

Blockchain in startups

*A case study on the impact of blockchain on
the business model of startup-companies in
Norway*

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Abstract

Blockchain based technologies and companies have been on the rise the last decade with much hype surrounding this topic. It has been promoted as a revolutionary technology that is capable of more than just sending and received digital assets. It has the possibility to lead to innovation in the creation of new product and technologies. Blockchain has in many ways outgrown what Satoshi Nakamoto initially published in the first paper in 2008. Research looking at how this technology affect businesses from a non-technical perspective has on the other hand been scarce. Especially regarding how it affects the business models of startup companies.

The purpose of this study is to explore how startup companies use this technology and what impact it may have on their business model. A case study was conducted where five startups company founders based in Norway were interviewed.

Findings suggest that many companies need to spend much time and resources developing products from the ground up, as there is a lack of established product chains. This can be attributed to the immature nature of the technology. Some time and effort also has to be spent communicating the value to the, as this might appear unclear. Revenue structures are mostly based on “traditional” models, but many companies are looking at alternative models such as micro-payments. If alternative payment models that use blockchain are still viable, remains to be seen.

The research also discovered that there might be some resentment from people outside the blockchain community, because of negative perceptions about the technology. However, the founders themselves are very positive. There also seems to be a divide between open and closed blockchains that can be interesting to take a closer look at.

This study contributes to the overall literature in this field by both confirming and challenging some of the existing views. Most notably, it discusses new findings that need to be explored further in the context of startups, blockchains, and business models.

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1 Introduction and research question

Blockchain is a relatively new technology that has emerged during the last decade. The first mention of the technology originates back to the work of Satoshi Nakamoto from 2008, in the paper “Bitcoin: A Peer-to-Peer Electronic Cash System” (Nakamoto, 2008). Interestingly the term “blockchain” never appeared in the original paper. Nakamoto’s paper described a way to support transaction of a global peer-to-peer digital currency with the name Bitcoin. Blockchain has been known to be the first public ledger that has resolved the double-spending problem by combining peer-to-peer technology with public-key cryptography (Nowiński & Kozma, 2017). In layman terms the blockchain can be described as a distributed database comprising records of transactions that are shared among participating parties (Zhao, Fan, & Yan, 2016). What makes the blockchain work, is that each transaction is verified by the participants in the system, making fraudulent transactions unable to pass the collective verification. Once a record is created and accepted by the blockchain, it can never be altered.

This is perfect for creating digital currency, but the blockchain also offers other types of application as it enables people who do not know or trust each other to create a record of who owns what. It is a way of making and preserving truths (“The great chain of being sure about things | The Economist,” 2016). Some argue that the blockchain concept is even more; it is a new organizing paradigm for the discovery, valuation, and transfer of all quanta (discrete units) of anything, and potentially for the coordination of all human activity at a much larger scale than has been possible before (Swan, 2015).

The infamous Hype Cycle for blockchain business published by Gartner has early on speculated that the expectations for this technology might be exaggerated, and years later the prognosis has changed but most business are still uncertain of the impact. It’s estimated that 60% of business will have some level of adoption of the blockchain technologies in the next three years (“Gartner 2019 Hype Cycle for Blockchain Business Shows Blockchain Will Have a Transformational Impact across Industries in Five to 10 Years,” n.d.). However many products are still in the research and proof-of-concept phase (Higginson, Nadeau, & Rajgopal, 2018) and not much is understood regarding the technologies impact on business models. Especially not regarding how startup companies use this technology and how it shapes their business

models. This study will take a deeper look at startup companies beyond the hype and look at how they approach this technology and how it potentially affects and changes business models.

1.1 Current gaps in literature

As an initial investigation, the term “blockchain bibliometric” was used in search engines to see if research has been done on the field of business and entrepreneurship. As well as to see if any research was originating from Norway. This led to the papers “The rise of “blockchain”: bibliometric analysis of blockchain study”(Firdaus et al., 2019) and “The Evolution of Blockchain: A Bibliometric Study” (Dabbagh, Sookhak, & Safa, 2019). Both papers noted a substantial growth in the amount of research published from the year 2016 onwards to 2018. Previous to this time period the amount of publications was very slim. 995 papers were totally published relating to blockchain between the year 2013 and 2018 (Dabbagh et al., 2019). The most amount of published papers were related to the computer science field. The total amount of publications relating to business, management and economics was between 114 and 131. The three most prominent countries to publish literature were United States, China and Germany (Firdaus et al., 2019). Interestingly, there were twelve papers from Norway citing other blockchain related work.

This led to further investigation through the Oria service (oria.uio.no) that allowed me to search with similar terms as mentioned in the first paragraph for other papers and theses. Current literature on the topic concerning business models and blockchain indicates that the implementation of blockchain in organizations that already have established business models will impact the current model to a lesser extent (Fadnes Brattebø & Lodden, 2019). Blockchain might potentially change business models across industries (Seppälä, 2016) and businesses within the established industries in the Nordic region already are developing new models for this technology (Lokøy & Nyberg, 2018). The technology will have a multidimensional impact on those business models as well (Lokøy & Nyberg, 2018). This suggests that there is a different impact on the business model, but startup companies and their impact has not been studied.

Startups differ from many established firms in the sense that they are more agile and better adapt to rapid changes in the market. Something that is interesting in the view of a rapid and changing technology as the blockchain is. Given that the blockchain is very technical, most of the research done has focused on potential technological improvements relating to limitations

and privacy perspectives (Yli-Huumo, Ko, Choi, Park, & Smolander, 2016). The scope of this research will focus on startups and where the blockchain plays an integral role to the business.

1.2 Motivation and research question

It is always interesting to look at new and emerging technologies. Especially given the hype around blockchain combined with the buzz around cryptocurrencies that had an up-rise in the past years (“Global Charts,” n.d.). Despite all this, little is known about the technology’s potential and fit. Looking at the paper “The Evolution of Blockchain: A Bibliometric Study”, there is a clear indication that there is a lack of research done within this topic, though there has been a growth of papers written since 2017 (Dabbagh et al., 2019; Firdaus et al., 2019). Little focus has been given to startups, business models and their relation to blockchain. Thus, the following research questions was formed:

Research Question:

How does the blockchain influence business models of startup-companies?

The question was selected with startup-companies that employ this technology as part of their core business proposition in mind. The opportunity to gather as much information about this phenomenon and study the unexplored areas; the impact on the business model itself is an integral part of this research.

1.3 Importance of this research project

An extensive literature review provided on the given topic has proven lack of knowledge in regards to how startup companies perceive blockchain and what impact this can have on their business model. Both bibliographies (Dabbagh et al., 2019; Firdaus et al., 2019) suggest a low amount of research in general on this topic as well as a lack of business related research compared to other fields, there is a strong trend in literature to look at the technological aspect of the technology instead of looking at it from a business and entrepreneurship perspective (Yli-Huumo et al., 2016). Other theses relating to this technology have looked primarily at how it affects business models of larger companies.

The combination of startup and blockchain in relation to business models has not been studied exclusively. This research paper aims to add to the knowledge on how the use of blockchain based technologies might have an impact on different aspects of the business model of startups. And explore possible further ventures for even more specific research regarding this.

1.4 Structure of the paper

The beginning of the paper presented the current state of blockchain following with the identification of gaps within this field of research. The research question and its motivation has also been presented. The following parts of the paper will give a simple background to what blockchain is. A chapter covering business models, their relation to blockchain and other relevant literature will also be presented. Chapter four contains the description of research methodology, followed up with the presentation of research data. Finally, the analysis and discussion of data will be given. A recommendation for further research will also be proposed.

2 Blockchain background

Blockchain is still novel and can be compared to the state of the early internet (Braendgaard, 2018). One can argue that we are still in the early infancy of blockchain and related technologies. So far, according to Swan (Swan, 2015) the blockchain can be classified into three levels of complexity and applications. Blockchain 1.0 is used to denote technologies such as Bitcoin and other crypto currencies. Blockchain 2.0 focuses on the financial aspect which includes smart contracts, smart property, Dapps (decentralized applications), DAOs (decentralized autonomous organizations), and DACs (decentralized autonomous corporations). While Blockchain 3.0 is blockchain applications beyond currency, finance, and markets particularly in the areas of government, health, science, literacy, culture, and art, which some may also constitute as the digital society (Zhao et al., 2016).

Given the broad spectrum of blockchain and its application it is important to grasp what these technologies are and how they fundamentally work, as much of this technology lays the foundation to how business utilize it for business opportunities. The following information in this chapter of the thesis will give background to some of the common themes and concepts. Even though blockchain started as a novel solution to provide a distributed digital currency, its uses have now expanded to include many new use cases.

2.1 How does the blockchain work?

In the introduction of this paper a brief description of the technology was given. To reiterate and expand; blockchain can be described as a distributed database comprising records of transactions that are shared among participating parties (Zhao et al., 2016), and it can also be described as a distributed ledger. None of the data can be altered when it is inserted into the system. Each piece of information that is added, is done in such a way that it is attached to the previous information that was added. This information is called a block. A block therefore contains information about what is added and what the previous piece of information was. Chaining and storing these blocks together is where the term “blockchain” most likely originates from. What makes the blockchain work, is that each transaction is verified by the participants in the system, making fraudulent transactions unable to pass the collective verification. Once a record is created and accepted by the blockchain, it can never be altered,

thus providing immutability. However, it is worth noting this might not always be the case for some types of blockchains.

Even though the first version of the blockchain was accompanied by the first cryptocurrency Bitcoin, it is important to understand that Bitcoin is not blockchain. It can be segmented into several different components, this will be done to give a better understanding of the core concept illustrated below (Figure 1). With this background we can look at how a transaction in most blockchain networks happen. Adapted from different explanations (PricewaterhouseCoopers, n.d.; Swan, 2015; Zheng, Xie, Dai, Chen, & Wang, 2017):

- **Digital asset:** The value and movable asset itself. It can be a cryptocurrency, smart contract, record or any other information. Many blockchains combine currency with other digital assets.
- **Protocol and client:** The software that handles transactions and enables communication with the rest of the blockchain network. This can for example be a digital wallet for a cryptocurrency or mining software that the nodes use to verify transactions.
- **Node:** Computer that verifies if a transaction within the blockchain is valid or not. This happens by having multiple nodes reach a consensus. How this is done depends on the specifications for the specific blockchain. All the nodes have an identical copy of all the transactions i.e. the ledger.
- **Blockchain:** The underlying decentralized and distributed ledger.

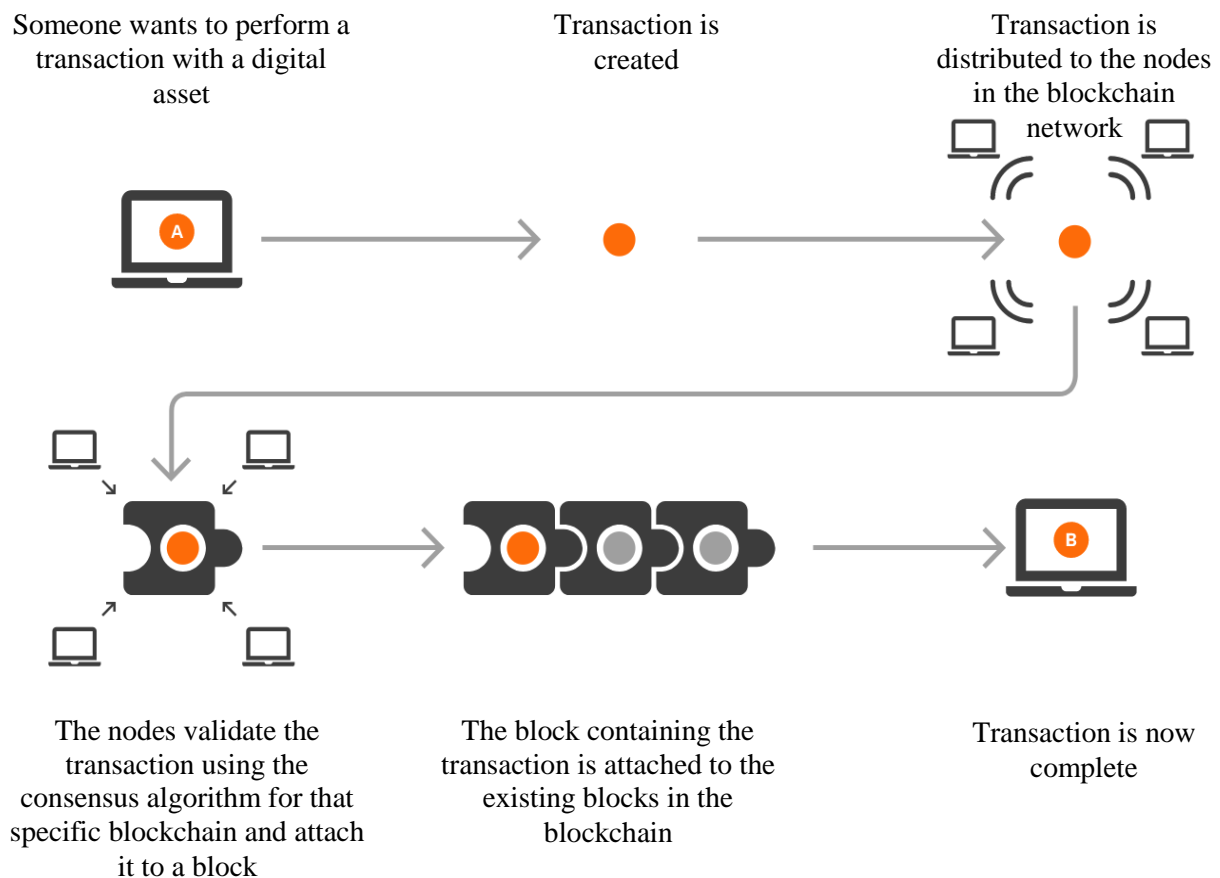


Figure 1 Conceptual figure of how a blockchain work adapted from ("REFILE-UAE bank NBAD offers blockchain payments after tie-up with Ripple," 2017)

2.2 Blockchain architectures and other relevant concepts

Different types of blockchain exist and have different innerworkings, despite this there are several things that are common amongst them, with decentralization and use of cryptography being a major part. This sub-section will go into greater detail regarding those concepts, especially in regard to the difference between public, private and consortium blockchains.

Some key characteristics that can be found in most blockchains (Zheng et al., 2017):

- **Decentralization:** In conventional centralized transaction systems, each transaction needs to be validated through the central trusted agency (e.g., the central bank),

inevitably resulting to the cost and the performance bottlenecks at the central servers. This also causes the central authority to have control over the system. Contrast to the decentralized mode, a third party is not needed in the blockchain network it is the network itself that performs the validation. This might differ for a private/closed blockchain.

- **Persistency:** Transactions can be validated quickly, and invalid transactions will not be admitted. It is nearly impossible to delete or rollback transactions once they are included in the blockchain.
- **Anonymity:** Each user can interact with the blockchain with a generated address, which does not reveal the real identity of the user. Note that blockchain cannot guarantee the perfect privacy preservation due to the intrinsic constraint. The case for anonymity might not be strong for private and consortium blockchains.
- **Auditability:** Any transaction has to refer to some previous unspent transactions. Once the current transaction is recorded into the blockchain, the state of those referred unspent transactions switch from unspent to spent. Transactions can be easily verified and tracked.

2.2.1 Public vs private vs consortium blockchains

Blockchains can generally be segmented into three different major categories (Zheng et al., 2017):

- **Public blockchains (open):** blockchain is open to anyone, everyone has permission to join. This is a completely decentralized system where consensus is reached among the different freely participating parties. All transactions within the network can be accounted for and are visible to anyone.
- **Private blockchains (closed):** some of the key concept that make the blockchain unique might be removed in a private blockchains, as a central authority is controlling the network, thus it is hard to provide guarantees for immutability. This type is also permissioned as only select nodes and users can participate. It can be argued that a private blockchain is comparable to a traditional database.

- **Consortium blockchains (hybrid, a type of closed blockchain):** Usually consists of multiple closed blockchains that are connected together in a decentralized manner. Typically, different organizations that do not trust each-other usually partake in such agreements. Allowing the companies to have a local and controlled copy of data, while being able to partake in transaction outside the organization as well. This combines elements of decentralization and centralization, while providing immutability to the data that is shared. Such blockchains are permissioned. Usually the congregation that is controlling them also imposes certain rules and regulations that are not necessarily in line with the open and free nature of public blockchains.

Table 1 Comparison among public blockchain, private blockchain and consortium blockchain

	Public blockchain (open blockchain)	Private blockchain (closed blockchain)	Consortium blockchain (hybrid blockchain)
<i>Immutability</i>	Nearly impossible	Could be tampered	Could be tampered
<i>Decentralized</i>	Yes	No	Partially
<i>Consensus process</i>	Permissionless	Permissioned	Permissioned

2.2.2 Consensus

The mechanism that allows the blockchain to accept transmission through validating the data is known as consensus. This prevents a bad actor from creating their own version of the blockchain and distributing it among legitimate users. How can the blockchain and its users know what is the legitimate blockchain or not? This is solved using a consensus algorithm. It also prevents double-spending, which is a flaw in cryptocurrency or other digital cash schemes where the same single digital token can be spent more than once. This is possible because a digital token consists of a digital file that can be duplicated or falsified. By letting the nodes in the network work together to verify what information is correct, this can be avoided.

There are multiple algorithms for doing this, but the main ones are Proof of Work (PoW) and Proof of Stake (PoS):

- **Proof of Work:** Is a requirement to define an expensive computer calculation, also called mining, that needs to be performed in order to create a new group of trustless transactions (the block) on a public blockchain. Mining serves as two purposes (“Proof of Work vs Proof of Stake,” 2017): To verify the legitimacy of a transaction thus avoiding double-spending. And to create new digital currencies by rewarding miners for performing the previous task.
- **Proof of Stake:** Is an energy-saving alternative to PoW. Miners (called validators) in PoS have to prove the ownership of the amount of assets they have, as validators lock up some of their assets as a stake in the ecosystem. It is believed that people with more assets would be less likely to attack the network.

2.2.3 Digital signatures and cryptography

All of this is made possible by the clever use of multiple types of cryptographical implementations with asymmetric cryptography being the central mechanism that make such systems work. Blockchain uses an asymmetric cryptography mechanism to validate the authentication of transactions. Digital signatures based on asymmetric cryptography are used in an untrustworthy environment. (Zheng et al., 2017)

Asymmetric Cryptography

Asymmetric cryptography also known as Public key cryptography is a system that uses a pair of keys to ensure the authenticity and integrity of a message. This is done by having one key that is private and only know to the sender of a message, and a public key that is broadcasted and shared freely. Using mathematics both keys are tied together, which allows two parties to communicate over an unreliable channel without revealing the content to third parties.

Digital Signatures

Digital signatures are an essential part of public key cryptography as they can also be used to sign pieces of information, this can be thought of actual signatures on a document. These ensure that the creator of a piece of informant is in fact the person they claim to be. In the context of blockchain, this is used to check if data has been tampered with or not. This combined with a

hash function¹ to create the public address that user in for example the Bitcoin blockchain use to send and receive funds.

2.2.4 Smart contracts

The idea behind smart contract were likely first introduced by Nick Szabo in 1996, long before Satoshi Nakamoto's original Bitcoin paper, but were never realized before the blockchain. Szabo explains this concept as contracts i.e. contractual clauses (such as liens, bonding, delineation of property rights, etc.) that can be embedded in the hardware and software we deal with, in such a way as to make breach of contract expensive. ("Nick Szabo—Smart Contracts: Building Blocks for Digital Markets," 1996). In essence a computerized transaction protocol that executes the terms of a contract. Vitalik Buterin the co-founder of the Ethereum blockchain, describes a smart contracts from a blockchain perspective, as systems which automatically moves digital assets according to arbitrary pre-specified rules (Buterin, 2014). The decentralized nature of most blockchains combines with the clever use of digital signatures allow for such contracts to exist.

2.2.5 Why trust is an integral part of the blockchain

Trust is an important part of the blockchain, the same can be said when it comes to business transactions whether it is digital or not. Trust mitigates the inefficiencies caused by information asymmetry, making it play a crucial role in computer mediated transactions and processes (Jøsang, Ismail, & Boyd, 2007). Given that the blockchain is "virtual" we also have to take the importance of trust in an online setting, where the degree of uncertainty, dependency, and risk is higher than in the offline world (Aljazzaf, Perry, & Capretz, 2010). What makes the blockchain unique is that the trust is not with a third-party but with the system it-self, this can potentially open for new ways of providing services and potentially with new business models/or disrupting existing models.

¹ A hash function, takes any input, and produces an output of a specific size. The process of applying a hash function to some data, is called hashing. The output of a hash function is called a hash (ConsenSys, 2019).

3 Theory

This chapter will provide an overview of the literature surrounding business models, blockchains and how these interact. Frameworks and theories that will be used as a basis for describing the findings in the data analysis will also be presented here.

3.1 Business models

Business models have gained a lot of popularity in the business and management field in recent years (Klang, Wallnöfer, & Hacklin, 2014). Despite this, scholars still don't agree on what a business model is. This can be partially attributed to researchers adopting different definitions distinctive to the purpose of their own studies, thus making it difficult to reconcile with each other (Zott, Amit, & Massa, 2011).

Despite conceptual differences among researchers, certain emerging themes in regard to what a business model is have been presented by Zott et Al. It underlies that all business models have these key elements:

- 1) There is implicit and explicit acknowledgements that the business model is a new unit of analysis that is distinct from the product, firm, industry, network; it is centered on a focal firm but its boundaries are wider than those of the firm.
- 2) Business models emphasize a system-level holistic approach to explaining how firms "Do business".
- 3) The activities of a focal firm and its partners play an important role in the various conceptualizations of business models that have been proposed.
- 4) Business models seek to explain that both value creation and value capture.

Wirtz et al (Wirtz, Pistoia, Ullrich, & Göttel, 2016) defines a business model primarily as a simplified and aggregated representation of a company's relevant activities and interactions. This definition is further divided into three main categories such as; strategic components, customer and market components, and value creation components. These different components should be understood as interrelated, with strategy providing a linkage between "customer and market" and "value creation" components. This differs some from the description that Osterwalder gives. He distinguishes business models from strategy and states that the business model is a conceptual link between strategy, business organization and systems. (Alexander Osterwalder, Pigneur, & Tucci, 2005). DaSilva and Trkman also argue that strategy and

business should not be mixed (Nowiński & Kozma, 2017). A business model is oriented towards short term consequences, while strategy looks towards the long-term. Thus the business model is not an answer to strategic dilemmas but rather a description of how the various elements of the business work together at a certain point in time (DaSilva & Trkman, 2014).

Osterwalder's definition of a business model is as follows (Alexander Osterwalder, 2004):

A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams.

This definition was changed after the creation of what is known as the Business Model Canvas to (Alexander Osterwalder, Pigneur, & Clark, 2010) :

A business model describes the rationale of how an organization creates, delivers, and captures value.

3.2 Business Model Canvas

The Business Model Canvas (Figure 2) is one of the most popular and used tools for describing, analyzing and designing business models. It works best when it is printed out on a large surface. Such that groups of people can join in by sketching and discussing the model elements with post-it notes or board markers. This will foster understanding, discussion, creativity and analysis of the business model. (Alexander Osterwalder et al., 2010).

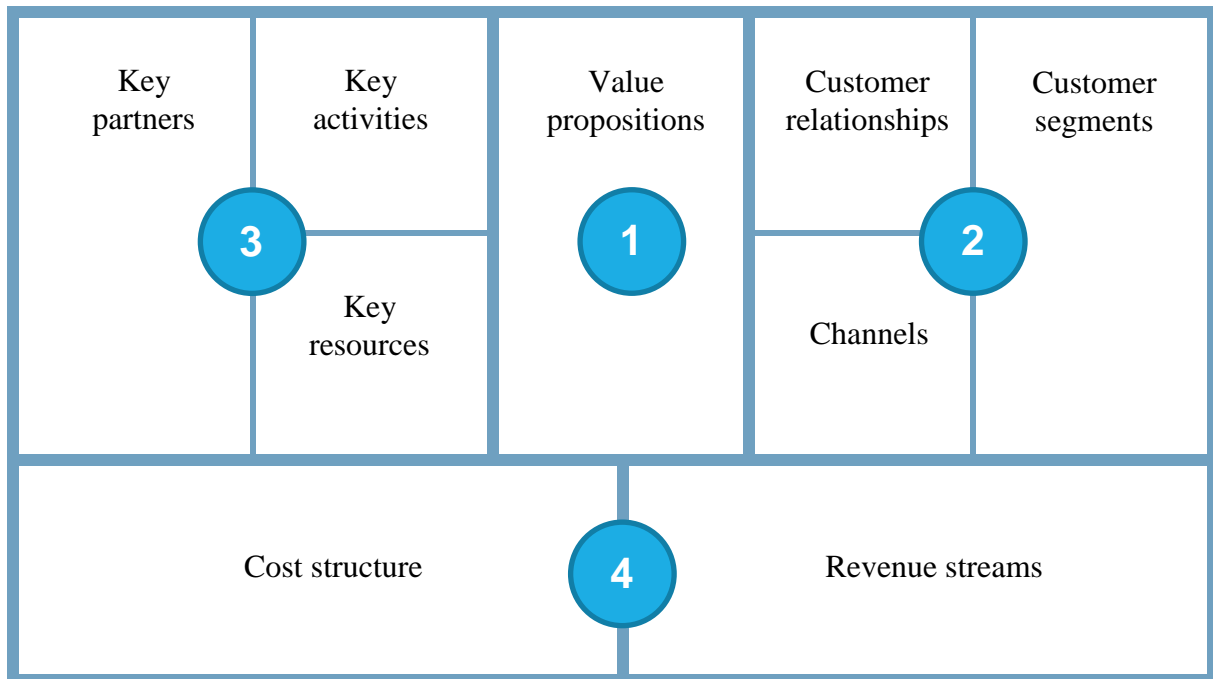


Figure 2: Conceptual representation of the BMC adapted from (Osterwalder, 2004), based on Keane et Al. (Keane, Cormican, & Sheahan, 2018).

The dimensionality of the Business Model Canvas can be broken into four categories:

1. Product
2. Customer Interface
3. Infrastructure management
4. Financial aspects

The categories are further divided into nine-subcategories of blocks that affect the Business Model Canvas (Figure 2). The book “Value Proposition Design”(Alex Osterwalder, Pigneur, Bernarda, Smith, & Papadacos, 2014) gives the following description of all the separate elements in the canvas:

Table 2 Business Model Canvas description (Alex Osterwalder et al., 2014)

Dimension	Elements	Description
<i>Product</i>	Value proposition	Value proposition are based on a bundle of products and services that create value for a customer segment.
<i>Customer interface</i>	Customer segments	Are the groups of people and/or organizations that a company or organization aims to reach and create value for with a dedicated value proposition.
	Channels	Describe how a value proposition is communicated and delivered to a customer segment trough communications, distribution and sales channels.
	Customer relationships	Outline what type of relationship is established and maintained with each customer segment, and they explain how customers are acquired and retained.
<i>Infrastructure management</i>	Key activities	Most important activities an organization needs to perform well.
	Key resources	Most important assets required to offer and deliver the service or product that is offered.
	Key partnerships	Show the network of suppliers and partners that bring in external resources and activities.
<i>Financial aspects</i>	Revenue streams	Result for a value proposition successfully offered to a customer.
	Cost structure	Describes all cost incurred to operate a business model.

3.3 Choice of framework

Despite several definitions of business models, there are still some scholars that argue that strong business models cannot be generated by brainstorming the elements of a business model using a tool like the Business Model Canvas (Euchner & Ganguly, 2015). It does not represent the relationship among elements, nor does it represent the competitive positions and nodes not quantify the economic leverage points. Even though it does not capture everything, it still provides a way to describe a business model in a clear and concise fashion. The competitive position and quantification of financial aspects is not detrimental to this study, as the study aims to provide an exploratory look at how busines modes might be impacted. The four dimensions of the canvas are used to guide the study.

Compared to the definitions given by Zott et Al. the Business Model Canvas itself acknowledges that the business model is centered on a company, but also includes elements such as customer management and infrastructure management. These elements span wider than those of the firm and play a vital role to the business model. As a whole the Business Model Canvas portrays how business is done or how it should be done. While emphasizing the value through the products value proposition and also taking into account the financial aspects in direct relation to this. Thus, it could be argued that it represents a relationship between important elements.

3.4 Business model innovation

Given this new technology and how it ties to economical systems and the importance of profit in a business model as stated earlier, it is important to take a look at how the business model of a company can be changed and innovated upon because companies commercialize new ideas and technologies through their business models (Chesbrough, 2010). Chesbrough states further that technology by itself has no single objective value. The economic value of a technology remains latent until it is commercialized in some way via a business model.

Business model innovation, in this context, is any innovation that creates a new market or disrupts the competitive advantage of key competitors (Euchner & Ganguly, 2015). Foss and Saeb define business model innovation as a process where that redefines the companies' fundamental business logic. Meaning that you think in a new way in regards to how the company creates, delivers and captures value ("Fremtiden for forretningsmodell-innovasjon i Norge—Magma," n.d.; Saebi & Foss, 2015). Given that this is a new technology with potentially new ways of creating value, it is important to have the context about business model innovation in mind.

3.5 Blockchain's potential impact on business models

According to Nowiński et al. Blockchain can disrupt a range of business models across different industries (Nowiński & Kozma, 2017). Some examples include the implementation of smart contracts in financial settings, (Capgemini, 2017). Technology can be used in sharing services

such as computing, offered for example by MIT's Enigma, or the direct renting of apartments, office space or wi-fi routers, as declared by the German startup Slock.it (Sun, Yan, & Zhang, 2016). In combination with physical systems, smart contracts and encrypted chips can be used to enable smart tagging to authenticate luxury products ("Blockchain Startups Take Aim at Counterfeiting of Luxury Products | Bitcoin Magazine," n.d.).

Blockchain technology may not only provide disruption in well-established business models, but it can also offer solutions to industries with structural problems. One example of this is real estate where illiquidity proves a structural bottleneck in the smooth operation of the market (Nowiński & Kozma, 2017). Another industry that can be completely changed is the financial sector, as many of the blockchains today are centered to some degree around crypto currency. It can put such industries at the center of innovation, and will foster better and faster transactions, especially a cross borders. It can make current financial services obsolete and current business models can change as a result of this (Holotiuk, Pisani, & Moormann, 2017).

Buterin describes the issues surrounding how this technology can be used as follows: "Blockchains are useful for decentralized consensus on databases that update themselves according to non-commutative (ie. order-dependent) state transition functions." ("Blockchain Apps: Moving from the Jungle to the Zoo » Brave New Coin," n.d.). Meaning that blockchain based technologies have value when a group of entities need to agree on data where the order of the transactions depends on one and other. Inherently the blockchain can provide a level of trust that potentially can open for many new use cases. How this will unfold in practice still remains to be seen.

Despite the potential use mentioned, the technology is still new and in developments. There is a level of uncertainty connected to it. However, the maritime industry have included blockchain and smart contracts as part of their business and have seen a potential growth in innovation, customer relations and environmental impact (Fadnes Brattebø & Lodden, 2019). Other companies and industries have also seen multiple impacts on several dimensions of their business model. Especially related to transactions and digital assets. Blockchain has also opened up for a possible shift in structures between providers and users, given the technology's' democratizing effects (Lokøy & Nyberg, 2018). This is also in line with other findings, Seppälä states that the blockchain is an innovation in such a drastic way that it enables many more

innovations, such as business model innovations and have the potential to change how the world works (Seppälä, 2016).

4 Research Methodology

A research design is a detailed framework or plan that helps to guide a researcher through the research process and will allow for a greater likelihood of achieving the research objectives according to Wilson (Wilson, 2014). In his book “The Honeycomb of Research Methodology” is proposed and will be used as a framework for conducting this study. The following chapter will take a closer look at the way the study was conducted with this framework in mind. A closer look at the validity and reliability of the study will also be presented.

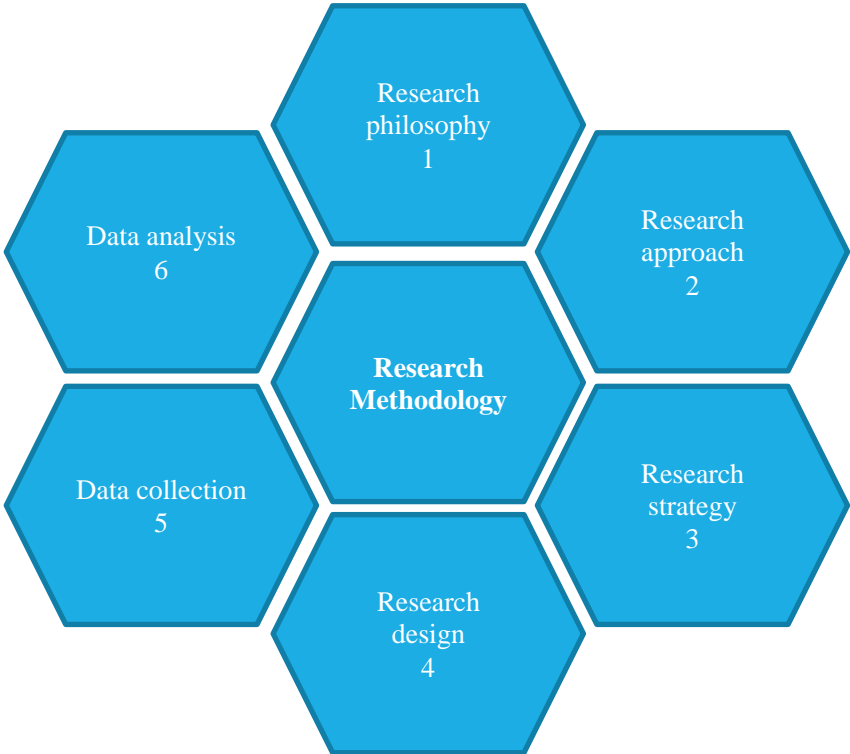


Figure 3: The Honeycomb of Research Methodology (Wilson, 2014)

4.1 Research philosophy

Before the research was started different research philosophies were looked at and weighted. An understanding of research philosophy is important because it is fundamental to how the research is approached. Mark Easterby-Smith (Easterby-Smith, Thorpe, & Jackson, 2012) gives three reasons for why it is important to understand the philosophical aspects. It helps clarify research design, secondly it allows the researcher to recognize which design works best and it can help the researcher identify and adapt research design according to the constraints of different

subject or knowledge structures. An epistemological-research approach with a pragmatist look has been chosen for this study. Epistemology can be branded as the study of the criteria by which the researcher classifies what does and does not constitute the knowledge (Hallebone & Priest, 2008). Given that the study is looking at:

How does the blockchain influence business models of startup-companies?

It was natural to both recognize the importance of both the physical and social world and choose the most appropriate research methods for conducting this type of research as focus will clearly be on the research question itself. Different business models that could be used as a framework to guide this study have been looked at. These different models were weighted and looked at in order to create a study that would implement a research design to answer the research question as good possible. The simplicity and clear representation of a business model that the Business Model Canvas provides, was found to be appropriate for this type of research question and approach.

4.2 Research approach

The research follows an inductive approach, which is a theory-building process starting with observations of specific instances and seeking to establish generalizations about the phenomenon under investigation (Hyde, 2000). An inductive approach will collect data and develop a theory as a result of the data analysis. This was deemed the most appropriate as it is important to understand the developments of this new and emerging field before applying a well-known theory as is done in deductive research.

The framework for working with this research is primarily the Business Model Canvas given the broad adoption of this framework as well as it provides a clear way to describe business models. The framework covers a broad enough area of the business model and captures the current state, therefore it is a suitable framework to choose as a basis for both the research design and future analysis in this type of research. It gives some structure to an explorative study so that building theory based on the observations can be performed in a somewhat structured way.

4.3 Research strategy

In order to be able to fully explore and answer the research question a qualitative approach to data collection was selected, Wilson (2014) notes that most qualitative research is linked to an inductive study. This also makes sense in the context of the research giving a varied picture of what can be collected. Qualitative research focuses on the socially constructed nature of reality, the intimate relationship between the research and what is studied, and the situational constraint that shape the inquiry. Such research emphasizes the value-laden nature of the inquiry and seeks to answer questions that stress how social experience is created and given meaning. (Denzin & Lincoln, 2011).

This study is based on the collection of data from firsthand interviews. The various sections in the business model canvas were used to create the basis for the interviews as to stay within the topic of business models, as well to create a future framework for the data analysis, such that the data findings and the analysis could be correlated. Using interviews allowed for questions and findings to also be presented that even if they might not fit the Business Model Canvas. This allows for further theory building based on other findings. Interviews with founders of startup-companies that employee blockchain were chosen as the group to be interviewed. The reasoning behind this is that they give the best firsthand data regarding their experiences with their business and blockchain.

4.4 Research design

4.4.1 Research study

The choice of research design was based on the scarcity of available information related to the topic entrepreneurship and blockchain. There is a lack of published research and knowledge about the blockchain and how it ties into entrepreneurship. Not many companies in this space exist within Norway making the information related to this even more scarce. Thus, an exploratory design study was chosen. Exploratory research is conducted into a problem where there currently exists very little, if any, earlier work to refer to. The aim of this type of research is to develop a better insight into a particular topic, leading to the development of a set of propositions.

4.4.2 Research method

A multiple case study with a holistic analysis was selected for this research. A case study was chosen because it is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003) and it aligns well with the type of question that my research looks into. A ‘how’ type of questions also aligns with case study types of research. A multiple case study was chosen based on Yin’s book, which can provide a more robust foundation for the resource as multiple case studies can be used to either augur contrasting results for expected reasons or either augur similar results in the studies (Yin, 2003). In this way the author can clarify whether the findings are valuable or not (Eisenhardt, 1991). When the case studies are compared to each other the researcher also can provide the literature with an important influence from the contrasts and similarities (Vannoni, 2015).

The research case will also be examined as a one unit, as it looks at founders of startups that employ blockchain technology as a whole unit. In contrast if an embedded design was chosen, a design that payed attention to a number of units of analysis could potentially make it difficult to determine which specific part of analysis is using the observed effect and which are correlated.

4.5 Data collection

In order to perform the primary data collection founders of startup-companies involved with blockchain were searched for using public search engines such as Google. Other tools such as Apollo.io and Proff.no were also used. This was then combined with the search on other platforms such as LinkedIn to find the relevant people to contact.

There exists a total of 16 companies that I have managed to find using online sources mentioned above that matched my search criteria “startup”, “in Norway”, not “consultancy” firm and not “large established enterprise”. Request for interviews were sent to the founders of these companies, the total amount of companies that were able to participate in the study were five.

4.5.1 Anonymity and privacy

Given the small sample size of companies and the sensitive nature of some of the questioning in the interview, as well as some of the initial candidates asked to be anonymized, the whole study was carried out by anonymizing the companies and the founders themselves in the data presentation and analysis. This might pose some challenges when it comes to the validity and integrity of the data discussed later in this chapter. On the other hand; anonymity might provide the interviewees an ability to express themselves more freely regarding topics that might otherwise be deemed too sensitive to be disclosed publicly.

All the interviews were recorded and stored on encrypted devices. Data processing and analysis of the companies were coded such as to not allow the information to be tied to the specific companies. All recorded information and notes were deleted at the deadline for the thesis. Candidates were given this information regarding their participation and had the option to withdraw their consent. The study has also been reported to the Norwegian Centre for Research Data (Norsk senter for forskningsdata).

4.5.2 Primary data

One interview with each founder of company were conducted, meaning a that a total of five interviews were done. In-depth interviews were conducted as they are the most appropriate for situations in which you want to ask open-ended questions that elicit depth of information from relatively few people (Guion, Diehl, & McDonald, n.d.). The main structure of the interview guide (Appendix A) was based around the four dimensions in the Business Model Canvas. Further questions were done in combination with the findings from the initial research topics relating to the blockchain and business models. The shortest interview was just shy of 30 minutes and the longest was one and half hour long.

Interview method

The interviews were semi-structured and done in a face-to-face setting at the companies' offices. Semi-structured interviews strike a fine balance between asking follow-up questions on the spot allowing for flexibility and the set of fixed questions that will be given to all participants.

4.5.3 Secondary data

Secondary data was collected in order to verify certain claims by the interviewees at a later point and also to gain a better insight into the given research topic. The secondary data consisted of information regarding the companies and the review of literature that laid the foundation for the theory chapter. In combination with other materials and articles that the companies and founders have published related to their business. This makes it possible to prepare better follow up questions that will be specific for the business and can provide deeper insights.

4.6 Data reliability and validity

It is important to gauge the validity and reliability of data in order to be able to assess its credibility. Concerns related to observer bias and the possible nonobjective nature of the researcher can often arise given the qualitative nature of this study. Reliability concerns the extent to which a measurement of a phenomenon provides stable and consistent results (Carmines & Zeller, 1979). While validity is the relationship between a construct and its indicators, and it can be viewed on the basis of internal and external validity (Wilson, 2014).

4.6.1 Reliability

It is difficult to ensure high reliability as interviews were conducted as a primary source of data. The transcription of interviews used for analysis is subjective and could thus influence the reliability. These types of interviews are also not standardized. In order to improve the reliability of the following best practices mentioned by Wilson (2014), based on Yin 2003, were followed:

1. **Use multiple sources of evidence:** Multiple founders in multiple companies were interviewed, total of five people in five companies.
2. **Create a case study database:** When the interviews were completed, they were entered into a case study database. They were later categorized and coded by topic and relevance to improve reliability and help with the data analysis.
3. **Maintain a chain of evidence:** All interviews were recorded, and notes were taken during the interviews. Given the privacy concerns, the transcripts will not be published.

4.6.2 Internal validity

Internal validity asks if the study is measuring what it is supposed to measure. Both primary and secondary data were used to increase the validity of the data. In addition to this some of the Mays and Pope (2010) recommendations relevant for this study were also followed in an effort to improve data validity:

1. **Methodological triangulation:** Multiple companies and founders in different sectors also helped with the validity for some of the non-industry and non-company specific question that were asked in order to substantiate an overall interpretation.
2. **Clear exposition of data collection and analysis:** Part of this is described in this chapter as well as in in the data analysis part of this paper.
3. **Reflexivity:** is defined as sensitivity to the ways in which the researcher and the research process have shaped the collected data. In order to minimize these effects open-ended and neutral questions were asked so that the interviewees could speak freely about the given subject. Follow-up question were asked based on the data previously provided by the interviewees. On the other hand, some of these follow-up questions could have some amount of bias due to the data collected from secondary sources about the company and its use of the blockchain technology. My initial interest into this topic were explained in the motivation part of this paper. The possibility for personal bias is always present, especially given the qualitative nature of this study.
4. **Attention to negative sources:** This is done in the discussion and analysis part, there is also secondary literature in this paper that supports the “hype” and at times unrealistic use for this technology.
5. **Fair dealing:** ensures that research design explicitly incorporates a wide range of different perspectives so that the viewpoint of one group never dominates the findings. As mentioned earlier different companies in different sectors were interviewed but given the small sample size and limited amount of such companies that exist, it is important to recognize that this might have some effect in regards to the fair dealing.

There was no previous relationship with any participant of this study before the interviews were conducted. Making it less possible that the candidates were in some way influenced before the primary data-collection happened.

4.6.3 External validity

The relevancy of this study is that it can provide future entrepreneurs and startup-companies intending to utilize blockchain an overview of what effects it might have on their business. Thus giving them a better understanding of the challenges and benefits this might impose. It can also help existing startup companies within this space to see if these findings relate to their business. This can be followed up with further research and allow for the development of new theories and insights.

All companies were founded and located in Norway. This might have some effect on the external validity if the study were to be conducted in a different region. However, all the companies were providing services and products to the global market.

4.7 Data analysis techniques

Given the exploratory nature of quantitative data and no definitive steps applicable to qualitative data analysis, different authors have proposed different approaches for this type of analysis (Wilson, 2014). The three general activities proposed by Miles and Huberman (Miles & Huberman, 1994), data reduction, data display and conclusion have been chosen as the underlying method for analysis. These will be coupled with the four analytical steps given by Wilson:

Transcribing data: All the interviews have been transcribed as accurately as possible.

Reading and generating categories themes and patters: This can also be regarded as coding the data found in the interview based on the different types of categories. A combination of emergent (inductive) and priori coding (deductive) has been used. This approach makes it possible to look for a specific set of codes while at the same time providing the flexibility to note any emergent and unforeseen codes (Wilson, 2014). A combination of open and selective coding has been conducted.

Interpreting the findings: The open coding has provided a general insight into words and terms many of the participants used. While the selective coding looked specifically for themes strongly relating to the business model. Other findings that did not have a strong relation to the business model that were placed in their own category. Based on this certain conclusion were drawn, as well as the forming of additional theories or other research question that might be to take a look at.

5 Data presentation

The data conducted from the interviews will be presented and will be linked to the coding that has been done during the initial analysis. This is so that the data can be discussed and analyzed in the context of the Business Model Canvas. A presentation of the respective companies will be given in an anonymized form to give more context to the data.

5.1 Presentation of companies

Company 1 – C1

Description	
This company specializes in delivering a software product where the main focus is that it's decentralized. The company utilizes a democratic form of governance and controls this through the release of custom tokens that can be used as a voting mechanism. Tokens can also be used as a means of purchases within the eco-system.	
Sector	Computer services
Blockchain-type	Public
Uses smart contracts	Yes
Project status	In development, shipping some services to customers
Year active	~ 5

Company 2 – C2

Description	
Specializes in different parts of the financial sector, has focus on developing own software to be used for payment services, as well as being involved in crypto-currency trading and investment.	
Sector	Fintech
Blockchain-type	Public
Uses smart contracts	Yes
Project status	In development
Year active	~ 3

Company 3 – C3

Description	
Specializes in interbank transfers of funds and money. Is also involved with different smart contracts and identity projects as well.	
Sector	Fintech
Blockchain-type	Consortium
Uses smart contracts	Yes
Project status	In development, testing prototype
Year active	~ 4

Company 4 – C4

Description	
Research platform for randomized controlled trials. Leverages mainly the key aspect of open-blockchains that provides unique ability for data-immutability.	
Sector	Research and science
Blockchain-type	Public
Uses smart contracts	Potentially
Project status	In development
Year active	~ 1

Company 5 – C5

Description	
Platform that connects parties that want to purchase and sell certain waste products. Allows for a multisided marketplace where the blockchain provides traceability and ability for cross border-payment.	
Sector	Environmental
Blockchain-type	Public
Uses smart contracts	Yes
Project status	In use, also doing more development to decentralize other parts of software
Year active	~ 2

5.2 Data results

This sub-chapter contains the main interview data structured by themes that have been recognized during the coding. The coding was done in multiple passes, the first pass was done in an open fashion. Selective coding was also used afterwards to relate the data to The Business Model canvas. The presentation of this data is the result of the final coding and has been sectioned into different themes that were common for the companies interviewed. It will be presented such that it gives more context to the subject matter and its relevancy to research question. It will present for relations between business model and elements that can be affected due to the use of blockchain. The four main categories of the Business Model Canvas will be used:

- Product: Value proposition
- Customer interface: Customer relationships, segments, and channels
- Infrastructure Management: Key partners, activities and resources
- Financial aspects: Cost structure and revenue streams

It is important to note that four of the five companies were relying on public-blockchains. Only one of the companies was using a consortium blockchain, no companies used a private-blockchain. Company C3 that is using the consortium based blockchain.

5.2.1 Themes for data coding

Table 3 List of themes discovered during coding of interviews in relation to the Business Model Canvas

Theme	BMC relation	Who mentioned it
Transparency and immutability	Value proposition	C1, C5, C4
Trust	Value proposition, customer Interface, infrastructure management, financial aspects	C1, C3, C5
Revenue streams and use of tokens/ cryptocurrency	Financial Aspects, customer interface, value proposition	C1, C2, C3, C4, C5
Cheaper for the customer due to better efficiency	Infrastructure management, financial aspects	C1, C2, C3, C5
Efficiency and smart contracts	Infrastructure management, financial aspects, value proposition	C1, C2, C3, C5
Maturity of technology	Value proposition, Infrastructure, customer interface, financial aspects	C1, C2, C3, C4, C5

Themes that were not related to the Business Model Canvas but were still interesting were put in the following table:

Table 4 Themes discovered during coding of data that are not directly relevant to the Business Model Canvas

Theme	Who mentioned it
Public perception	C1, C2, C5
Business model (mentioned directly)	C1, C2, C5
Public (open) vs private (closed and in this context consortium)	C1, C5, C4

5.2.2 Interview results

Transparency and immutability

Multiple companies mentioned that the transparency of a public blockchains is something that will have an impact on the value that their product and services provide. As it provides a way for people to verify what they have done and how:

I think it's the transparent way of having an impact really. You can do something and verify that it has been done, and it's transparent and visible for everyone. You have NGO's that tell you some stories about what they have been doing, but here you can actually see where your money goes. You can see where and when the money was spent on how much plastic was collected. That is kind of allowing people to have an impact on the product. (C5)

In the case of Company 5, they are in some way driving a multisided marketplace and facilitating the transfer of goods and services between two or more parties using this technology. This ties also into the immutability of the data. It allows third-parties or in this case customers, to verify that everything is in order and hasn't been modified. Also relevant for Company 4 that explains it in the following way:

It just provides a level of immutability that no other service can provide without also applying blockchain technology to it. You can offer the topline processes, but you cannot give the fundamental guarantees that the blockchain offers without applying the technology. (C4)

Company 4 also elaborates that the way the data is stored, allows for systems and application that were not possible to create previously. Security and trust that the blockchain offers is a key element of this:

Well, we cannot be accused to tamper with data, because it is so hugely distributed and because there are more and more transactions, the cost of trying to attack the blockchain goes up exponential, using high volume open blockchain, the way I understand it, it will really increase the security of the immutability. (C4)

Company 1 is also saying that the way this technology is intended to be used is with these things in mind; transparency, trust, and efficiency:

Blockchainers that are using tech for good, are using blockchain for it's supposed to be used for, which is transparency, trust and efficiency. (C1)

Trust

The topic of trust seemed also to show up during interviews, as put by Company 1:

Blockchain is about transparency, accountability, that's what it's about. It's a trust machine because it's an open ledger, it's a distributed leader, it's an open register with a common infrastructure with logical separation, where crypto is used for this logical separation. That is what in reality it is. (C1)

It seems like many of the incumbents of this technology use it where multiple parties are operating and none of the parties trust each other. Given as example for why it is important from the perspective of a consortium based blockchain:

So, we don't really see the benefit of using this in traditional settlement, but when you have international settlement, especially when you also deal with currency exchanges, that is where you can see some benefits in using this technology. (C3)

The same goes as to provide value by having a product where your customers and your business doesn't rely on a third party:

I guess a part which you can't do without the blockchain is really issuing the value from here to the ones who are doing the collection. That would be reliant on middlemen that you trust even more, at least now we can shift that balance a bit. (C5)

One problem relating to trust is mentioned by Company 4. Where the problem of bad data in to the blockchain will result in bad data out, you need to be able to somehow trust users to give correct information:

You need to be able to force people to only enter true information or not to manipulate what they have put on the blockchain, or you need to align their incentives, that they always have and incentives to not manipulate whatever is put on there (C4)

Revenue streams and use of tokens

Some of the companies also employed a revenue model that included regular sales and charging a fixed amount to provide their services. One company also mentioned custom issued tokens and their ability to decentralize the control of the company as well. This can be regarded as a new form of company control and governance:

We started the company with equity, and it's controlled with equity, and we are turning a profit with regular enterprise licenses. But we realized immediately that when we start with this, we are also going to make an opensource copy and put it in an association, which is now established. The association is purchasing software from the mother-company. How is it making money? Well it's selling tokens. Selling tokens to anyone who wants them, then it's purchasing the software and building its own IP opensource. The association is owned and controlled by the owners, It doesn't have any other owner and that is consensus, then we are also implementing some other reasonable mechanisms. Regarding voting, we are using the token utility as an incentive to bring forwards proposals. (C1)

Besides bringing forward the point about different company governance, alternative models when it comes to profit have also been brought forward by Company 2:

Large enterprise who receive a lot of online payment. Especially, if instant payment of smaller sums is desired. For example, a microtransaction, where the user doesn't need an account, that is possible using lightning. You can pay 1 kr for the article, and then it's sent to the payment network immediately. The API will handle it and tell the website that now the transaction is complete, and you get to read the article. (C2)

This is regarded as a type of micro-payment or transaction. Something that has been proposed earlier many times but never been fully realized and people have proposed blockchain projects

in order to make it main-stream (“Shouldn’t We All Have Seamless Micropayments By Now?,” n.d.). A similar type of microtransactions, where you pay for what you use is also probed by another interviewee, there the potential for regular consumers to earn money is, something more in line with the concept known as sharing economy (Filippi, 2017):

You can have incentive models that are per CPU-cycle, so per bit and byte. This is what is so great about blockchain, for tax purposes and others, is that you pay exact of what you are supposed to pay. Therefore, when people are not using their device such as their smart-tv they can rent it out (as in renting out the CPU power) You are doing an AirBnB of your device. (C1)

Company 5 is already applying a type of microtransaction model with borderless payment, that is converted to fiat once a certain amount has been reached. The following is in relation to how the use of blockchain as a payment mitigator can enable borderless payment:

But you can’t send him one dollar, because if you were to do that through a bank or Western Union, it’s impossible. But this way we can at least send that, you can exchange it, attest it has the value and we will back it. And once you got a thousand you can do a bank transfer. That’s a bit about how we are doing it. (C5)

These types of changes of how payments are done and received can pose some challenges for consumers, more instances of difficulties with consumers and customers understanding this will be detailed further down:

I think that it even has opened up for a lot of new ways of thinking even, because you are suddenly mixing assets and identities and ownership of things. I think that has a lot of use cases and new business models. It will take some time to adapt to, even just to thinking that you can have your money on your phone without it being in a bank account, it’s kind of hard for people to grasp (C5)

Company 1 has a bit different take on how the tokens is a way to fund the project. It can also be used as a way to perform transactions and purchases within the system:

One sets price-anchors in fiat, then this is converted. This makes it possible for people to purchase services with fiat or with token. With token you get 1 to 1, but with fiat you get 1 to 0.85, a 15% premium that goes to the project. That gives incentives for everyone to get tokens. You need tokens in order to do transactions within the system. (C1)

These examples also bring forward the theme that companies prefer fiat currency as opposed to just deal with crypto currency. This is because they find it easier to deal with regular money given the way current banking and society is not aligned with the blockchain way of doing things. Although as noted earlier, some companies incorporate a mixed model where things are converted from tokens or crypto currency back to regular currency.

They will pay traditionally in the sense that technology guaranteeing the properties of this platform is the blockchain, but I want dollars. There is no requirement to use blockchain here and there, there is some resistance to these newer types of currency in these more traditional conservative research and academic environments. (C4)

We will of course take profit in regular currency as this is what we need to pay bills, bonuses and salaries for most people. (C2)

Cheaper for the customer

Reducing the amount of third parties in a transaction can bring some benefits. It allows to cut down costs. Less parties involved means cheaper for the customer, this can be given back to the customer as a lower price offering than the competition offers:

Given that we are able to eliminate many of the parties in a transaction, that will dramatically lower the cost for the consumer of this platform. Some of the price that we are able to provide is lower due to the efficiency of the technology is so much better. (C3)

By utilizing the blockchain and shared computing Company 1 hopes that this will also bring the price of other devices down as a result of the way their product in combination with the blockchain allows for a higher level of remote computation than previously possible:

Then these (smartphones) will go down in price drastically, there are 800 million sim-cards in India, 80 million smartphones, that is because smartphones are expensive. If these get down to 5 – 10 dollars in price, then they can be given away as a sponsor thing. You then just don't have internet for everyone, you get computing for everyone. (C1)

Company 2 talks about developing technology that extends the proposition of blockchain, by enabling even faster and cheaper transactions for its financial customers:

That uses crypto currency, which has a focus on bitcoin and the lightning network, and is a wrapper system for Bitcoin that ensues faster and cheaper transactions. (C2)

Efficiency and smart contracts

The use of tokens also brings forward some other benefits associated with efficiency in the regards to offering something that is both a benefit for the customer, but also for the company itself:

I guess we are going to get users in a hundred countries, where we have this kind of infrastructure, where any token can be exchanged, it opens up wasn't amount of potentials for financial services for thigs such as poverty reduction, banking in an efficient manner just by using tokens and peer to peer technology. (C5)

People tend to make errors, computer don't in the same way and frequency. This allows for increase efficiency that again reduces the overall operating cost:

It's the cost efficiency that drives this and the risk. People make errors, computer don't as much. That is the major driver, the next 20 years are going be really cool, its great time to be in the industry. (C1)

This efficiency is also recognized by larger companies as well:

I see all these big companies, everyone will have blockchain projects, if they say it or not, it will be integrated because it's efficiency and you can't compete if you don't use technology. (C5)

Efficiency can also relate to the freedom the technology provides to do what you intend. It removes constraints that might be present in current technologies and business processes:

It gives many of the same freedoms that the internet does, anyone can set up a website, you don't have ask someone for permission. You don't have to ask broadcasters such as BBC for permission, you can just set up your own YouTube channel. That freedom is what blockchain enables. (C2)

Company 3 also mentions the efficiency used, but relates it to the possible use of smart contracts within the financial sector:

Efficiency and execution. So, you could say that, if you have already implemented a smart contract in programming so to speak, it provided better efficiency and also it can, if written correctly eliminate a lot of resources. When you do the smart contract structure, you are able to execute on the contract without having to specify everything that goes out of the contract. Obviously, this has to be taken into consideration upon drafting the contract and programming the contract, but once you have programmed it, you can increase the efficiency on the output side. (C3)

Company 2 also recognizes the ability to use smart contracts in a financial setting, in this case they are using an open-blockchain:

The lightning network can be thought of as a smart contract system on top of Bitcoin. And we are using this smart contract system in the next part to facilitate transactions. (C2)

The efficiency can also be related to the easier and cheaper way of transferring funds, given that it removes a third-party, it also increased the speed of which these cross-border payments can be done:

Also, better efficiency than sending money from A to B, takes long time today, lots of middle people. I can send money anywhere any time within 3 minutes, and I can send a shitload of it and there is virtually no transaction cost. And when you then automate this, there is a reason why the big banks are waking up to blockchain pretty fast and the exchanges. (C1)

If a blockchain becomes integrated into current payment systems and becomes widespread enough, it can provide a unified way of sending values, thus improving efficiency by removing vendor lock-in:

By jumping between bitcoin as a unified global value transaction network, you can send money to PayPal, Venmo, Swish or whatever you have, because you have a common infrastructure. In many cases that is more important. (C2)

Maturity of technology

On one hand the technology provides efficiency, but it also is not mature. Not mature in the sense that companies have to spend many of their resources developing things that existing companies not involved with blockchain take for granted. Things are not plug and play currently as put by Company 1 “...Its evolution not revolution”. This is also in accordance with what other interviewees have said:

Because all the parts are not fully matured, so that you can just improve the one process. You can be good at just one thing, but you need to lift up the other parts in order to land the sale. That is what we are doing by having the broad focus. (C2)

This also highlights that some companies cannot use the technology to its full extent even if they would like to, and thus have to use “traditional” services:

It's not yet fully mature. It's a bit because of the whole infrastructure isn't there. You are still reliant on the banks and everything. But still we have been using it, and that is why we have been using stellar as well. Because its already being used and it is working, if it is the most optimal in the end, I don't know. It's maturing and it will be more and more useful going forward. (C5)

This also changes people's perception as touched on previously, this building of new technology also has another effect on the customers and regular people's perception:

We have to teach the customers. But the exciting part is that it allows for better customer journeys than the alternative. Many of the users/customers don't completely understand lighting, but they are saying "yes please" if you can deliver the customer journey that you are promoting. For example: You arrive, you click, it's paid. No card information, no credit risk, no chargeback, no monster fees. Then they are saying, apply! We can create a complete solution that can be sold to an immature market. If you are just selling the receival of crypto currencies to an established actor today, then they are not going to do anything with it. You also need the exchange part. So to have the ability to sew together a 365 almost a solution, because the value chain is not fully developed (C2).

Perception of the blockchain

Both consumers, costumers and company partners might have a lack of knowledge regarding the technology. This can make it difficult to distinguish between fact and hype:

One should have the technological competency. And one should also have the ability to distinguish between what is hype and facts, something that is very difficult to do. (C2)

There are so many buzzwords, so many popular science presentations, that makes it impossible for a regular person to understand what is real and what is not. If I'm saying that you need the lightning network to enable micro transactions because the bitcoin blockchain cannot scale, and the network will collapse and not become decentralized. (C5)

This hype can also lead to companies and investors not realizing what is real and not when it comes to investments. It has opened up new ways of investing this without any regulations and

safety. This has led to frauds and other things that are negative for the community. In addition, people that do not follow this technology are exposed to these types of stories, rather than being exposed to the positive aspects:

When it comes to blockchain in general, I do hope that we can get over the hype of crypto currencies, not saying that crypto currencies are a negative thing, because in some circumstances it can actually be a very good thing, but it has been overhyped. If you look at some of the ICOs² that have taken place, where is a reason why they got banned. Most of them were scams. I don't think that we will see that much more, and I think that it was unfortunate for the whole discussion around the technology. There was one company here in Norway that actually did an ICO that said "oh, it was fantastic, you just got money into the company and you didn't have to provide anything for it, people just got a coin and they weren't able to spend it or anything". That is not what you want. So, there has been some restructuring where actually some coins have been attached to share ownership, allowing you to get another means of transacting shares which can be a good thing. (C3)

Its more volatile and more scam, more people connected, higher velocity. You cannot use blockchain for everything. (C1)

They associate it with hackers, with terrorists, these things. The news coverage and the stories that these people, generally the older generation, the stories that they are exposed to, are largely negative. But for me it was really a surprise talking to people who aren't into the blockchain world, that hey we have actually negative associations with this world, this technology, you probably shouldn't advertise this. And that is fascinating you know. That this really in many ways revolutionary technology is not something we should deal with, to certain segments of the population anyway, that's fascinating. That was something new that I learnt that I learnt and that is relevant. I think that we have a job to do if we want to change the perceptions around the technology for not just regular people, but people even in technology entrepreneurship

² Initial Coin Offering, a way of raising funds, where a company creates tokens or crypto currency and sells them before the initial product is developed. It is similar to stocks but doesn't necessarily grant any way to control or influence the company.

positions. So it's a rather large problem I think, and one that I think blockchain entrepreneurs really should be aware of. (C4)

Aside from the potential negative aspects perceived by people, consumers tend not understand the value of the positive aspects:

That is a problem many engineers are facing, now we have solved something so that it can be decentralized and it's so much better. But regular consumers are sitting and asking the question, why should I change, I have Facebook. But it's decentralized. But so what? (C2)

Business models

Some of the interviewees also shared their perspectives on what they thought of their current business model and how the blockchain might impact this. It is evident that multiple companies have “traditional” business models, and not newly created ones in regard to this. It seems that it is hard to jump to new models immediately:

What we do, started with looking like traditional business models. Hopefully it will iterate pretty far away from those after some time. But it is very difficult to jump straight to the new. It is about the already established value chains. It's the adoption part of it that is challenging. (C2)

That is also why we have the traditional business model. We do see that there might be a challenge when it comes to the stable coin, because much of the banks today make a lot of money doing currency exchanges, so whether or not they would want to include a stable coin solution is not certain, as they have a high fee on currency exchanges. We would have to see how that goes. (C3)

Money and IT is very conservative, you don't just jump with two feet, evolution not revolution as I mentioned earlier, I don't know how well it's going to be regulated but will be more standardized, and that is why the global blockchain organization will play a meaningful role in coming to a mutable acceptable principles without reintroduction the old models which we see are failing. (C1)

Open and closed blockchains

Opinions regarding open and public blockchains have also been voiced by the interviewees. All but one company implemented an open/public blockchain. Different reasons why were given by the companies, but the decentralized, permissionless and open nature was appealing to most companies. It also seemed to align with their personal beliefs about technology governance and freedoms:

Open blockchain is 0 to 1 innovation. Open blockchain and a common agreement in a global accounting system that nobody controls, in addition to this is programable as a smart contract, has not existed before. (C2)

Blockchain is about transparency, accountability, that's what it's about. It's a trust machine because it's an open ledger, it's a distributed leader, it's an open register with a common infrastructure with logical separation, where crypto is used for this logical separation. That is what in reality it is. (C1)

It's more idealistic that we prefer an open public blockchain as much as possible It's also where we see the use benefits in the long term. One of the reasons why we are using blockchain in addition to what has been mentioned, is really the potential for impact. I guess we are going to get users in a hundred countries, were we have this kind of infrastructure where any token can be exchanged (C5)

For maximum credibility the best approach would is to use an open blockchain. And in fact to use one that is not managed by the firm itself by rather to use one of the many open blockchains. This for multiple reasons, well we cannot be accused to accused to tamper with technology, because it is so hugely distributed and because as there are more and more transactions. (C4)

Company 3, which also is using a “closed” consortium blockchain, does not agree with this Some of the benefits that are promoted for some public (open) blockchains. Specially in regard to the financial sector given the regulated nature if this industry:

And any kind of open distributed ledger won't be compliant with the requirements in banking today. So Obviously due to KYC, Know your customer, and AML anti money laundering. You have seen the scandal with DNB know, you obviously don't want to have that now. So obviously you don't want to have those kinds of transactions performed in financial situations. Ways to mitigate that has been to not necessarily have an open distributed ledger, or an open blockchain, but using it as an closed permission ledger, so the functionality is much of the same but, instead of having openness with everyone, you have parties that need permission to take part in assessing the transactions. (C3)

By putting the different parties in a confirmation role without being a miner. By doing so you allow the banks themselves to be involved in confirming a transaction without centralizing the power, that would also be counter intuitive, but you want them to be banks in order to actually be supervised and be more secure than if you had an open party doing the confirmation. (C3)

6 Data analysis and discussion

In this section a discussion and analysis of the data will be given. This is a qualitative study of an exploratory nature, meaning that the interpretation will have a subjective approach, despite the data in the previous chapter being presented in a more objective manner. A further relationship with the codes given in the previous chapter will be discussed and related to the Business Model Canvas. It will try to answer the research question: *How does the blockchain influence business models of startup-companies?*

6.1 Product

Value proposition

Blockchain seems to propose an inherent benefit to the startup companies that is manifested as a value proposition for the customers. For some of the solutions the inherent trust that the data cannot be altered and the immutability of the data, is something that provides credibility to the customers. Trust in a digital transaction has been proven to play a crucial role (Jøsang et al., 2007). This signals to the consumer that the products or services provided are credible. Achieving credibility can be challenging for young companies.

This aspect is also tied to the trust in what the company actually offers. This seems especially true for the data that is put on a public blockchain. It gives the inherent value that digital assets can be verified and trusted without involving a third-party. This can be especially evident in a multi-market situation with multiple parties that don't trust each other but do trust the system. Similar to what Company 5 is doing. This can also enable for the creation of services that were previously not possible. Thus making way for completely new use cases as mentioned by Buterin ("Blockchain Apps: Moving from the Jungle to the Zoo » Brave New Coin," n.d.).

An interesting point has been brought forward from one of the interviewees that raise the question of the term in computer science and mathematics known as "garbage in, garbage out" ("What is garbage in, garbage out (GIGO) ?," 2008) in terms of what is put on the blockchain. How do you know that the information placed on the blockchain is correct in the first place? If this is not properly assessed, it can affect the products value proposition as the product might not provide what is actually intended.

You need to be able to force people to only enter true information or not to manipulate what they have put on the blockchain, or you need to align their incentives, that they always have and incentives to not manipulate whatever is put on there. (C4)

A possible way to mitigate this is by using incentives that are driving people and companies to do what is best for the system and themselves in the long run. Something that is also proposed as one of the main driving factors in Satoshi's original blockchain paper (Nakamoto, 2008). If the data that is put on the blockchain is not credible, then this can affect their value proposition negatively. This is something companies need to take into consideration.

The ability to send funds or values across borders also possesses an inherent value, in the terms that it makes it cheaper and easier for the customers. If a company can provide something faster, potentially better and cheaper as well, then that gives them a value proposition that is hard to match compared to their competitors. This is something that both of the financial companies relate to. Holotiuk (Holotiuk et al., 2017) et.al state that the technology will replace existing banking systems and with the level of current innovation it seems to move in that direction. If this will manifest or not is currently hard to say given that the companies interviewed still had their products in the development phase.

The ability to provide something at a lower price given the efficiency of how blockchain can be implemented to do things with less overhead and errors, thus reducing the price for the customers in general. This efficiency has also been attributed to the use of smart contracts, as many of the companies are implement such, the impact on efficiency and the value this can provide has also been noted by others (Fadnes Brattebø & Lodden, 2019; Lokøy & Nyberg, 2018; PricewaterhouseCoopers, n.d.).

Another aspect of providing products at a lower price, is the potential to use micro-payments in an easy way. Thus, the customer will only pay for exactly what they consume. This does however depend on a mass adoption of blockchain and that people actually become familiar with such services. Other service providers and companies also have to implement this in some way. Both of the financial companies in this study were still developing their theologies in

related to this. And the other companies had also not fully implemented such models yet but have thought about it.

6.2 Customer Interface

Relationships, segments, and channels

The ability for customers to partake in the company by purchasing tokens gives the customers a way to influence the company. This can allow a new way of controlling and building companies. Mostly the companies building their services on top of an open blockchain mentioned the democratization argument. The democratizing effects are similar to what has been seen in other studies as well (Lokøy & Nyberg, 2018). Leading to possibly more engaged customers as they have a stake in the company's future development. Company 1 allowed consumers to invest directly by purchasing tokens and have chosen to democratize the way the company is controlled through these tokens. Company 5 allows people to have an impact through the money that they are paying and seeing an actionable and provable results.

Many of the companies are doing regular sales models and they are reaching their customers through regular channels. There might be some inherent challenges when communicating with the customers, due to certain customers not understanding the full extent of the technology and all the benefits it might provide. They might understand the value but not the technology itself. This can pose problems and make it harder to sell additional services or communicate the value of new additions to the product.

6.3 Infrastructure management

Key partners, activities, and resources

In order to provide some of the value that these companies offer, one has to note that efficiency plays a large role in terms of being able to do more for less. If used correctly the technology, allows you to perform actions in a faster and more accurate way. As mentioned previously, this can allow for economical transactions that are faster and cheaper. It can also allow for optimization of the financial processes within the company and the partners that the company relies on. Efficiency can also relate to the lack of limitation the technology imposes in terms of

what you can and cannot do. There is no governing third-party that is posing restrictive requirements in regard to how the blockchain is implemented within the company.

Many key resources were spent on developing and refining technology as the whole product and supply chain surrounding blockchain is not fully established, this also seems to align with Carson et. Al paper that mentioned potential challenges related to this. (Carson, Romanelli, Walsh, & Zhumaev, 2018). This can be challenging for startups, as much time and financial resources have to go into technological development that does not directly translate to the main product offering. The time spent on development can on the other hand provide the company with a stronger position in the marketplace, as the company will gain unique knowledge about the blockchain and its applications. This can allow for future vertical integration.

One can argue that some of the efficiency that has been mentioned earlier does not relate to the development, but rather to the use of a fully developed solution. The increased resources that are needed to develop solutions with blockchain might be greater than the benefits in the short term. Meaning that full potential will be the seen in the long term. This can however cause some uncertainty to the company and the way it prioritizes resources. Simply because there are not many key partners within this space that are available to the companies. In the case of consortium blockchain, key partners play an important role as they are necessary in order to come to an agreement on the development and acceptable use of the technology.

Some of these points can be attributed to the lack of maturity regarding the technology itself, that can cause companies to utilize non-blockchain solutions until they are fully developed. Company 5 for example is still relying on banks to do certain transactional things, as some of the payment processing technology is not ready yet. Suggesting that companies might have to balance between using blockchain and using “traditional” technology, this can have an impact on efficiency, and might impact on the price or might affect the investment or prioritization of funds, but this is hard to say given the scope of this study.

6.4 Financial aspects

Cost structure and revenue streams

The blockchain introduction chapter specified that blockchain and crypto currencies are not the same thing, but they have to be understood as being strongly related. This is also true for many of the blockchain companies that were part of this study. Many of them use or plan to use the financial ability inside their blockchain of choice, to perform transactions in addition to storing of data.

The financial aspects naturally raise questions surrounding the revenue models in relation to the use of blockchain. It also brings up the question of how companies are making revenue. Only Company 4 did not fully leverage the blockchains ability to transfer money, the immutability aspect of the technology was a key part of their product instead. One of the interesting things is that all companies in some way had a fee-based model for their services. Some were also incorporating regular licensing models or models where customers are billed as any regular service would be.

Many of the companies mentioned alternative revenue streams and new business models. New business models allow companies to commercialize these types of ideas (Chesbrough, 2010) and might be part of a future goal for these companies. The notion of micro-transactions was mentioned earlier, but how profitable and reliable source of income this can be, is difficult to say as none of the companies have currently implemented a working solution. One could argue that this would make the income less predictable, though as mentioned, most of these companies currently have fixed fee models usually in combination with other income sources. They also don't depend fully on this type of revenue stream either. This revenue model and way of getting revenue to a company can be interesting to look at in the future.

It was also mentioned earlier that companies have to spend financial resources on developing the technology. This is an upfront cost, but in return the finished solution will have lower cost compared to alternatives that are not blockchain based. None of the companies preferred to keep their revenue as crypto currencies or tokens. Some of the fees that in their solutions were done in crypto currency but would quickly be converted back to regular fiat money.

Most of this is due to the low adoption of crypto currencies among other businesses and people. Some of this can probably be attributed to the high volatility such currencies can have. It is important to note that people's salaries are paid in regular currency. It is evident that that most of society has not accepted crypto currencies and blockchain, what the future hold in this regard will be interesting to see.

6.5 Other aspects

Public perception

There exists some negative perceptions regarding the way some potential customers and the general public view blockchain technology. Generally speaking, all of the founders have a positive view, but that is not the case for people outside this community. Much of the public have negative associations with the technology given that it has been used for conducting fraud. Investors have also been affected by this, something that might have broader impact on how blockchain based startup-companies are perceived and might lower the ability to secure funds or to attract customers. On the other hand, there has also been a lot of hype surrounding the possibilities of this technology, some which have been unrealistic. This can also lead to a generally negative perception of the technology.

Founders perspective on current business model

Three founders shared very similar views on their current business model; it is hard to implement a model that is non-traditional. As Company 1 puts it: "its evolution not revolution.", a gradual change over time needs to happen. This is evident as some companies have do juggle between regular payment models and ones that are related to crypto currency. Some of it is due to the way current financial services are implements, as well as the previously mentioned immaturity of the technology. Others might be related to regulations.

Open and closed blockchains

Most of the companies see the biggest benefits when it comes to public/open blockchains given the decentralized and transparent nature of such blockchains. None of the companies used a private blockchain. Such blockchains might not have any of the benefits compared to a traditional database, as it does not bring any new value or enable any new market opportunities

(Lokøy & Nyberg, 2018). On the other hand, due to regulations Company 3 has chosen to work with a consortium blockchain, thus using the technology in less open manner than what the other companies have mentioned.

7 Concluding remarks

The purpose of this study was to gain an overall understanding in relation to how startup companies use blockchain and how this can impact their business model. This is why the following research question was asked:

How does the blockchain influence business models of startup-companies?

By interviewing different startup-companies that use this technology, different insights have been gathered. The data has been interpreted and analyzed with the Business Model Canvas used as a framework. The study found that blockchain has a multidimensional impact on the business model, something that also has been observed in different companies and industries by other scholars. Startup companies welcome the possibilities that blockchain can provide when it comes to new ways of gaining revenue and the potential to enable for different business models in the future. However, they are currently stuck developing some these services and technology rather than using them.

Much of the impact has been on the value proposition, as the properties of blockchains can translate directly to benefit the products and services that the companies offer. Most of these properties relate to trust, immutability and the general efficiency that the technology might provide in currently established processes. Companies also need to be aware of the possibilities that bad data can be provided to the blockchain and this can potentially be mitigated by incentivizing users in some way not input such data. It also has the potential to have a significant impact on revenue streams, by enabling companies to include new payment models. One such model that has been mentioned is micro-payments, though none of the companies have implemented such models currently. Most companies still receive payments through regular means and turn crypto currency into regular money in order to deal with the cost of running the company.

Most of the companies see benefits in smart contracts due to the increased efficiency and accuracy of such contracts. On the other hand, many of the companies have to spend much time and resources developing services and tools in order to launch their products to utilize the blockchain to its full extent, showing evidence that the technology is still immature and in a

phase of growth. There are also some challenges with potential business partners and customer not understanding how blockchain works nor how it provides value to the product.

7.1 Future research

Given the exploratory nature of this research, other topics were also discovered that might need to be taken a closer look at. One of the more interesting points that were mentioned, was the ability use the blockchain's decentralized nature to also decentralize the control and ownership of a company. It would be interesting to study what effects such ownership models can have.

There was some discussion regarding the nature of completely open and public blockchains versus blockchains that are more closed in nature such as consortium chains. Many proposed that the completely decentralized nature of public blockchains is what makes them unique, but one of the companies in particular fond that this did not fit well within their regulated industry. This begs the question if it is possible to implement the same levels of functionality on a public blockchain, while at the same time being compliant with regulations.

Most people within the blockchain community have positive outlooks for the technology and the benefits it might provide. However, there are still some skepticism and negative public perception towards the use of blockchain. An interesting research topic would be to see what levels of impact this might have on entrepreneurs using or that are about to use this technology.

Lastly, it could be interesting see if micro-payments in a blockchain solution is a viable revenue model and what kind of products this is best suited for. Not many companies are employing this type of revenue model currently, but multiple companies have talked about doing it. It also raises the question if it is viable in the long term.

7.2 Limitations

The main limitation of this study is the small sample size. Only five companies were interviewed. The small sample size does not capture enough data about different business sectors to give a conclusion that could be generalized across the board. No follow up interviews were performed, and this could have a negative impact on the study. Multiple interviews with the same people could have allowed for further analysis in unclear areas.

All of the companies were located in Norway, this does give an insight to the nature of companies in this geographical area. But might include some findings that are not applicable to other areas. Given the exploratory and qualitative nature of this study some bias during the interpretation of data is hard to avoid. A possibility to reduce this, would be to try do a similar study with more quantifiable data.

Given the limited maturity of some of these companies and technology, it is also hard to measure effectiveness of their business models as they haven't been fully implemented yet.

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Appendix A – Interview guide

Introduction

- Who am I and why is this study conducted
- Elaborate on why the specific company/person was chosen for the interview
- Introduce consent form (if this hasn't been done previously) / ask verbally for consent and explain implications as being part of the study
- Inform again that the interview will be recorded and the rights regarding this

Warm-up / Getting to know the person and company / Getting context

- Can you explain what your company does?
- What is your role/day to day task?
- When was the company founded?
- How many people are involved?
- Still “startup” phase/developing product, or have product that is live and customers are using it?
- Explain your business model
 - o How did you get introduced to blockchain?
 - o Part of any other initiatives/commitments relating to this technology apart for this company?

Main part, getting to know more about what role blockchain plays

- Explain what roles blockchain plays in the company's business?
 - o What is the value proposition?
 - o How does it differ from other competing solutions?
 - o Would it be possible to create the same product/service without blockchain?
 - What exact problem is solved by utilizing blockchain?
- How did the business come to life?
 - o Demand from potential customers etc.?
- Who are your main customers/ideal customers?
- What is the main technology used (public blockchain, consortium, private etc.)
 - o And why was this chosen?

Ending the interview

- What are the positive and negative aspects of the technology and products that you are offering?
- How do you envision the future of your company and the world of blockchain?
- Closing questions; ask if they have any questions for me or would like to talk about a relevant topic that I haven't mentioned?
- Ask if it is OK to contact them again if I have some follow up questions