.134***	0.138***	0.136***	-0.052***	-0.057***	-0.054***
	(0.017)	(0.016)	(0.014)	(0.014)	(0.012)	(0.009)
`WP pages`			-0.0001			-0.008***
			(0.005)			(0.003)
`Product phase`First Customers			1.145***			-1.046***
			(0.277)			(0.178)
`Product phase`Growth			2.869***			-2.292***
			(0.663)			(0.427)
`Product phase`Idea			-0.084			0.306
			(0.308)			(0.199)
`Product phase`MVP			0.681***			-0.586***
			(0.242)			(0.156)
`Product phase`Prototype			0.141			-0.176
			(0.210)			(0.135)
token_buyers		0.0001***	0.00004***		-0.0001***	-0.0001***
		(0.00001)	(0.00001)		(0.00001)	(0.00001)
`Token Type`UT		-0.705***	-0.447***		0.537***	0.229**
		(0.171)	(0.158)		(0.128)	(0.102)
`Blockchain relevance`Yes			0.139			-0.155
			(0.195)			(0.126)
`Team members`			0.033**			-0.023**
			(0.016)			(0.010)
Constant	-1.153***	-0.879***	-1.769***	6.404***	6.325***	7.327***
	(0.087)	(0.145)	(0.246)	(0.072)	(0.108)	(0.158)
Observations	221	221	221	221	221	221
R^2	0.218	0.329	0.498	0.057	0.331	0.632
Adjusted R^2	0.214	0.320	0.472	0.053	0.322	0.612
Residual Std. Error	1.291 (df = 219)	1.201 (df = 217)	1.059 (df = 209)	1.065 (df = 219)	0.902 (df = 217)	0.682 (df = 209)
Note:						*p<0.1; **p<0.05; ***p<0.01

6.2. Operational Measures

The operational success measurements were very different in both the way the models were structured and in what they are depicting. That is why the models were interpreted one by one for all three dependent variables.

6.2.1 External Rating

The External Rating is referring to how the project is perceived by official rating sites in the cryptocurrency industry. Some of the rating sites publish what the final score consists of and explain the rate, for example, coincheckup.com/, others like icobench.com only show the final score. During the data collection, the inconsistency of the rating was obvious, with some project rated both on the top of the rank by some sides and on the bottom by others.

Even though the objectivity of the score may be questioned, the external image is in the blockchain start-up industry still important, so this measurement should not be omitted entirely.

Table 9 shows the result of the regression model estimated for the dependent variable "External rating". The variable is continuous and ranges from 1.7 to 4.6 with 5 being the highest possible rank. Testing proved that this resulted in data suited for linear regression, without the need for any kind of transformation. The final model was less powerful than the previous models, judged by the lower value of R^2 and a smaller number of predictors evaluated as significant. This can be influenced by the low quality of the variable itself, already discussed above.

Looking at the "External Rating" in six months, three variables are evaluated as significant, the strongest the ETH Price change with coefficient value - 0.041. The negative correlation is interesting, suggesting that rating sites tend to rate projects higher when the market represented by Ethereum is performing worst. The number of token-buyers is significant but with very positive low effect. The last significant variable is the number of team members, which is one of the criteria evaluated by those rating sites that publicly expose the rating mechanism.

Surprisingly, the white paper is not evaluated as significant in either of the two periods. The presence of a whitepaper is also one of the criteriums of transparent rating sites, so the insignificance of it in the model indicates that the non-transparent rating sites do not consider it in their assessment.

In the second period, the ETH price change is no longer significant and instead, the Blockchain relevance gains importance with loading 0.173. This can be interpreted in the way that after some time of project existence, the rating sites evaluate the technical side and more detailed business model.

Table 9: External Rating in 6 Months and in a Year

	Dependent variable:		*Dependent variable:*
	ExternalRating		ExternalRating_Y
`ETH Price % change in 6 months`	-0.041***	`ETH Price % change in a year`	-0.011
	(0.013)		(0.008)
token_buyers	0.00001**	token_buyers	0.00001*
	(0.00001)		(0.00001)
`Team members`	0.018***	`Team members`	0.020***
	(0.007)		(0.007)
`WP pages`	0.002	`WP pages`	0.003
	(0.002)		(0.002)
`Blockchain relevance`Yes	0.127	`Blockchain relevance`Yes	0.173**
	(0.080)		(0.087)
`Token Type`UT	0.028	`Token Type`UT	0.064
	(0.071)		(0.076)
`Product phase`First Customers	0.063	`Product phase`First Customers	-0.016
	(0.121)		(0.130)
`Product phase`Growth	0.337	`Product phase`Growth	0.227
	(0.282)		(0.304)
`Product phase`Idea	0.099	`Product phase`Idea	0.118
	(0.110)		(0.118)
`Product phase`MVP	-0.006	`Product phase`MVP	-0.068
	(0.103)		(0.111)
`Product phase`Prototype	0.013	`Product phase`Prototype	-0.060
	(0.089)		(0.095)
Constant	2.850***	Constant	2.748***
	(0.107)		(0.114)
Observations	301	Observations	301
R^2	0.136	R^2	0.119
Adjusted R^2	0.103	Adjusted R^2	0.086
Residual Std. Error	0.520 (df = 289)	Residual Std. Error	0.561 (df = 289)
Note:	*p<0.1; **p<0.05; ***p<0.01	*Note:*	*p<0.1; **p<0.05; ***p<0.01

6.2.2. Exchange listing

Proceeding with the external environment, the next measurement of operational success is examining the ability of a project to get listed on an exchange. As already explained in the methodology, the number of exchanges is not considered due to the potential bias of considering low-quality exchange listing as a success.

Due to this, the variable is represented as a factor of values Listed/Not listed. This allows for the use of binomial logistic regression model for estimation of the coefficients. Table 10 summarizes the result of the logit model for "Exchange listing". Since the listing on exchange typically happens with a delay after the ICO, the analysis was conducted only in the longer period in order to maintain the integrity of the sample.

From all models so far, the variable "token buyers" is for the first time significant with a positive value. This can be explained by the fact that a higher number of buyers is related to higher liquidity of the token and thus makes the token more attractive for the exchanges. As the trading fees are the main source of revenue for the big exchanges, they are likely to list tokens that are held by more investors and potential traders.

Significantly positive loading and on "White Paper page numbers" and "Team members" probably refers to the due diligence process of exchanges, which is similar to the already introduced process of transparent rating websites. Exchanges evaluate the availability of information and the size of the team as signals of a credible project. The coefficient for "Blockchain relevance" is also significantly positive, the project that utilizes blockchain in its business model or project is 50% more likely to get listed, ceteris paribus.

What is interesting is the value of coefficients for the variable related to the "Product phase". In comparison to the Financial measurements, the results are reversed for the initial phase of the project's lifecycle. Even though more advanced phases are also significantly positive (Prototype with 0.336 and MVP with 0.307), the projects in Idea phase are 293 percentage points more likely to be listed on an exchange.

This can be explained again based on the business model of exchanges. When the project is in a later stage and thus likely to be profitable, the token owners (investors) tend to hold

the tokens. This is either in expectancy of increase in value or for the purpose of claiming the ownership rights and earning revenue connected to the security token. In the early stage, before the project proves its value and potential, the tokens are very often bought for speculation purposes and intended to be sold and traded. This generates higher trading fees for the exchange.

In line with this explanation is also the significantly positive coefficient for the Utility tokens. When done correctly, the security tokens should be a subject to KYC process and a certain level of restriction of the trader's pool is expected. Together with the potential of revenue sharing, security tokens are in comparison to utility tokens less liquid and less likely to be traded.

Table 10: Exchange Listing

	Dependent variable:
	Exchangelisting_Y
token_buyers	1.000***
	(0.0002)
`ETH Price % change in a year`	0.997
	(0.030)
`WP pages`	0.958***
	(0.013)
`Team members`	0.876**
	(0.055)
`Product phase`First Customers	0.350
	(0.861)
`Product phase`Growth	0.00000
	(1,162.580)
`Product phase`Idea	2.930*
	(0.624)
`Product phase`MVP	0.307**
	(0.553)
`Product phase`Prototype	0.336***
	(0.421)
`Token Type`UT	2.517**
	(0.451)
`Blockchain relevance`Yes	0.506*
	(0.381)
Constant	6.902***
	(0.665)
Observations	301
Log Likelihood	-106.960
Akaike Inf. Crit.	237.919
Note:	*p<0.1; **p<0.05; ***p<0.01

6.2.3 Community

The last set of models examine the determinants of success measured in the size of the community around the project. Data for assessing the community were gathered from social media and then divided into three groups based on the span of a number of community members. The division in Small, Medium and Big community determined ordinal logistic regression as the optimal model for the “Community” analysis. Results are presented in Table 11.

The fact that the number of token-buyers is positively influencing the size of the community is not surprising. The significantly positive coefficient for “White Paper pages” signals that for the community, the transparency and amount of provided information are very important.

According to the results, the community around the project also takes into account the quality of the project, signaled by the loading on Blockchain relevance almost 0.5. The advanced product phase has a significant impact as well, especially for the projects in phase First customers and MVP.

The strongest significantly positive variable in the six months period is the "Token type/Utility token". The result indicates that Utility tokens are more likely to have a bigger community with 152 percentage points. This result supports the promise of Utility token sales, to create a built-in customer base for the project.

However, when looking at what happens in the longer period, the variable completely loses its significance and in fact, does not report any evidence of influencing the size of the community around the project.

This trend is supporting the hypothesis that the Utility token fails to deliver its promises in regard to an engaged group of investors and early adopters. The community is not formed organically and in a sustainable manner. More likely, the demand is driven chiefly by speculative motives and does not persist in the longer term after the tokens are sold and open for trading.

The rest of the variables remain more or less the same in between the two periods, most of the coefficients are slightly lower but still significant. Only one variable changed in an upward direction, the loading on Blockchain relevance, indicating that with a longer period, the technical aspects of the projects tend to gain in importance.

Table 11: Community in 6 Months and in a Year

	Dependent variable:		*Dependent variable:*
	Community		Community_Y
token_buyers	1.000*	token_buyers	1.000**
	(0.0001)		(0.0001)
`ETH Price % change in 6 months`	1.026	`ETH Price % change in a year`	0.988
	(0.050)		(0.032)
`WP pages`	0.976***	`WP pages`	0.973***
	(0.008)		(0.008)
`Team members`	0.974	`Team members`	0.980
	(0.029)		(0.030)
`Product phase`First Customers	0.388***	`Product phase`First Customers	0.278***
	(0.228)		(0.227)
`Product phase`Growth	0.00000***	`Product phase`Growth	0.00000***
	(0.000)		(0.000)
`Product phase`Idea	1.552	`Product phase`Idea	1.592
	(0.325)		(0.341)
`Product phase`MVP	0.576**	`Product phase`MVP	0.551**
	(0.272)		(0.293)
`Product phase`Prototype	0.796	`Product phase`Prototype	0.800
	(0.234)		(0.248)
`Token Type`UT	1.517*	`Token Type`UT	1.100
	(0.228)		(0.251)
`Blockchain relevance`Yes	0.487***	`Blockchain relevance`Yes	0.517**
	(0.249)		(0.261)
Observations	301	Observations	270
		Note:	*p<0.1; **p<0.05; ***p<0.01

6.3. Discussion

6.3.1. Key findings and hypotheses evaluation

Based on the empirical analysis, the hypothesis can be evaluated. Starting with the effect of the lack of regulations. The hypothesis **H1.a** "The higher availability of information before ICO increase the success after the ICO." was tested by examining the impact of White Paper as the most common source of information. Even though the White Paper variable was identified as a determinant of raising funds through ICO (Bourveau et al., 2018), it did not prove to be significant in the financial success of the project after the

ICO. On the other hand, the presence of informative White Paper is beneficiary for getting listed on an exchange and building a bigger community around the project.

The hypothesis **H1.b** was concerned with how the measures from the VC decision process increases the success after the ICO. Regarding the size of the team, it had a significant effect only on the positive external rating and to some extent on listing on the exchange. We can assume that for the financial performance, not only the quantity but also the quality play role and the size of the team is important only when evaluated by the external sites as a due diligence criterium.

The product factor, represented by the product phase, was proven to play a significant role in most of the success measurements, chiefly in financial success. The bigger community also tends to be built around projects that are more advanced in development. The only aspect where the initial stages were favorable was the listing on an exchange.

Choosing the right market in the meaning of suitable blockchain application is significantly influencing virtually every success variable, even though for the external rating the effect can be observed only in the longer run.

As for the token type, the analysis revealed that Utility tokens are more likely to perform worst financially. They present a better chance to get listed on an exchange and build a community shortly after the token sale, however, in the longer term their role loses the significance.

The token role is also a key variable for testing the hypothesis of technology utilization. Significantly negative coefficients for the financial performance is pointing to confirmation of the hypothesis **H2.a** that Utility token decreases the success after the ICO and the loss of effect on the community in the long term suggests that the demand created by utility token is not serving as a validation of the final product or service.

The hypothesis **H2.b** stating that the success of a start-up is strongly connected with the Ethereum token price was confirmed particularly in the scope of financial performance. The token price and with it also the whole project valuation is to a great extent influenced

by the ETH price trend. This also represents considerable currency risk for the projects that received funding in the form of ETH.

The last tested hypothesis is **H3**, concerned with the effect of increased investors' base. The variable was significant through all success measurements, however, for the financial performance and external rating, the coefficient value is very low, in tenths and thousandths of percentage points. The number of investors, however, plays a significantly positive role in both exchange listing and community building. This would suggest that even though the token buyers alone cannot influence the success measured by financial performance, they are able to support the project in the scope of the crypto market specific measurements.

6.3.2 Implications for start-ups

After performing the empirical analysis and testing the hypothesis, the final implication for entrepreneurs that consider blockchain-based funding can be concluded. When looking back to what was identified as positives from the blockchain based-funding specifics, the analysis was not able to confirm the potential for enabling scalable and affordable regulatory compliance. This is due to the fact that the regulatory environment is still developing and thus it is complicated to measure the compliance with the regulations.

What is clear is that in the current regulatory landscape, token sales managed to acquire a negative reputation in several countries and are even banned in some, for example China, Macau, Pakistan (The Law Library of Congress Global Legal Research Center, 2018). The negative image is caused mostly by the high portion of scams or unexperienced projects, which would likely not get funded in regulated environment. This leads to an associated risk for entrepreneurs: in comparison to the positive media coverage of striking a VC deal, the PR value of the token sale is limited. Doing an ICO can even damage the company's image and complicate future opportunities for funding through institutional investors.

However, the interest in Security tokens offerings (STOs) indicates the inclination to step out of the grey zone of ICOs. The increasing pressure from the SEC also urges the industry to become more transparent and compliant with the regulations. It will be

interesting to observe how the traditional funding environment, restrained by strict regulations, reflect this. An example is the Andreessen Horowitz, changing the classification from venture capital fund to financial advisor. This recent change seems to be motivated chiefly by the restriction regarding the limit on how big percentage of VC's fund can be invested in investments labelled by SEC as high risk. The fund a16z has already demonstrated its belief in the cryptocurrency industry[16] and switching to a registered investment advisor enables them to continue with it (Konrad, 2019).

Despite the limitation in testing the regulatory environment, the statistics summary of the dataset confirms that the unique technology utilization enables funding of platforms and open source protocols and rewarding its contributors. The developers of these protocols, with Ethereum in the foreground, are rewarded when the open source protocol is utilized in other applications.

As the protocols are built on blockchain and ensure the relevance of utilization of blockchain technology, they are one of the projects that perform best in the post-ICO lifecycle. In the empirical analysis, the importance of blockchain technology relevance was confirmed through all success measurements. This finding is in line with previous papers that identified blockchain-relevant projects to be more likely to raise money in ICO and to obtain an exchange listing (among others, Lyandres et al, 2018).

The statistical summary also confirmed that a notable proportion of start-ups that raised funds through ICO were at a very early stage. The specifics of blockchain based funding are enabling projects to get funded at an as early phase as Idea or a Concept, however, the further analysis speaks against it. Even though early stage can help to get the project listed on an exchange, projects that get funded in a more advanced phase of development are performing better both financially and in terms of community building.

One of the main implications for a start-up to consider is the huge influence of the ETH price on the performance of their projects. This is a potential risk inherited in the blockchain based funding. The volatility of the crypto market is an external factor with a strong impact on both the token price and the company's financial health, which remains

[16] In 2018, the firm raised a $US 350 million fund dedicated to cryptocurrency area.

outside of the entrepreneur's influence. There are a few approaches that can be adopted in order to mitigate the risk. The project can consider building their own blockchain, which would weaken the relation to Ethereum platform. However, this approach can be time-consuming and costly and at the same time, does not protect the project from the total crypto-market sentiment. Regarding the currency risk, there are possibilities to hedge it with the use of stable coins, however, these are still in an early stage of development.

Security tokens, that can be tied to ownership rights and thus backed by an asset, possess the potential for higher stability. In the same time, the security tokens that are issued in compliance with the SEC regulations restrict to a certain extent the secondary market, thus protect the projects from purely speculative investors. These are often the type of investors for the utility tokens, and as suggested, do not tend to be true contributors in the longer perspective of the projects.

In line with the customer-base building is the recommendation for entrepreneurs that aim to establish a strong community: transparency is likely to help with both the credible image with exchanges and with the community around the project. Publishing details about the project in White Paper is inclined to have a positive impact on project success.

6.3.3 Study limitations

Throughout the description of the analysis method, the limitations were mentioned multiple times. The novelty of the industry prevented from testing the assumptions and hypothesis in the long term and only future studies will show if the findings from the empirical analysis hold in three- or five-year period.

In the long term, different success measurements can be tested, for example, the likelihood of obtaining financing outside of blockchain based methods. This would definitely be an important criterium when deciding for token sale as a form of funding.

Regarding the data set, more detail information on the quality of the team members could result in a deeper understanding of the team role in the ICO and post-ICO performance. Similarly, more information on the character of the investor base would definitely bring

interesting insights to the study, however, the anonymous character of the token sales prevents this kind of information.

Lastly, the limited scope of this thesis did not take into account other forms of token distribution. Projects that aim to build a community through Airdrops or Bounty schemes likely differ in the way their success and future performance is determined. And what is more, there are new specific forms of token sales emerging. The dynamic environment of blockchain start-ups introduced the term Initial Exchange Offering (IEO), new token emission mechanism with new forms of consensus and is currently shaping the conditions for STO. These are yet to be formalized and should be a subject of future studies.

7. Conclusion

This thesis aimed to answer the research question "How the blockchain enabled funding differs from the traditional funding forms and how these differences influence the start-ups originating from ICOs". Based on the answer, implications for entrepreneurs that consider the token sale was concluded, taking into regard the specifics of blockchain funding.

In the theoretical part, the token sale was introduced in the context of the financial market and different methods of fundraising. The brief description of the technology behind the blockchain based funding and the economic principles of tokens and token sales models resulted in the depiction of specifics of blockchain enabled funding, answering the first part of the research question. These are chiefly the lack of regulations, unique technology utilization and a broad investor base.

Through comparison with standard financing methods, the paper was able to identify the main benefits and challenges of the unique and novel environment. Based on these findings, the framework for the empirical part was created, with three main hypotheses answering the second part of the research question.

Through the empirical analysis, it was confirmed that the availability of information supports the success of the project, but only to a limited extent. The number of team

members has an even lesser impact. On the other hand, the phase of the product development is influencing the success significantly, with the general tendency of more advance project to perform better. The blockchain relevance turned out to play a key role in virtually every measurement of start-up success.

The second hypothesis regarding the technology impact was divided into two sub-hypotheses. The first one, concerned with the token type was confirmed to a certain extent, with results suggesting that Utility tokens tend to be less successful, especially over a longer period of time. The second hypothesis, stressing the impact of ETH price change was confirmed, with special emphasis for the financial-based success measurements.

The third hypothesis, suggesting that the broader investor base results in a higher success rate of the product was not proven entirely. The role of big investor based was significant only in regard to measurements relevant mostly within the crypto-industry: listing on cryptocurrency exchange and building a community of followers around the project.

Through the analysis, this paper extended the empirical ICO literature by focusing on the post-ICO performance of the projects that get funded through the token sale. The results of the empirical part provided insights into what should the entrepreneurs consider in order to leverage this novel means of funding.

Bibliography

Shin, L. (2015, September 28). Bitcoin's Shared Ledger Technology: Money's New Operating System. *Forbes.com*. Retrieved February 26, 2019, from https://www.forbes.com/sites/laurashin/2015/09/09/bitcoins-shared-ledger-technology-moneys-new-operating-system/

Nasdaq, Nasdaq Stock Market. (2018). Nasdaq Blockchain Strategy [Press release]. Retrieved February 26, 2019, from https://business.nasdaq.com/media/Blockchain_Mutual_Fund Strategy SEB and Nasdaq 2018_tcm5044-61791.pdf

Serman, A. J. (2012). *Raising Capital: Get the money you need to grow your business* (3rd ed.). AMACOM.

Bachmann, A. (2011). Peer-to-Peer Lending – A Literature Review. *Journal of Internet Banking and Commerce,* 16(2), 2-18.

Ordanini, A., Miceli, L., Pizzetti, M., & Parasuraman, A. (2011). Crowd-funding: Transforming customers into investors through innovative service platforms. *Journal of Service Management,* 22(4), 443-470. doi:10.1108/09564231111155079

Bradford, C. Steven (2012). Crowdfunding and the Federal Securities Laws. *Columbia Business Law Review,* 2012(1), 2012. Available at SSRN: https://ssrn.com/abstract=1916184

Hemer, J., Schneider, U., Dornbusch, F., & Frey, S. (2011). *Crowdfunding und andere Formen informeller Mikrofinanzierung in der Projekt- und Innovationsfinanzierung.*

Boreiko, D., & Sahdev, N. K. (2018). To ICO or not to ICO – Empirical analysis of Initial Coin Offerings and Token Sales. *SSRN Electronic Journal*. doi:10.2139/ssrn.3209180

ICObench, (2019). ICO Market Analysis 2018. Retrieved February 12, 2019, from https://icobench.com/reports/ICO_Market_Analysis_2018.pdf.

ICObench, (2019). ICO Market Analysis - January 2019. Retrieved February 12, 2019, from https://icobench.com/reports/ICObench_ICO_Market_Analysis_January_2019.pdf

ICObench, (2019). ICO Market Analysis - February 2019. Retrieved February 12, 2019, from https://icobench.com/reports/ICObench_ICO_Market_Analysis_February_2019.pdf

Drescher, D. (2017). *Blockchain basics: A non-technical introduction in 25 steps*. New York: Apress.

Antonopoulos, A. M. (2018). *Mastering bitcoin: Programming the open blockchain*. Beijing; Boston; Farnham; Sebastopol; Tokyo: OReilly.

Wattenhofer, R. (2016). *The science of the blockchain*. Inverted Forest Publishing.

Nakamoto, S. (2009). Bitcoin: A Peer-to-Peer Electronic Cash System [White paper]. Retrieved from https://bitcoin.org/bitcoin.pdf

Catalini, C. & Gans, J. (2016) Some simple economics of the blockchain. *MIT Research Paper*, 5191-16. doi:10.3386/w22952

Swan, M. (2015). Blockchain: *Blueprint for a new economy*. Beijing: OReilly.

DiNucci, D. (1999) Fragmented future. Print Magazine, 4, 32. Retrieved from http://darcyd.com/fragmented_future.pdf

Christidis, K. & Devetsikiotis, M. (2016). Blockchains and Smart Contracts for the Internet of Things, *IEEE Access*, 4, 2292 – 2303. doi: 10.1109/ACCESS.2016.2566339

Szabo, N. (1996). Smart Contracts: Building Blocks for Digital Markets. Retrieved February 21, 2019, from http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html

Buterin, V. (2013). Ethereum White Paper [White paper]. Retrieved from https://www.weusecoins.com/assets/pdf/library/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf

Chanson, M., Risius, M., and Wortmann, F. (2018). Initial Coin Offerings (ICOs): An Introduction to the Novel Funding Mechanism Based on Blockchain Technology. *Proceedings of the 24th Americas Conference on Information Systems (AMCIS)*, New Orleans, USA.

FINMA, Swiss Financial Market Supervisory Authority (2017). Regulatory treatment of initial coin offerings [FINMA Guidance]. Retrieved February 16, 2019, from https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/

Gritz, L. (2018). Teaching a New Dog Old Tricks: Why the Howey Test is Still the SEC's Best Friend When Examining Initial Coin Offerings. *19 N.C. J.L. & Tech. 193* Available at: https://scholarship.law.unc.edu/ncjolt/vol19/iss4/7

Li, J., & Mann, W. (2018). Initial Coin Offering and Platform Building. *SSRN Electronic Journal*. doi:10.2139/ssrn.3088726

Amsden, R., & Schweizer, D. (2018). Are Blockchain Crowdsales the New Gold Rush? Success Determinants of Initial Coin Offerings. *SSRN Electronic Journal*. doi:10.2139/ssrn.3163849

Lyandres, E., Palazzo, B., & Rabetti, D. (2018). Are Tokens Securities? An Anatomy of Initial Coin Offerings. *SSRN Electronic Journal*. doi:10.2139/ssrn.3287583

K. Monaghan, Maura. (1994). An Uncommon State of Confusion: The Common Enterprise Element of Investment Contract Analysis.

Monaghan, K. M. (1995). An Uncommon State of Confusion: The Common Enterprise Element of Investment Contract Analysis. *63 Fordham L. Rev.* 2135. Available at: https://ir.lawnet.fordham.edu/flr/vol63/iss6/6

Borneman, R. (2005). Why the Common Enterprise Test Lacks a Common Definition
A Look Into the Supreme Court's Decision of SEC v. Edwards. *5 U.C. Davis Bus. L.J.* 16. Available at: https://blj.ucdavis.edu/archives/vol-5-no-2/why-the-common-enterprise-test.html

Gordon, J. D. (2011). Defining a Common Enterprise in Investment Contracts. *Ohio State Law Journal, 72*(1), 2011th ser., 59-94. Retrieved from http://hdl.handle.net/1811/71438

Buterin, V. (2017). Analyzing Token Sale Models. Vitalik Buterin's website. Retrieved March 12, 2019, from https://vitalik.ca/general/2017/06/09/sales.html

Kiska, A., Jr. (2015). Central European Start-up Guide. Credo Ventures. http://www.credoventures.com/resources/Central_European_Start-up_Guide.pdf

Metcalfe, R. M., & Boggs, D. R. (1983). Ethernet: Distributed packet switching for local computer networks. Communications of the ACM, 26(1), 90-95. doi:10.1145/357980.358015

Eghbal, N. (2016). How I Stumbled Upon The Internet's Biggest Blind Spot. *Medium.com*. Retrieved March 21, 2019, from https://medium.com/@nayafia/how-i-stumbled-upon-the-internet-s-biggest-blind-spot-b9aa23618c58

Wenger, A. (2016). Crypto Tokens and the Coming Age of Protocol Innovation. *Continuations by Albert Wenger*. Retrieved March 21, 2019, from https://continuations.com/post/148098927445/crypto-tokens-and-the-coming-age-of-protocol

Hall, J., Hofer, C. W. (1993), Venture capitalists' decision criteria in new venture evaluation. Journal of Business Venturing, Vol. 8, No. 1, pp. 25-42.

Simic, M. (2015). INVESTMENT CRITERIA SET BY VENTURE CAPITALISTS. Econviews, 457-479. Retrieved January 2, 2018

Gompers, P., Gornall, W., Kaplan, S., & Strebulaev, I. (2016). How Do Venture Capitalists Make Decisions? National Bureau of Economic Research. doi:10.3386/w22587

Chod, J., & Lyandres, E. (2018). A Theory of ICOs: Diversification, Agency, and Information Asymmetry. *SSRN Electronic Journal*. doi:10.2139/ssrn.3159528

Chamber of Digital Commerce (2019). NATIONAL ACTION PLAN FOR BLOCKCHAIN [Call for Action]. Retrieved March 14, 2019, from https://digitalchamber.org/blockchain-national-action-plan/

Momtaz, P. P. (2018). Putting Numbers on the Coins: The Pricing and Performance of Initial Coin Offerings. *SSRN Electronic Journal*. doi:10.2139/ssrn.3169682

Adhami, S., Giudici, G., & Martinazzi, S. (2017). Why Do Businesses Go Crypto? An Empirical Analysis of Initial Coin Offerings. *SSRN Electronic Journal*. doi:10.2139/ssrn.3046209

Bourveau, T., George, E. T., Ellahie, A., & Macciocchi, D. (2018). Initial Coin Offerings: Early Evidence on the Role of Disclosure in the Unregulated Crypto Market. *SSRN Electronic Journal*. doi:10.2139/ssrn.3193392

Jong, A. D., Roosenboom, P., & Kolk, T. V. (2018). What Determines Success in Initial Coin Offerings? *SSRN Electronic Journal*. doi:10.2139/ssrn.3250035

Benedetti, H. E., & Kostovetsky, L. (2018). Digital Tulips? Returns to Investors in Initial Coin Offerings. *SSRN Electronic Journal*. doi:10.2139/ssrn.3182169

Lee, J., Li, T., & Shin, D. (2018). The Wisdom of Crowds and Information Cascades in FinTech: Evidence from Initial Coin Offerings. *SSRN Electronic Journal*. doi:10.2139/ssrn.3195877

Wust, K., & Gervais, A. (2018). Do you Need a Blockchain? *2018 Crypto Valley Conference on Blockchain Technology (CVCBT)*. doi:10.1109/cvcbt.2018.00011

MacMillan, I. C., Siegel, R., Subba Narasimha, P. N. (1985), "Criteria used by venture capitalists to evaluate new venture proposals", Journal of Business Venturing, Vol. 1, No. 1, pp. 19-128.

Hills, F. J., & Haykin, S. S. (1978). *Agricultural experimentation: Design and analysis*.

Hlavac, Marek (2018). stargazer: Well-Formatted Regression and Summary Statistics Tables. *R package version 5.2.2*. Available on https://CRAN.R-project.org/package=stargazer

The Law Library of Congress, Global Legal Research Center (2018). Regulation of Cryptocurrency Around the World. *Library of Congress*. Retrieved April 15, 2019, from https://www.loc.gov/law/help/cryptocurrency/cryptocurrency-world-survey.pdf

Konrad, A. (2019, April 30). Andreessen Horowitz Is Blowing Up The Venture Capital Model (Again). *Forbes.com*. Retrieved April 09, 2019, from https://www.forbes.com/sites/alexkonrad/2019/04/02/andreessen-horowitz-is-blowing-up-the-venture-capital-model-again/#6f998ec97d9f

List of Appendices

Appendix 1 Trial token contract
Appendix 2 Token sale dilemma and trilemma
Appendix 3 Snapshot of the Framework to assess if token is security
Appendix 4 Research questions and Hypotheses tree
Appendix 5 Projects summary
Appendix 6 Correlation between variables

Appendix 1 – Trial token contract

The process of creating a token is described on Ethereum website (ethereum.org) and starts with ETH sent to MyEtherWallet to provide funds for setting up a smart contract on the Ethereum blockchain. The test token created for the sake of this paper costed ETH fees in value of approximately $US 30 and took two hours in total.

There are essentially two options, first to set up two separate smart contracts, one for the ICO and one for creating the ERC-20 token, or second, to set up one smart contract for creating the token and adding the ICO extra feature of the token.

The basic token contract example:

```
pragma solidity ^0.5.0;

import "../token/ERC20/ERC20.sol";
import "../token/ERC20/ERC20Detailed.sol";

/**
 * @title ThesisToken
 * @dev Creates a simple ERC20 Token example for the sake of testing
 * where all tokens are pre-assigned to the creator
 * ThesisToken can later be distributed `transfer` and other
 * `ERC20` functions.
 */
contract ThesisToken is ERC20, ERC20Detailed {
    uint8 public constant DECIMALS = 18;
    uint256 public constant INITIAL_SUPPLY = 10000 * (10 ** uint256(DECIMALS));

    /**
     * @dev Constructor that gives msg.sender all of existing tokens.
     */
    constructor () public ERC20Detailed("ThesisToken", "THE", DECIMALS) {
        _mint(msg.sender, INITIAL_SUPPLY);
    }
}
```

Other features defined within the ERC-20 standard are for example the total amount of token created (100,000), its name (ThesisToken) and abbreviation (THE). Within the ICO contract, specific such as the *cap* can be determined, the number of tokens that are to be sold or the *basePrice*, the number of tokens that will be sold per 1 ETH.

After the contract code is compiled, it can be deployed after paying the GAS fee on the Ethereum blockchain, creating a unique contract address. To this address, the funds can be sent in exchange for newly created THE tokens. This test did not go as far as publishing the token sale; however, it will be potentially possible within a few hours.

Appendix 2 – Token sale dilemma and trilemma

Vitalik Buterin, the main developer and founder of Ethereum, defined five main goals each token sale strives to achieve. These five properties of a well-done token sale are according to him: 1. The certainty of valuation, 2. The certainty of participation, 3. Capping the raised amount, 4. Avoid token issuer holding majority of tokens, 5. The efficiency of the token sale (Buterin, 2017).

Buterin further elaborates on his theory and introduces the token sale dilemma, in which he claims that first two cannot be satisfied simultaneously, and trilemma when later three cannot be satisfied simultaneously.

The dilemma is caused by the fact that when the token issuer wants to assure valuation of a certain amount, there is the risk that there will be more investors interested into the sale and not every one of them will be able to participate.

He further explains the trilemma based on supply-and-demand argument, stating that to be able to avoid the issuer holding majority of the tokens, there needs to be some fixed percentage of the total token supply being sold. To satisfy the third property at the same time (to be able to impose a cap on the raised amount) the price of the token needs to be capped. Hence the fifth property, of efficiency achieved in equilibrium cannot be reached as the price is not dictated by supply-and-demand. Either there will be a shortage of the tokens at the given price when the demand exceeds supply, or the other way around, the total amount of tokens will not be sold as there is supply overhang at the price given by issuer.

The dilemma and trilemma as introduced by Buterin mean that different token sale models achieve different results, succeeding only partially in fulfilling all five properties.

There have been several attempts to overcome the dilemma and trilemma, with various results. A notable case is the dutch auction model adopted by the project Gnosis, sale capped at $US 12.5 million with a total amount of token was 10 million. The percentage of tokens available for purchase would depend on the duration of the sale, with 5% of tokens on the first day, 10% the second-day et cetera. The price per token was supposed to decline with each mined block, decreasing the valuation over the time of token sale.

The goal of this strategy was to create a mechanism that would generate an optimal valuation per buyer. The individuals considering participation in the sale were to follow a simple strategy. First, they would choose the highest valuation (V) for which they would be willing to buy the Gnosis token. Second, they would time the purchase in the sale based on the valuation of the token, waiting for it to drop below the predetermined level.

If the V is set at a low level, meaning that the potential buyer does not believe that the investigation is worth more, it can occur that the sale closes before valuation drops below the level V. The buyer does not purchase the token and escapes what he/she evaluated as a bad deal. If it drops below low-level V, it may still be a bad deal but with a low stake**.**

If the V is set at a high level, meaning that buyer trust the investment, it is likely that the sale will not close before valuation drops below V. Buyer will get into what he/she evaluated as a good deal.

With this mechanism, the Gnosis team was aiming to break the dilemma of providing the sales participants with both certainties of valuation and certainty of participation. However, the intended purpose was spoiled by the buyers not behaving according to the economic principles. Due to the fear of missing out, the cap was reached within minutes, with 5% of the total amount of tokens sold for $US 12.5 million, implying a valuation of $US 300 million.

This left the founders with 95% of the total amount, wrecking the fourth property, one crucial to the decentralized ecosystem of blockchain based start-ups. With such a majority, the founders would have major power over the price of traded tokens and there is a risk of future dilution of the tokens sold in the ICO.

Appendix 3 – Snapshot of the Framework to assess if token is security

Framework to assess if token is security

Based on the Four-condition Howey test and the Coinbase report

Coinbase report

First Condition: Investment of Money

Is there an investment of (money)?				
Characteristic	**Points**	**Explanation**	**Examples**	**Y or N**
There is no crowdsale. New tokens are given away for free, or are earned through mining	**0**	Tokens which are not sold for value do not involve an investment of money. For example, if all tokens are distributed for free, or are only produced through mining, then there is no sale for value.	There was never any token sale for Bitcoin. The only way to acquire new bitcoin is via mining. A token which is randomly distributed for free	
Tokens are sold for value (crowdsale)	**100**	Tokens which are sold in a crowdsale, at any time, regardless of whether sold for fiat or digital currency (or anything else of value) involve an investment of money	A token which is sold for bitcoin in a crowdsale. A token which is sold for ether in a crowdsale.	

Total for Element 1 **0**

Second Condition: Common Enterprise

What do token holders have to do in order to get economic benefits from the network?				
Characteristic	**Points**	**Explanation**	**Examples**	**Y or N**
All token holders will always receive the same returns	**25**	If returns are paid to all token holders equally (or in proportion to their token holdings) regardless of any action on the part of the token holder, then their interests are more likely aligned in a common enterprise	'HodlToken' holders are automatically paid an amount of ETH each week, based on fees generated by other users of the network 'FoldToken' does not pay any return, and there is no way to earn more tokens within the network (but they can be bought, sold or traded)	
There is a possibility of varying returns between token holders, based on their participation or use of the network	**-20**	If token holders' returns depend on their own efforts, and can vary depending on the amount of effort they each put in, then there is less likely to be a common enterprise	'CloudToken' holders can earn more tokens by providing data storage on the network, or can spend tokens to access data storage. Holders who do not provide data storage do not earn any more tokens.	

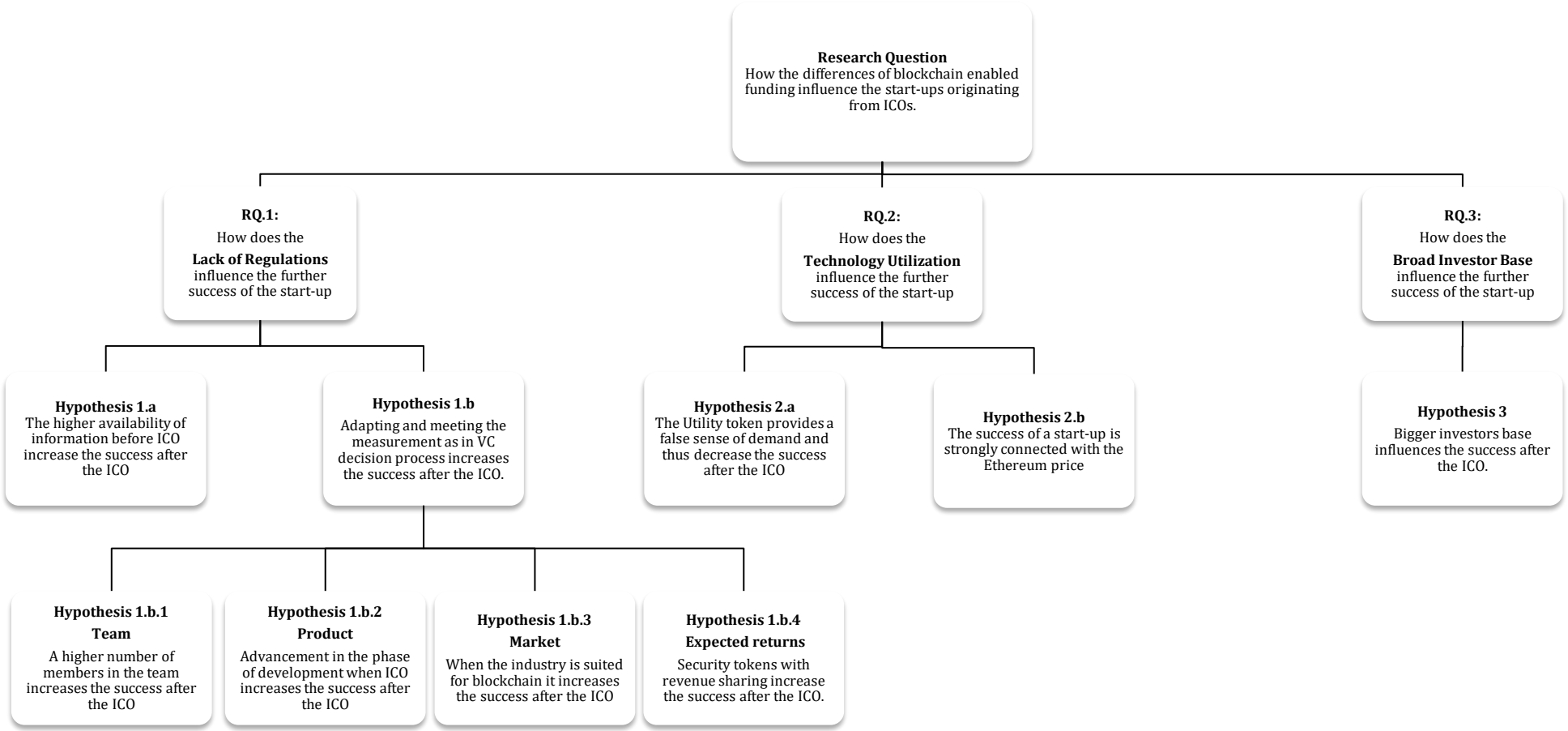
Total for Element 2 **0**

Third Condition: Expectation of Profit

What function does the token have?				
Characteristic	**Points**	**Explanation**	**Examples**	**Y or N**
Ownership or equity interest in a legal entity, including a general partnership	**100**	Tokens which give, or purport to give, traditional equity, debt or other investor rights are almost certainly securities. ***If one or more of these characteristics apply, the token is almost certainly a security, notwithstanding the results of the other elements***	A developer releases and sells 100 'BakerShares' tokens. Each token entitles the holder to 1 share in Baker, Inc. A developer releases and sells 100 'BakerProfit' tokens. Each token entitles the holder to 1% of the profits of Baker, Inc. for the next year. A developer releases and sells 100 'BakerDebt' tokens. Each token entitles the holder to principal and interest repayments	
Entitlement to a share of profits and/or losses, or assets and/or liabilities	**100**			
Gives holder status as a creditor or lender	**100**			
A claim in bankruptcy	**100**			

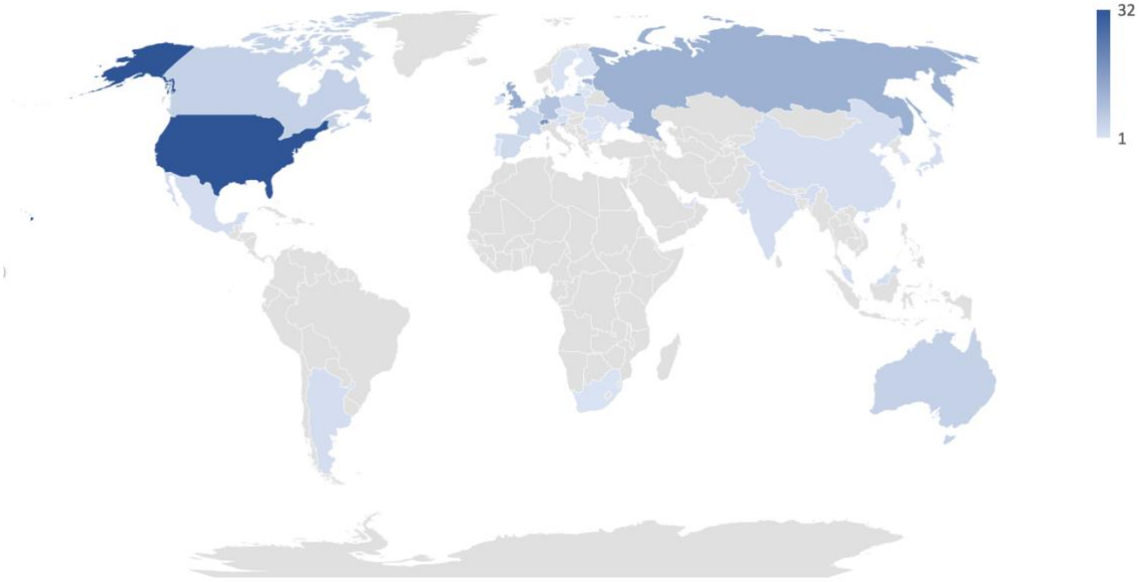
The online framework can be found under this link

Appendix 4 – Research questions and Hypotheses tree

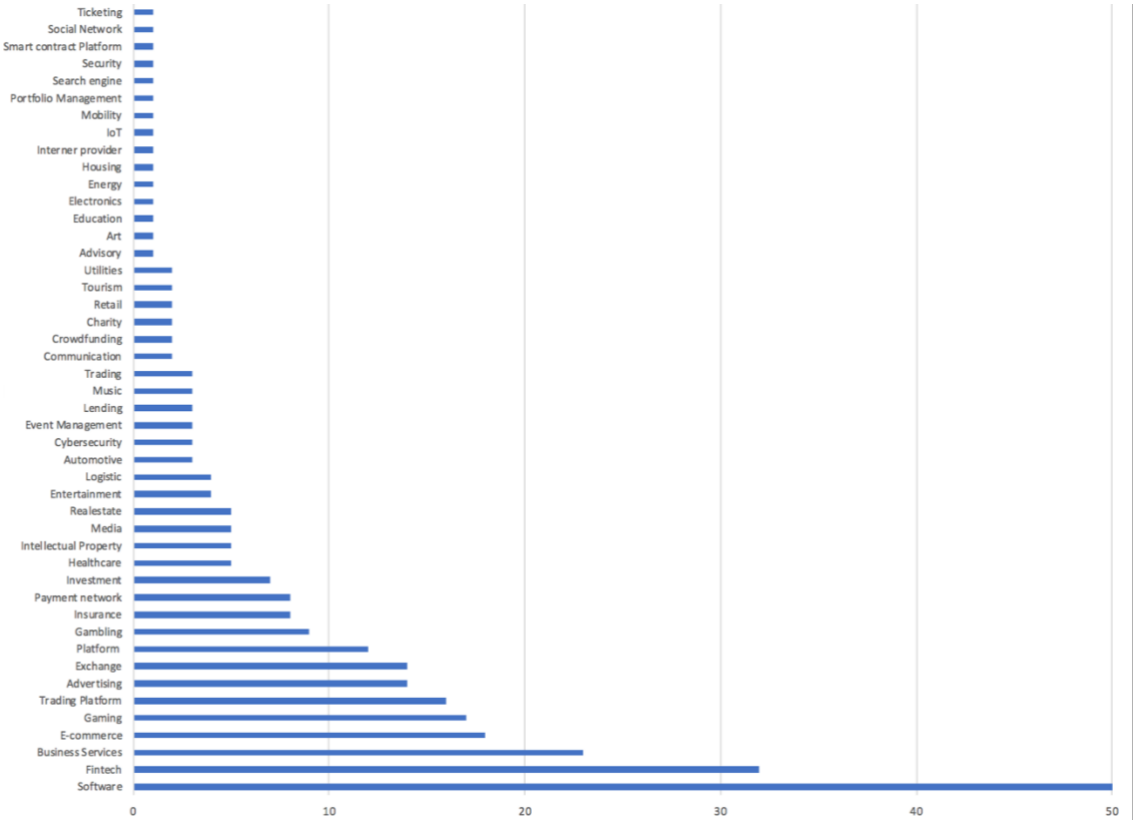


Appendix 5 – Projects summary

Geographical representation



Project Industry



Appendix 6 – Correlation between variables

Plot of correlation between variables