Universiteit Leiden

ICT in Business and the Public Sector

An exploratory study of blockchain projects factors for success

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Date: 29/06/2019

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MASTER'S THESIS

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I. Disclaimer

I hereby declare that this dissertation is my own original work and has not been submitted before any institution for assessment purposes.

Further, I have acknowledged all sources used and have cited these in the reference section

29/06/2019

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Nick Xaverius Lefevere   Date

THE EFFECTS OF VARIOUS FACTORS OF BLOCKCHAIN PROJECTS ON ITS
SUCCESSFULLNESS

II. Abstract

Objective

This study its objective was to identify the factors that influence a blockchain project on its chance of success. This objective is set due to the active problem of blockchain projects continue to fail or be stale while the blockchain market is increasing. The focus of this study is to find the overarching factors so that it is applicable to a broader set of blockchain projects.

Methods

A qualitative study with an interpretive exploratory research design was used for finding, collecting, and analyzing data. Ten semi-structured interviews were conducted for data collection, and with the use of open coding and the thematic analysis method of Braum & Clarke (2006), the data was analyzed. The participants of the interviews were all from different companies and knowledgeable of blockchain.

Results

The problem of blockchain projects failing was researched. The key reasons for a project to fail are the lack of knowledge within organizations and the technology immaturity along with the lacking of a clear business case with its definitions. Within the data, it was analyzed that several factors have an influence on a blockchain project on multiple levels. These levels: project, organizational, and external, are based on the research of Reeves, Levin & Ueda (2016). Each level has a different interaction with the project. The factors in table 1 are the factors that are found within the data.

Table 1 Overview of Factors that influence blockchain projects

| Project level	Organizational level	External level
Start of the project -Having a clear business case -Data investigation -Involvement of parties -Looking into alternative technologies **Management and surroundings** -High expectations -Governance -Change management and adoption	**Organizational** - Organizational encouragement and support - Organizational understanding - Mindset **Knowledge and awareness** - Business value misconception - Variety of knowledge - Expectations of management	**PESTLED** - Maturity of the technology - Political involvement - Law and regulations

Managing these factors could, in theory, contribute to a higher chance of a successful blockchain project. This study analyzed when a blockchain project is successful by the opinion of professionals. The result of this analysis was that a blockchain project could be

seen as a success when it is completed within the terms and conditions set at the beginning of the project and if possible add value to the business and be applicable to the ecosystem.

The last result of the study was the model that is shown in figure 1. The model was created with the levels of Reeves, Levin & Ueda (2016) in mind, together with all the factors found to result in a higher chance of success for a blockchain project.

Figure 1 Blockchain Project Success Model
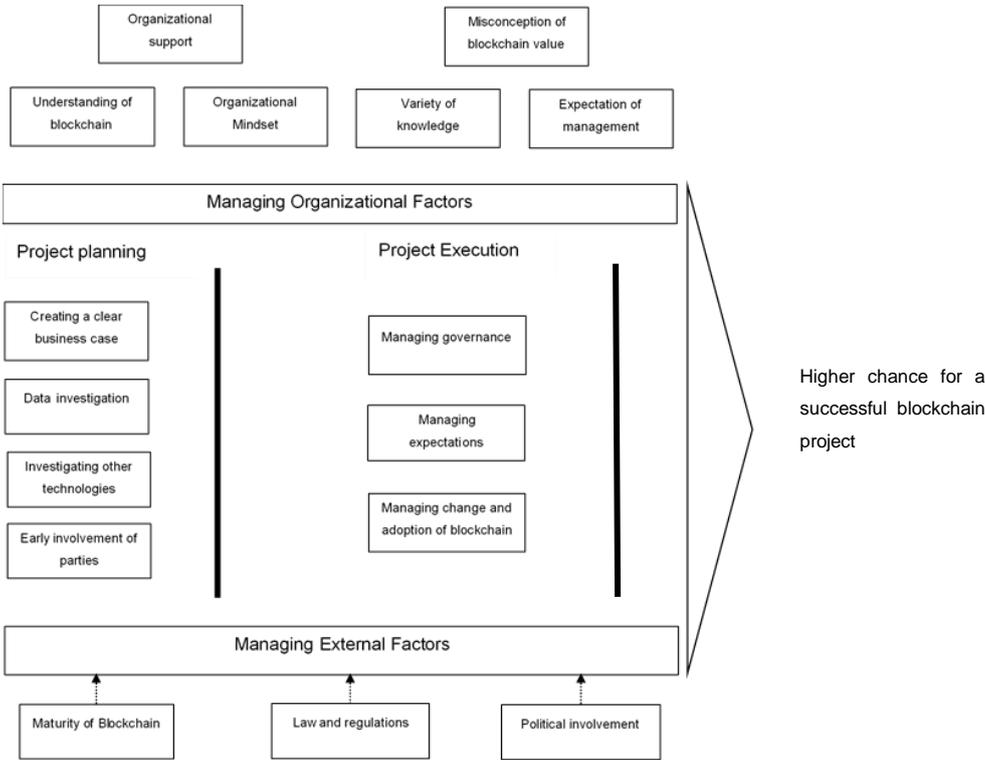
Conclusions

The results tell that there are a lot of factors that influence a blockchain project. The technology maturity level is not yet ready for what the general audience wants it to be. The results are not sufficient to guarantee success if used due to the factors being overarching and not specific enough, but they can give an understanding of a situation. Further research could act further upon this model and see its effect on a blockchain project. Furthermore, This study could have interesting results if it is repeated in 5 years. The objective of the study can be made to see what factors have changed.

III. Preface

Before you lies the research "An exploratory study: Blockchain projects factors that influence success", the basis of which are interviews on finding factors that have influence on blockchain projects. These interviews were conducted among several participants who had knowledge on the subject. This thesis has been written to fulfill the graduation requirements of the ICT in business program at Leiden University. I was engaged in researching and writing this dissertation from October to April 2019.

The project was undertaken at the request of KPMG, where I undertook an internship. The research was challenging but exciting. The interesting subject of blockchain sparked many questions. It was at first difficult to find a precise question and research, but thanks to extensive brainstorm sessions the questions were identified. Fortunately, Both Mr. Revet and my supervisors from Leiden University, W. Heijstek and R. Hewings guided me when it was necessary.

I like to thank all of my supervisors for their guidance and support during this process. I also wish to thank all of the participants, without whose cooperation I would not have been able to conduct this research.

To my other colleagues and fellow interns at KPMG: I would like to thank you for the wonderful time. It was always helpful to bat ideas about research subjects with you. My parents deserve a particular note of thanks: your wise counsel at the time of this research have served me well and your kindness.

I hope you enjoy reading this master thesis.

Nick Lefevere

Amstelveen, Juni 29, 2019

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1. Introduction

By the end of 2018, the world of IT has come accustomed to hearing the word blockchain as well as in the research world. Since the initial paper by Satoshi Nakamoto (2008)on Blockchain, the technology has evolved from using bitcoin to buying a pizza through the blockchain (Bitcointalk , 2010) to integrating blockchain into a supplychain (IBM, 2018). When it comes to blockchain most people immediately think about the cryptocurrency potential it has. Blockchain is often put together in the news with bitcoin and cryptocurrency, so the general public mostly reads about those topics (PWC, 2019). According to an article in Forbes (Del Castillo, 2018), fifty of the biggest of companies are starting to see that blockchain has more to offer than the cryptocurrency side of the technology. These companies, as well as many others, more focus on the technology DLT (distributed ledger technology) and blockchain itself and what it can offer to existing problems (Gartner, 2018). I have always been interested in the technology and the possibilities that it holds since I read about it in in the textbook of Swan (2015). Back then, in 2015, there was limited information on the technology but in recent years there have been an increasing amount of books and academic publications come out regarding blockchain according to research done by Yli-Huumo, Ko, Choi, Park ,and Smolander (2016) and in a recent report of Gartner (2018) (Bol.com, 2018). The increase of literature in blockchain means that information about the technology is getting more available, and companies are getting knowledgeable about DLT and blockchain. In an article in the Harvard Business Review Lanstiti and Lakhanu (2017) describe problems that blockchain faces in terms of the technological adoption of blockchain, they state the following about blockchain:

"It has the potential to create new foundations for our economic and social systems. But while the impact will be enormous, it will take decades for blockchain to seep into our economic and social infrastructure" (Lansiti & Lakhanu, 2017, p. 4)

The article points out the tremendous potential blockchain has but that it will take time before it will be acknowledged by the whole industry and on a social level. However, there are companies, according to Gartner (2018), who are looking for ways to find or create that impact with an increasing interest in the technology. Academia is also discovering that blockchain and distributed ledger technology as a whole has more applications then only Bitcoin, for example, in the article of Wüst & Gervais in (2018) who state:

"blockchain as a technology has gained much attention beyond the purpose of financial transactions – distributed cloud storage..., ownership and royalty distribution, and decentralized autonomous organizations just to name a few" (Wüst & Gervais, 2018, p. 375)

Next to all the positive remarks and possibilities about blockchain in the industry and academia are also publications that express the problems that blockchain as a technology still has, like in the instance of the research article of Zheng, Xie, Dai, Chen, and Wang (2017) on an overview of the blockchain technology.

1.2 Statement of Problem

The problem statement for this research is as followed:

"Blockchain projects are being dropped or are failing to fulfill expectations. This is happening while the number of projects and the sum of investments are growing."

As stated in the previous paragraph, there is a growing interest in blockchain and DLT from companies (Gartner, 2018). With this growing interest in the technology, there has been an increase in projects regarding blockchain (Gartner, 2018). These projects, which are done by companies like Deloitte and IBM, try to use the technology together with blockchain partners for their clients. Some projects over the years have had moderate success in terms of real implementation at the client.

For example, the chocolatier organization Tony Chocolonely (2018) wanted to experiment with the technology to see if their cocoa beans could be tracked by using blockchain technology. The project carried out by Accenture was implemented into their beantracker system. However, in the experiments, it was noticed that not every functionality was needed or not technologically ready and that there were challenges with usability. In conclusion, they determined that for their use case, blockchain was still in a too early and immature phase of its existence. In recent research of the Volkskrant (2018), they made an inventory of the blockchain projects within the Netherlands and provided the status of them in terms of completion and success. They concluded that 85% of blockchain projects tend to get stuck in their test or proof of concept phase. This research is not the only publication that concludes this high percentage for also the research company Forrester (Bennet, 2017) released an article in which was stated that an estimated 90 percent of cases the project will never become part of a company its operation.

Moreover, in an interview in 2018 with Bloomberg, Kharif the executive director of Hyperledger stated: *"They want to see other people fail first – they don't wanna be a guinea pig"* (Kharif, 2018, p. 5) meaning with "they" the companies that might be hesitant towards blockchain. In brief, the industry is growing, but yet it can be said that it is stale in some ways. As a result of the growing industry, the European Commission (2018) agreed to invest 300 million euros allocated towards the development of blockchain over the course of the next 2 years.

According to Gartner (2018), the number of investments into blockchain and DLT projects is growing immensely, and the industry is trying to find the right way to do these projects. In coming years, the investments are only going to increase while the industry is still finding its way onto how to use blockchain to add value (Gartner, 2018). Blockchain is a technology that has had a significant influence so far on not only the IT industry but on many others like the financial industry (Zheng et al, 2017) and the shipping industry (IBM, 2018).

1.3 Purpose of research

The purpose of this research is not to solve the problem as a whole but to help companies and other parties understand what is needed and where the focus needs to be when conducting blockchain/DLT projects. The findings and conclusions of this research could be useful as a guideline to ask the right questions when considering blockchain/DLT for customers and suppliers.

As stated in the problem explanation, it is predicted that there will be more projects and investments concerning blockchain and DLT (Gartner, 2018) in the next 5 years. The technology will continue to evolve in those years, and the purpose of this research is to aid that evolution. One of the goals of this research is to decrease the percent failed or discontinued blockchain projects. While there is a clear difference between a failed project or a discontinued one, both are initially bad, although professionals can learn from both of them. A failed project is one that did not succeed expectations or specific goals while a discontinued one was stopped in a phase of the project. The purpose of this research is also to lessens bad investments in projects which, if successful, could eventually help create a healthy investment environment for blockchain projects. We might conclude that the goal could be to improve the blockchain industry and to help it develop towards a mature technology. In an article that McKinsey (2019) published in January is stated that the blockchain technology and market are now trying to get towards the second phase of the project lifecycle seen in figure 2. It argues that the growth in this model is stale cause of the doubts, the technology, and the caution of the industry. This research wants to relieve the industry of some of the doubts and erasing a bit of the caution the industry currently has.

Figure 2 Blockchain life-cycle stage by market size
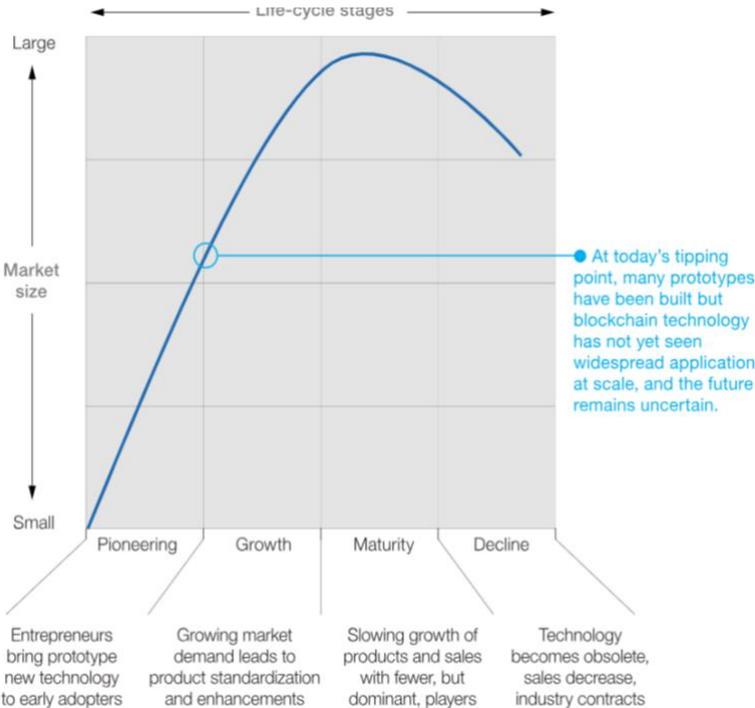
1.3.1 Scientific purpose

Despite the intense focus on the technology itself and the possible applications of it, few researchers have examined projects based on blockchain. One of the reasons could be because it is still a young technology. While research has been done on the subject of the effects of blockchain in multiple angles, these researches have mainly looked at the technology possibilities itself and the effects they have. This research looks if the characteristics of the technology and lessons learned of blockchain projects have overarching factors that can be linked with the success chance of a project. It acknowledges those who come before me in the literature review and will further act upon them.

1.4 Thesis statement

Now that the problem statement of the research is established and the purpose of the research is clear, the thesis statement can be stated and split in the form of research questions. The research question for this research is as followed:

"What success factors are needed for non-financial blockchain projects to be successfully implemented into business environments?"

This research question is the focus of this research. The question is related to the problem for looking at what factors are essential in a blockchain project for it to have a better chance of being successful. The problem first needs to be further investigated for it to find a solution to why these blockchain projects are failing or dropped. With the main research question alone, the research would not be feasible; for that reason, sub-questions are constructed to make the research manageable.

1.5 Sub Research questions

In the thesis statement, the main research question was introduced. To support the main research question, sub-research questions are set in this paragraph. These questions are used to construct findings to answer the main research question and its hypotheses. One of the reasons sub-questions are used is to make the main research question more accessible. The sub-questions are as followed:

Sub Question 1: Why are blockchain projects failing or being dropped?

This ties with the problem given earlier in this chapter. The question is based on the problem statement and finds its goal in the current literature, reports, and the industry. It is essential to get a clear understanding of the current situation.

Sub Question 2: What internal and external project factors have an influence on a blockchain project?

To understand what factors are needed for a successful blockchain project, first, the influencing factors of such a project need to be known. These factors could be both internally in the project or externally outside of the project.

Sub Question 3: When is a non-financial blockchain implementation project considered a success?

The first part of this question is answering when just a (software) project is a success in broader terms. The step afterward is looking specifically at non-financial blockchain projects by asking the industry. The focus and goal of this sub-question are to understand the terms of success.

Sub Question 4: What success factors can be bound together with the terms of success of a non-financial blockchain project?

This last sub-question focuses on the answers from the previous questions. It combines the data and analyses it to look if the variables can be linked with each other and with that creating a valuable answer either way. All these questions and their methods are supported by current and past literature.

1.5 Research Question Terminology

In the research question, mentioned in the previous paragraphs, there exist concepts that are important to define for the sake of clarity. Since blockchain technology and its concepts are relatively new, there is not yet been one clear definition that emerged. Due to this fact and the importance of clarity, an overview is given in Table 2, but the definition may differ in the industry and the business

Table 2: *Overview of terminology for the main research question*

Concept/term	Definition	Reference/source
Blockchain technology	"A blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties"	(Crosby et al, 2016, p. 1)
Non-Financial Blockchain	See "Blockchain technology", this concept adds that it is used for non-financial appliances for example usage as a peer-to-peer database, data transfer, supply-chain, IOT, etc.	(Lansiti & Lakhanu, 2017)
Distributed ledger technology (DLT)	See "Blockchain technology", terms are used synonymous	-

Business environment	"An organization or economic system where goods and services are exchanged for one another or for money. Every business requires some form of investment and enough customers to whom its output can be sold on a consistent basis in order to make a profit."	(Business dictionary, 2019)
Successful project	"[...] meeting or exceeding stakeholder needs and expectation [...] [by] balancing competing demands among: . Scope, time, costs, quality. . Stakeholders with different needs and expectations. . Identified requirements (needs) and unidentified requirements (expectations)."	(Project Management Institute, 1987, pp. 1-3)

1.6 Restrictions/focus of the research

There are some restrictions made to make the research more feasible and have more focus on the problem it is based on. For this research, it is chosen to focus on non-financial blockchain projects, this is due to the industry evolving in that direction according to research organization Gartner (2018). Moreover, companies like SAP (2018), IBM (2017) and Microsoft (2017) are likewise putting the focus more on the non-financial possibilities of blockchain. The next focus point is that this research looks both into successful and non-successful projects since factors that influence success could be collected from both. There were no restrictions on the size or scope of the blockchain projects in question because it may be an important factor for answering the RQ. At the same time there it was chosen to not focus on a specific industry or blockchain application. The reason for this choice of focus is due to the restriction of time and the difficulty of accumulating enough participants and data to go specific. Although researching the overarching factors within the terms "non-financial" makes the research less specific than choosing a particular application or industry, as shown in Figure 3, for the blockchain industry itself it could have a better effect. After all, the problem statement is not industry specific or bound to a single applicational use of blockchain (see chapter 1.2). In other words, focusing on the overarching factors would be beneficial for the research.

Figure 3 Scope and Focus of the research
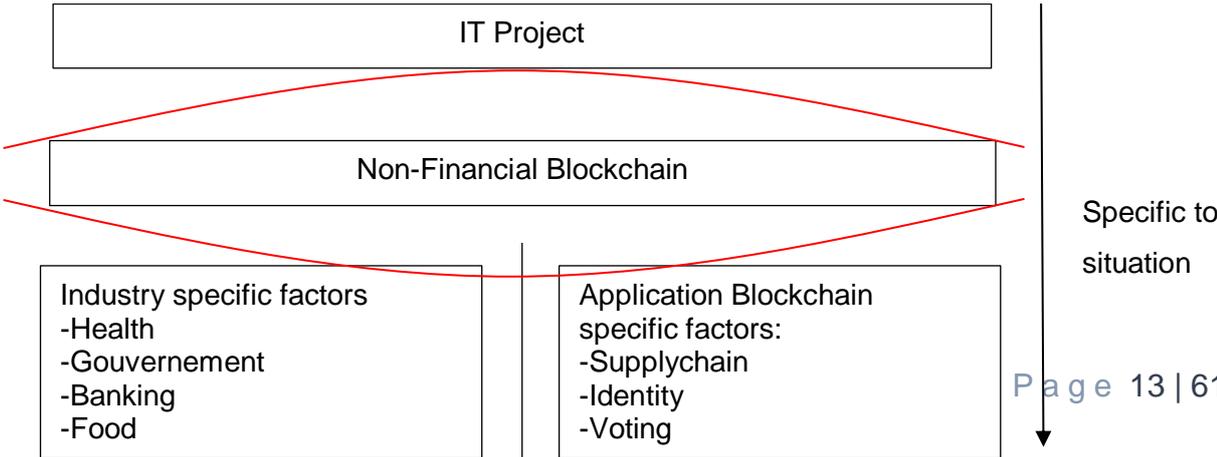
1.8 Conclusion introduction chapter

Blockchain as a technology is continuing to develop itself with applications into many sectors. The problem that many companies and the industry face are that projects regarding blockchain are getting stuck in their test or proof of concept phases of implementation or development. This research is going to find out what is needed for a blockchain project to be successfully implemented and why they are failing in the first place. The focus of the research will be on the non-financial applications of blockchain due to the market growing in that direction. Before diving into the methodology and results of the research, the literature review will distinguish and explore all the variables in current and past literature.

2. Literature review

In the last chapter, the introduction of the study is presented. In this chapter, we will dive into the literature review of this proposal and research. The literature review acts as a base for the thesis to conduct research and for the methodology. In this chapter, academic journals will be the primary source with textbooks and other research papers which act as support sources. Other than acting as a base for the research, the literature review answers the sub-questions introduced in the last chapter.

2.1 What is Blockchain technology

To begin understanding the technology known as blockchain, we need to look at the start of blockchain in 2008. In this year, the still mysterious, Satoshi Nakamoto published a paper online called *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008). In the paper, he mentions how electronic cash can be sent between parties without the need for a third party like a bank. This protocol soon became a realization when bitcoin, the currency, launched using the details of the paper together with software Nakamoto published the next year in 2009 (Cuccuru, 2017). Although many believe Nakamoto is a fabricated person, in many papers and reports within academia the paper is referred to the one that resulted in emerging the new technology (Swan, 2015). There are multiple definitions in academic literature regarding the term blockchain. While in the original paper of Nakamoto the definition was focused on electronic cash payments, publications in recent years define blockchain in another way. In the article of Christidis and Devetsikiotis (2016) about blockchain and smart contracts of the internet of things, blockchain is defined as a distributed data structure that is replicated and shared among members of a network. This definition is shared with the definition of the paper of Crodby, Nechiappan, Pattanayak, Verma, and Kalyanaraman (2016), which is the following:

"A blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties" (Crosby et al, 2016, p. 1)

These two definitions share a resemblance to each other by both focusing on the distributed database and the transactions within a network. These two definitions and also others in recent years diver from the original idea that Nakamoto had within his paper. It focuses more on the technology and the fact that with a blockchain you can store all kinds of data. This difference comes most likely from the 8-10 years of development of the technology.

In her book, Swan (2015) explains the concepts of; blockchain 1.0, which is related to currency; Blockchain 2.0, which focuses on contracts, this will be further discussed later in this chapter; And Blockchain 3.0, that is described as applications beyond currency. These concepts are linked with the evolution of blockchain and how blockchain has been perceived

over the last decade. This transition or evolution is also somewhat proven by the research organization Gartner (2018), from recent years they research the evolution of blockchain and its many appliances.

Before we go into what types of blockchain there are and how blockchain operates, it is essential to look at the characteristics of blockchain technology and why a lot of organizations and people were hyped about the technology. Niranjanamurthy, Nithya and Jagannatha (2018) state that blockchain technologies consist of six key elements: Decentralized, Transparent, Open Source, Autonomy, Immutable, and anonymity. These elements are also commonly used by tech vendors like SAP (2018) and IBM (2017) when portraying blockchain. Decentralized is considered one of the most basic key aspects of blockchain. Rather than having a third party validate each transaction (for instance a bank), the third party is nonexistent in blockchain in this case. The data within the transaction and the transaction information is stored and recorded in the blockchain. With transparency, Niranjanamurthy et al (2018) mean that a data record can be added or updated by every node. A node is a participant in the blockchain network. In the article, they additionally mentioned the term open source, with that the protocols and many software are open to use and be developed upon. Autonomy is a key aspect they argue because of the base consensus that no one can intervene between the system and a single person. Immutability in blockchain is that records in blocks cannot be changed when they are put in the blockchain. Anonymity is a key aspect due to the that every transaction is anonymous within the blockchain. With immutability, there is a difference in the literature, Niranjanamurthy et al (2018) find it a key aspect however they mentioned that when someone controls 51% node in the same records can be changed. Some literature does not mention immutability, like in the article of Zheng et al (2017), which states four key characteristics of blockchain. They argue that because immutability is not guaranteed in every situation, it should not be a key aspect. This is more explained in their comparison between the different kinds of blockchain shown in figure 4.

Figure 4 Blockchain type comparison (Zheng et al, 2017, p. 599)

TABLE I: Comparisons among *public blockchain, consortium blockchain* and *private blockchain*

Property	Public blockchain	Consortium blockchain	Private blockchain
Consensus determination	All miners	Selected set of nodes	One organization
Read permission	Public	Could be public or restricted	Could be public or restricted
Immutability	Nearly impossible to tamper	Could be tampered	Could be tampered
Efficiency	Low	High	High
Centralized	No	Partial	Yes
Consensus process	Permissionless	Permissioned	Permissioned

The public blockchain is most known for its usage for cryptocurrency, this due to the nearly impossible tampering to the records and the popularity of Bitcoin. Public blockchains could work for non-crypto appliances, but since it is not centralized it would not be applicable for companies in many cases. Private blockchain is used in one organization, while this is not decentralized anymore, there could be cases it could work. In theory, if an organization would have 20 departments where administration tasks are done every day, a private blockchain could improve the situation. The last version of blockchain is the Consortium blockchain, it has a selected set of nodes that govern the blockchain. Consortium blockchain has the difficulties and advantages of creating a blockchain with other parties or companies. Every type of blockchain has different applications for different situations or cases.

Crosby et al (2016) describe how blockchain works with an example of sending currency between 2 people. When A wants to send money to B the transaction is presented online as a block, the block is then broadcast to every party within the network. Those in the blockchain network approve the transaction is valid. It validates if A has enough funds to send and if the addresses are correct. The block is then added to the chain where it is connected to the previous block (Nakamoto, 2008). If the transaction is found to be invalid the transaction will not be put into the blockchain.

2.2 Evidence of Non-financial blockchain

As stated in the previous section blockchain has been evolving over the last decade. Crosby et al (2016) state that the non-financial applications are endless. They argue that blockchain is not only for the use of transaction of currency. They envision putting the proof of existence of documents and records like licenses, order documents and even health records in the blockchain. When these documents and records are in the blockchain they become a single source of truth. While the possibilities may be endless, it is always important to look at what kind of data a company can share in a blockchain. In the article by Niranjanamurthy et al (2018) they make a statement that it is important to understand that in blockchain you are dealing with transactions and not data. They say that there needs to be an understanding that it is not like collaborating in a document where participants can add or remove information like stated earlier when a transaction is set in the blockchain is nearly impossible to tamper with.

For non-financial applications, Zheng et al (2017) argue that smart contracts have a significant role for future appliances in companies. The idea of a smart contract can be originated from a peer-reviewed article by N. Szabo (1997). Szabo explains in his article the basic idea behind smart contracts how they can be used for transactions. He defined smart contracts as transaction protocol, which create a contract with predetermined terms. In recent years the terminology has not changed much, and the key aspects of his idea are still in use

in blockchain and blockchain related articles to this date. In a recent report however, by Lauslathi, Mattila, and Seppälä (2017), they argue that there is a newer definition. They state the newer definition as a set of promises, specified in digital form, including protocols within the parties platform on these promises. The smart contracts technology enables blockchain to have evolved into a technology that can be used for multiple purposes. With smart contracts, a set of companies can decide on the rules of executing. For the past few years, there have been many ideas for blockchain appliances. From the idea of creating traceability in a supplychain for the food industry by F.Tian (2016) to incorporating the concept of blockchain into the audit sector by a report of Rennock et al (2018). There are many forms of blockchain application in literature and cases that could be considered non-financial, most have in common that they are trying to use the transactions within the blockchain to save non-cryptocurrency related data. The definition for the term non-financial blockchain is not set in literature, but evidence can be found in the article of Iansiti and Lakhani (2017), they show that it is about appliances of blockchain which are not focused on sending financial value but other kinds of data true the blockchain. However, since there is no concrete evidence of the term, it is included in this research for validation.

2.3 Success and Survival

In the article about the biology of corporate survival, Reeves, Levin & Ueda (2016) stress that companies are identical to biological species due to that both are what is known as adaptive systems. In their article, they identified six principles that can help make complex adaptive systems in business robust and help them persisting from collapsing or decline. In their definition, they argue that companies are adaptive systems; if we take this definition into account, a project could fall under the same description. Further in their article, they mention that the principles mentioned could mean the survival of a company or a biological species. Survival of a project can by definition mean it is successful otherwise it would be a failure, but there are different definitions of success found in literature (Cambridge University Press, 2019) and success could have different definitions resulted by the goals set beforehand.

Reeves, Levin & Ueda (2016) find that complex adaptive systems like businesses are often embedded in broader systems. These broader systems can be distinguished into three levels, which can be seen in table 3. Each of the three levels means interaction in some way that can effect change in the system. The authors further argue that nature and business are similar to each other and made a comparison between nature and business at these levels. Additionally, since a could fall project under the same description, levels can be determined for a project by comparing the nature and business levels.

Table 3 Interaction levels of systems (Reeves, Levin, & Daichi , 2016)

Level	Nature	Business	Project
First	THE POPULATION Individual organisms of the same species	THE COMPANY Individual employees	THE PROJECT Project members
Second	THE NATURAL ECOSYSTEM Populations of species that depend on and compete with one another	THE BUSINESS ECOSYSTEM Companies that depend on and compete with one another	THE COMPANY ECOSYSTEM Members and other projects within the organization
Third	THE BROADER NATURAL ENVIRONMENT Neighboring ecosystems and nonbiological elements, such as the climate	THE BUSINESS ENVIRONMENT Overlapping ecosystems and other stakeholders, such as NGOs, government entities, and civil society	THE EXTERNAL ENVIRONMENT Competitors, law, government and society. All external factors influencing a project

The three levels of nature are used to determine the equivalent levels for a project. The definition of the first level of nature, the individual organisms of the same species, can be seen as the people who are working in a project. The equivalent can be done with the second level of nature, populations of species that depend on and compete with one another. In a project situation, the natural ecosystem is the organization itself since you compete for the survival of the project but depending on the organization for support. The last and third level of nature show the external entities and elements on which the population of the first level does not have much influence, for example, the climate. To take into account the broader environment and compare it with the business it can be claimed that the third level for a project is the external environment of the organization, which is comparable to the third level of business. These definitions are keeping with the ideas expressed by Reeves, Levin & Ueda (2016). With these definitions of levels for projects determined, the factors that influence a project can be separated into these levels.

2.4 Potential Factors of influence in literature

There could be many factors that influence a blockchain project and in different levels of interaction. In the literature of blockchain few research, the project factors and yet some researchers investigated the technology on its flaws. The technology itself could be an influential factor for the projects based on the next research.

In the SWOT analyses executed by Niranjanamurthy et al (2018) on blockchain as a technology, they claimed that one of the threats that exist for blockchain is that there is a need for research to be done on blockchain before the industry is ready for it. Additionally, they acknowledge that the maturity of the technology is a weakness, therefore suggesting the maturity of the technology being low. The conclusion that emerges from this study resembles that in the article of Wang, Chen & Xu (2016). In their article Wang, Chen & Xu (2016) constructed a maturity model for blockchain as a technology. Wang et al used the capability maturity model, CMM, made by the Software Engineering Institute (1997). They state that blockchain is a promising technology but that evidence that they found made clear that the technology back in 2016 was not at an optimum maturity level to include in processes. The main question would be how the immaturity of the technology impacts a blockchain project.

Other potential factors within the literature could come from external factors. One method used when looking at the external environment is the PEST (or PESTLE(D)) analysis that was created by the Harvard professor F. Aguilar (1967). Although many different acronyms exist of the analysis, its goal remains the same. In the book of Martin, Scott & Thompson (2010) about strategic management, they find that the analysis aims to find out the current external factors that are affecting an organization or entity. The different factors in the analysis are political, economic, social, technological, environmental, legal, and demographic, which are used may differ in each situation. For this research, these factors can be used in categorizing the external factors that are found in a blockchain project.

2.5 Conclusion chapter 2

Blockchain in the literature is still uncommon in many aspects but current academia lets us understand the technology with its flaws and strengths. Although this research is not deep diving into the technology aspect of blockchain an understanding of it is necessary to make concrete data collection instruments. The categories of factors that have been concluded from the literature are used to design the instruments that are explained in the methodology chapter.

3. Methodology

In the previous chapter, the literature review was presented. This chapter focusses on the methodology that is used to answers the main research question and the sub-questions that are mentioned in the introduction chapter. The goal of this chapter Is to give a clear understanding of how the research was executed in detail. This chapter is structured based on the information in the book of Gary Thomas (2017) about research projects.

3.1 Research design

Within the research design, a qualitative interpretative exploratory design is chosen for this research.

The choice was made to use sub-research questions to separate the main research question into manageable parts. With the use of sub-questions, the research is more focused due to splitting up the main research question into different sections. Another reason for using sub-questions is that it provides structure for the study and creates validity for the answer to the main question.

In table 4, a summary is given of the sub-questions and their methodology and instrumentation used for answering them.

Table 4 Sub-question design summary

Question	Methodology	Instrumentation
Sub-RQ1: Why are Blockchain projects failing?	Thematical Analysis	Desk-research- literature review Qualitative field research: semi-structured interviews
Sub-RQ2: What internal and external project factors have an influence on a blockchain project?	Thematical Analysis	Qualitative field research: semi-structured interviews
Sub-RQ3: When is a Blockchain project considered to be a success?	Thematical Analysis	Desk-research-literature review Qualitative field research: semi-structured interviews
Sub-RQ4: What factors can be bound together with the terms of success of a non-financial blockchain project?	Thematical Analysis	Qualitative field research- semi-structured interviews

All the mentioned questions in table 4 need to be answered to give concrete and clear answers to the main research question. To get to the final results, a clear approach of conducting research is needed. As can be seen in Figure 5, the research takes steps to get to the answers and conclusions it needs for its purpose.

Figure 5 Research flow
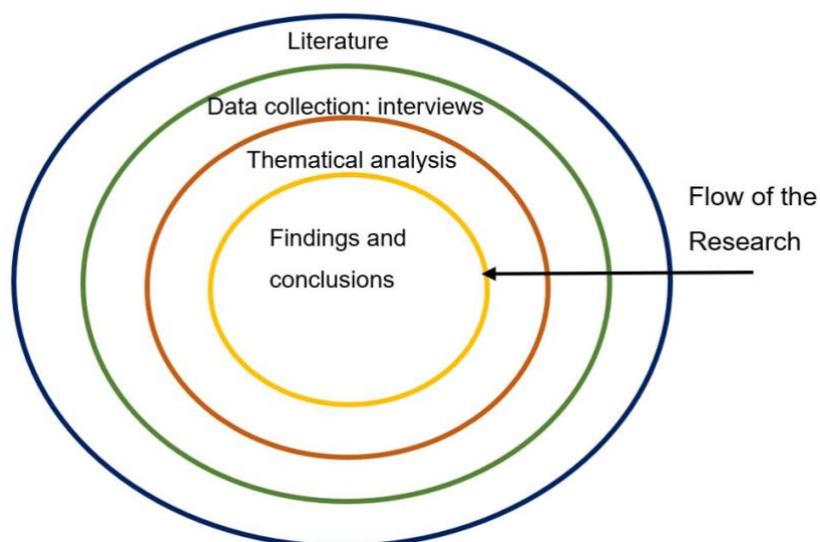
3.2 Instrumentation

The instrumentations used in this research are desk research and a semi-structured interview. In conducting desk research, specific keywords were used to find articles related to the subject. The keywords with their corresponding subject can be seen in table 5. A keyword was added when in the primary literature (journal articles, publications, textbooks) another keyword was used often and had a connection with both the subject and the question. The leading search engines for finding the articles that are used in this thesis is Google Scholar and the Leiden University tools.

Table 5 Desk research keywords

Subject	Keywords
Non-financial blockchain	"blockchain", "blockchain appliances", "smart contract", "peer-to-peer database", "supply-chain blockchain", "distributed systems", "Bitcoin", "blockchain-architecture", "blockchain use cases", "DLT", "blockchain applications", "Blockchain projects"
Successful	"software implementation", "project value", "value creation", "success definition", "rating success", "project success", "survival of projects", "complexity project"

Success Factors	"key success factors", "project success indicators", "success factors", "macro success factors", "internal success factors", "external success factors", "pest analysis", "pestle tool"

The interviews will be on a semi-structured base or otherwise called the general interview guide approach. Semi-structured interviews allow the researcher to have the freedom of diving into answers of the participants while still maintaining the structure of the interview. It can happen that the participant has the knowledge or an opinion that requires a follow-up question, with the choice of semi-structured interviewing the interviewee had the adaptability to acquire that data. The interview questions are built up from existing literature and from the questions that were established. In the case of new questions arising during the conduction of the interviews, the interview schema was adjusted to implement the question. At the end of conducting the interview, the questions which were not answered during the interviews with the participants will be mailed to the participants for them to answer. This is done so that every participant has answered the same questions for the validity and trustworthiness of the research. Before the semi-structured interviews were conducted a test interview was done to test the interview questions, test the answers for any biases and to see it both have a clear connection to the research questions and its objectives.

With conducting interviews, the researcher or the interviewer can subject to the interview bias as stated in the article of MCnamara (1999). The interviewer will implement the following steps to reduce the chance of influencing the results and findings of the interviews:

- The questions are constructed using by finding themes in the current literature and the research questions.
- The interviewer will ask clear questions by speaking clearly and repeating the question when necessary.
- The questions have a neutral standpoint so that they cannot influence the answer. This is tested with the use of a test interview.
- The terms and words mentioned in the questions will be based on the definitions in the literature so that the interviewer will not tent to classify the responses in the direction of his own bias (see also paragraph 3.6).
- All interviews will be recorded (with the approval of the participant) with two recording devices and eventually transcribed for coding.
- The interviewer will control the course of the interview to avoid digression from the topic in a civil matter.

3.3 Procedure

The procedure of the data collection is an integral part of the methodology, it gives an insight into how the data collection was done and if it was done in an ethical way. After the literature review was almost done, the questions for the interview were constructed. Although an ongoing progress, the questions were eventually set with the acceptance of the university. The questions follow a universal interview flow with the more straightforward fact-based questions asked first and the harder theoretical or knowledge questions presented later in the interview. This way of interviewing let the participant grow accustomed to answering questions. In his book, Thomas (2017) advises on how to contact a possible participant for an interview and were followed for this research. In contacting the participant, the purpose of the interview needs to be clearly explained as well as the terms of confidentiality. The format and the estimated length of the interview were included as well in the introduction of the interview. These parts are crucial for contacting a participant. The participant was also allowed to clarify any doubts about the interview. The interviews were planned with 1 hour estimated time and two days prior to the interview, the interviewer send a reminder if deemed needed. To uphold the confidentiality, the participants and their companies will be mentioned in an anonymous matter. However, the general industry will be given.

As has been said, all the interviews were transcribed for coding. The interviews were transcribed within 7-10 workdays by an external party and were send towards the participant for validity. The transcripts were sent when all of them were transcribed. The participant then acts as a source of validity when giving clearance to what has been written. For confidentiality and anonymity, the transcribed interview and the recordings will not be presented outside of university purposes. These are also not listed in the appendix.

3.4 Setting and Participants

In this paragraph, detailed information about the setting of the interviews and its participants will be clear. In the last two decades interviewing by telephone or using the internet has grown in popularity. In 2006, Raymond Opdenakker (2006) researched the advantages and disadvantages of different interview techniques like face-to-face interviewing and telephone interviewing. He concluded in his research that face-to-face interviews are preferred when social cues are essential to the research. He states that face-to-face interviews have the advantage to connect and interact better with the participant. Though for this research, face-to-face interviews preferred it will be mainly determined by the limitations within the budget of the researcher.

The limitation was set on 3 hours distance from the main office for traveling to hold the interview. When it is not feasible due to distance or time to hold the interview face-to-face a

skype (or similar technology) interview was performed. If the participants preferred to do the interview by mobile telephone, it was accepted. The participants that were chosen have experience with blockchain projects. The participants have knowledge of the technology and how a project with blockchain included is conducted in any way. The sample size was set between 9 and 12 in discussion with the university supervisor. This was done by examining the possible sample size and the difficulty in recruiting participants for interviews.

Moreover, after the data collection was finished, the data was examined to conclude if the number of participants was enough to ensure validity and reliability. Snowball sampling (Biernacki & Waldorf, 1981) was used to gather participants together with recruiting participants through the researcher his network. The number of participants matched the sample size that was set at 10 participants, not counting the participant used for testing the data collection method. The language used in the interviews was Dutch or English, depending on the native language of the participant.

To illustrate the use of the snowball sampling method of Biernacki and Waldorf (1981) a horizontal tree can be seen in Figure 6. Of course, these are not the only people that were contacted for an interview, but these participants were available for the interview within the restricted time window that was set.

Figure 6 Participants snowball tree
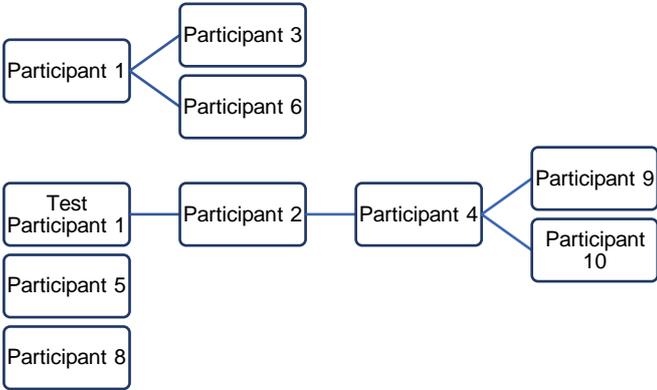
The scope and the focus of this thesis are, as mentioned in chapter 1.5, not bound by industry or application of blockchain. The participants were from different companies and had different experiences in blockchain projects. Shown in Table 6 are the participants that were interviewed for the data collection.

Table 6 Participant list

CodenameName Participant	Company name	Industry
Test Participant 1	Company A	Audit, IT & Consulting
Participant 1	Company B	IT & Consulting
Participant 2	Company A	Audit, IT & Consulting
Participant 3	Company C	Consulting
Participant 4	Company D	Energy
Participant 5	Company E	IT & Consulting
Participant 6	Company F	IT & Consulting
Participant 7	Company G	Food Industry
Participant 8	Company H	Trade
Participant 9	Company I	Food Industry
Participant 10	Company J	Banking & Finance

3.5 Data Processing and Analysis

After the data gathering through interviews and with that data having been transcribed the data needs to be processed and analyzed in a way that reliable and valid conclusions can be drawn. To uphold the reliability and validity of the research, a data processing and analysis method is chosen. The Thematic analysis, used to find patterns within the data, is described in the article of Braun & Clarke (2006) and has over 49000 citations on google scholar. The method has been proven inside and outside of psychology.

The thematic analysis is most commonly used within psychology discipline. The method is used for identifying, organizing, and offering insights into patterns, also described as themes, across a set of data. There exist other articles and researchers who describe and reference the thematic analysis. As an example of such articles we can look at the article of Aronson (1995), who gives a pragmatic view of the analysis method or researchers Fereday & Muir-Cochrane (2006), who in their article give a demonstration of using the thematic analysis with the use of coding and theme development. However, the article of Braum & Clarke (2006) is chosen as the primary source for the thematic analysis for the reason that the explanation of the analysis method is clearly defined in detail in their article.

The thematic analysis method is a six-step process for analyzing data. The six steps are shown and described in table 7.

Table 7 Phases of the thematic analysis method (Braun & Clarke, 2006)

Phase/step	Description of the thematic analysis process
1.Familiarising yourself with your data	Transcribing data, reading and rereading the data, noting down initial ideas.
2.Generating initial codes	Coding features of the data in a systematically across the entire data set, collating data relevant to each code.
3.Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4.Reviewing themes	Checking in the themes work in relation to the code and entire data set, generating a thematic map of the analysis.
5.Defining and naming themes	Ongoing the analysis to refine each theme more specific. Generating clear definitions and names for each theme
6.Producing the report	Selection of compelling extract examples, the final analysis of selected extracts, relating back of the analysis to the research question and the literature.

Within the paper of Braun & Clarke (2006), they present a checklist of criteria for conducting proper thematic research. The checklist is implemented for this research to uphold the reliability and the validity of the research itself. Step two of the analysis requires the researcher to code the transcribed interviews systematically. Due to the inexperience of the researcher with coding interviews the book of J. Saldaña (2015) about coding for researchers was used. Additionally, the program RQSA (Huang, 2016) is used as a tool to support the coding phase of the analysis. The method of coding used was open coding due to the exploratory design of the research. Open coding is described by Corbin and Strauss (1990) as a process of breaking down, examining, comparing, conceptualizing and categorizing. Moreover, it is a technique that lets the researcher code the raw data. To ensure the codes are not for a specific case or industry the codes must be active in multiple interviews to be implemented into a category. After all the interviews have been coded, the third step is followed accordingly to the thematic analysis method seen on the last page.

3.6 Ethical Considerations/review

Working ethical in research is very important and can be considered one of the most important parts of research. According to the book or Bryan and Bell (Bryman & Bell, 2007)about business research methods, there are ten important principals related to ethical considerations. In the next section, those ten principals are listed with an explanation of how this thesis will provide for it.

1. Research participants should not be subjected to harm both physically and non-physically.

This study takes responsibility for its preparation and execution of the interviews. Furthermore, all contact with stakeholders and participants will be done with respect.

2. Respect for the dignity of research participants should be prioritized.

The participants for the interviews have full discloser of their data. In the interview the participants were treated with respect for their opinion, taste, personality, and knowledge.

3. Full consent should be obtained from the participants prior to the study.

Within the process of contacting participants, their full consent is asked.

4. The protection of the privacy of research participants has to be ensured. 5. An adequate level of confidentiality of the research data should be ensured.

The recording, transcription and email conversations will not be shared with anyone other than the participant and the researcher, unless agreed upon otherwise (for instance for proof of conducting the interview the researcher may ask if the recording may be shared with an entity of the University of Leiden). The recording of the interviews will be destroyed after the research is completed.

6. The anonymity of individuals and organizations participating in the research has to be ensured.

Participants are written as "participant(1)" and the organizations are described but their name is written as "organization (A) in the thesis. The names and any personal information of the participants are not stated in the thesis.

7. Any deception or exaggeration about the aims and objectives of the research must be avoided.

The aims and objectives are set prior to the interviews and are tested during the setup and making of the interview questions. The aims and objectives of the research will be discussed and tested with the university supervisor.

8. Affiliations in any forms, sources of funding, as well as any possible conflicts of interests have to be declared.

All affiliations or conflicts of interest will be declared within the research in detail.

9. Any type of communication in relation to the research should be done with honesty and transparency.

The researcher uses the book of Thomas (2017) for guidelines to uphold communication in an honest and transparent way. If any communication is not done in this way, it is reported to the University entity.

10. Any type of misleading information, as well as the representation of primary data findings in a biased way must be avoided.

This research uses the thematic analysis methodology for coding and representing primary data findings. Using this methodology is a way of avoiding unwanted biases into the research and its findings. Moreover, all the transcripts will be presented and tested with the participants so that if unintentional misleading information is found, it can be changed. These ethical principles are upheld throughout the whole research.

3.7 Ensuring Validity and Reliability

In all research, the concepts validity and reliability come to fruition. These terms are essential to define but more than that it is critical for the quality of the research itself to address the questions that come with those definitions. In the book of Thomas (2017) about how to do a research project he gives a clear definition of both reliability and validity and explains how to uphold them with references from other sources, which will also be presented in this chapter.

3.7.1 Reliability

The definition of reliability is as followed:

"Reliability refers to the extent to which a research instrument such as a test will give the same result on different occasions." (Thomas, 2017, p. 144)

Although Thomas argues in his book that in his opinion that reliability is irrelevant in interpretative research due to the researcher in most times being the only one who emerges himself in the transcripts of all the interviews (Thomas, 2017). To uphold the reliability of this research there have been actions taken before and during the research. One of these actions is describing clearly how the data is gathered and analyzed in the methodology chapter, this gives readers an insight into how the research has been performed and how to replicate it. A second action that is taken to increase the reliability is that the coding and the creation of the thematic map and the interpretation of that will be supervised jointly by trusted parties from the University of Leiden and KPMG without endangering the ethicality of the research and with that the anonymity of the interview participants.

3.7.2 Validity

Within the terminology of validity are more types of it, for example, construct validity or content validity that can or should be addressed. In the book, Thomas argues that it is rather challenging to take responsibility for some pieces of validity in qualitative, or actually interpretative, research. He states that many researchers ask questions about the subject for example on the subject of the adequacy of the sample generalizations.

In addition, Hammersley (2005) in his article about assessing the quality in qualitative research acknowledges that these questions need to be taken seriously when discussing validity in qualitative research. He devised an assessment including considerations assessing the validity of findings, which can be seen in table 8. These considerations are implanted into the research its findings and conclusions to ensure the validity of the research.

Table 8 Considerations in assessing the validity of findings (referenced in Thomas, 2017) (Hammersley, 2005)

1	The main claims and evidence:
(a)	Are the main claims plausible enough to be accepted at face value?
(b)	If not, is evidence provided?
(c)	If so, is the evidence sufficient, in terms both of strongly implying the validity of the main knowledge claim and in being sufficiently plausible or credible to be accepted?
(d)	If not, is a further layer of evidence provided
(e)	If so, is this evidence sufficient? And so on.

2	The relation between the findings about the cases studied and the conclusions drawn:
(a)	Where these are empirical generalizations about some finite population, on the basis of whatever evidence is provided, are they sufficiently plausible or credible to be accepted?
(b)	Where they are theoretical statements of conditional casual kind, on the basis of the evidence provided, are they sufficiently plausible or credible to be accepted?

This concludes the methodology chapter of this research; in the following chapters, the results and findings of the data collection and the analysis are presented.

4. Findings and Discussion

In this chapter of the thesis, the findings of the data collection are presented together with the discussion regarding the results, findings, and research method. This chapter is connected to the analysis chapter 5. In this chapter, findings are presented that are found in the data that has been collecting. The analysis of that data and detailed conclusions to the questions are found in the next chapter. The findings in this chapter will be supported with data from the interviews by using quotes from the participants. The ten interviews were conducted between 15 February 2019 and 15 March 2019, with an average length of 54 minutes.

4.2 Maturity of the technology

In the interviews, the participants were asked to give an estimation of the current maturity of blockchain as a technology. In figure 7, the results are shown of these estimations. The majority of the participants concluded that the blockchain is low in terms of maturity. The scale uses the article of Wang, Chen & Xu (2016) to give a general impression of what the participants their thoughts are on the maturity of blockchain.

Figure 7 Current Maturity of Blockchain
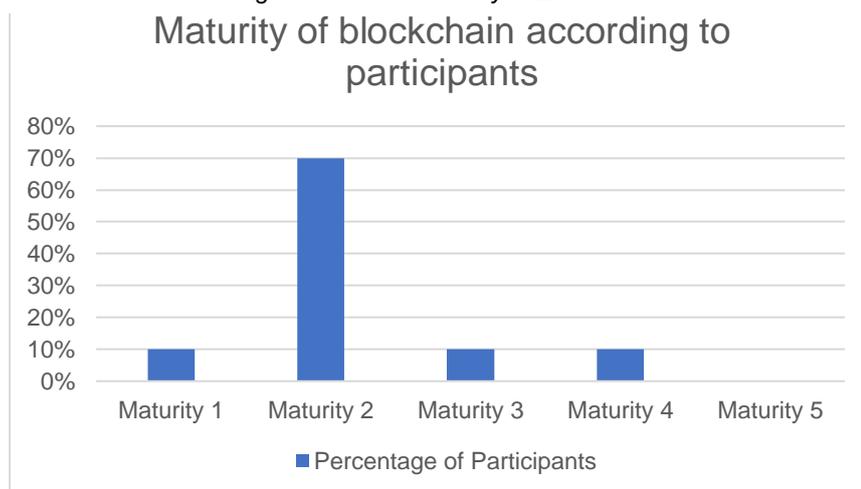
This result is in line with the current literature presented in the literature review. Both Niranjanamurthy et al (2018) and Wang, Chen & Xu (2016) concluded that blockchain was still immature as a technology. When asked on which basis they set the maturity on low, the participants often referred to the development of the internet, and that there are still many faults within the technology. One of the Participants stated the following on this matter:

"Tja, dat zijn natuurlijk allemaal systemen die heel echt technologisch in ontwikkeling zijn, de manier waarop de blockchains vandaag werken is niet meer hoe dat die morgen zullen werken en en waarschijnlijk zullen wel 80, 90% van alle initiatieven die vandaag al zelf gestart, zullen die niet meer bestaan binnen nu en vijf jaar, waarschijnlijk. Het is echt history repeating wat

op het internet zal staan voor mij en zit er nu heel veel initiativen in, soms de gekste ideeën worden geprobeerd." Participant 1 [6816:7354]

The participant states that the technology is still very much in development and that history is repeating itself compared to when the internet started. The technology is, for this reason, an important factor within blockchain projects. Although the maturity may be low of the technology, there is evidence stated in the data that blockchain as a technology has proven itself in theory and in the potential it has, this is proven by the next extract of the raw data:

"Ik zou zeggen een twee. Er zijn, natuurlijk, er zijn al, de use van de technologie heeft zich bewezen, om te zeggen dat we zeker weten dat we er iets mee kunnen en dat het ook echt voordelen kan brengen die de theorie beloofd had dat te brengen, maar we zijn er nog lang niet." Participant 5 [7212:7489]

Blockchain then is a technology with much potential, but due to the immaturity, it can endanger a project its chance of success.

4.3 Non-financial blockchain

In the literature review and the main question, the term "non-financial blockchain" is stated. To determine a clear definition and to see if the term is understood with the industry, participants were asked to give their definition of the term non-financial blockchain. Within the data provided by the participants, three categories of definitions could be found. Beneath this statement, the definitions with examples from the data are shown.

1. Blockchain whereby the nature of the transaction is not to send financial data.

"Ik zou zeggen ieder blockchain of netwerk gebaseerd op blockchain, dat niet als core focus heeft het processen van of het registreren van van financiële transacties. Er kan nog steeds financiën bij te pas komen, maar de core focus zal een ander soort transacties, of een ander soort proces zijn." Participant 5 [11490: 11786]

2. Blockchain application and solutions that does not involve cryptocurrency.

"I would say that first of all maybe there is no currency involved in this Block chain, because Block chain does not need a currency per sé, that is one thing, or if there is a currency involved it would be a functionality that is not seen as a financial solution almost like governance is a function that you would not say has a financial value, a different value but it's not a financial value so if you take away the financial value then it would be non-financial." Participant 3 [10886:11369]

3. Blockchain that is not used in the finance and banking industry.

"*Dan kom je heel snel van wat is money, wat is waarde? Hoe definiëren we dat? Dus ik zie, misschien is het verschil in dat je nu de enterprise blockchains, die niet in de financiële sector liggen, dus supplychain achtige dingen, de retail, de reclame industrie voor een stuk ook nog wel, ligt eraan, dan kunnen we waarde gaan transfereren tussen partijen, en kunnen dan een ander soort vertrouwen inbouwen, kunnen daar heb je dan, right, dat zijn non-financial blockchains.*" Participant 6 [11276:11748]

The differences in the definitions and statements given could be analyzed and molded together to form one definition. Although the definitions seem similar, they contradict each other in some ways. Within the finance and banking sector, there could still be applications where the nature of the transaction is not financial in any way; for example, in identification blockchain. For this reason, with the data gathered, the conclusion has to be that the definition is not yet clear in the industry and among the participants.

4.4 Discussion findings and results

The findings and results of this research are discussed in this part of the chapter. From a general examination towards the research objectives to more specific discussions of what the findings could mean for current literature and further research. To be able to discuss the findings and results, brief answers to the sub research question are presented in table 9. The sub-questions are answered in depth in chapter 5.

Table 9 Brief answers to the research questions

Sub research questions	Brief answer
Why are Blockchain projects failing?	Blockchain projects are failing for multiple reasons. The main reasons are technology and business case driven. The lack of knowledge of the technology within an organization and the maturity of the blockchain are the technology-driven reasons. The business case driven reasons are; too high expectations of what the technology can bring and that there is no clear business case constructed. Moreover, choosing blockchain for only the hype or marketing reasons can also be a reason for a blockchain project to fail.
What internal and external project factors have an influence on a blockchain project?	Three different levels have an influence on a blockchain project: project, organizational, and external. On a project level, there are seven main factors divided into two categories: **Factors at the start of a blockchain project**: having a clear business case, investigation of available data, early involvement of parties, and looking into alternative technologies when constructing a business case. **Factors regarding the management and surroundings:**

	High expectations of the project, the governance regarding blockchain, and the change management and adoption in the execution of blockchain. On an organizational level, on which a project has limited influence on, there are six main factors divided into two categories: **Factors that are active as an organizational supporting role:** The organizational encouragement and support towards the project, the understanding of the project on an organizational level, and the mindset of the organization towards blockchain. **Factors regarding the knowledge and awareness of an organization:** The misconception of the business value that blockchain has in the organization, the variety of knowledge of blockchain, and the expectations of management on what the blockchain project can offer. On an external level, where a project has no influence on, has three main factors within one category: **Factors that have an external influence on a blockchain project:** The maturity and development of the technology blockchain, the political involvement on a national, international, and continental level, and the change of law and regulations regarding blockchain.
When is a Blockchain project considered to be a success?	There is not a single definition for a successful blockchain project. However, there is data that suggest what a successful blockchain project should have. These two lines represent when a blockchain project could be considered a success: • A blockchain project is completed within the terms and conditions set in the beginning and if possible; • Add value to the business and is applicable to the ecosystem.
What factors can be bound together with the terms of success of a non-financial blockchain project?	All the factors that influence a blockchain project found in sub research question two influence the success chance of a blockchain project. The project level factors for the start of a project or in the planning phase could be used as a checklist to lower the chance of failure. The other project-level factors are manageable during the project its lifetime. The organizational factors can be managed to a certain degree due to the influence a project can act upon them. The external factors influence the project, but the project does not have an influence on them. However, the impact of the external factors can be managed by keeping an eye out for changes that accord within these factors.

4.4.1 General discussion answers

The objective of the research is to help organizations and other parties understand what is needed to increase the chance of success of a blockchain project and where the focus of such a project needs to be. The sub-research questions represent this objective by looking into what the reason of failure is, answering what influences a blockchain project and where the focus needs to be. The scientific purpose of researching projects instead of focusing on the technology spectrum of blockchain is upheld by keeping the focus of the study on blockchain projects. However, the research did find that the technology maturity is a reason of influence on blockchain projects. The research did not go further into dept on the specifics of the low maturity due to the purpose and objective of the research. This finding could, however, be used as an incentive for future research by using the blockchain maturity research of Wang, Chen & Xu (2016). In the literature review, it was found that in the research of Wang, Chen & Xu (2016) the immaturity of blockchain could be a factor that influences a project. In the findings and results, it was confirmed that the immaturity of blockchain is low and that it indeed influences a project. In the SWOT blockchain analysis research of Niranjanamurthy et al (2018), they also concluded the technology maturity as a weakness. The changes in maturity between now and five to ten years could be an interesting future study.

The answers of the questions are not always applicable to every blockchain project, this is due to the many situations which in a project can be operating. Some factors or answers are more applicable in different situations, but they could give a general insight into what could be done to create a higher chance of success. The focus of the research was to investigate the overarching factors so that the research can be used for general purposes instead of a specific situation.

The answer to sub research question one gives an understanding of why blockchain projects fail. These reasons could also be applicable to other technologies. Creating a clear use case is one of these reasons and is a common practice in technology-driven projects. The answer, however, means that creating a clear business case is a reason for failure that is frequent in blockchain projects. This also means that there could be more reasons for a blockchain project to fail but that they are specific to a situation.

The answers within sub research question two are the most elaborated of the research due to the three different levels of interaction implemented from the research of Reeves, Levin & Ueda (2016). Each of these levels could be seen as a separate sub-question. The separation of the factors is needed because they are no be managed differently. In the article of Reeves, Levin & Ueda (2016) they state that the interaction and influence become more distant the more external it becomes, meaning they are different from each other when it comes to the

relationship with, in this case, the blockchain project. The validity of the answers lies within the result chapter, by using quotes and the thematic analysis method, the factors are proven.

The answer to sub-question three was difficult to develop due to the many different variations within the data. When a blockchain project is a success in specific technical terms is not answered, but the answer that is given is a more general answer. This was done by open coding each of the different answers and looking if there was a connection between them. The last sub-question is answered by combining the previous answers and creating an overview in the form of a table and model seen in chapter 5.4. The answer to this question can be used for business purposes as a guideline for blockchain projects. It does not include a step by step approach because the factors in each project can be different in time and impact.

4.5 Discussion research method and instrumentation

The research design chosen for this thesis was qualitative interpretive exploratory research. The research is qualitative due to its best fitting the research question and the situation the research could be conducted. The qualitative nature of the research resulted in conducting semi-structured interviews, the interviews were knowledgeable and rich with data for the analysis. This can be the result of testing the interview questions beforehand with a separate participant.

4.5.1 Progress of change

Although the research that is shown in this thesis is qualitative, in the beginning, the idea was that it would have been quantitative research. The idea was to research online cases and analyze them for reasons why they failed or were a success. The problem with this idea was that most cases that were found online were not applicable and frequently incomplete for a good analysis. As a result, this path was not taken for the research.The first thought of doing qualitative research led the research to use the grounded theory (Charmaz, 1996) as a method to analyze the raw data. After researching the method and the goal it has, it was clear that with using the Grounded theory method, the research would have difficulty to stay within the timeframe that was set. Furthermore, in the book of Thomas (2017) the method was described to be difficult if you are not experienced with qualitative research. In summary, that resulted in choosing the thematic analysis method.

4.5.2 Perception of the researcher

The perception of blockchain has changed since the beginning of this thesis. I understood the principles of blockchain and my thoughts were that blockchain already was a very mature technology that could be implemented everywhere. But as a result of conducting the interviews, my perception was altered. My perception is that blockchain is a technology that can do a lot of things but it still has flaws like every technology.

5. Analysis

In the previous chapter, the findings and discussion are presented. These findings act as support for understanding the analysis results. In this chapter, the thematic analysis results are presented and explained. These results are used to answer the research questions with models and interpreting these results towards the question. As stated in the methodology chapter, open coding was used to find themes in the transcribed interviews. The subchapters in the analysis each represent a sub-question of the research.

5.1 The Reasons why blockchain projects fail

Since the semi-structured interview was conducted, the focus was more on the aspects of the success factors than on the problem this thesis was based on: "Blockchain projects are being dropped or are failing to fulfill expectations. This is happening while the number of projects and the sum of investments are growing.". The first analysis and answers the first research question related to this problem statement. The goal of the question is to get an understanding of why blockchain projects are failing or being dropped. The thematic map in figure 8 gives shows the results of the analysis and overview of the reasons why a blockchain project could fail.

Figure 8 Thematic map why blockchain projects may fail
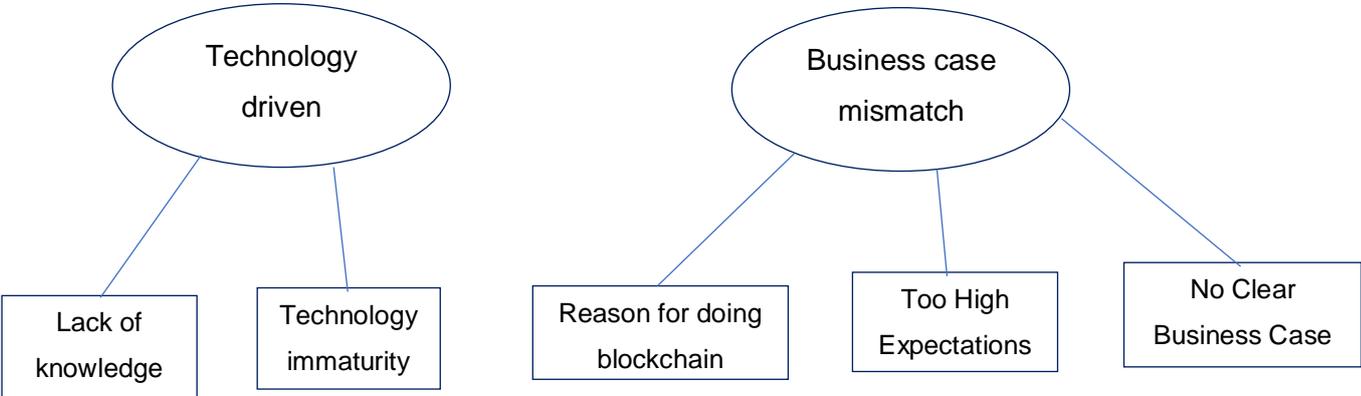
The thematic map has two themes in which it separates these reasons for failure. The technology theme is linked with the immaturity of the technology that was proved in the previous chapter and the lack of knowledge within an organization about the technology. The other theme focuses on when the business case does not meet expectations. The business case can be badly influenced by doing a blockchain for PR reasons or doing blockchain project because the competitor does it. An interesting statement made in an interview with regards to this is, for example:

"Expectations are here, like in reality so it's the Gardner Hype Cycle at it's best, I would say. It really shows that a lot of people sell Block chain like it's saving even the climate change can

*be done with Block chain. So it's really expectations are huge and that's why now a lot of
frustration happens because again I come to the point where I say that Apple would have never
released it at this point, nobody would've known it, because then there's no expectation that
you have to meet, and now people expect so much of this technology and everybody says
well, it failed, because it cannot do this. To me it's stupid because its way to early to come to
this expectation. So, yeah, to me there's a huge gap between expectation and believe or hope
and true products." Participant 3 [22030:22800] coded with High expectations*

In the statement, the participant acknowledges that currently, there is a gap between the
expectations of what blockchain can do and the reality of what can be achieved with the current
technology and knowledge. Another reason is that there is no business case for the project to
continue. This can be related to proof of concept projects concluding that blockchain is not the
right solution for the problem. This, as will be discussed further on, can be considered a
success instead of failure.

While these reasons have been concluded from the data, it does not fully reveal all the possible
reasons that a project is stopped or failed. Other reasons for failure could be to economic
reasons within the company or industry situational but did not come forward in the analysis.
To conclude, the thematic map gives an overview of the answer to sub-question 1.

## 5.2 The factors that influence a project

The factors that influence a project are critical to answering the main research question of this
thesis. In the literature review, it was concluded that factors could be separated into three
levels for projects by comparing them with the biological equivalent. For each level, a thematic
map is established to understand what factors influence a blockchain project.

5.2.1 Project factors

The analysis and the data show that multiple factors influence a blockchain project. There are two themes concluded from the data, shown in figure 9. The project factors are in boundaries of the project, and so the project and its members should have access to these factors.

Figure 9 Thematic map: Project level factors
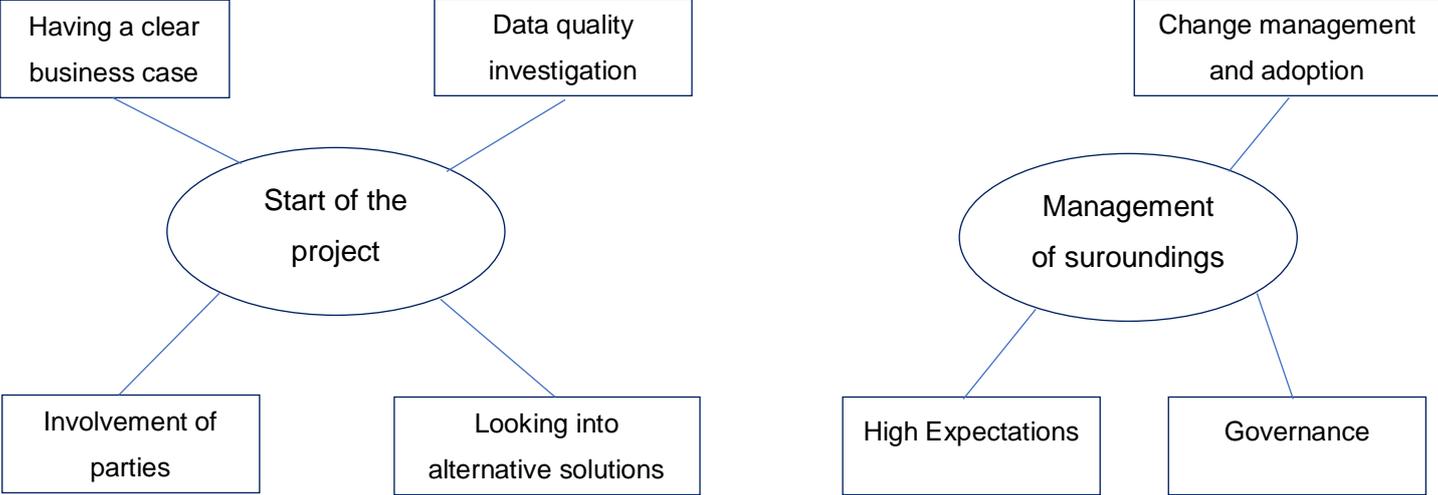
The first theme is named "start of the project" due to the factors being active at the start of the project and where they are most important. The involvement of parties may seem like a factor that comes later in a project however, for blockchain projects it is important to involve all parties involved in the business case so that consensus can be made in an early stage. An interviewee described the reasons to involve other parties in an earlier stage:

"Ja. Ik heb twee voorbeelden. Eén voorbeeld van ██ en ██, die shipping containers wereldwijd verschepen, die hebben een heel leuk ding gebouwd, meest case die grootste, één van de grootste wereldwijd, een leuk ding gebouwd, er zitten, ik denk honderdtal douanekantoren en zitten nu in, maar die andere twee concurrenten, die willen daar nu op. Alders is dit niks. Het is op zich leuk dat het bestaat. Maar het grote feit is dat ██ en ██, hebben gewoon in dat kleine clubje iets gebouwd, en als wij groot willen worden moeten we nu die winkel. Dat is een lastig verhaal. Dat ik ook denk, dat als zij met de drie grote jongens van de scheepvaart om de tafel hadden gezeten dat afgesproken hadden kunnen krijgen, die uitzondering er over heen, hadden ze waarschijnlijk twee, drie jaar verder geweest, dat had een redelijke poos gescheeld." Participant 4 [21663:22501] coded with Early involvement of parties

The other factors within the theme are about the gathering knowledge and researching if blockchain is the right solution to choose and in which way. Knowing what kind of data you

need for a blockchain application to work can influence the project, this is combined with not only having a clear business case but in that business, case looking if alternative technologies might be more applicable for the situation. Having a clear business case forced a project to investigate the problem that needs to be solved. An interviewee made a statement on this:

"Ja, en ik denk dat dat je blockchain, dat je het blockchain project noemt want, wat ik zei, het gaat om de oplossing van een probleem en het gaat niet om beginnen met een techniek en dan eens kijken wat die voor ons zou kunnen doen want ik denk dat er veel reëler problemen zijn binnen de meeste bedrijven waar een blockchain geen oplossing voor is. Dus, wat dat betreft denk ik het zeker ja". Participant 7 [24323:24716] with coded Clear business case, Problem focused

The second theme that came out of the analysis focusses around the factors that are about managing expectations, your stakeholders, and change. The expectations are important to manage, due to if not managed well; it could lead to a reason for failure as concluded in chapter 5.1. The code "Governance" was coded 15 times from 8 different interviewees and can be concluded as one of the most chosen factors in a project by the interviewees. Working together with other parties and managing the shareholders of the project is common in blockchain. Guidelines and rules for the data between parties need to be established due if not managed well, could lead to project delays.

The project factors are only part of the factors that have an influence on a blockchain project. The next factors are looking at organizational factors and external factors

5.2.2 The company ecosystem factors

The company ecosystem factors or organizational factors deal with the organization and its members. Some factors within this level could be considered as standard factors that are important to every IT project, and yet these factors are present in blockchain projects by looking at the data. In figure 10, the thematic map of the organizational factors is presented. Within this thematic map, two themes have been constructed and analyzed.

Figure 10 Thematic map: organizational factors
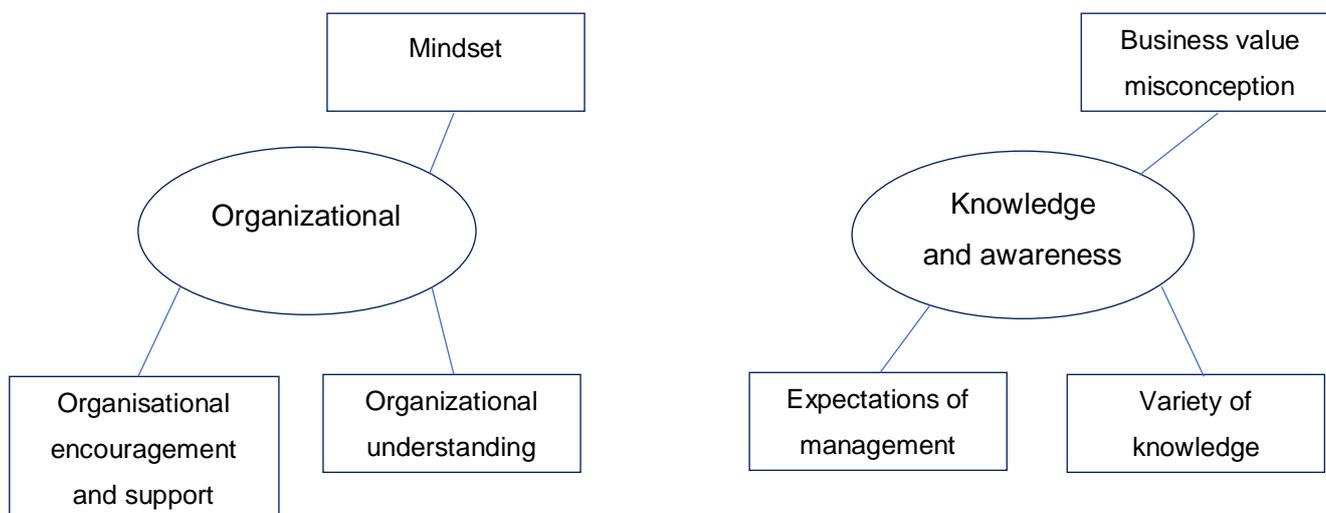
The theme "organizational" is based on the need for organizational change and support that influence the blockchain project. Within the theme, both pull and push factors are implemented, pull meaning the need of the organization to influence the project positively and push meaning that the project influences change in the organization. The factor organizational encouragement and support include the positive and negative influences of organizational entities on the blockchain project. An interviewee described one of these influential factors as followed:

"Maar je moet wel echt een team hebben dat er achterstaat. Ik denk dat het heel gevaarlijk is om iemand erbij te hebben die eigenlijk hoopt stiekem dat het project gaat mislukken, weet je wel, want het is een nieuwe techniek technologie, het is logisch dat niet alles gaat zoals je verwacht dat het gaat dus je moet echt wel een beetje een buffer hebben in goodwill en in tijd en geld, omdat door te kunnen zetten als er tegenslag is. Zorgen dat het team er vol achter staat en dat je echt support hebt van de verschillende businessunits waarvan je de support moet hebben dat dat heel belangrijk is. Dat iedereen er achterstaat waarmee je wil." Participant 5 [27569:28212] with coded Organizational encouragement and support

The second factor is about organizational understanding. The meaning of organizational understanding is that the part of the organization that has an influence on the project has an understanding of what the project is doing and its objective is. If the understanding of the project is low within the organization, then it could affect the speed, budget, and quality of the project due to misunderstandings. The last factor within this theme is about the mindset of the organization. Often in the case of blockchain, you need to work together with other parties, this could mean in most cases sharing data. If the mindset of the organization(s) is not cooperative

towards sharing data, then it could influence the course of the project and its goals. Two interviewees gave statements on this factor:

"Yes it's definitely a mindset shift that blockchain brings, that you no longer can think about what it brings for you because you're no longer centralized, you know, so what it can bring for a wider ecosystem as an industry so it's a mindset the change that you need to go through" Participant 10 [25315:25595] Coded with Changing the mindset

"En als jij wil samenwerken in een blockchain in een ecosysteem met andere stakeholders die WhireChain rulen met je concurrenten, moet jij stukken data gaan vrijgeven die voorheen staatsgeheim waren en je gaat proberen in die keten ga jij een systeem creëren diezelfde bron van data te geven, dan moet je dus dingen opgeven en die mind shift dat is voor veel bedrijven retespannend!" Participant 4 [9403:9784] Coded with Changing the mindset

The other theme within organizational factors is named knowledge and awareness. The theme is based on the knowledge of the technology itself within the organization. Additionally, the level of awareness contributes to this theme with the expectations of management factor. The first factor is the business value misconception of blockchain. When people have a different image of what blockchain can do, they can push the technology in a different direction. This push includes the usage of blockchain as a marketing value for the organization instead of providing a solution or benefit to a situation. The second factor is the expectations of management, this factor has similarities with the previous factor. However, the expectations of management focuses on the high expectation management can have when thinking about what blockchain can do. The business value mismatch of blockchain its focus is on that the business side of the organization tries to value blockchain as something other than its initial use case.

The last factor within this theme is the variety of knowledge, this factor is influential for a project due to the members or parts of the organization making assumptions on the technology and the project. An interviewee gave statements in these last two factors:

"Nee, nee, geen enkel denk ik. Het niet dat ik die heb, begrijp me niet verkeerd, ik wil niet verwaand overkomen, maar ik denk gewoon dat veel bedrijven niet beseffen , also als ik zeg van, geef mij een aantal van die projecten, ik kan waarschijnlijk aanduiden van op dat en dat gebied, om die en die reden kun je dat beter met een database doen of is blockchain geen goede oplossing hier. Dus ja, moesten al die bedrijven dat wel beseffen dan zouden ze 99% van de projecten die ze nu op doen blockchain, niet op blockchain worden gedaan." Participant 1 [22534:23071] Coded with Blockchain case mismatch & Variety of knowledge

These are the company ecosystem factors, or organizational factors that have influence on blockchain projects.

5.2.3 External environment factors

The external environment factors are the third and last level of factors gathered with the interviews. External factors like the once mentioned in the literature review about PEST referenced in the book of Thompson, Martin & Scott (2010). Although influential factors for a project, mainly the project itself cannot influence these factors but need to learn how to deal with them instead.

Figure 11 Thematic map: External environment factors

```
                        ┌─────────────┐
                        │   PESTLED   │
                        └─────────────┘
          ┌─────────────────┼─────────────────┐
┌──────────────────┐ ┌──────────────────┐ ┌──────────────────┐
│  Maturity of the │ │    Political     │ │     Law and      │
│    technology    │ │   involvement    │ │   regulations    │
└──────────────────┘ └──────────────────┘ └──────────────────┘
```
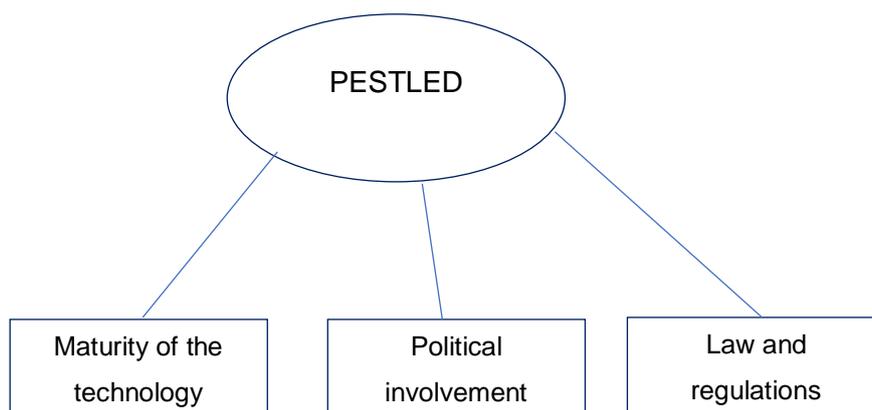
In the thematic map seen in figure 11, only one theme is presented, called PESTLED. The reason for naming this theme after the external environment tool is that the three main factors are represented within the definition. The letters presented are Technology, Political, and Law & regulations. Not all the types of external influence came forward in the interviews. The first factor, the maturity of the technology blockchain already has been concluded as an important factor of influence to a project in the findings chapter. Due to not being able, as a project to have a significant influence on the maturity of the technology of blockchain in most cases, it is set as an external environmental factor. The second factor is the political involvement of the government or organizations like the European Union.

The last factor within this theme is law and regulations. This factor in the process of open coding was coded for 18 times in 9 of the 10 interviews. It is an important factor when doing blockchain projects because it sets a limitation for that a blockchain is able and allowed to do. Examples of statements are given of two interviewees:

"je kan in de blockchain een hoop dingen doen maar als de buitenwereld op een gegeven moment zegt joh, dat is allemaal leuk en aardig maar ons wetboek zegt: dat mag niet ja, fijne wedstrijd!" Participant 4 [10600:10789] coded with Law and regulation

"De reguleringen kan het in ieder geval een beetje moeilijker maken,maar valt wel mee te werken. Ik zit te denken of wetgeving ook echt, dat weet ik eigenkijk niet of daar ook, kan niet zo'n voorbeeld bedenken maar er zijn vast landen waarin het je echt heel moeilijk wordt gemaakt." Participant 5 [23176:23457] Coded with Law and Regulations

These are all factors that influence a blockchain project according to the analysis done. These factors will be further implemented in the last paragraph of this chapter

5.4 Industry definition of a successful blockchain project

The definition of a successful blockchain project in this chapter is concluded by theming the answers of the interviews regarding the definition. The thematic map is shown in figure 12.

Figure 12 Thematic map: Definition of success
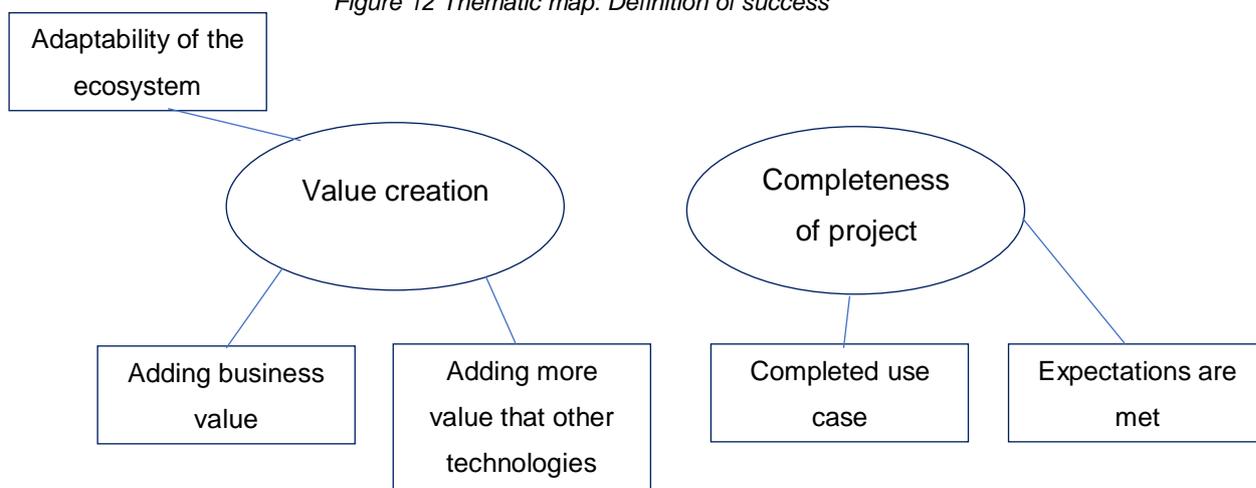
There are two themes analyzed from the data for the definition of success. Due to the different answers given in the interviews, the conclusion is that success in dependable on the situation. However, the results of the analysis create an understanding of some parameters of success and should be included for defining success for a blockchain project. The first theme is named value creation due to adding a layer of extra expectations compared to the other theme. A statement is given by an interviewee as an example:

"Dus als jij een platform neerzet dat ook daadwerkelijk gebruikt wordt, want er zijn nog niet zoveel natuurlijk, echt producties dus productie grade, en je dus genoeg transacties kunt doen om ook echt te kwalificeren van hé, dit zijn inderdaad de voordelen die ik had gehoopt, of meer, of andere voordelen, dan denk ik dat je een succes hebt." Participant 5 [17081:17422] Coded with Adding Business Value.

The other theme is named completeness of the project. This theme is about completing the use case with it the expectations that were set beforehand. Both of the two sub-themes have a similar goal within this main theme. An interviewee described it as followed:

"I would define a successful block chain project as one which has been able to validate the assumptions that were made in order to, you know, fulfill a used case" Participant 10 [22798:22958] Coded with Completed use case & Expectations met

The industry definition of a successful blockchain project cannot be defined in one sentence. If the analysis and the data are used, a few parameters become clear to what a successful blockchain project should have:

- Completed within the terms and conditions set in the beginning and if possible;
- Adding value to the business and be applicable to the ecosystem

5.5 The factors for a successful non-financial blockchain project

The factors of influence on a blockchain project its success are defined in the previous chapters along with the parameters of success. In this chapter, all the analysis results from the previous chapters are combined to an understanding by visualization in table form and model form. Table 10 uses the interaction level model of Reeves et al (2016), together with the analysis results presented in chapter 5.2 to give a detailed overview of the factors that influence level in a blockchain project.

Table 10 Factors that influence success per level

| level	Factors of influence	Factors for success
1st project	**Start of the project** -having a clear business case -data investigation -involvement of parties -looking into alternative technologies	At the start of a blockchain project take into consideration: - There is a clear business case for using blockchain. - Blockchain alone or together with other technologies is most suitable for the project - The data quality is good for blockchain, and there is access to that data - All parties are involved in an early stage of the project
	Management and surroundings -High expectations	While doing a blockchain project take the following into consideration:

	-governance -change management and adoption	- Expectations before and during the project are conformable with reality - Stakeholder management is used to keep expectations to reality - Change management is used to optimize the usability and adoption of the blockchain
2nd company ecosystem factors, or organizational factors	**Organizational** - Organizational encouragement and support - Organizational understanding - Mindset	During and before starting a blockchain project take the following into account: - The project is backed throughout the organization - The organization has an understanding of what the project is about - The organization needs to be open to sharing data to make use of blockchain (not if private blockchain fully
	Knowledge and awareness - Business value misconception - Variety of knowledge - Expectations of management	During a blockchain project, take the following consideration into account: - The organization and members understand what the realistic possibilities are of blockchain - If there is a large variety of knowledge within the organization, try to create awareness and share knowledge of the project and blockchain - Manage the expectations within the organizations in the technology with knowledge sharing
3rd External environment	**PESTLED** - Maturity of the technology - Political involvement - Law and regulations	During and in preparation of a blockchain project take the following factors into consideration: - The technology has limitations of what it can do, keep up with the latest development news - Follow the news on political involvement in blockchain so the project can react accordingly - Involve a legal party (internal or external) who knows the limitations of what is possible with blockchain.

THE EFFECTS OF VARIOUS FACTORS OF BLOCKCHAIN PROJECTS ON ITS
SUCCESSFULLNESS

These factors increase the chance of success of a blockchain project by dealing with the factors that influence the project. In table 8, the row "Factors for success" exist to translate the influential factors found in the analysis of the considerations of success.

These factors of success are meant as guidelines to increase the chance of success for a blockchain project. To visualize it better and to give a summary of the information that is presented in table 10, a model is created and shown in figure 13.

Figure 13 Blockchain Project Success Model
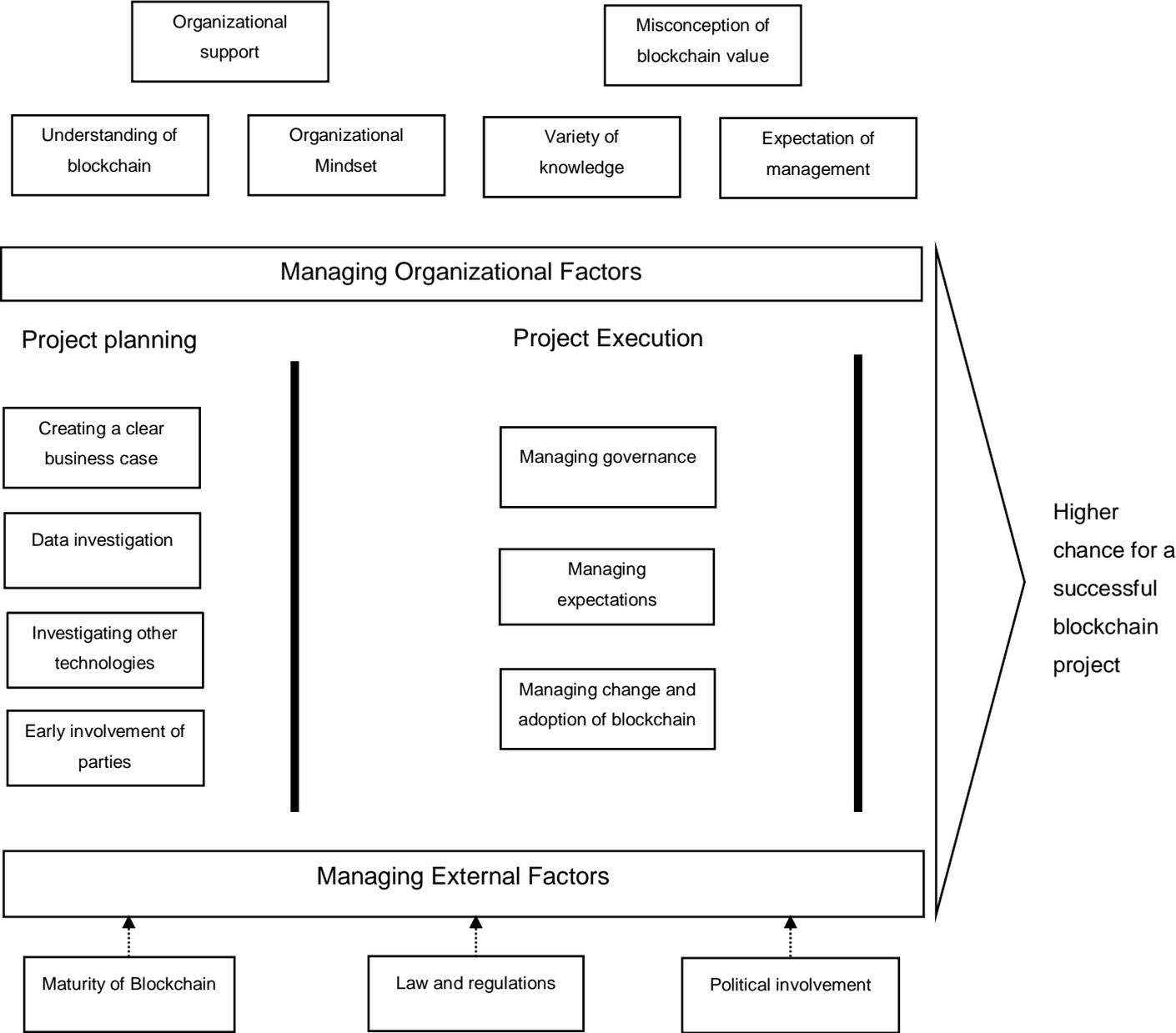
The model integrates all of the factors of influence into an overview. The first level or project level is separated into two phases of a project; project planning and project execution. The factors are separated because the factors are mainly active in each of their phase of a project.

The organizational or second level represented at the top level, each of the factors mentioned need to be managed throughout the whole project, which is why the managing organizational factors process is integrated. This process manages all the factors by managing the incoming influences and also acting influence towards these factors, although limited thanks to the interaction level. The external three internal factors found are shown at the bottom of the model. Since the project cannot influence these factors, they can only be managed by their impact on the project. This relationship is shown by the arrows between the process "managing external factors" and the three external factors. This model its objective is to give an overview of which factors influence a blockchain project, how to manage them, and how it can lead to a higher chance for a successful blockchain project.

Although some of the factors could be considered general and be factors for other technologies, the results only indicate that these factors are what influences a blockchain project. Using the model will not guarantee that a blockchain project will be a success. It merely should be used as a guideline to increase the chance of success. The factors should increase the chance of a blockchain project being completed within the terms and conditions set in the beginning and if possible, both adding value to the business and be applicable for the ecosystem. Both the model and table 8 act as the answer to the main research question, and it supports the objectives of the research.

6. Conclusion

In this section, the research its conclusions to the problem and main findings are given. Secondly, the research its progress of change and its limitations & weaknesses are discussed and presented. Thirdly, recommendations are given as managerial implementation. And last, possible future research is suggested.

Referral to the purpose and problem

With the answer to all the questions, we can refer back to the introduction to conclude the purpose of the research was met and how the answers impact the problem. The purpose of the research was to help companies and other parties understand what is needed and where the focus needs to be when conducting blockchain projects. Notwithstanding its limitations, this study does provide some focus on conducting blockchain projects. The conclusion of factors that influence such projects can be taken into account as guidelines. These are not to be served as a checklist as every project and situation is different. However, the findings and results of this research may help projects understand the technology from a different angle.

The problem that was stated in the introduction was that projects continue to fail when the market and industry is growing. Although this research and its results can shed light on the overarching factors for success when starting or conducting a blockchain project and similarly it may reduce the chance on failure, failing is natural in the technology phase we are in. The problem will keep existing in combination with the immaturity of blockchain as a technology. The problem can be reduced, but, in every project, there exists a chance of failure.

Main findings

However, exploratory, this study may offer some insights into the reasons for blockchain projects that are failing. The main source would still be the high expectations that lie within the industry and surrounds the term blockchain. Blockchain will not yet change the world said by the interviewees, and that is partially due to the immaturity of the technology. With the expectation high compared to the reality, caution is advised when starting a blockchain project. One of the most important factors when starting a project is that before you start, there is a clear business case that is defined from a problem or needs to improve. A clear business case can add insights on questions about what kind of data your blockchain needs and if you have that quality of data. One of the major external factors is law and regulation due to the limitations it sets for blockchain projects and the frequency of changes in recent and coming years. The model in figure 13 should be used as a guideline for blockchain projects, the factors within this model influence a blockchain project to a certain degree.

Limitations and weaknesses

This study its focus was towards overarching factors that influence non-financial blockchain project. Although those factors were found, many factors that were industry or application specific were not included due to the scope and focus that was set of the research. Unfortunately, the research was unable to determine from the data if these factors had a big influence on a certain blockchain project. The research its limitation and weakness in this situation is that even if a project team took the overarching factors into account, it would not guaranty that the project is a success. This study has addressed only the questions of which factors should be taken into account to increase the chance for a successful non-financial blockchain project, but at the same time, it does not research how much each factor influences this chance.

The findings and conclusions drawn have the weakness that may be very general for the existing industry of blockchain. The generality of the factors limits the strength they have. Nevertheless, these factors can still act as guidelines to be taken into account, but depending on the case and project situation, they may not be all applicable.

Recommendations

To start blockchain project, non-financial or not, my recommendation is first to understand the business case and situation. With every IT project, projects need to make sure if blockchain is the most applicable and best solution for the problem. In the same way, it is recommend investigating if combining blockchain with other technologies will solve the problems with the immaturity of the technology. The last recommendation is about the expatiations surrounding a blockchain project. Regardless of the hype surrounding blockchain, within a project that involves blockchain, management needs to be updated and managed towards the expectation.

Future research

This thesis results in possible future research that could be interesting for the industry and academia. It would be interesting to assess the effects of success factors needed in a specific industry or application of blockchain in the future when there are enough cases within a certain scope. This would solve the weakness of generality of current factors by combining them with specific factors.

A second possible future research is in dept further investigate what the maturity is of blockchain in a few years. The research from Wang et al. (2016) about the maturity of blockchain could be used to assess the maturity of the blockchain as a technology to investigate the progress of the technology.

7. Reference list

Aguilar, F. J. (1967). *Scanning the Business Environment.* New York, Macmillan: Harvard University.

Amit, R., & Zott, C. (2001). Value creation in E-business. *Strategic Management Journal*, 493-520.

Aronson, J. (1995). A Pragmatic View of Thematic Analysis. *The Qualitative Report, 2*(1), 1-3. Retrieved from http://nsuworks.nova.edu/tqr/vol2/iss1/3

Bennet, M. (2017, November 9). *Predictions 2018: The Blockchain Revolution Will Have To Wait A Little Longer*. Retrieved from forrester: https://go.forrester.com/blogs/predictions-2018-the-blockchain-revolution-will-have-to-wait-a-little-longer/

Bennett, M., Cser, A., Hoppermann, J., & Dai, C. (2017). *Predictions 2018: Be Ready To Face The Realities Behind The Blockchain Hype.* Cambridge: Forrester.

Biernacki, P., & Waldorf, D. (1981, November). Snowball Sampling. *Sociologicl methods & research, 10*(2), 141-163. Retrieved January 15, 2019, from http://www.columbia.edu/itc/hs/pubhealth/p8462/misc/biernacki_lect4.pdf

Bitcointalk . (2010, May 10). *Forum*. Retrieved from https://bitcointalk.org/index.php?topic=137.0: https://bitcointalk.org/index.php?topic=137.0

Bol.com. (2018, November 17). *Blockchain Boeken*. Retrieved from Bol.com: https://www.bol.com/nl/s/algemeen/zoekresultaten/sc/media_all/index.html?searchtext=blockchain&view=list

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, III*(2), 77-101. doi:10.1191/1478088706qp063oa

Bryman, A., & Bell, E. (2007). *Business research methods.* Oxford: Oxford University Press.

Business dictionary. (2019, January 14). *business definition*. Retrieved from Business dictionary: http://www.businessdictionary.com/definition/business.html

Cambridge University Press. (2019, March 9). *dictionary/english/success*. Retrieved from https://dictionary.cambridge.org/: https://dictionary.cambridge.org/dictionary/english/success

Charmaz, K. (1996). Grounded Theory. *Rethinking methods in Psychology*, 27-49.

Christidis, K., & Devetskiotis, M. (2016, June 3). Blockchain and Smart Contracts for the
internet of things. *IEEE ACCESS, 4*, 2292-2302. doi:10.1109/ACCESS.2016.2566339

Corbin, J., & Strauss, A. (1990). Grounded Theory Research: Procedures,Canons, and
Evaluative Criteria. *Qualitative Sociology*(Vol. 13, No 1), 1-20. Retrieved March 5,
2019, from https://med-fom-familymed-research.sites.olt.ubc.ca/files/2012/03/W10-
Corbin-and-Strauss-grounded-theory.pdf

Crosby, M., Nachiappan, Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016, June).
BlockChain Technology: Beyond Bitcoin. *Applied Innovation Review*(2), 6-19.

Cuccuru, P. (2017, September 1). Beyond bitcoin: an early overview on smart contracts.
International Journal of Law and Information Technology, 25(3), 179-195. doi:10.1093

de Volkskrant. (2018, November 5). *Ondanks hoge verwachtingen blijft blockchain in
Nederland nog vaak steken in de testfase*. Retrieved from volkskrant:
https://www.volkskrant.nl/nieuws-achtergrond/ondanks-hoge-verwachtingen-blijft-
blockchain-in-nederland-nog-vaak-steken-in-de-testfase~b6569223/

Del Castillo, M. (2018, July 3). *The 50 Largest Public Companies Exploring Blockchain*.
Retrieved from Forbes:
https://www.forbes.com/sites/michaeldelcastillo/2018/07/03/big-blockchain-the-50-
largest-public-companies-exploring-blockchain/

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Acedemy of
Management Review*, 532-550.

European Commision. (2018, April 10). *European countries join blockchain partnership*.
Retrieved from europa.eu: https://ec.europa.eu/digital-single-
market/en/news/european-countries-join-blockchain-partnership

Frereday, J., & Muir-Cochrane, E. (2006, March). Demonstrating rigor using thematic
analysis: A hybrid approach of inductive and deductive coding and theme
development. *International Journal of Qualitative Methods, 5*(1), 1-11. Retrieved
January 20, 2019, from
https://sites.ualberta.ca/~iiqm/backissues/5_1/PDF/FEREDAY.PDF

Gartner. (2018). *Blockchain trends report 2018.* Stamford, Connecticut, United States:
Gartner.

Haegens, K. (2018, November 5). *Ondanks hoge verwachtingen blijft blockchain in
Nederland nog vaak steken in de testfase*. Retrieved from Volkskrant:

https://www.volkskrant.nl/nieuws-achtergrond/ondanks-hoge-verwachtingen-blijft-

blockchain-in-nederland-nog-vaak-steken-in-de-testfase~b6569223/

Hammersley, M. (2005). *Assessing quality in qualitative research.* Oxford: Quality in

Educational Research.

Herbsleb, J., Zubrow, D., Goldenson, D., Hayes, W., & Paulk, M. (1997). *Software quality

and the capability maturity model.* Pittsburgh, Pennsylvania: Software Engineering

Institute.

Higginson, M., Nadeau, M.-C., & Rajgopal, K. (2019, January). *Blockchain's Occam problem*.

Retrieved January 25, 2019, from mckinsey.com:

https://www.mckinsey.com/industries/financial-services/our-insights/blockchains-

occam-problem

Huang, R. (2016, December 12). *RQDA*. Retrieved from RQDA project: http://rqda.r-forge.r-

project.org/

IBM. (2017, October 26). *blockchain essentials*. Retrieved from IBM Cognitive Class.ai:

https://courses.cognitiveclass.ai/courses/course-

v1:developerWorks+BC0101EN+v1/info

IBM. (2018, November 14). *blockchain/industries/supply-chain*. Retrieved from

https://www.ibm.com/: https://www.ibm.com/blockchain/industries/supply-chain

Karlsen, J. T., Andersen, J., Birkely, L. S., & Odegard, E. (2005). What characterizes

successful IT projetcs. *International Journal of information technology & decision

making, Vol.4*(No.4), 525-540. Retrieved from

https://www.worldscientific.com/doi/abs/10.1142/S0219622005001738

Kharif, O. (2018, Juli 31). *Blockchain, Once Seen as a Corporate Cure-All, Suffers

Slowdown*. Retrieved from Bloomberg:

https://www.bloomberg.com/news/articles/2018-07-31/blockchain-once-seen-as-a-

corporate-cure-all-suffers-slowdown

Kharif, O. (2018, Juli 31). *Blockchain, Once Seen as a Corporate Cure-All, Suffers

Slowdown*. Retrieved December 12, 2018, from bloomberg:

https://www.bloomberg.com/news/articles/2018-07-31/blockchain-once-seen-as-a-

corporate-cure-all-suffers-slowdown

Lansiti, M., & Lakhanu, K. R. (2017). *The Truth About Blockchain.* Bosten: Harvard Business

Review. Retrieved November 30, 2018, from

https://enterprisersproject.com/sites/default/files/the_truth_about_blockchain.pdf

Lauslathi, K., Mattila, J., & Seppälä, T. (2017). *Smart contracs- how wil blockchain technology affect contractual practices?* The research institure of finnish economy. Aalto: ELTA. Retrieved from https://pub.etla.fi/ETLA-Raportit-Reports-68.pdf

MCNamara, C. (1999). *General Guidelines for conducting interviews.* Minnasota: Sage Publications.

Microsoft. (2017, January 19). *Microsoft Blockchain as a service.* Retrieved from Mircrosoft virtual academy: https://mva.microsoft.com/en-us/training-courses/microsoft-blockchain-as-a-service-17104?l=aZrQbG3SD_3206218965

Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System.* Online: www.bitcoin.org.

Niranjanamurthy, M., Nithya, B., & Jagannatha, S. (2018). Analysis of Blockchain technology: pros, cons and SWOT. *Cluster Computing*, 1-16.

Opdenakker, R. (2006, September). Advantages and Disadvantages of Four Interview Techniques in Qualitative Research. *FQS, 7*(4), 11.

Pinto, J. K., & Prescott, J. E. (1988). Variactions in critical succes factors over the stages in project life cycle. *Journal of management, 14*(1), 5-18. Retrieved January 4, 2019

Project Management Institute. (1987). *Project Management Body of Knowledge.* Upper Darby, PA: Project Management Institute.

PWC. (2019, January). *bitcoin blockchain cryptocurrency.* Retrieved January 20, 2019, from PWC.com: https://www.pwc.com/us/en/industries/financial-services/fintech/bitcoin-blockchain-cryptocurrency.html

Reeves, M., Levin, S., & Daichi , U. (2016). The biology of Corporate Survival. *Harvard Business Review*, 46-55. Retrieved January 29, 2019, from https://hbr.org/2016/01/the-biology-of-corporate-survival

Rennock, M. J., Cohn, A., & Butcher, J. R. (2018). *blockchain technology and regulatory investigations.* Boston: Practical law.

Saldaña , J. (2015). *The coding manual for qualitative researchers* (3rd ed.). Bosten: Sage Publications Ltd.

SAP. (2018, November 1). *An introduction to blockchain.* Retrieved from Open Sap: https://open.sap.com/courses/leo4

Swan, M. (2015). *Blockchain.* Champaign, Illinois: O'Reilly Media, Inc, Usa.

Szabo, N. (1997, september 1). Formalizing and securing relationships on public networks. *First monday, 2*(9), 1-15. Retrieved from https://ojphi.org/ojs/index.php/fm/article/view/548/469

Thomas, G. (2017). *How to do your research project a guide for students* (3rd ed.). Londen: SAGE Publications.

Thompson, J., Martin, F., & Scott, J. (2010). *Strategic Management: Awareness & Change* (8th ed.). London, United Kingdom: Cengage Learning EMEA. doi:ISBN10 1473726336

Tian, F. (2016). An Agri-food Supply Chain Traceability system for China based on RFID & blockchain technology. *IEEE*, 63-72.

Tony Chocolonely. (2018, JUli 23). *Blockchain.. kunnen wij er (traceerbare) chocolade van maken?* Retrieved from Tony Chocolonely: https://tonyschocolonely.com/nl/nl/onze-missie/nieuws/blockchain-kunnen-wij-er-traceerbare-chocolade-van-maken

Trujillo, J. L., Fromhart, S., & Srinivas, V. (2017, November 6 6). *Evolution of blockchain technology*. Retrieved from deloitte insights: https://www2.deloitte.com/insights/us/en/industry/financial-services/evolution-of-blockchain-github-platform.html

Wang, H., Chen, K., & Xu, D. (2016). A maturity model for blockchain . *Financial Innovation, 2*(12), 12. doi:https://doi.org/10.1186/s40854-016-0031-z

Wit, A. d. (1988). Measurement of project succes. *Project management*, 164-172.

Wüst, K., & Gervais, A. (2018). *Do you need a Blockchain?* Zürich: CVCBT.

Yin, R. K. (2002). *Case study research: design and methods.* CA: Thousand Oaks.

Yli-Huumo, Jesse; Ko, Deokyoon; Choi, Sujin; Park, Sooyong; Smolander, Kari;. (2016). *Where is currect research on blockchain technology.* Seoul: Plos One. Retrieved Janurari 4, 2019, from https://journals.plos.org/plosone/article/authors?id=10.1371/journal.pone.0163477

Zheng, Z., Xie, S., Dai, H., Chen, X., & Wang, H. (2017). *An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends.* Guangzhou, China: IEEE.

8. Appendix

Appendix 1:Interview setup

Name participant:	name, surname
Name interviewer:	Nick Xaverius Lefevere
Date:	dd/mm/yyyy
Timestamp beginning interview:	00:00
Timestamp end interview	23:59
Place:	streetname, number, place, country
Recording accord:	Yes/No
Summary accord:	Yes/No

Questions

#	Theme	Subtheme	Question
1	Introduction	Experience	Could you tell me a about yourself?
2			What is your experience with blockchain?
3			How did you come into this industry?
4	Blockchain	Industry	How do you feel about the state of the industry?
5			What developments do you think have been important in the last few years?
6		Technology	On a scale of 1-5 where do you think blockchain as a technology is in terms of maturity, 1 being ad hoc, chaotic. Emerging and lack of understanding. 5 being reliable, continues improvement
7			how would you define non-financial blockchain?
8		Projects	what do you think is the difference between a blockchain project and a software development project if there is any?
9			In your experience, is there a clear approach for doing blockchain projects?
10			What is the main reason companies choose blockchain in your experience?
11	Success	Definition	What would you define as a successful blockchain project?

12	criteria	What criteria would a good blockchain project have internally within the project?
13	Failing	May you know any reasons why blockchain projects would fail?
14	If no	How do you think blockchain projects fail?
15	External	What external factors, outside from the project limits, have an influence on a blockchain project?
16	If answered yes	How would you deal with those external factors?
17	Client	How do you feel about the level of knowledge about blockchain at companies?
18		Do you think companies in general have the knowledge about blockchain to set correct requirements for projects?
19	Future	Industry	How does the industry need to change in the next 5 years in your opinion?
20	references		May you know any professionals who you can introduce to me for interviews?

Transcription

-A full transcription of the interview without the use of coding

Appendix 2: Codebook

Adoption and changemanagement

Beginning Small

Blockchain case mismatch

Bringing parties together

Budget to experiment

Business IT alignment

Business value understanding

Chanching to sharing mindset

Change will come eventually

Choice impacts success

Choosing an other tech

Choosing Blockchain for Hype

Clear business case

Combinding Technologies

competitive Blockchain market

Competitor focused

Creating awareness

Creating organizational understanding

Data quality

Decision making between parties

Difference in type blockchain

Double input resolvement

ds Adding Business value

ds Adding more value than other tech

ds adoptability ecosystem

ds Completing use case

ds Filling lack of trust

ds if expectations meet reality

ds Learning and understanding

ds Secure

Early involvement of parties

Economical factor

Enterprise blockchain is improving

Enterprise Blockchain pro

Expectation management

Experiment fase

Fraud prevention

Fysical and Data missalignment

Geographical challange

Gouvernance

High Expectations

High maturity

Hype positive influence

Immutability

In need of a killer app

Increased current awareness

industry depentend

Industry maturity

Industry not ready yet

internal blockchain success

Internet comparison

Investigation of Data used

Lack of knowledge

Large variety of knowledge

Law and regulations

medium maturity

Missing Standards

nfb equals non-crypto

nfb no finantial nature

nfb Non finance sector

No Agile Deployment

No existing cases

No knowedge for solo project

Normalizing Blockchain

One main party

Optimalisation

Organizational engagement and support

Organizational politics

Organizational push

Perception on blockchain

POC for Knowledge

POC to project wall

POC<real project

Political involvement

Positive future Blockchain

PR focused

Pro-Crypto

Problem Focussed

Process improvement

Project uncertaincy

Public Blokchain Pro

Replacement of trust

security of information

Shareholder management

Sharing knowledge

Software projects and blockchain projects similarity

Staffing Project

Start-up within a company

Technical improvement

Technological choice

technology challenge

Technology Immaturity

Thinking in Silos

Too large Risk

Tracability

Trail, error and learning

Uncertain future direction

Unique blockchain factor

Usability

Users knowledge not neccecery

Variation of knowledge level

Waiting for change

Appendix 3: Raw data examples

Participant 10, 15:35 minutes

Q. Do you think that, you said the technology, you're depending on the technology, do you think that you as Company J can be very involved in to let that maturity grow?

A. Oh yeah, for sure. I think, yes, because, you know, we have fantastic DLT lab here, so every new technology every new aspect of the blockchain technologies that can we try out and for us, you know, it's like, because our lab is so extensive, we have IOT, which is about capturing data, real time, then you have artificial intelligence which is again another department, here looking at it, here we make a meaning out of A.I. and blockchain which is about creating that single source of truth, once you have the data. So for us it's..

Q. ..So it's really combining all these technologies?

A. Yeah. So for us it's really like bringing all these trends together and creating a real story out of it. So for us it's definitely something that we definitely know will contribute, you know, we've contributed like, I said, to the blockchain initiative, you would see a photograph there, in the agreeworld. We have made a difference in the analogy world, creating ██████, we made difference in the IT world to, for us, yes, we are in a position, a very comfortable position.

Q. How would you define the term non-financial blockchain?

A. Non-financial blockchain? I would say it has two nuances, a non-financial blockchain could mean that are not trading any upload on the currencynet, a non-financial block chain on the other side could mean, what is the nature of, or what is the business that the blockchain has been set up for? That it self could be non-financial, you know, for example, if it set up for only trading, you know, or it's set up for just exchanging tokens, which are not linked to any digitalized finance, so yeah, it depends in what nuances it's been used.

Participant 4, 22:08 minutes

V. En zou je naast een software development project ook nog andere soorten projecten kunnen vergelijken met blockchain?

A. Ik denk nog sterk aan ? wat onder renovatie zit. Je hebt zo'n zelfde zweem van, dit kan alles oplossen maar het is best spannend waarbij de grootste change vanuit blockchain, in mijn ogen, mist van context shift ga jij toepassen op je eigen database is niet zo spannend dan ga je niet mee de poort open zetten van jouw data. En als jij wil samenwerken in een blockchain in een ecosysteem met andere stakeholders die WhireChain rulen met je concurrenten, moet jij stukken data gaan vrijgeven die voorheen staatsgeheim waren en je gaat proberen in die keten ga jij een systeem creëren diezelfde bron van data te geven, dan moet je dus dingen opgeven en die mind shift dat is voor veel

bedrijven retespannend!

V. Dan kan ik dat samenvatten in een stuk governance? Tussen bedrijven?

V. Ja, jazeker. Hoe werken we samen ik denk ook, voor mij is het heel oud bekend al van een IT projecten dat 20% van je tijd gewoon in je programmeerkosten zit en dat het gewoon in de stakeholdersmanagement en je governance project en alles wat er omheen zit cblockchain is het…

V. Denk je dat daar aan nu ook de grootste, geen valkuilen, maar grootste bergen nu zitten om overheen te gaan bij in dat governance gedeelte? Of ook in het technologische gedeelte dankzij de maturity?

A. Nee, ik denk dat met software dat het niet zo heel spannend is. Met andere aspecten voor de service technologie als blockchain, zo spannend is het niet, hele lullig, een database moeten nog iets gebeuren die komende zijn spannender maar hier bijvoorbeeld ook, je kan in de blockchain een hoop dingen doen maar als de buitenwereld op een gegeven moment zegt joh, dat is allemaal leuk en aardig maar ons wetboek zegt: dat mag niet ja, fijne wedstrijd!

V. In jouw ervaring, is er een duidelijke manier om blockchain projecten aan te pakken?

A. Ik zou beginnen met boerenverstand. Je kijkt naar met welke stakeholders je te maken hebt, hoe dat netwerk in elkaar zit, wie gaat met wie handelen, informatie uitwisselen of producten uitwisselen, dat zijn gewoon de waardes, kijk wat voor informatiestromen of kasstromen er in zitten en die de blockchains aan kunnen pakken. Bedenk dan of een tussenstuk party een andere oplossing is om bilateraal ieder voor zich, of toch door die blockchain en pas als die businesscase daarin positief lijkt voor blockchain, ga dan pas je stappen zetten. En betrek dan ook gewoon al die stakeholders en al die enge concurrenten erbij. Ga lekker op de hei zitten van hey, dit zouden we kunnen doen en daar zit een systeemvoordeel in voor iedereen en iedereen die gaat het spannend vinden.