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BLOCKCHAIN

How the implementation of blockchain is affected by, and affects, business models

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By Lina Asadi & Trang Hoang

ABSTRACT

The world is becoming more and more digitalized, and technologies are emerging and being developed continuously. Some of these technologies are considered to have disruptive potential, whereby it is of importance that companies keep themselves updated with the ongoing changes. One technology with an ongoing hype is called *"Blockchain"*; however, it is not only believed to be an occasional hype but also to possibly be disruptive and to have great potential within most industries. Nevertheless, blockchain is a novel technology that still is immature and uncertain, and it is not yet clear how it will develop and affect companies. The purpose of this study is, therefore, to analyse how the implementation of blockchain is affected by business model environments, and how it, in turn, affects business model canvases.

The research was conducted in collaboration with *"Coboom"*, a joint project with CGI Sweden AB, Stena AB, and Volvo Cars AB, based on two frameworks; the business model environment framework and the business model canvas. The first one investigating which external factors within the environment of the companies that affect the implementation of blockchain in the different companies and industries, and the latter which factors, and how these factors, will be impacted by the implementation of the technology. Since the area is novel and previous literature lacks information concerning it, a qualitative study with interviews was used in order to gather information for the study. The findings indicate that the implementation of blockchain will be affected by ***regulatory trends***, ***technology trends,*** and ***industry forces***, while it, in turn, is expected to primarily affect the ***key partners*** and ***key activities*** seen from the company-side, and the ***customer segments*** and ***value propositions*** from the customer-side. Blockchain is however still under development, making it an interesting area for future research.

Keywords*: blockchain, blockchain technology, business model, business model canvas, business model environment, digitalization, innovation, technology.*

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Lina Asadi Trang Hoang

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1. Introduction

1.1 Background

Technologies with disruptive effects have been changing our economies and societies, including a number of emerging technologies developed within the areas of biotechnologies, advanced materials, digital technologies, and energy and environment. Some of these technologies have been applied widely across industries with clear effects, for example Big Data, while other technologies still appear uncertain for practitioners (OECD, 2016). One of these uncertain technologies is considered to be blockchain, which potentially might disrupt the traditional administrative control system on a global scale (Iansiti and Lakhani, 2017). Blockchain can be described as *"an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way"* (Iansiti and Lakhani, 2017, p.120). Blockchain can also be interpreted as *"a database that allows the transfer of value within computer networks"* (OECD, 2016, p.107). The technology is believed to have great potential on different scales and levels. For example, CGI (n.a.) argues that it creates traceability and transparency with a combination of advanced encryption, which provides a basis for secure transactions. Fewer steps and intermediaries will be needed when doing business since the technology allows the different parts to handle the sales without involving other actors (ibid). Once the information has entered the blockchain, it can never be erased, making each and every transaction ever verifiable (Crosby et al., 2016).

Blockchain is according to, among others, McKinsey (2015a) and Choudhury (2017), considered to have a potential of being disruptive. This makes it essential to study how the technology might affect companies' business models which may be seen as the heart of any business (Osterwalder et al., 2010; Teece, 2010).

Business models can be considered a tool for companies to commercialize their ideas and the new technologies (Chesbrough, 2010). However, internal factors within a company, as well as external ones, for example technological changes, lead to the need for changes in business models. Chesbrough (2010) further argues that changes also do have to be made concerning the organizational processes, and the barriers to all the needed changes are high. Thereby, business model innovation is essential, even though it might be challenging to achieve (ibid). This type of innovation is usually linked to the company's resources (Bucherer et al., 2012). Baden-Fuller and Haefliger (2013) argue that the ability to combine both a new technology and an innovative business model may become a competitive advantage. This indicates that it is crucial for companies to understand new technologies and how they might affect their business models.

This study was conducted in collaboration with three companies in different industries, namely CGI Sweden AB, Stena AB and Volvo Cars AB. The companies are leading a collaboration project called *"Coboom"* with the aim of creating a platform for student-industry partnerships primarily in Gothenburg, and in the future also at different locations. The platform is believed

to facilitate the collaboration between students and companies regarding innovation and projects. The main partners in the project are highly innovative companies, who have intentions towards emerging technologies like virtual reality, artificial intelligence, and blockchain. Concerning blockchain, the technology's potential effect on the companies' business models has been most interesting for the companies to consider.

1.2 Research problem

Blockchain will probably affect companies' businesses in the future (Iansiti and Lakhani, 2017), but the problem is that the impacts that this new technology has on business models have been ambiguous so far. The technology has not been widely applied for non-financial institutions, such as manufacturing companies or service companies, in comparison to other technologies as for example the Internet, Big Data, 3D printing etcetera (ibid). Therefore, empirical evidence about how blockchain might lead to changes in business models have not been clearly studied yet. By investigating how the technology is affected by the business model environment, and in turn affects the business models, the authors aim to investigate how each component of the business model canvas might need to be changed. In this study, the research problems will be discussed further, connected to the specific contexts and business models of each company, in the case studies in chapter 4.

1.3 Research purpose

All considered, the purpose of this study is to contribute to the empirical knowledge and to analyse the circumstances and potential effects that the adoption of blockchain might have on companies. That is, to analyse which external factors that have the most significant influence in the determination of the development and implementation of blockchain, and what elements within the business models that will be affected. The authors, together with the earlier mentioned companies, found it practically valuable to study how business models will be affected by blockchain to get a clear view when it comes to the implementation of this new technology. The objective is aimed to be fulfilled by using the Business Model Environment framework, developed by Osterwalder et al. (2010), and the Business Model Canvas, developed by Osterwalder (Osterwalder and Pigneur, 2010).

1.4 Research question

The following research question, divided into two sub-questions, specifies the concrete objective of the study that is aimed to be explored;

❖ *How will the implementation of blockchain affect companies' business models?*
  ➢ *What external forces will affect the implementation of blockchain?*
  ➢ *Which elements of the companies' business models will be affected by blockchain?*

1.5 Delimitations

Since this study was conducted in collaboration with three certain companies and primarily aims to provide suggestions for them considering the adoption of blockchain, the majority of the insights were gathered from them. Information about blockchain in general was collected; however, the primary focus of the study was put on consortium blockchains since this type of the technology currently is more applicable for companies. Consortium blockchains have certain advantages, such as risks that are shared when collaborating, or that companies could have more control over the value chain when applying blockchain. The companies do furthermore operate within different industries, which might have lead to varying results in the case studies. Additionally, the research was only running for five months, which limits the number of interviews that were possible to conduct, and thus the empirical findings that could be analysed. Due to the previously mentioned factors, the results of the study cannot be generalized to all companies or all industries. The sampling approach used for the research might also become a delimitation due to a possible bias (further discussed in section 3.3.3).

1.6 Disposition

The structure of this study is as follows: Part I is the background and description of blockchain, business models and the project, followed by a specification of the study's purpose, research questions and delimitations. Part II consists of the theoretical framework, including the theories and concepts of blockchain and the canvases used in the study. Part III is the methodology including the data collection and data analysis approaches, part IV the empirical findings, part V the data analysis, and finally part VI the discussions and conclusions.
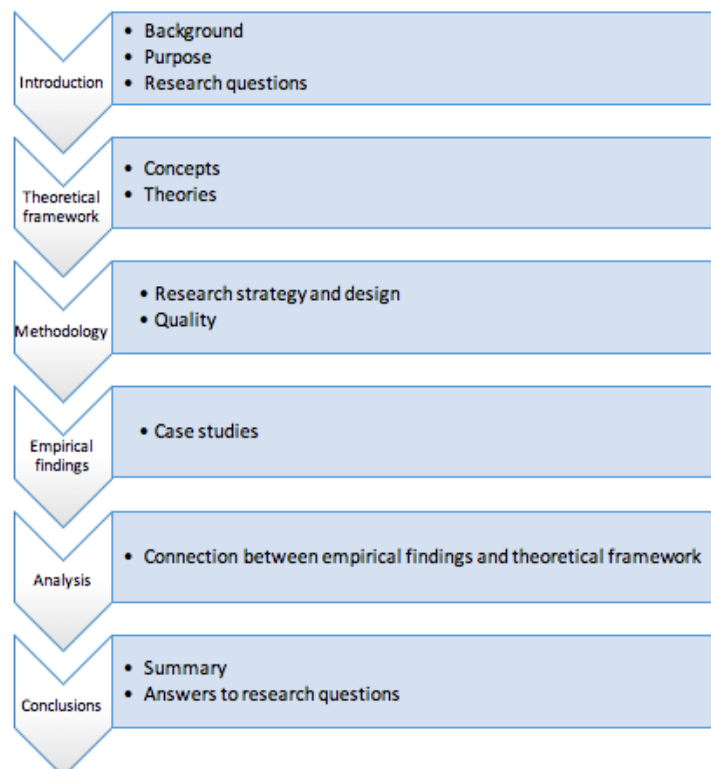
Figure 1 - Disposition of report

2. Theoretical framework

The following section consists of the theoretical framework that summarizes the literature about blockchain, the business model environment, and the business model canvas. This section is crucial for the authors in order to build the guidelines for the data collection and the foundation for the data analysis. Definitions and characteristics of blockchain, as well as different types of blockchain, will be presented based on the academic researches so far. Following the part of blockchain, detailed descriptions of the business model environment and the business model canvas are presented in relation to the implementation of blockchain.

2.1 Blockchain

Definitions

Blockchain can be defined as "*a distributed database comprising records of transactions that are shared among participating parties*" (Zhao et al., 2016 p. 2). It registers and time stamps every transaction, resulting in safe transactions and a secured contact between the companies and customers, thus reducing the need for intermediaries. The technology is also believed to facilitate the conformity with regulations, improve the efficiency of operations in many areas, and through the implementation of programmable contracts, so-called *"smart contracts"*, affect businesses (Nowiński and Kozma, 2017). Blockchain was firstly used in crypto currencies, for example Bitcoin. However, Zhao et al. (2016) and Swan (2015) argue that there are three generations of blockchain:

- Blockchain 1.0 - referring to digital currencies.
- Blockchain 2.0 - referring to digital finance and contracts
- Blockchain 3.0 - referring to digital society.

Characteristics

The benefits are believed to be many, although the main ones being increased transparency, accurate tracking, a permanent ledger as well as cost reductions. Nevertheless, there are also unknowns. The technology is quite new and complex and might be affected by regulatory implications, implementation challenges, and competing platforms. An example of a potential application of blockchain is within the automotive industry, in which the technology could be used by consumers to manage the ownership of autonomous cars. It has furthermore great potential within the financial services by enabling faster and cheaper settlements, which helps companies decreasing transaction costs while simultaneously offering improved transparency. By using blockchain, electronic voting may also be handled and improved, resulting in immediate results. Additionally, patients' information within the healthcare sector could be shared with several actors without taking the risk for leakages of private matters (PWC, n.a.).

Blockchain is considered trustworthy since several users need to agree with each other before any data is created and added to the chains, which differs from the cases with central authorities. The data can furthermore be viewed in real-time when it is published to a platform that is

common for the participants, which decreases the risks for manipulations and fraud. Additionally, blockchain has improved the speed of transactions, and it has also become more attractive and minimizes difficulties depending on regulations since it is independent of financial institutions (ibid).

Nevertheless, and as with everything else, there are of course risks of adopting new technologies to companies' business models. According to Crosby et al. (2016), one of the risks of adopting blockchain is due to the changes in behaviours since these might be faced with resistance. When introducing blockchain, it is of importance that customers feel comfortable with the technology and get used to the fact that it provides safe, secure and complete electronic transactions. Another challenge is related to the scaling of the current services that are based on blockchain. When executing a transaction with the technology for the first time, there will be a need for downloading sets of existing blockchains first, which might take a long time. Furthermore, companies will need to move their current contracts and/or business documents and frameworks to the new methodology that will be based on blockchain. Thereby, a set of tasks will be needed to be done, which might result in time and costs (ibid).

However, the technology has a great potential as mentioned earlier, which in the long run probably will weigh more than the challenges that anyway may be faced professionally (Swan, 2015).

How blockchain works
Morabito (2017) describes how blockchain works with a five-step process;
1. *Transaction definition*: A transaction request is sent to the network.
2. *Transaction authentication*: All nodes in the network receive the information about the transaction request on the distributed ledger. Related nodes then have to validate the authentication of the requested transaction.
3. *Block creation*: When the authentication of the requested transaction is confirmed, a block containing information about the transaction is created. The newly formed block has to wait for validation from the other nodes.
4. *Block validation*: All nodes validate the newly created block.
5. *Block chaining*: The new block is attached to the chain.
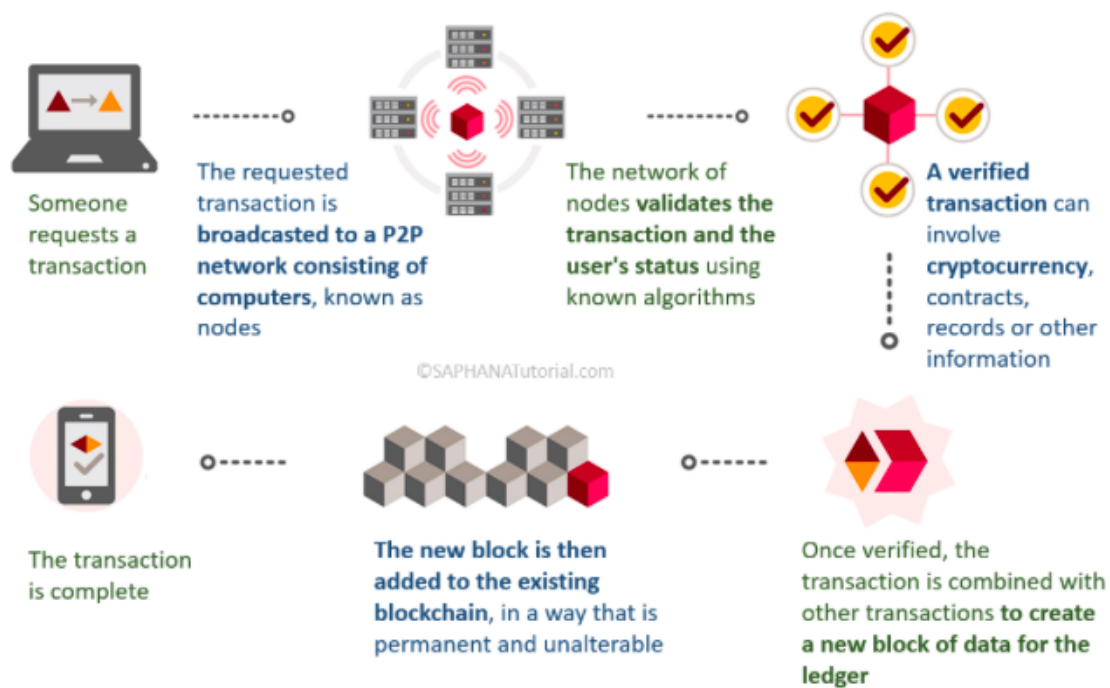
Figure 2 - How blockchain works (PWC, n.a.)

Three types of blockchains

Blockchains may be divided into three types, namely private, public and consortium blockchains (Olleros and Zhegu, 2016), discussed further below. However, the technology is still immature, which implies that there is a lack of data or reliable evaluation of the technology to thoroughly compare the different types (Xu et al., 2017).

2.1.1 Private

A private blockchain is a centralized blockchain, kept to the organization with a limitation of users involved (Morabito, 2017). These are usually connected to, for example, auditing for a specific company and database management, which are not necessary to be public (Olleros and Zhegu, 2016). One advantage of this type of blockchain, in comparison to public ones, is that modifications and changes can be done if desired or necessary. This makes it the most flexible type for changes and configurations, which in turn is a result of the blockchain being hosted by one organization (Xu et al., 2017). Another advantage is that it is known who the validators are, and participants within the private blockchain are also known and trusted (Morabito, 2017). Furthermore, a few nodes with high levels of processing powers are sufficient for the verification of transactions, which makes these cheaper. Moreover, faults within these nodes, which usually are well-connected, can be fixed quickly (Buterin, 2015).

2.1.2 Public

Public blockchains are, as the name indicates, blockchains that are accessible to every user on the Internet, which also means that anybody may participate and affect the blocks that are added to the chain. In other words, these blockchains are decentralized. However, they are secured by what is called *"crypto economics"*, that is a combination of cryptography and economic

incentives. The influence of every person on the blockchain is furthermore limited and proportional based on the amount of economic resources that he/she puts in the chain (Olleros and Zhegu, 2016). The advantages of private blockchains are many, but according to Buterin (2015) there are also advantages with public blockchains in comparison to the private ones, and none of them can be considered better than the other. Since public blockchains are available for everybody, they may be used by many people and result in networks. Their availability and accessibility furthermore hinder the developers of an application from operating freely and establishing whatever they want (Buterin, 2016). The public blockchain is however considered suitable when the developers or companies do not have enough institutional support since the entry barriers for this type are fewer. In this case, it is moreover not necessary for them to convince actors to adopt the application (Buterin, 2016). Nevertheless, there are also disadvantages. Two points of criticism for this type of blockchain are the data privacy and scalability. As previously mentioned, there are no privileged users; hence the privacy is limited. The scalability is also limited in terms of data size of the technology, the rate of transaction processes and the data transmission latency. Furthermore, there are also limits for the number of transactions that may be included in each block, which is a result of the bandwidth of the different nodes that participate in the leader election. Implementing blockchain might imply certain problems and potential risks. In terms of performance, adding blocks to the network at high speed might lead to delayed transactions or communication failures (Nofer et al., 2010). This type of blockchain results in improved information transparency and audibility, however, while sacrificing the performance as well as having different cost models (Xu et al., 2017).

2.1.3 Consortium

There are also blockchains that include pre-selected authorized nodes, controlling the chain. This type is called consortium blockchains and are partially decentralized since some parts might be public while others stay private (Buterin, 2015; Xu et al., 2017). Furthermore, it may be used across and in collaboration with multiple organizations (Xu et al., 2017). The advantages of this type of blockchains are quite similar to the ones of the public type. Since these blockchains require permissions for accessing them, they have the potential for developing quickly. The limited number of actors and the need for permissions ensure that the data is confidential, and it further makes the determination of responsibilities and potential changes easily managed in case of a challenge or a problem (Waelbroeck, 2018).

	Need for permission to read	No need for permission to read
Need for permission to write	Private & consortium blockchains	E.g. Govenment blockchains
No need for permission to write	E.g. Insurance blockchains	Public blockchains

Figure 3 - Summary of blockchain permissions (Inspired by Waelbroeck, 2018)

Type of blockchain	Impact			
	Fundamental properties	Cost efficiency	Performance	Flexibility
Public	+++	+	+	+
Consortium	++	++	++	++
Private	+	+++	+++	+++

Figure 4 - Blockchains' impact on internal processes (+ less favourable, ++ neutral, +++ more favourable)
(Inspired by Xu et al., 2017)

2.2 The Business Model Environment and blockchain

To explore which factors that affect the implementation of blockchain, and in turn affect the business model of each company, an understanding of the business model environment is necessary for the foundation of the analysis. As suggested by Osterwalder et al. (2010), the business model environment comprises four factors influencing the business model, including key trends, macroeconomic forces, market forces and industry forces. The first factor, key trends, could be interpreted as the foresight analysis for each company. The scanning for significant trends includes regulatory, technology, societal and cultural, and socioeconomic changes, that potentially might affect the current business models. The second factor, macroeconomic forces, provides broader information about global market conditions, capital markets, economic infrastructure and commodities, and other resources. Regarding the market influence, the factor of market forces is generally the market analysis, which includes market segments, needs and demands, market issues, switching costs and revenue attractiveness, which in turn identify main drivers from customers' perspectives. Finally, the fourth factor that is the industry forces is mainly the competitive analysis, which includes competitors, new entrants, substitute products, suppliers and other stakeholders of the companies. Within the focus of this study on the impacts on blockchain, literature about each force of the business model environment is, in relation to the implementation of blockchain, further explained below.
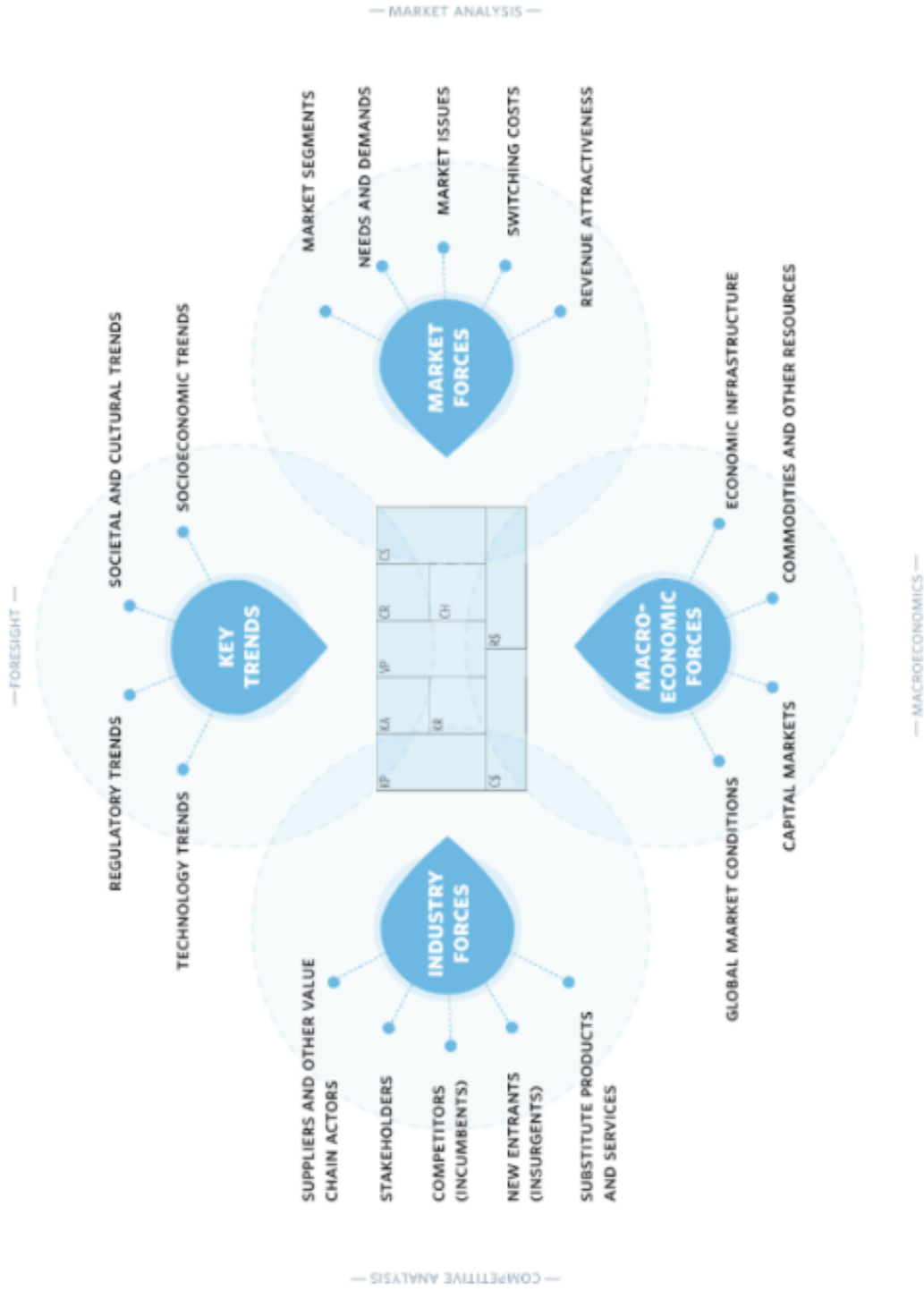
Figure 5 – Business Model Environment (Osterwalder et al., 2010)

2.2.1 Key trends

A foresight analysis might include essential patterns that may enhance or threaten companies' current business models, such as technology trends, regulatory trends, social trends or socioeconomic trends. Technologies from both inside and outside are considered regarding if they have disruptive effects on the companies. Regulatory changes that might affect customers' demand by changing taxes or social and socioeconomic factors, which in turn change customers' behaviours are discussed in the foresight analysis as well. These changes furthermore lead to changes in components of the business model canvas, as for example if the new technology brings other value propositions to the company, or if customers respond positively to the new technological developments of products etcetera (Osterwalder et al., 2010). Osterwalder et al. (2010) discuss an example of a pharmaceutical company to demonstrate how key trends in business environments might affect the business model of the company. The authors mention three significant pharmaceutical technology trends, including the rise of personalized medicine, significant improvements in diagnostics and the perversion of computing and nanotechnology for drug delivery. To be adaptive with these trends, companies need to consider and adjust their own business models, such as the key resources that need to be added if the company offers personalized medicine, how the nanotechnology might affect the current cost structure and how customers might respond to the technological development of the pharmaceutical industry.

Concerning blockchain, firstly, specific regulations directly limit applications of the technology. For example, some countries like Bangladesh, Iceland or Vietnam etcetera have banned Bitcoin completely. China has moreover forbidden their financial institutions from digital currencies, and some European nations appear not to favour Bitcoin as well (Swan, 2015). Another topic related to blockchain is crowdfunding, which has been discussed concerning its legality, which might violate security laws (ibid). Furthermore, the current literature describes two current trends when considering regulations related to privacy and information in both commercial and personal settings. While some regulations are towards protecting privacy, other regulations are more promoting open access to information (Pila and Torremans, 2016). On the one hand, towards protecting privacy with data protection and data security, the right to privacy is considered fundamental; thus it has a higher status than the exclusive right of data. On the other hand, the argument presented for the open access to information is that information is a type of public good, which means that information is non-excludable and non-rivalled to be utilized. Therefore, this situation has raised the need for a balance between regulations that protect privacy and laws that promote open access to information (ibid). With blockchain, several legal questions are also raised (Berberich and Steiner, 2016) regarding privacy and information access. Primarily, the decentralized and distributed ledger of the technology, making it transparent and traceable and leading to encrypted transactions (CGI, n.a.; Crosby et al., 2016), brings implications for the privacy (Berberich and Steiner, 2016). This might lead to a tension between blockchain and the new GDRP (General Data Protection Regulation) (ibid) since GDPR is an EU law regulating privacy and data protection for everybody within the union (European Commission, 2016).

Simultaneously, the PSD2 (Revised Payment Service Directive), which is an EU law regulating and eliminating the monopoly of banks on the payment services and account information of customers (European Commission, 2015), favours the ability of obtaining information for the blockchain, leading to an increased freedom for the consumers by making it easier to reach out to third-party providers (Karajovic et al., 2017). To sum up, regulations seem to have different effects on blockchain, and therefore, it would take time to see if these recent regulations might steer the implementation of the technology in a meaningful way (Berberich and Steiner, 2016).

Secondly, changes in socioeconomic trends of the business model environment might support the implementation of the technology. With the trend of urbanization towards smart cities, the decentralized structure of blockchain may facilitate the governance system, involving each citizen to the planning and execution process of the city governance. This, in turn, encourages the cooperation between cities to solve global problems, such as the climate change, poverty or crime levels (Marsal-Llacuna, 2018). Another trend is related to the sharing economy with sharing services and might support the implementation of blockchain as well. According to Sun et al. (2016), the sharing economy is enabled by digital connectivity technologies that provide real-time information as well as sharing information of idle assets, like spare apartments or idle vehicles. From this point of view, blockchain could lead to an appropriate solution for sharing services by creating an electronic, distributed, secure, transparent and trust-free platform (ibid).

2.2.2 Macroeconomic forces

The macro analysis presents factors related to the macroeconomic point of view. It describes the current conditions of the economy, like the GDP growth rate or the unemployment rate, identifies costs and prices related to the company's business model, like funding costs, labour costs or oil costs, and highlights changes in the economic infrastructure (Osterwalder et al., 2010). Indeed, these macroeconomic factors within the business model environment affect the business model, for example, if the new economic infrastructure can maintain the current support levels for a company's key activities, or if the new infrastructure still supports a company's channels, bringing the value propositions to the customers (ibid). Osterwalder et al. (2010) use the specific example for the pharmaceutical industry, again, to illustrate how macroeconomic forces might affect the business model canvas. A pharmaceutical company might operate in different regions, which means that the macroeconomic factors, in terms of economic infrastructure, might be different in various countries as well. The understanding of how the infrastructure is in different markets, for example, if universities could educate sufficient talents for companies or about how the corporate taxes change, might have an impact on companies' business model.

Concerning the capital market, the trend of crowdfunding with *"peer-to-peer fundraising models"* (Swan, 2015, p.12) is considered an alternative for venture capital funding, which in turn could be a driver for the implementation of blockchain. The models remove intermediary

parties in the funding processes by allowing start-ups to create their own digital currency, which is called *"token"*, and to sell these *"digital shares"* to their investors (ibid).

2.2.3 Market forces

Market forces are investigated through a market analysis, including information about customers, market segments, switching costs and new revenue resources etcetera. The analysis has to identify the crucial pains and gains of the customers, describe the implementation pattern of each market segment and really understand the customers' needs and demands. All this, in turn, affects the components of the business model canvas. A company needs to consider if new resources need to be acquired in order to maintain the position in current segments, or if new value propositions of the company might be created with new suppliers (Osterwalder et al., 2010). Also illustrated by Osterwalder et al. (2010), a pharmaceutical company might divide its different customer segments in two ways; either doctor segments/patient segment, or emerging markets/the market of the United States, among which the latter still is the predominant global playground. In case the market forces from emerging markets have been more significant, it might push the company changing almost all elements of the business model if the current one has been focusing mostly on the US market.

Customers have different expectations and demands for new technologies, which may put pressure on companies to fulfil the customers' desires. Their interests might also differ along the process of the technology, which is why it is crucial for companies to take both the customer type, demands and interests into consideration (KPMG, 2017). Atasoy and Morewedge (2017) have compared physical products to digital products and found out that customers might be willing to pay for the physical more than the digital ones. The reason explained is that physical goods require more space as well as provide *"psychological ownership"* (Atasoy and Morewedge, 2017, p.1343), which in turn makes physical goods more valuable. However, since blockchain still is relatively new, the effect on it is still unknown.

2.2.4 Industry forces

The industry forces are presented in the competitive analysis that evaluates the pressure from competitors, new entrants, substitute products etcetera. The analysis should clearly identify different players in the industry, such as the companies' competitors, new entrants, potential substitutes, key players in the value chain and other stakeholders, such as the shareholders, workers, governments etcetera, and then point out the effects of all these factors on the business model. For example, it might be necessary to evaluate if changes in the industry might lead to changes in the companies' value propositions, or to recognize which parts of the industry that currently provide the most significant revenue sources for the companies in the sector (Osterwalder et al., 2010). As mentioned in the example of a pharmaceutical company from Osterwalder et al. (2010), suppliers and other value chain actors, such as laboratories, insurance companies or doctors and healthcare providers, are vital players in the industry. However, there is a growing use of research contractors, biotech firms, and drug developers for new product generators. When it comes to the business model, a pharmaceutical firm needs to consider

which partnerships the company should build within the changing value chain, or which resources that need to developed in-house to help the company maintaining the competitive position.

Related to suppliers and other value chain actors within the industry forces, the supply chain management is involved in manufacturers' operations, in which they have to work with suppliers, raw materials inventory, production, assembly with work-in-process inventory, warehouses with finished goods inventory, distribution depots, and finally customers (Rushton et al., 2014). Within this field, the supply chain integration trend, where the supply chain management is more towards controlling the whole supply chain rather than controlling each involved component, might be a driver for information systems technology (ibid).

Concerning the context of blockchain, the technology might lead to an industrial revolution among other digital technologies by changing the conventional mechanism of business transactions (Iansiti and Lakhani, 2017; Maull et al., 2017). According to Maull et al. (2017), the technology, enabling different solutions combined with its transparency capability and its real-time implementation, can furthermore lead to a new way of thinking. This, in turn, creates disruptive innovations within industries, especially for industries that mostly include middleman players. The finance industry might potentially be replaced by blockchain when there is no need for waiting several days for transactions of credit cards to be settled. The transactions could be done in a real-time blockchain-based platform by only adjusting the distributed ledger (Nofer et al., 2017). Similarly, notary public might be not necessary anymore when the technology may stamp original documents, as well as store and validate signatures and documents (ibid).

To sum up, blockchain with its decentralized structure might be affected by, and contribute significantly to, all forces in the business model environment; more general from the global scope of key trends and macroeconomic factors, to narrower extents of specific or certain markets. In addition, there is a mutual relationship between the implementation of blockchain and each force of the business model environment. This means that while the emergence of blockchain initiates or contributes to changes in each force, inherent changes of the business model environment still need the new technology to facilitate the change processes, which in turn affects companies' business models. However, empirical evidence about how these combined effects influence components of the business model canvas have not been considered thoroughly in previous academic studies.

2.3 The Business Model Canvas and blockchain

From outside the company, the business model environment might affect the implementation of blockchain, which in turn might affect the elements of the business model. However, from inside the company, McKinsey (2015b) argue that company-specific knowledge, data, algorithms, and ideas also are factors that influence the choice of business models and do also define how the assets may be used and developed. In the context of blockchain, Swan (2015)

states that blockchain cannot be applied to the traditional business models since the decentralized character of the technology might take out all intermediaries within a classical business model. However, to have a clearer look about how blockchain might affect the business model, the authors of this report have organized the theories of blockchain effects within the framework of the business model canvas by Osterwalder et al. (2010). In this study, the business model can be defined as something that *"[...] describes the rationale of how an organization creates, delivers, and captures value"* (Osterwalder et al., 2010 p. 14). As a management tool, the business model canvas can be considered a language shared by companies that helps them describe, visualize, assess and change their business models (Osterwalder et al., 2010). It consists of nine building elements described further below.
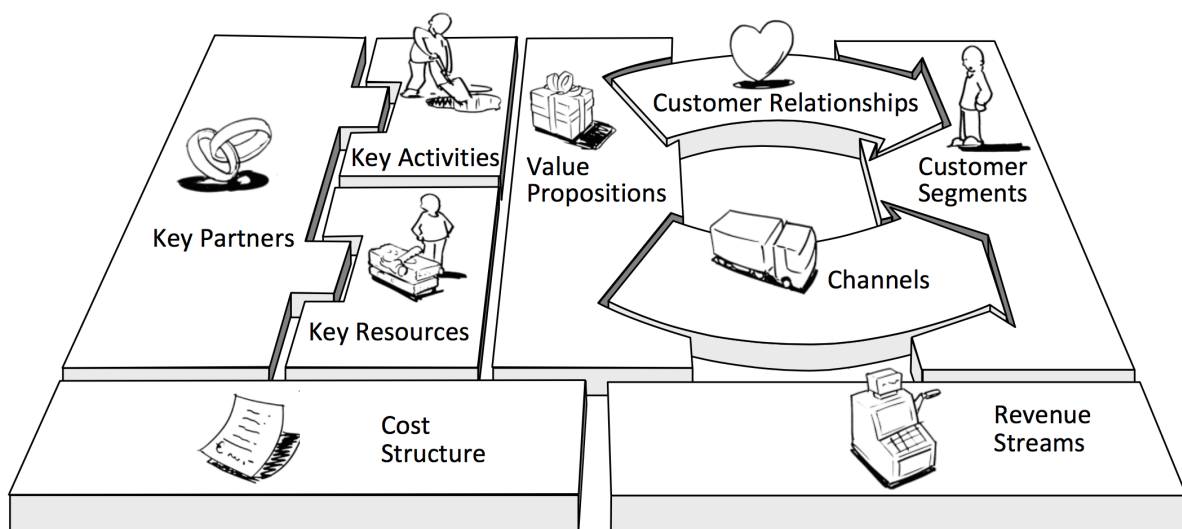
Figure 6 - The nine building elements of the Business Model Canvas (Osterwalder et al., 2010)

2.3.1 Customer segments

According to Osterwalder et al. (2010, p. 20), the *"customers comprise the heart of any business model"*, since they are the ones who make the company survive. The organizations or groups of people that are aimed to be reached and served by an enterprise are defined in the element of customer segments. To facilitate the satisfaction of customers, the company groups them into different segments depending on their needs, behaviours and other factors (ibid). Blockchain is expected to affect the customers by reducing the need for intermediaries and increasing the use of smart contracts. Furthermore, it is expected to support personalised offers and micropayments (Nowiński and Kozma, 2017). When it comes to personalised offers, blockchain can provide a digital marketplace to sell more niche products to serve for individual needs, implementing better customization with lower quantities rather than the same product with large quantities to achieve economies of scale (Swan, 2015).

2.3.2 Value propositions

The value propositions element describes the products and services that solve customer problems and/or satisfy customer needs, or in other words the value that the products and services create for specific customer segments. It is this element of the business model canvas that constitutes the reason for why customers prioritise one company before another. The propositions may furthermore differ, some being innovative and representing something new or disruptive, while others being quite similar to what already exists on the market but with a twist to add features. The value may be added both quantitatively, for example in terms of price, cost reduction and speed of service, and qualitatively, in terms of design, customization, customer experience etcetera (Osterwalder et al., 2010). Novel value propositions, driven by possibilities to collect, use and share data, are currently leading to the arising of new business models. Offering solutions to integration and new services may build new business models, which enable manufacturing companies to capture and benefit from the future and emerging values (McKinsey, 2015b).

According to Tapscott and Tapscott (2016) as well as Nowiński and Kozma (2017), blockchain will influence the value propositions by simplifying the delivery of value, increase the safety of supplies, eliminate fraud and deception, and support both crowd-sourcing and financing of small and medium-sized enterprises (SMEs). Several characteristics of the technology are believed to affect the value propositions of companies. Blockchain is believed to reduce the privacy of data by increasing decentralization and recording all the data (ibid). Furthermore, the structure of a blockchain cannot be changed. The data for every step and every node is stored, reducing or even eliminating the risk of fraud (Swan, 2015; Cai and Zhu, 2016). The technology also increases transparency between partners, which makes the exchange of data and collaborations more secure (Tapscott and Tapscott, 2016).

2.3.3 Channels

This element describes the company's way of communicating and reaching the customer segments when delivering the value propositions. The element of channels and the contact with customers constitute of the communication-, sales- and distribution channels that profoundly influence the customer experience. The channels furthermore have several functions, that are to raise awareness about the products and services of a company, help the customers with evaluating the value propositions, allow the purchasing of specific products and services, deliver value propositions to the customers, and last but not least to provide the customers with post-purchase support (Osterwalder et al., 2010). In a blockchain, the integrity of each and every step of the process is encoded and distributed. Thereby, the values can be exchanged between the participants directly and with integrity, since acting without integrity is expensive in terms of time, reputation, energy, and money; or even impossible (Tapscott and Tapscott, 2016).

2.3.4 Customer relationships

The types of relationships established between a company and specific customer segments are described in this element. The kind of relationship, by the company, desired to be built with each customer segment should be clarified, and these can vary from being personal to automated. Motivations such as customer acquisition, customer retention and boosting of sales may influence and drive the relationships, which affect the customer experience in total (Osterwalder et al., 2010).

One way of improving the customer relationships and boosting the demands for products and services is by enhancing the operational efficiency, for example by shortening the settlement times. This does not only affect the demands but also the costs by decreasing them and generate savings that in turn might be shared with the company's customers (Heinen, 2017), which according to Nowiński and Kozma (2017) may be accomplished by implementing blockchain. Morabito (2017) argues that the potential of blockchain is great, and one example is the use of smart contracts. In many cases, customers will prefer this option to finance, for example, their car. This, even though the company may control the ownership of the vehicle if the payments are not made according to the contract. This, in turn, since the deal with smart contracts will be better, with a cheaper rate and with reduced interests, resulting from the direct payments to the company and with no need for intermediaries (ibid).

2.3.5 Revenue streams

This element includes the revenues generated for the company from each customer segment. It reflects the willingness to pay of the customer segments, wherefore the company must consider what value each segment is willing to pay for. Each stream may furthermore differ in terms of pricing mechanisms, which could be fixed prices, market dependent, or volume dependent etcetera. The pricing mechanisms are mainly divided into fixed or dynamic pricing, and may also have different impacts on the generated revenues (Osterwalder et al., 2010).

Regarding blockchain, the technology is expected to create new platforms and services in different industries, which could become new sources of revenues for companies. An example is that the technology may increase the ability for customization, loyalty points programs and other things that also aim to improve the customer experience, creating more customer segments and thereby increasing the revenue streams (Morabito, 2017). New revenue sources may also be from services that implement blockchain, customer education about the technology, or *"Software as a Service"* for blockchain platforms (Swan, 2015, p. 85). Companies might also provide services for *"Proof of Existence"* (Crosby et al., 2016, p.15) for documentation on a blockchain platform.

2.3.6 Key resources

The key resources are important factors within the business model since they enable the value propositions, customer relationships and revenue streams to be created. The resources can be acquired either from the key partnerships or owned by the company itself, and of physical,

financial, intellectual or human type (Osterwalder et al., 2010). Doz and Kosonen (2010) argue that the fluidity of resources, among others, may result in business model innovation. This is further corroborated by Hock et al. (2015). The resource fluidity leads to an increased autonomy that is accompanied by coordination, which, in turn, helps the company in achieving flexibility. It furthermore leads to an increased ability to modularize IT systems and underlying business processes, and to new ideas resulting from acquired or developed businesses (Doz and Kosonen, 2010).

When implementing blockchain, resources for infrastructure (Swan, 2015), expertise and skills (Beck and Müller-Bloch, 2017) as well financial resources (Beck and Müller-Bloch, 2017; Xu et al., 2017) are needed. The resources for infrastructure, such as a decentralized ecosystem for the technology, should be built to have it effectively operated. This might include vast computing infrastructure, storage, file serving or archiving functions (Swan, 2015). Human resources with specialized skills, such as exploratory, conceptualization, experimentation, and business exploitation skills, are required for the implementation of blockchain (Beck and Müller-Bloch, 2017). Funding is also needed since testing might be significantly costly (ibid). Regarding the financial resources for the implementation of blockchain, Xu et al. (2017) discuss the investment efficiency for each type of blockchain. According to these authors, the private blockchain might be the most favourable type to apply among the three types of blockchain, while the public one might be the least favourable in terms of costs. Consortium blockchains seem to be neutral, between private- and public blockchains. However, the decision to choose which type of blockchain to implement depends on the nature of the organizations. For example, while private blockchains might be more applicable to governments, courts or banking, online payments, and cloud services, consortium blockchains might be used for organizations that have to handle operations on the level of transaction (ibid).

2.3.7 Key activities

The most important things that a company has to do in order to have a functioning business model are described in the element of key activities. These have to earn revenues, create value propositions and maintain customer relationships. The activities may furthermore be categorized as production, problem-solving and platform/network, and do differ from one type of business model to another (Osterwalder et al., 2010). It is considered crucial for companies to focus and adapt their key activities to emerging technologies, in this case blockchain, since net values are created throughout these. The fact is that other partners within the activities will not participate if no value is created. Furthermore, the key activities affect the operation and development of the companies (Chesbrough, 2007).

When implementing blockchain, several activities need to be taken into consideration. Beck and Müller-Bloch (2017) explain that the company has to work through activities, starting with the discovery of blockchain during which the technology is recognized and the potential areas that it can be implemented in are assessed. This also leads to the need of stimulating the interest for the technology within the organization. It is also of importance to gain new insights through

activities to be able to acquire financial resources and find suitable environments in which it is possible to work with the technology. Step by step, the activities then end up in the acceleration phase during which blockchain actually is implemented.

Supply chains today are seldom clear and understandable for the consumers, hindering them from participating actively in relationships. By implementing blockchain, this may, however, become a solution for all types of partners within a relationship, making it possible to track every step within the supply chains. Not only will the ownership of a product be able to be tracked, but also the processes throughout the chain. Examples could be to control environmental conditions of perishable food or to track specific parts of a product that might be defective (Olleros and Zhegu, 2016). Blockchain will indeed affect the supply chain management by reducing costs and risks, as well as improving quality and speed throughout the chain (Kshetri, 2018). Additionally, making payments based on a blockchain platform might speed up the payment processes as well as reduce the problem of uncollectible debts in supply chain finance (Swan, 2017).

As mentioned earlier, blockchain may also be used for a service called *"Proof of Existence"* which makes it possible to store documents and their *"Online proof of existence"* (Crosby et al., 2016 p. 15). This implies that blockchain helps to store the so-called fingerprint of a file and the time that the user uploads the document. The privacy is although perceived and the user is thereby not possessed to any risks since only the fingerprint and not the document itself is stored (ibid).

2.3.8 Key partners
The key partner element constitutes the network of suppliers that operate and make the business model work, created to make the business models as good and efficient as possible, reduce risks and acquire resources. The partnerships can be of four different types, namely strategic alliances between non-competitors, coopetition: strategic partnerships between competitors, joint ventures to develop new businesses, and buyer-supplier relationships to assure reliable supplies (Osterwalder et al., 2010). The partnerships and collaborations may help companies in addressing revenues or achieving goals (Beecham Research, 2015; McKinsey, 2015b).

With blockchain, intermediaries might not be eliminated totally, but less of them will be needed (Nowiński and Kozma, 2017). The transactions will be able to be verified by each partner directly, and neither the data nor the information will be controlled by a single party. The communication between the partners will also be affected by being able to communicate directly with each other and not through central nodes (Iansiti and Lakhani, 2017). Hence, the key partnerships will be developed, managed easier, and cost saving.

McKinsey (2015a) furthermore argues that market participants, technologists, and regulators have to cooperate to realize and reach the full potential of blockchain. Companies need to collaborate early in the processes, but also be aware of both benefits and threats, and ready to

respond if another participant has a faster uptake of the technology. Moreover, the key partners, or at least the relationship to these, has a potential of being affected due to the intermediaries being reduced, which is the aspect that even is considered to be most disruptive (ibid).

2.3.9 Cost structure

The operational expenses in a business model are explained in the cost structure element, which can be of cost-driven or value-driven structure. The cost structure can furthermore be of different characteristics; fixed costs, variable costs, economies of scale, or economies of scope (Osterwalder et al., 2015). Blockchain is believed to increase operational efficiency by, for example, shortening the time for the execution of transactions and by facilitating transactions of smaller sizes by decreasing the operational costs. The costs are also reduced by the decreased number of intermediaries that, as mentioned earlier, is another effect of the technology (Beck and Müller-Bloch, 2017; Nowiński and Kozma, 2017; Friedlmaier et al., 2018).

2.4 Conclusions of literature review

Figure 7 summarizes the theoretical findings of the effects of the business model environment on blockchain, as well as the potential impacts of blockchain on the business model canvas.

Literature

Key trends

- Privacy protection law vs. Open access to data base law
- Direct regulations to blockchain applications
- Urbanization, sharing economy, smart cities

Industry forces

- Blockchain applications for supply chain management
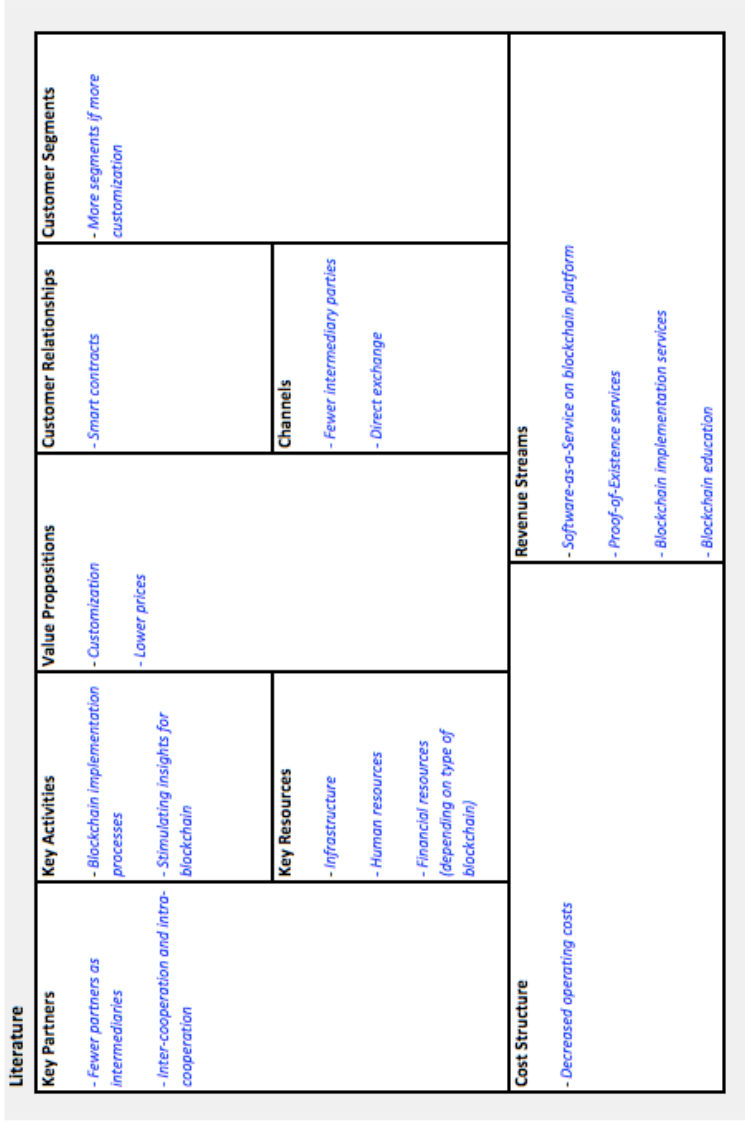
Market forces

- Unclear expectations and demand of customers towards technologies
- Willing to pay for physical goods more than digital goods

Macroeconomic forces

- Peer-to-peer fundraising models

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
- *Fewer partners as intermediaries* - *Inter-cooperation and intra-cooperation*	- *Blockchain implementation processes* - *Stimulating insights for blockchain*	- *Customization* - *Lower prices*	- *Smart contracts*	- *More segments if more customization*
	Key Resources - *Infrastructure* - *Human resources* - *Financial resources (depending on type of blockchain)*		**Channels** - *Fewer intermediary parties* - *Direct exchange*	

Cost Structure	Revenue Streams
- *Decreased operating costs*	- *Software-as-a-Service on blockchain platform* - *Proof-of-Existence services* - *Blockchain implementation services* - *Blockchain education*

Figure 7 – Summary of theoretical findings

3. Methodology

The methodology chapter describes the research strategy, the research design and the research method that are used in this study, as well as the rationales about how the chosen research methodology helps the authors achieve the research purposes and answer the research questions. A qualitative approach along with a multiple-case study design and semi-structured interviews for the data collection brings advantages for the authors in terms of enhancing their understanding about the research topic of the implementation of blockchain, business models, and business model environments.

3.1 Research strategy

The study was conducted as an action research. This, due to the collaboration between the researchers and the companies in identifying the problem (Bryman and Bell, 2011). The aim was, as mentioned earlier, to answer the research questions in a proper manner that can help the companies find out the effects of blockchain on their current business models. According to McKay and Marshall (2001), a characteristic of an action research is that the researcher is a key participant in the research, collaborating with other actors to solve the problems of the study. They further argue that this is crucial for the success of the action research process. It can be concluded that the researcher provides the involved actor with knowledge of the process itself and, while the actor, who usually is the problem owner, provide the researcher with an intellectual framework and knowledge of the context (ibid). In short, the action research is a process in which the competencies and needs of all involved actors are shared in order to obtain a result.

Concerning the methodology, a qualitative analysis with case studies has been the main approach of the study. Therefore, the study utilized primary data from interviews, the companies' websites and internal documents, as well as secondary data from existing literature within the field of the study. Furthermore, interviews with experts within the fields of business models and blockchain were interviewed to get as much and valuable information as possible regarding the potential effects on the business models. The interviews were conducted with a semi-structured approach, in which the interview questions were well-prepared, but allowed to be changed. According to Bryman and Bell (2011), the approach furthermore indicates that follow-up questions are possible to be asked to not only collect necessary data that is related to the literature review but also encourage the interviewees to discuss more areas that are not covered in the literature.

Furthermore, an abductive approach was chosen since it addresses the weaknesses and facilitates the overcoming of the limitations of both the inductive and deductive approaches. It usually starts with a puzzle, arising in studies for which there is a lack of theories and seeks to make the area less puzzling (Bryman and Bell, 2011). Since the literature for this new technology, as mentioned earlier, is modest, and the authors' knowledge also limited, this approach was found most appropriate and valuable for the study. Moreover, the approach

enables the modification of the theoretical framework and the back-and-forth engagement in the report (ibid), which is another reason found beneficial for the research.

3.2 Research design

According to Bryman and Bell (2011), the authors are more inclined to focus on the unique context of each company when using a qualitative approach. In other words, the approach was considered appropriate for the authors in order to provide specific explanations for each company within the collaboration project regarding the implementation of a new technology, such as blockchain. Furthermore, the companies in the study are operating with their own business models in various industries, whereby a qualitative approach enhances the authors' understanding about the effects of the technology on the different business models. By using interviews for collecting qualitative data, the authors have been able to identify points of views of companies for blockchain's impacts as well.

Following the qualitative approach, the thesis was designed as a multiple-case study, involving three individual cases of the companies. The case studies have been presenting how the companies perceive the effects of blockchain on their business models. Since the study has focused on the unique context of each case, as well as the unique business model of each company when considering the adoption of blockchain, the multiple-case study was an appropriate design (Bryman and Bell, 2011). Moreover, by using a case study design, the authors have more opportunities to describe a complex situation of adopting blockchain in an understandable and structured way, while they still can leverage data from various sources and perspectives (Yin, 2003; Baxter and Jack, 2008). In the case of an emerging technology such as blockchain, different applications and various potential impacts of the technology are uncertain for different business models, wherefore this research design enhances the authors' understanding about the multiple aspects of the blockchain phenomenon.

Additionally, the multiple-case study is an advantageous design for the authors in order to answer the research question of how blockchain affects companies' business models. According to Yin (2003), a case study method should be used when (1) the research question is *"how"* and/or *"why"*, (2) the authors cannot influence participants' behaviours, (3) the contexts are highly relevant to explain the research phenomenon, and/or (4) the contexts cannot be separated from the research phenomenon. Therefore, besides answering the *"how"* question of this study, the authors expect to understand companies' and experts' perspectives on blockchain's impacts and the unique context of each company when adopting the technology to their current business models. Thereby, this is another reason for why a multiple-case study design is an appropriate method, facilitating the findings related to the research question and in turn the achievement of the research purposes of the study.

Regarding the case analyses, each case study represents one individual company. This decomposition, in relation to the research purposes, furthermore facilitates the authors' intentions to deliver value to each company in the collaboration project, meanwhile providing

broader empirical knowledge to academia about how different organizations are affected by the implementation of blockchain. In other words, the external forces that affect the blockchain implementation and the components of the business models, mentioned in the sub-research questions, were analysed at an organizational level for each company in the case study.

Last but not least, the multiple-case study design provides means for the authors to compare similarities and differences between cases, especially when expecting to point out common findings of the relation of blockchain and effects from the business environments as well as the changes in the business models. With this approach, the authors may identify if the blockchain implementation has been affected similarly by a particular force in different business environments and if it, in turn, can reform the same components in different business model canvases. Otherwise, differences may be analysed by considering the unique context of each company, providing an alternative explanation to answer the research question.

3.3 Research method

3.3.1 Primary data collection

The interviews of the study were, as mentioned earlier, of semi-structured approach. Following the instructions of Bryman and Bell (2011) for this kind of research method, an interview guide was prepared, containing a list of questions with the aim of covering a specific topic. However, the researcher is not obliged to follow the exact order that is outlined in the guide, and the interviewees may reply quite freely. Furthermore, the interviewer may ask other questions than the ones included in the guide, but generally, all interviews are run in a similar manner with questions asked in a similar way (ibid). In other words, the reasons for choosing this approach is the desire of, to a certain degree, control the interviews, but also to be able to give the interviewees some leeway and have some flexibility. By this, it becomes possible to get as much information as possible, to ask follow-up questions, make misunderstandings clear as well as avoid them, and also to gradually make the interviews more and more comfortable. Additionally, the focus becomes clearer from the start when using a semi-structured approach, which makes it more straightforward and in turn clearer to analyse the results. Furthermore, it leads to more structure which is fundamental when comparing different interviews (Ljungberg, 2017). Moreover, the semi-structured approach was chosen for this study to explain the unique context and pattern of each company related to a potential implementation of blockchain and their business models.

To increase the quality of the data collection process, an interview guide was, as previously mentioned, prepared carefully (Appendix I) before the meetings. All interview questions and the interview setup did also go through trial stages, in order to make sure that the questions were understandable and to give the authors a chance to get feedback from initial participants, and in turn, improve the interview questions and the interviews in general. Moreover, in order to keep track of the interviews, these were recorded, which decreases the risk of missing or forgetting useful and essential information. By recording interviews, the reliability is increased

and the analysis of the study facilitated (Bryman and Bell, 2011). Since both authors were present during the interviews, notes were able to be taken. The tasks were divided for one person to record and take notes, and the other moderating the interview, allowing to manage the interviews smoothly without creating stressful or distracting circumstances.

Additionally, primary data as internal documents from the companies were studied to obtain additional information about how they work. This enhanced the authors' understanding about the companies' specific business models and business model environments, complementing to the information collected in the interviews by providing a broader perspective of each company towards the research topic. This indicates that while the interviews could help the authors in collecting the interviewees' opinions for the study, written internal documents presented data with the companies' viewpoints rather than with certain individuals'.

3.3.2 Secondary data collection

The secondary data in this study was primarily based on existing literature within the fields of blockchain, the business model- and business model environment canvas; that is books, articles, and other researches. The databases that were used to find relevant material are Google Scholar, Google Web, ScienceDirect and the SuperSearch function at the website of the University of Gothenburg. The literature was moreover screened for useful references in order to extend the research.

3.3.2.1 Inclusion criteria

With the objectives of the study in mind, contributing to the empirical knowledge about which external factors that affect the implementation and how it, in turn, affects the business models, the inclusion criteria for the literature were the following:
- Articles about blockchain.
- Articles about the Business Model Canvas and the Business Model Environment Canvas.
- Articles/studies using the Business Model Canvas and the Business Model Environment Canvas for specific cases, including applying the frameworks for other technologies.
- Articles about other big technologies and their effects on companies.
- Articles published in journals (or equivalent).
- Matching of keywords.
- Peer-reviewed articles.

3.3.2.2 Exclusion criteria

Exclusion criteria were also taken into account in order to exclude and avoid irrelevant information in the theoretical framework:
- Articles not published in sources that are considered reliable (based on the type of publisher and peer-revision).

- Articles using other models of strategy besides the Business Model Canvas and the Business Model Environment Canvas.

3.3.3 Sampling

The authors followed a purposive sampling approach for this research as the study focuses on the effects of blockchain on business models. Interviewees, who should be highly relevant to the research questions, should generally understand the concepts of blockchain and the business model canvases. The purposive sampling is well-fitted to the study since the authors aimed to focus on the problems stated in the research questions. This sampling was advantageous when including people who not only work with innovation processes or new technologies but who also thoroughly understand their company's business models and the pressures on these, which in turn helped the authors in collecting valuable information for the case studies. Since blockchain is a relatively new technology that still is under development, the number of years of experience was not considered highly significant. More specifically, since different occurrences during different years may vary in relevance to the research.

Firstly, the interviewees had to be people with some knowledge about blockchain and the technology's potential applications for companies within their industries. Other criteria were that they possess knowledge about the companies' business models or parts of the companies' business models, as well as the ability to provide the authors with opinions about the research problems. The authors, therefore, used the contacts from the companies within the collaboration project to choose interviewees who matched the requirements mentioned above. The purposive sampling approach, however, might raise a possible bias when choosing interviewees purposively instead of randomly. Nevertheless, to achieve the goal of the study that was to focus on each company's features and contexts in the case studies, the purposive sampling was considered to bring more advantages than the random sampling method does.

Secondly, a snowball sampling facilitated the collection of information focusing on the research topic. Therefore, the authors have interviewed participants who have knowledge and experience about either blockchain, business models or both areas. The interviewees from the companies mostly work with information technologies or have been involved in operations of digitalization at the companies. The positions of the interviewees have more specifically been a Business Developer (Supply Chain), a Chief Digital Officer, an IT Manager, Innovation Managers, a Payment Solution Manager, a Senior Strategy Architect and a Vice President Consulting/Digital Transformation Lead, as well as two experts within the field, with the positions of Associate Professor and Associate Senior Lecturer. The experts outside the companies have years of experience working on the topic of innovation, specifically blockchain, and knowledge about the business environments including macroeconomic factors and key trends.

Interviewees	Title	Length (minutes)	Method
CGI Sweden AB	1. Interviewee 1 2. Interviewee 2	1. 71 2. 53	1. Face-to-face 2. Phone
Stena AB	1. Interviewee 3 2. Interviewee 4	1. 60 2. 21	1. Face-to-face 2. Face-to-face
Volvo Cars AB	1. Interviewee 5 2. Interviewee 6 3. Interviewee 7 4. Interviewee 8 5. Interviewee 9	1. 2. 39 3. 39 4. 27 5.	1. Face-to-face 2. Phone 3. Phone 4. Face-to-face 5. Face-to-face
Swedish Center for Digital Innovation	1. Expert 1 2. Expert 2	1. 55 2. 33	1. Face-to-face 2. Face-to-face

Figure 8 - List of interviewees

3.4 Analysis method

In terms of data analysis method, a thematic analysis was used to classify the information collected from the interviews. The thematic analysis is, by Braun and Clarke (2006, p.79) defined as *"a method for identifying, analysing and reporting patterns (themes) within data"*. One of the advantages of using a thematic analysis is that it is flexible in comparison to other methods, allowing the researchers to analyse patterns in the interviews. It thereby enables the finding of common denominators and the comparison of the data obtained from the different interviews. The analysis may also be classified in codes in the form of themes, which makes it coherent and structured (ibid). With its flexibility, it becomes a useful tool allowing the collection and analysis of rich and detailed data. This was found valuable since the case studies were conducted for companies operating in different industries, to be able to see common factors that may be generalized for the technology.

Another advantage of the thematic analysis is that data is reduced by coding (Ljungberg, 2017), which makes the comparisons clearer. Since the codes might be predetermined, the questions and follow-up questions during the interviews may be twisted towards the themes of the study. This, in order to get as much and valuable information as possible for the analysis. Nevertheless, for this study, the codes were not predetermined but chosen depending on the answers received in the interviews in order to increase the reliability.

By using the thematic analysis for the study, the authors could classify information from the interviews into themes and categories that might be related to blockchain, the four forces of the business model environment and the nine elements of the business model canvas. This method facilitated the classifying of information into a coherent and structured form where different data from different viewpoints could be compared to each other. Especially for a study like

this, in which the authors conducted interviews with participants working in various industries, the thematic analysis provides an efficient framework for the analysis of rich and detailed data.

3.5 Quality of the study

3.5.1 Validity

Validity refers to which extent a research measures what it is aimed to measure and may, in general, be problematic in qualitative studies. In order to make a study valid, the external validity is of great importance, which indicates that the results must be able to be generalised and applied to other situations and people. The internal validity, on the other hand, refers to how well the theory and the observations of the study are matched, which is considered a strength of qualitative research (Bryman and Bell, 2011). The validity in this report was aimed to be increased by making the research question clear and well formulated, which in turn steers the direction of the research. Furthermore, the interviews were conducted with appropriate respondents, which was facilitated with the help of the authors' contact persons at the companies. Nevertheless, the external validity is not expected to be fully met due to the limited number of interviewees, caused by the limited time frame of the study.

3.5.2 Reliability

Reliability refers to if a research, if being repeated by another person, would have got the same results; that is if it can be replicated. However, because of problems and challenges for creating the same conditions and settings under the studies and investigations, it is also tricky in qualitative studies in general (Bryman and Bell, 2011). Nevertheless, this was managed by motivating and explaining all factors and decisions of the study that may affect the reliability of it. Since the research furthermore was conducted by two authors, the inter-observer consistency was ensured by both authors validating and discussing what had been heard and observed during the study.

3.5.3 Replicability

Replicability, on the other hand, refers to if the study is replicable, which is that if it can be duplicated at another time and/or place (Bryman and Bell, 2011). In order to increase the replicability, the process of the research, above all described in section 3, has been explained in detail. Nevertheless, the replicability will decrease by nature with the years since the area of blockchain probably will be during continuous development, affecting the ability of replication of the study.

4. Empirical findings

This part will present three case studies with data collected from participants from the three companies. Each case study will present the company background, the description of the company's business model environment and the effects of this on the blockchain implementation, as well as the description of the company's business model canvas and the impacts of blockchain on the business model of each company. The data collected from external experts will follow the case studies, presenting their opinion about the business environment and the effects of blockchain on business model canvases in general.

4.1 Case studies

4.1.1 CGI Sweden AB

Company background

CGI Sweden AB (hereinafter *"CGI"*) provides information technology and business consultancy services for clients in many industries including banking, transportation and logistics, oil and gas, manufacturing etcetera. The company is currently working with clients and artificial intelligence, as well as different blockchain projects, to gain knowledge and experience about how to use the technologies to transform businesses.

The Business Model Environment

Key trends

According to interviewee 1, innovation management is still a big trend occurring in the company's business environment. They have been joining associations among other big companies in Sweden to discuss and exchange the ideas about how to manage innovation, exploit new ideas and being upfront for innovative solutions. Moreover, concerning technology trends, digitalization is still the most attractive area with artificial intelligence, Internet of Things, and blockchain included. Interviewee 2 argued that the interest of adoption of new technologies has extended over the past couple of years, beyond the banking sector and into all industries. Interviewee 1 further explained that companies want to have, and control, as much data as possible, which is good when using new technologies. However, the technology is considered disruptive from the perspective of control. This, since it leads to that people that used to have control do not have it in the same sense anymore, and it could be that the competitors also have the same data, *"so there need to be shifts in the mind-sets"*. Thereby, both interviewees agreed on that it may be valuable to collaborate with competitors sometimes in order to create domain solutions built on blockchain. Furthermore, companies might collaborate on building a common way of data that is shared among them all, which in turn might be better for the customers.

Interviewee 1 also mentioned that the crypto currency space opens up many grey areas and ways of looking at how money flows around, and also that a key issue of blockchain is the scaling issue of the technology. That is why new crypto currencies are being created, with

different consensus mechanisms. Blockchain is still an immature technology in its early stages, and it is still unclear what it can be used for both from a business- and a technical perspective.

From a socioeconomic point of view, interviewee 2 explained that a general trend of younger people using services in different ways than older ones can be seen. The uptake of services among them is faster and the willingness to try new things also greater. It was also explained that blockchain is unique in the way of its transparency of information and the trust into that transparency, which typically is difficult to achieve in another setup. *"We strive to have more transparency in order to feel that the service is better"*, was stated by the interviewee, which might favour the implementation of blockchain.

Regulatory trends within the company's business environment remain varied due to the nature of the service offerings and the industries that the clients are operating within (MarketLine, 2017d). Therefore, regulations for data processing services applying for banks and financial institutions might have an indirect impact on the case company's business model (ibid). However, according to interviewee 1, it takes some time before a regulation is set when a new technology comes up and is being used. Interviewee 2 also explained that *"you cannot ban something and think it will go away"*, it is essential to have a closer look upon how a technology such as blockchain potentially may be used, as well as to compare it to something else and regulate it from that perspective.

Macroeconomic forces

Generally, the macroeconomic factor might have an impact on CGI's clients, which in turn affects the performance of the company (CGI, 2018). During the downturn of the economy, the customers might choose to integrate less information in technology systems or delay with installing new applications, which might reduce the revenues and lead to a decrease in service prices (ibid). In terms of economic infrastructure, interviewee 2 explained that the evolution of technologies, such as the Internet, might reduce the barriers for new entrants. According to the interviewee, new entrants needed to invest a lot of infrastructures initially in former days, but with the Internet, start-ups might not need that, they *"can basically get all of the internal administrative infrastructures for free as a start-up"*.

According to interviewee 2, banks also usually focus their interest on the economic infrastructure of the business model environment. Therefore, they have not seen the potential disruption threat but consider blockchain more as a technology that may be used to make the interbank world more efficient. However, the global banking infrastructure is rather old, takes time and is costly, making it risky from the point of view that different kinds of intermediaries need to be trusted. By this, it also takes time to figure out where the problem lies when something goes wrong. The interviewee thereby considers blockchain to have the potential of solving issues within many of these areas.

Industry forces

Other players within the IT service industry in the Scandinavian region are seeking for more profits with higher margin sectors (MarketLine, 2017a). Leading companies within the industry include Accenture, Capgemini, Hewlett Packard Enterprise Company (HP) and International Business Machines Corporation (IBM). Despite the presence of global IT service providers, the rivalry level was at the medium level in the year 2016 due to the fact that the industry is fragmented with a wide range of customer segmentation. Differentiation strategies among competitors of the IT services industry also mitigate the rivalry level. New technologies within analytic and cloud tools allow IT providers to offer more products and services, widening the product portfolios. However, the key success factor of the industry is lying on the competitive contractual terms, in turn, related to cost reductions within labour costs and data storage costs (ibid).

The threat from substitutes and new entrants for the case company has also been at a moderate level (MarketLine, 2017d). Key factors impacting the possibilities of new entrants are distribution- and supplier accessible, which are not quickly built up by these smaller players. Smaller providers would ultimately have to reduce costs by outsourcing specialized IT services and target for niche markets, like Green IT or Internet of Things. Large players like the case company have the advantages from the economies of scale, as well as the established trust and relationships with their own large industry clients in specific key markets, like the healthcare- or finance industry (ibid). Interviewee 2, however, explained that new entrants are emerging on the market. Seen from the perspective of global market infrastructure, it is possible to have a small team with a great idea, creating something unique or new, and deploy it on a large scale with minimal effort. This may be disruptive without needing a big company to be able to compete.

According to interviewee 1, it would be valuable to have open innovation areas in which it is possible to work with both customers and competitors together. He furthermore argued that *"We see a clear trend where it is more and more about platforms and ecosystems that need to be built"*. Many companies look at blockchain just to have it internally. However, it is of importance that the case company needs to go together with its competitors to create a blockchain market for subcontractors, in which everybody can put their contractors. When doing so, companies that need consultancy may turn to one place, a blockchain consultant market, to facilitate for their customers and at the same time rule out the new entrants that serve as a threat. Moreover, the interviewee explained that this only can be achieved if collaborating with the competitors and that *"this is interesting because that means that blockchain is disrupting a market"*, but instead of cutting out the big companies, it can be used to cut out the new entrants.

Market forces

The digital transformation is still a demand of most customers of the company, across different industries. For clients operating in the capital market, the protection of customer data, as well

as the innovation with digital technologies, seem to be the most significant trend in 2017. For clients mostly operating with manufacturing activities, digitalization along with the integration of the whole supply chain seem to be most prioritized by the clients. Similarly, for the government, becoming more digital with modern IT systems, as well as a high level of cybersecurity, is the demand of the clients (CGI, 2017b).

The Business Model Canvas
Key partners
As mentioned on CGI's website, the company has an ecosystem for their partners including specialized partners, market analysts and advisors, and academic institutions. The company's partner programs include global partner programs and ecosystem management consulting programs (CGI, 2017c). If the company thereby creates an open market space for the consultancy with blockchain, as mentioned earlier, new partners will be needed. This since the case company then have to partner with the competitors to create the market. In other words, interviewee 1 stated that *"blockchain will force a lot of partnerships"*.

Key activities
As for any new technology, the key activities of the case company are studied. There currently are some activities that are used within the company to track blockchain. They also have practice activities for technologies, nevertheless, not for blockchain yet since it is not considered to reach maturity level until at least a year. As mentioned by interviewee 1, the company needs to join blockchain associations and communities to update themselves with the knowledge and the practical applications of the technology.

Key resources
Interviewee 1 explained that the company studies what type of people that know about blockchain that are needed in the company, also this as for any new technology. They also try to understand what maturity level the technology has reached in order to know when the best time for hiring people is. It was also explained that blockchain still is uncertain and that the company, together with the customers, is testing what the technology can be all about. Nevertheless, they currently do not have many people working with this. Interviewee 2 has the same opinion as interviewee 1, that expertise and skills related to blockchain are short for the current demand. In comparison to the development of the Internet, the uptake of blockchain might occur faster in a short period of time, which indicates that relevant human resources might be scare.

Value propositions
The company provides IT services and solutions for industrial clients with a portfolio of more than 150 IT-based solutions (CGI, 2018). Although CGI is a global company presenting in more than 40 countries, the services offered by the company are highly localized (ibid). According to interviewee 2, the company might expose more possibilities to their customers

with blockchain. For example, the transparency feature of the technology could be a use case to provide more options for the them, as explained by the interviewee.

Customer segments

The company's customers are highly interested in the digitalization processes, and specifically blockchain. According to interviewee 1, the company has tried specific applications for tracing materials or collecting real-time data. For example, construction companies among the company's customers started with blockchain to track parts in construction facilities. Specifically, they prefer to have a marker on steel which enables them to track all information about the steel through all the transactions of buyers and sellers in the previous stages of the value chain. Recently, meetings have been held for the company's customers, discussing how blockchains might impact their business models or certain parts of them. One customer of the company is a car manufacturer that has been interested in collecting information about materials that have been used for all the cars. By fastly accessing into the right information on a common platform, solutions provided for broken parts of the cars would be more efficient. Blockchain could also join the real-time data collection process for all the cars to give information on current traffic situations or about the geographic features of certain streets, for example, if there are queues or if the roads are too slippery for drivers. Another customer of the company, which is highly diversified, has tried to build an internal platform for all departments, using crypto currencies for internal transactions. A pharmaceutical firm has started to share medical trial results into blockchain platforms, as well to increase the testing sample, which could be one of the greatest potential applications of blockchain within the pharmaceutical industry.

According to the company's annual report 2017 (CGI, 2017a), the company has a wide range of customers including the banking industry, manufacturing industries, utilities, insurance, health- and life sciences, transportation and logistics, oil and gas, communications, retail- and customer services, and government. Most customers' focus areas are becoming digital, and data and analytics are being used for better insights or better products and services. Consumer-intensive industries, like communications or financial services, have been urged by their consumers' demand to adopt new digital technologies. Digital banking, real-time payments, or trade finance platforms based on blockchain, are on the other hand an attraction for banks and financial institutions. Meanwhile, asset-intensive industries, like manufacturing or transportation, have been adopting digital technologies to optimize and automate their operations, and in turn, reduce operational costs. Utility manufacturers are more towards digitalization and innovative features added to products to improve customers' experiences, while risk- and investment-intensive industries, like healthcare or oil exploitation, have been urged to change by regulations and policies more than by their own customers (ibid).

Channels

Interviewee 2 described the value delivery channel of the company to be through the decentralized organizational structure, *"Local Experts. Global Insights"*, as also mentioned in

the company's annual report 2017 (CGI, 2017a). Interviewee 1 furthermore explained that blockchain itself can be seen as a channel, but that they do not use it themselves within the company. Instead, they focus on the customers. *"When we do innovation, we always do it with customers"* the interviewee stated, and that it is crucial to satisfying customer needs but would also be interesting to focus on blockchain internally, which might lead to changes in the channels.

Customer relationships

CGI fosters long-term relationships with their customers through the company's service delivery framework. Moreover, their *"CGI Management Foundation"* has specified that one of their policies is *"Marketing, Client Relationship and Business Development"* (CGI, 2017a). It is furthermore mentioned in the company's annual report (ibid) that the understanding of clients' businesses and industries is an important factor for the company to maintain relationships with the customers. Certain programs have been held at a company level, such as a Client Satisfaction Assessment Program, or *"Voice of Our Clients"*, to evaluate products and services of the company as well as to understand customers' challenges and opportunities. At a team level, the customer relationship is more towards in-person relationships with highly localized services delivered.

Revenue streams

As a consultancy firm, the primary revenue stream comes from the company's contracts with its customers from two type of services: system integration and consulting, and management of IT and business functions (CGI, 2018). However, limited attention was given to this element during the interviews.

Cost structures

The costs of services, selling and administration are the major part of the operating costs of CGI (CGI, 2018). When it comes to applying more technologies to the company, interviewee 2 explained said that it might decrease operating costs generally.

Blockchain effects

As stated by interviewee 1, blockchain is a transformative technology, which potentially can contribute a lot to many industries. The technology could be used for the after-market, for example, that construction companies can track all the information related to the steel batches they receive in all previous stages of the value chain. However, the possibility of applying this technology has been unclear. For example, individuals and companies do currently trust the third parties for their transactions, so changing to another digital trust might take time. Interviewee 2 also affirmed that the technology potentially has been applied to many industries, not only the banking industry that he mostly has been working with so far. According to interviewee 1, blockchain might have a disruptive effect for traditional incumbents, but for CGI, it would open up for more opportunities for business cases since IT skills are one of the strengths of the company. However, when it comes to the transition, how to incorporate and

how to connect the new ideas or new technologies into what already has been built up, the implementation should be considered thoroughly in order to avoid that the process blows the inherited competitive advantages of the company. Additionally, as mentioned in the company's annual report 2017, blockchain might provide a concrete business case with the application to trade finance platforms. Blockchain and smart contracts could facilitate the supply chain finance industry, increasing transaction speed and reducing papers for the documentation (CGI, 2017a)
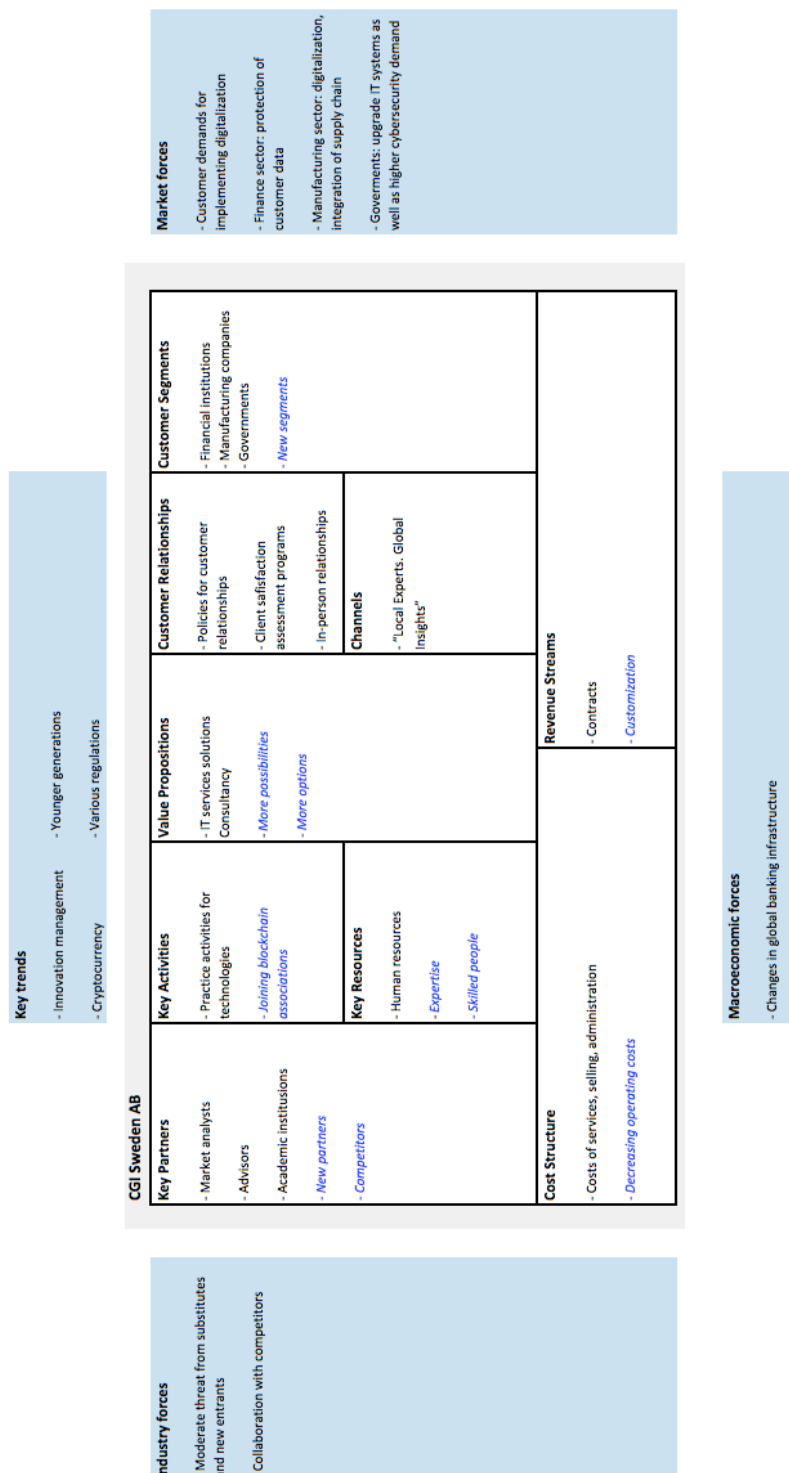

Figure 9 – Empirical findings of CGI

4.1.2 Stena AB
Company background
Stena AB is currently operating in many industries, including shipping and ferry operations, drilling, kitchen facilities, property, and steel operations, and is focusing more on innovation and digitalization to gain more competitive advantages. A *"turntable mentoring program"*, turning the traditional mentoring model to the opposite with younger mentors paired with managers, and a *"Digital Transformation Lab"* have been established to help the company quickly define technological developments and its new business opportunities (Stena AB, 2016). One of the biggest challenges today is that many parts of the company are old fashion, as stated by interviewee 3. The businesses are slow, and the organization is trying to take huge steps when it comes to digitalization in order to be on the front line. Another challenge is that the oil price is going down. On the one hand, that is favourable for Stena Line, one of Stena AB's organizations, since it makes the transportation cheaper, while on the other hand, it leads to short contracts.

The Business Model Environment
Key trends
Four significant trends in the company's business model environment have been mentioned in the annual report 2016 (Stena AB, 2016), including urbanization, digitalization, sustainability, and globalization. They are changing the way people are living and communicating, and in turn, creating opportunities for businesses as well. The urbanization and globalization might support the development of transporting people and goods with the contribution of sustainable technologies, while the digitalization might help the company improve services and routine planning on ships with the application of artificial intelligence or other cheap and accessible new technologies. Digital sales, digital bookings and digital communications etcetera are set up to improve current products and services for customers. Beside digitalization, battery technology, using electricity instead of fuel, furthermore might create competitive advantages for the transportation companies towards sustainability.

Moreover, the trend towards sustainability for future generations, which is related to the environment, safety, employees, and community, profoundly affects the operations of the company, explicitly reducing the fuel consumptions and replacing it by other environment-friendly alternatives. The climate agreement in Paris 2015 and seventeen global sustainable development goals by the United Nations might encourage companies and individuals to be more responsible for the environment and communities. Thus, cost-effective operations going along with eco-efficient transportation and reducing emissions might be a specific plan for companies working with sustainability (Stena AB, 2016). The company's vision *"Connecting Europe for a Sustainable Future"* has been reflecting how it will adapt to the current trends in the business environment; supporting people and goods transportation within the expansion of urbanization and globalization, with sustainable new technologies (ibid). Interviewee 3 explained that environmental regulations might affect the ferry operations because of the regulations for diesel in big cities. The company is operating centrally in many cities, which

indicates that such regulations probably will affect the company. Nevertheless, the company has big departments working on this, as well as close to the EU since they consider it essential to follow regulations. The GDPR was also mentioned as a significant challenge since it will be expensive for the organization if not following it properly, and more regulations that might make businesses even harder are also expected to pop up.

Recent socio-economic trends, besides urbanization, globalization, and sustainability, for example the Brexit progress, might affect the company's business environment as well, and in turn affect the business model (Stena Line, n.a.). Especially for the Swedish market, the property business might have an expansion opportunity in the next ten years when the immigration to Sweden and the economic growth have created shortages for the residential housing (Stena AB, n.a.).

Social trends that might affect the implementation of blockchain are according to interviewee 3, among others, the challenge related to age and younger generations. One initiative is, however, Coboom, which aims to find and understand younger people as well as work close to them. Collaborations with the academic world are considered favourable. However, universities usually want to have a plan, which might delay the collaborations. This because *"if the big companies are slow, the academic world is even slower"*, as stated by the interviewee. Moreover, the implementation may be affected by the reversed mentorship that exists within the company. Younger people are mentoring elder directors in things such as technology since combining young people with the top management is considered to be good. This is a big challenge, but might support the implementation of blockchain.

Macroeconomic forces
Concerning the freight market, the global demand has been stable and is expected to decline until 2021 (MarketLine, 2017b), which also was stated by interviewee 3. This will probably affect one of the companies within the organization, wherefore it is a big market focus for them. Furthermore, the interviewee explained that another challenge for another company is the low prices that may be found for flight trips. This might even be cheaper than to travel by ferry within Sweden. Additionally, the company will probably be affected by the trend of the sharing car economy since people will stop bringing their cars on the trips.

Industry forces
The marine freight industry has globally been highly competitive among incumbents due to the near saturation of the industry and the lack of service diversity. It leads to the situation that the industry has been more towards being price-driven, which stimulates even stronger competition among companies (MarketLine, 2017b). However, the threat from new entrants is quite low because of the high initial fixed investment costs as well as the economics of scale, which are hardly achieved by new players. Regulations for the marine freight operators are also complicated since they usually are related to different national laws of different operating markets, which in turn decrease the threat of new entrants (MarketLine, 2017b). The supplier

power in terms of quality fuel supplies has been high to the marine freight operators since the quality fuel is a crucial factor for shipping operations, and there are currently not many fuel suppliers around (ibid). For the ferry operations, substitute methods for other types of transportations, such as air- or rail freight, are considered to be a weak market force since it might be hard for clients to change their transportation methods. This, since it depends on the nature of the products being transported where the marine freight usually is more suitable for bulk shipping with lower costs (MarketLine, 2017b).

However, since Stena AB is operating in various industries, the industry forces might be different for each business. The threat of new entrants is neither significant for the steel industry, as mentioned by interviewee 4, nor the ferry operations, as indicated by interviewee 3, who nevertheless explained that there potentially are several new entrants for the recycling business. For example, the interviewee mentioned three start-ups entering the recycling field with special applications selling recycled products to customers.

Market forces
Furthermore, according to interviewee 3, market forces regarding the customers' needs might change and have a moderate impact on the company's revenue streams. Indeed, customers are currently more towards the sharing economy, where they can share utilities instead of owning them. For example, people could still use fancy kitchens by sharing them with others rather than owning them. Furthermore, the organization is building rental apartments rather than condominiums. This, both because the prices will stop increasing when the market goes down, and due to the fact of the sharing economy. The interviewee explained that there is a risk of people preferring to have several jobs, maybe at different locations, wherefore it will be preferable to rent an apartment instead of owning one. It will probably also be preferred to have shared spaces, for example kitchens as previously mentioned, or pick-up spaces for cars instead of own parking lots. When it comes to the sharing economy, it will be much easier for the organization to survive and gain market shares if already owning the market - *"if owning this kind of market, we can do something good"*, as stated by the interviewee. Interviewee 4 also explained that the switching costs might be high. If having a contract with a customer, the switching partner will need to have a new contract, which may indicate an increase in the switching costs.

The Business Model Canvas
Customer segments
"Everything we do must be for the customers, that is the most important thing of course", was stated by interviewee 3, to avoid losing customers. However, both interviewees agreed that the customers and the customer segments will change in the future. This, according to interviewee 3 since people probably will not want to own things in the future as they do today. In other words, due to the sharing economy. People will, as mentioned earlier, prefer sharing and renting, for example cars and living spaces, which is expected to be most feasible for students

and elder people. Moreover, interviewee 4 explained that everything keeps on changing over time, leading to new customers coming up when implementing the new technology.

Value propositions

According to interviewee 4, the value propositions will be affected when implementing blockchain. The technology will serve as an offer for the customers and affect the value in different ways. However, limited attention was given to this element.

Channels

It was by interviewee 3 explained that social media is vital to understand the customers. One example could be to use artificial intelligence in combination with Facebook. Stena Line pays a lot of money for social media, and since it is a travel company, it might be easier for them to use it. Moreover, the company needs to understand the truck drivers, all the other people, and their needs to be able to use social media in the right manner. However, he also stated that *"the biggest challenge is to convince other parts in the company that they need to put more on social media"*, and the channel for that is believed to be blockchain as well.

Customer relationships

The company has been defining themselves as a *"customer-oriented organization"* by maintaining good relations and being close to meet customer needs in each local market. For example, the ferry business of the company has implemented a digital booking system as well as artificial intelligence to facilitate the purchase processes of customers. According to interviewee 3, the company understands its customers quite well by working closely with them. For the freight operations, the first mobile application was introduced to customers to book and cancel trips, and to provide information about the trips if they would be late, in a queue, or to inform them about any status of the trips. A feedback system was also installed to improve the interaction with the company's customers. Furthermore, people are buying more and more things over the Internet today. Businesses are thereby changing, but the freight is also increasing, which is not good for the environment. These kinds of things, as well as the importance of social media mentioned earlier, will affect the customer relationships in a different way from today.

Interviewee 4 furthermore discussed another change in the customer relationship management if the company applies blockchain within the area. That is, that customers easier might be locked-in to the blockchain-based platform because they might face higher switching costs. For example, the customers would need to change their private keys or to set up another system for communicating with the company, which probably would be expensive.

Revenue streams

Since the company operates in many industries, it has several revenue streams. According to the company's financial report 2017 (Stena AB, 2017), revenues from the ferry operations are generated by ticket sales, freight haulage, and on-board sales. Drilling revenues are mostly

from charter hires of the company's drilling rigs. Shipping mostly has revenue sources from internal operations, including charter and vessel hires as well as the management fees from other operations of the company. The final revenue stream of the company comes from property business, consisting of rental- and management fees for properties owned by the company. According to interviewee 3, Stena Fastigheter is better suited for the future than some of the competitors since they own rental apartments for which the demand is expected to increase. The demand for services is also expected to increase, and services will be bought more in the future, for example through payments in the mobile phones, that is something becoming more and more popular. It is, however, considered a challenge for the company, and blockchain might be the key structure in this.

Key resources

Regarding human resources, interviewee 3 stated that the new and young generation will be the key resources for all management levels of the company. It was said that *"it is crucial for the future"* to have people who can discuss and implement new ideas. In terms of infrastructure, the blockchain platform can be installed easier when all the data already has been stored. For example, there are currently many small systems running within the company to operate all the functions and also, each company within Stena AB has its own system to run the businesses. However, this might be changed when applying blockchain. Demanding for more people with proper skills for digitalization processes has also been mentioned in the company's annual report (Stena AB, 2017). Moreover, digital expertise from all management levels has been gathered to implement a new strategy towards digitalization (Stena AB, 2016).

Key activities

Concerning the implementation of blockchain, the administration will at the beginning be affected by a lot of workloads to consolidate the data from all the current systems into only one big system. Interviewee 3 explained that bigger companies still are struggling with putting everything into the same system, *"the cloud"*, which would make it easier to implement blockchain when having all the data at the same place. It was further explained that *"a lot of things are going to change, but we do not know how it is going to change"*, but what is sure is that it is of importance to put all the data and information into the system and to build the system differently. It would be favourable to have a smaller central database with systems around it that make it possible to do good businesses. This would also lead to making it easier to implement and develop blockchain.

Key partners

According to interviewee 3, the shared economy and blockchain will affect the key partners of the company. New partners will be needed, and a bank is of great importance. Since blockchain affects the banking industry, the industry might change. However, the company will still need a bank for their investments and for the many assets they own. Interviewee 4 also agreed that new key partners might be needed.

Cost structure

The case company's annual report 2016 (Stena AB, 2016) states that cost reduction programs have been implemented for specific business areas in currently existing operations. Additionally, since the company is operating in different industries, the cost structure is different for each field. Concerning the ferry operations, direct costs might include personnel costs, costs of goods sold on-board, fuel costs and others. Although ferry operations have been varying by seasonal effects, the major part of the direct costs has not changed significantly. Direct costs of the drilling operations include personnel costs, insurance, maintenance and catering expenses. Similarly, the shipping's direct costs mostly include vessel charter costs, personnel costs, fuel costs, insurance and other expenses. Last but not least, direct expenses of the property business include maintenance, heating- and personnel costs (Stena AB, 2017). Nevertheless, not much could be said by the interviewees since the cost structure, in general, depends on what kind of partners and suppliers the organizations currently have, and will have in the future.

Blockchain effects

Digitalization will have a significant impact on the tanker industry, and blockchain might contribute to reducing the manual handling of the bill of ladings, and automating the transaction flows: in turn, decreasing the number of financial transaction errors (Stena Bulk, 2017). The technology is considered to have a potential of being applied to many areas of operations, but it is still a relatively new technology with uncertainties. In terms of implementing blockchain, it might be applied as another tool within the company's system, rather than substituting existing systems, according to interviewee 3. He further explained that it is essential that companies are well prepared for new technologies in order to start directly when the time seems right.

Key trends

- Urbanization
- GDPR
- Digitalization
- Brexit
- Sustainability
- Young generations

Stena AB

Key Partners
- Different partners across different operations
- *New partners*

Key Activities
- Ferry operations
- Drilling operations
- Shipping
- Property management
- *Central blockchain database management*

Key Resources
- Human resources
- *Younger generation*
- *Expertise*
- *Skilled people*

Value Propositions
- Different value propositions across different operations

Customer Relationships
- *"Customer-oriented organization"*
- Digitalization
- *Lock-in effect*

Channels
- Traditional channels
- *Communication channels*

Customer Segments
- Different segments across different operations
- *Changed segments*
- *New segments*

Cost Structure
- Depending on the industry

Revenue Streams
- Different revenue streams from different operations
- *Sharing services*

Market forces
- Towards sharing economy

Industry forces
- Highly competitive among incumbents
- Low threat from new entrants
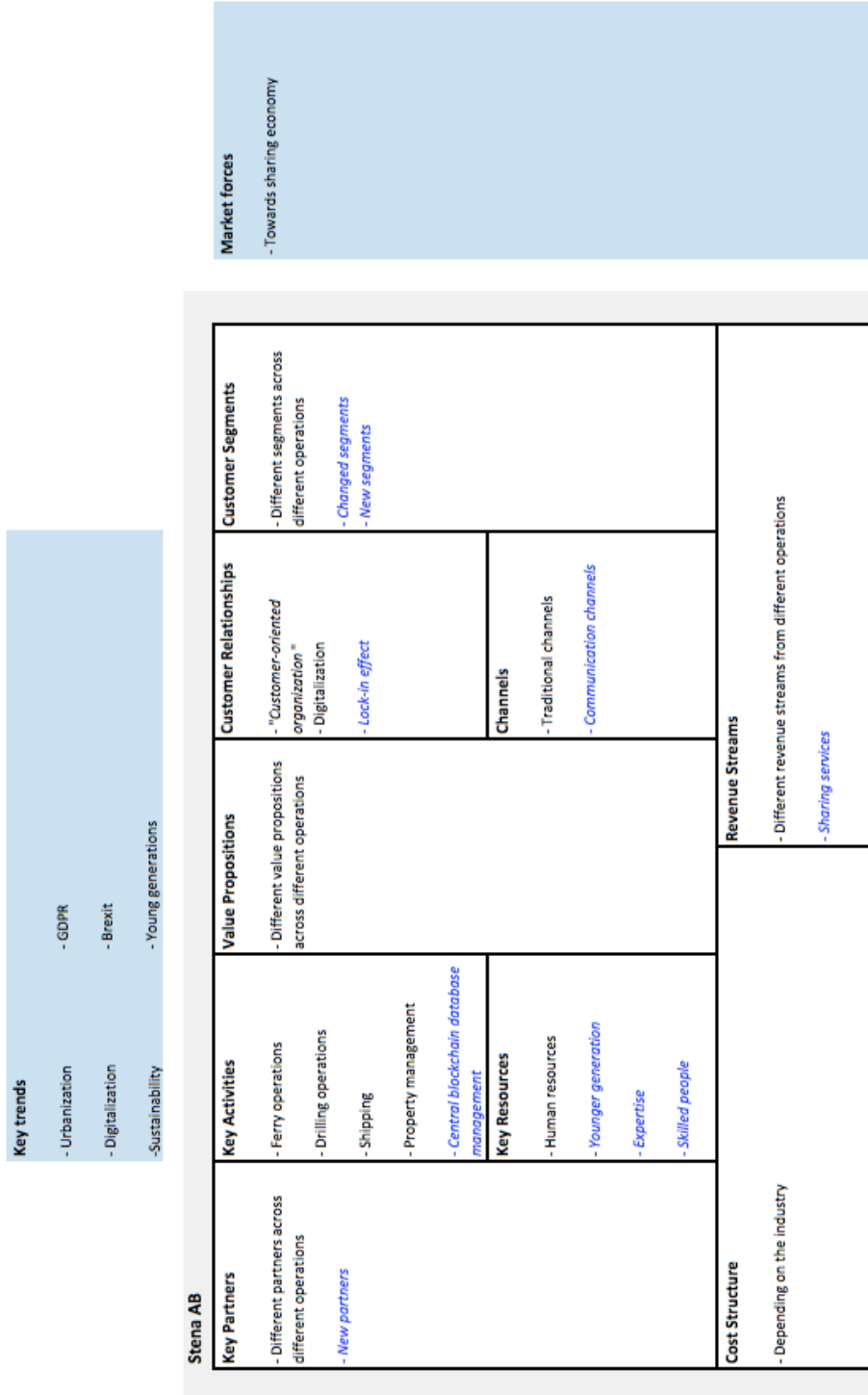- Different forces in different industries

Macroeconomic forces

Figure 10 – Empirical findings of Stena AB

4.1.3 Volvo Cars AB
Company background
Volvo Cars AB is an innovative Sweden-based car manufacturer but presents in over 100 countries. It has both traditional procedures for manufacturing cars and newly developed services for mobility and subscription. As mentioned in the company's annual report 2017 (Volvo Cars, 2017), Volvo Cars is investing heavily in mobility services, electrification, autonomous driving, connectivity, and subscription services.

The Business Model Environment
Key trends
Significant changes in the business environment, mentioned in the company's annual report 2017 (Volvo Cars, 2017), include *"technology shifts, digitalization and changing customer behaviours"*. In terms of technology shifts, interviewee 8 stated that these trends might be a positive driver for the implementation of blockchain. However, from another perspective, it might affect the research and development (R&D) activities of the company by bringing out more uncertain factors. Indeed, technological trends in the business environment might be unpredictable to some extent, and it can be hard for companies to identify important trends even in three years from now. Although there is a great hype for blockchain, the technology is still considered to have potential in many activities. Interviewee 9 explained that digitalization is a megatrend and that all countries try to adapt to the development. One thing is that it can improve efficiency, and on the other hand, it is also of importance to protect the systems since the base of digitalization consists of data. Blockchain is considered to have potential within this field since it by nature is very secure for the protection of data. It was furthermore explained that blockchain is important for Volvo Cars, who are known for their physical safety and now want to have cybersecurity. This was motivated by the fact that *"When we have the very trustable environment, we can improve efficiency a lot - that is very valuable for us"*.

Concerning regulatory trends, interviewee 7, who is based in China, explained that they could have both positive as well as negative impacts on the implementations of blockchain. In China, the GDPR might have more negative effects since using blockchain might require more information from users, and this regulation limits companies in handling users' personal data. Moreover, the Chinese government has been putting more restrictions on crypto currencies, which in turn might have more limitations for the application of blockchain within the company. This was also agreed by interviewee 9 who further explained that more and more regulations, such as the GDPR, might evolve both in Europe and other countries. Interviewee 6 also said that Initial Coin Offerings (ICOs) have been banned in China, but that this does not mean that blockchain as a technology might be regulated in the future. Furthermore, interviewee 5 stated that regulations to some extent have constraint the implementation of blockchain, while the technology actually aims to reduce friction. According to the interviewee, even specific regulatory requirements could be fulfilled with the implementation of blockchain. GDPR was also mentioned by interviewee 8 as a factor that might affect blockchain differently depending on where it is applied. In other words, it could have a more significant effect if

companies apply blockchain in Europe and the US, than if applying it in Asia, for example, since it is a regulation within the European Union.

According to MarketLine (2017c), socio-economic trends might affect the car industry through how people choose the suitable car. For example, small cars will be more appropriate for people living in urban areas, while compact-family cars will be ideal for family uses. On the markets of Europe and Japan, the trend seems to be that price-sensitive customers prefer smaller passenger cars, in comparison to the US customers. Interviewee 9, however, argued that blockchain may lower costs by either reducing intermediaries or providing more efficient ways of working. No other trends were mentioned by the interviewees of the company, but the social trends that were discussed by interviewee 6. However, it was stated that they might not affect the implementation of blockchain.

Macroeconomic forces
According to interviewee 7, different economic infrastructures might have different effects on the implementation of blockchain. The interviewee explained that this, as well as the high volume of transactions in Europe and the US, could be more appropriate for the establishment of blockchain-based platforms since both are necessary to create a solid system. Interviewee 6 also had a similar opinion about that blockchain could help to facilitate the high volumes of transactions. Still related to the economic infrastructure, the concept of smart cities might also be a driver for the implementation of the technology, according to interviewee 5. It was also concluded by interviewee 9 that *"From the efficiency point of view, blockchain will improve the whole society"*.

Industry forces
Although the initial investment could be high for new entrants, established car manufacturers still might face threats of new entrants in niche areas, such as Tesla with their electric vehicles instead of internal combustion engine cars (MarketLine, 2017c). Indeed, the car industry has been observing many radical changes with *"electrification, autonomous driving, connectivity and shared mobility"*, in turn *"shifting markets and revenue pools, new mobility solutions and behaviour, and new competition and cooperations"* (Volvo Cars, 2017, p.13). A pressure in the industry has been increasing not only from car manufacturers but also from technology companies with new products and new mobility services, launched by both incumbents and new entrants *"every week"* (ibid). For example, both interviewee 5 and 9 explained that Porsche currently is working with blockchain for a new service for their cars. The service is similar to Volvo's already existing *"Volvo On Call"*, but if their service can help them save money by using blockchain, the impact and thus threat may be prominent.

According to interviewee 7, the pressure might be significant, and the market will be challenging for the company if its competitors utilize blockchain. However, interviewee 8 argued that new entrants might not be a threat to the company since introducing R&D projects to include blockchain might require a lot of budgets that they cannot cumulate immediately.

The possible use case for blockchain was also explained to be within the supply chain with other value chain actors. For example, the purchasing department can put an order to the suppliers and be able to skip a lot of steps if the supply chain would use a blockchain platform. Interviewee 7 also had the same idea about applying blockchain within the supply chain of the company.

Market forces
"Consumers are seeking alternatives to traditional car ownership" (Volvo Cars, 2017, p. 106); therefore, Car-as-a-Service, as well as Mobility-as-a-Service, are becoming preferred models for car manufacturers (ibid). Nevertheless, interviewee 9 explained that the market forces from customers' demands have not had a significant effect on the implementation of blockchain. According to interviewee 7, blockchain requires high volume and high frequency transactions while traditional car services have high volume but relatively low frequency. *"Most frequency is about three years or five years for each car; I cannot see a very positive impact from the market side if considering applying blockchain to the traditional business side"*. Having the same idea, interviewee 8 and 9 stated that customers will not be aware of the underlying technology: it is more about the experience, and blockchain will be used more for internal purposes.

The Business Model Canvas
Customer segments
Interviewee 5 and 9 explained that blockchain might not create new customer segments since Volvo Cars is a car manufacturer, and the customers are the ones who want to use cars. The company was further argued to know which segments to niche certain cars towards. According to the interviewees, the technology is more for communicating with external parties, and not for customers.

Value propositions
Products offered by the company could be classified into two main categories; cars and mobility services (Volvo Cars, 2017). As a car manufacturer, the company has been shifting from manufacturing internal combustion engine cars towards providing fuel-efficient cars, electrification, and autonomous driving. As mobility providers, services with connectivity and the sharing of business models have been recent offerings to customers. The business unit *"Volvo Car Mobility"*, including the Sunfleet operations, the cooperation with Uber, and the launch of *"Care by Volvo"*, has been working to increase the presence of Volvo Cars on the mobility market (ibid). Moreover, one of the strategic focus areas of Volvo Cars is to leverage digitalization to create new values for customers (Volvo Cars, 2017). According to interviewee 5, blockchain could bring more value to the subscription services on cars. It will be easier for customers by registering on a blockchain platform, for example, instead of using papers. This might be a possible use case when it comes to providing better value propositions for customers with the new technology. In another aspect, blockchain can furthermore deliver more transparent information to customers, for example, the downloads of software into the cars or

the history of the car they want to buy. By using blockchain, the technology can make the information safer by making sure that no one can tamper with it. Therefore, the application of blockchain within the supply chain area might bring disruptive effects when the company can have total control for the ingoing parts of a car. *"With blockchain, you can trace the parts all the way back"*, the interviewee stated.

Channels

According to interview 5, blockchain might create significant changes in the way the company delivers products to customers, as well as the way it communicates with the suppliers. In terms of providing products to customers, a blockchain platform on which the customers directly can connect to the sellers, and not the dealers in between, would be useful if the company would prefer to not work with intermediaries. However, having other ideas about applying blockchain to the way Volvo Cars delivers products and services to customers, interviewee 8 explained that the channels have not enough motivation to apply blockchain so far.

Regarding the supply chain application, interviewee 7 argued that consortium blockchains might be the best option for the company to consider so far. Private blockchains might cost too much for one company to implement. However, the challenge of this application is that Volvo Cars might lose their leadership position in the value chain when the company has to share a lot of information with other actors on the decentralized platform. Additionally, each actor through the value chain has different processes serving their own benefits, whereby with a common blockchain platform, it might be hard to configure the benefits of all actors through the chain.

Not only applying to supply chains, digital currencies may also be used within Volvo Cars, for example as a payment method for customers' paying services and products, as explained by interviewee 8. The possible challenge is although how the company simultaneously may convert the digital currencies into real currencies. Their prices change quite fast, thus; it might be hard to predict the value of digital currencies.

Customer relationships

According to interviewee 8, customer relationships might change to some extent when there is a contribution to blockchain. It was explained that *"Let's say the dealer, handling all the cars, when we sell cars, blockchain maybe can be involved in the process of transferring data, and you don't want to have the configuration changed during the way, blockchain will facilitate the processes somehow"*.

Revenue streams

The company's revenue streams come from two sources: (1) building and selling internal combustion engine cars and electric vehicles, and (2) subscription fees from mobility services (Volvo Cars, 2017). According to interviewee 7, blockchain might have huge impacts on new mobility services, such as car sharing or parking services.

Key resources

Limited attention was given to the company's key resources and the effects of blockchain on these. However, as mentioned in the annual report 2017 (Volvo Cars, 2017), more investments in the future will be spent on the company's plants and R&D activities. Notably, human resources would be a significant long-term resource for the company to create value and grow in the future.

Key activities

As mentioned by interviewee 8, Volvo Cars might need a long time to change the R&D activities. Moreover, the company might find it difficult to change to other processes rather than using the ones that are used today. It is hard to prove that a new process, in this case blockchain, is effective and efficient to implement. *"The implementation process of any new technology could happen in many years since it needs to beat the current technologies or current processes"*. R&D is one of the most significant activities for the car manufacturer. Due to the nature of R&D, the interviewee explained that it is hard for this function to change immediately because it takes a lot of time, with long processes, to build new cars.

Nevertheless, interviewee 8 explained that when it comes to the internal communication and to have the information trusted and validated, a blockchain-based platform might be useful. For example, when the R&D is finished with a product and the company starts to prepare for the production, the communication on a blockchain platform between the R&D and the production operation could be a use case. Interviewee 5, in contrast, stated that blockchain might not be useful with the internal communication since the organization already is built on trust to operate. Therefore, the technology might be more helpful to use in order to communicate with external parties, and not for internal purposes.

Other activities for which blockchain may be implemented are, for example, the purchasing and documentation. Interviewee 8 stated that the technology might facilitate the purchasing function by handling contacts with the company's external suppliers. An instance is that *"when R&D are developing different kind of nodes, they often need to buy stuff from the suppliers. They then need to specify what kind of components to order, and what the requirements of those are and so on - the first thing I would use for this communication is the blockchain technology"*. The documentation processes are another typical process of every company. According to the interviewee, *"every paper being signed today could be replaced by technology"*, and blockchain has been proved to be a better use case. Interviewee 9 furthermore explained that a trend within the automotive industry towards more services can be seen. Car manufacturers will thereby provide more services in the future, and not only sell cars. It was also explained that this factor thus might be a significant stakeholder of blockchain.

Key partners

Procurement has a crucial role in Volvo Cars' success, so the company needs to ensure the commitments of its suppliers to maintain high-quality materials that are provided, as well as

manufacturing disciplines. All suppliers delivering vehicle parts and components need to go through the Supplier Evaluation Program of the company to be evaluated with their financial stability, production capability and quality assurance. Additionally, *"Code of Conduct"* for Volvo Cars' Business Partners describes other basic requirements of legal compliance, human rights, or basic working conditions for all suppliers in detail (Volvo Cars, 2017). Volvo Cars also has established the Volvo Cars' Supplier Portal to communicate and secure that *"the supplier base can produce and deliver parts within specifications to the required volume at the right time"*. Suppliers' performances have been monitored through the company's specific plan to meet the company's requirements, which includes social and environmental responsibility, technology, quality, and cost competitiveness. Supplier risks are also scored through Volvo Cars' method to identify and mitigate risk related to suppliers. Moreover, an association has been founded with other car manufacturers in order to promote a common approach through the value chain, which has guidelines, such as for responsible sourcing of raw materials (ibid). Within this context, both interviewee 5 and 8 stated that blockchain could play an essential role in communication, helping the company building trust with their external partners. However, interviewee 8 added that applying a new technology will take many years with different parties involved in all processes.

Cost structures
The cost of sales, which supports the improvement of sales, is the major part of the company's cost structure. In terms of operating costs, the major parts are R&D expenses, selling expenses and administrative costs, which mostly are related to the key activities of the company (Volvo Cars, 2017).

Blockchain effects
Blockchain is considered to potentially have effects on Volvo Cars' business model, as mentioned by all respondents from the company. The technology might increase trust with Volvo Cars' suppliers, with fewer intermediaries in-between, and it can be used to facilitate the key activities, like documentation or internal transactions, with a peer-to-peer characteristic. Worth mentioning is also that blockchain might have an impact on the sharing services of the company, but not on the cars and products that are provided. Although some applications of blockchain have been mentioned to create value for customers, interviewees still believe that these might not affect the customer segments considerably.

Key trends

- Technology shifts, digitalization
- Hype for new technologies
- Different regulations in different countries
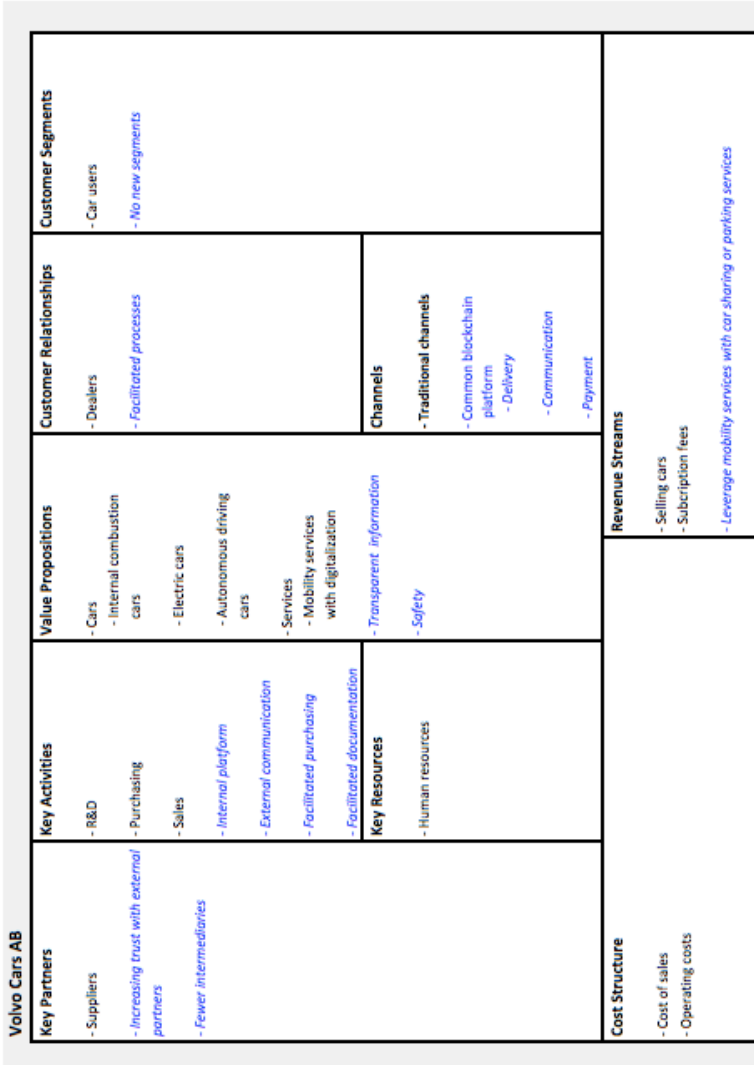
Industry forces

- Threat from new entrants in niche areas
- Technology companies as new entrants
- Pressure if competitors use blockchain
- Suppliers involving blockchain platforms

Market forces

- Changing customer behaviours
- Prefer Car-as-a-Service and Mobility-as-a-Service
- Appreciate performance and experiences rather than the technology underneath

Macroeconomic forces

- Developed economic infrastructure supports blockchain implementation

Volvo Cars AB

Key Partners
- Suppliers
- *Increasing trust with external partners*
- *Fewer intermediaries*

Key Activities
- R&D
- Purchasing
- Sales
- *Internal platform*
- *External communication*
- *Facilitated purchasing*
- *Facilitated documentation*

Key Resources
- Human resources

Value Propositions
- Cars
- Internal combustion cars
- Electric cars
- Autonomous driving cars
- Services
- Mobility services with digitalization
- *Transparent information*
- *Safety*

Customer Relationships
- Dealers
- *Facilitated processes*

Channels
- Traditional channels
- *Common blockchain platform*
  - *Delivery*
  - *Communication*
  - *Payment*

Customer Segments
- Car users
- *No new segments*

Cost Structure
- Cost of sales
- Operating costs

Revenue Streams
- Selling cars
- Subcription fees
- *Leverage mobility services with car sharing or parking services*

Figure 11 – Empirical findings of Volvo Cars

4.2 Experts

4.2.1 The business model environment's impact on blockchain

4.2.1.1 Key trends

"The world is moving into an area of disintegration. Something big is crumbling into something small." was stated by expert 1. A direct effect of integration is that costs plummet and that economies of scale are built, which is a faulty premise. It was also, by expert 2, stated that *"One of the main things to understand is that blockchain is not one technology, but a set of technologies, so it is kind of a design space where you can make selections to choose between different functionalities"*. Technology is developing and moving ahead rapidly, and IT can be used in order to integrate and communicate with other players in a much more efficient way than earlier. However, according to expert 1, big organizations are falling out. A trend can be seen of companies splitting their shares and being cut into two, as for example SCA and Atlas Copco. *"The era of conglomerates has passed"*, and bigger sizes are leading to problems when managing the fast moving environment. Blockchain may potentially be used for distributed platforms, which currently are increasing the pace of disintegrations, being more efficient than if investing in centralized infrastructures with many servers etcetera. Indeed, blockchain has other potentials than just crypto currencies.

Nevertheless, both experts explained that blockchain is in an early stage. The speculation and hype around the technology can be considered a key trend, and it is still uncertain if blockchain will have its own brand and installed base of customers in the future. It is furthermore uncertain how fast it will take over, although being challenging for incumbents.

Both experts agreed that the GDPR probably will affect the implementation of blockchain. This since *"The right to control the information you have and the right to be forgotten is in direct relation to the idea of immutability in all blockchains"*, as stated by expert 1. They both furthermore agreed that the PSD2 probably also will affect blockchain. This directive will, at least in Sweden, affect how banks hand out data to other actors, which may be facilitated and made more efficient by using blockchain.

Additionally, it was stated that the taxation of crypto currencies and ICOs are believed to affect the implementation of the technology. Nevertheless, it was argued that there probably will not be any regulation against crypto currencies. It was stated that there currently is a little difference between the Swedish currency today and crypto currencies, due to Sweden being a cashless state. If there anyhow would be any regulation, it is only believed to affect traders and not the whole society. Moreover, expert 1 explained that *"The government has not understood blockchain"*. Thus, it would take at least a year to come up with a regulation, which is a period during which much may happen and be obtained with the technology.

Regarding the socio-economic factors, it was by expert 1 stated that the only currency of the public sector is legitimacy and that *"The public sector is by no means ready for, for example,*

new apps created with blockchain". The public sector is built for economies of scale, not for size, and need to increase their pace of innovation. It was argued that it is a matter of efficiency versus innovation. The public management is geared towards efficiency, but with innovation comes risks and many innovations fail. According to expert 2 *"Most interesting within the socioeconomic factor is the need for increased innovation within the public sector, in order to obtain future legitimacy and relevance"*. What this sector needs to understand is that innovation is inefficiency, and that they need to make sure that they are more efficient in a long term perspective than what they are right now, since that is where the innovation of organizations resides in. The digitalization, in general, of banking functions and the increasing transfer of land and/or house ownership, however, depends on the type of blockchain that is implemented.

Both experts that were interviewed agreed that trust issues might be facilitated by blockchain. According to expert 1, Swedish people are IT mature and trust the central authority of the state. It was furthermore stated that *"blockchain adoption within the private sector is more irrelevant in Sweden than, for example, in Colombia where they do not trust the central authority"*. The trust may be negative in some cases, however, it leads to being early adopters of technology. The other expert stated that *"Social trends that are expected to drive blockchain is the limited trust of people to societal institutions, banking in general and central banking in particular"*. This could, however, be solved by the use of crypto currencies; hence, blockchain may be used for different reasons, such as banking accounts and payment solutions.

4.2.1.2 Macroeconomic forces
Expert 1 explained that the capital costs have decreased by approximately 5% from the 1980s till now, but no substantial trend can be seen here. The expert furthermore stated that there is an enormous surplus of capital on the market, which has made it easy to get funded for blockchain, leading to a lot of bad ideas being funded. Additionally, companies are doing things that are similar to blockchain, but without decentralized trust and with a centralized ledger, although calling them blockchain since anything called blockchain may be sold at the moment. This is, thereby, considered an extreme threat to blockchain. According to the expert, the economic structure might moreover restrict the implementation of blockchain. In terms of bitcoin, there is an energy problem, while there furthermore are other problems with other digital currencies. Nevertheless, a private blockchain is more limited in comparison to public or consortium blockchains, which makes the issue smaller.

4.2.1.3 Market forces
During the interview with expert 1, it was argued that the transaction costs are decreasing. Blockchain does from one perspective contribute to the decreasing, while from another perspective it might increase them too. This, for example, when the technology is implemented in an inefficient way, tracking and sending each and every move to all participants instead of only the involved ones. Furthermore, both experts explained that the transaction costs may be decreased if companies share their blockchain related ideas, working on consortium

blockchains in order to also decrease risks. Additionally, the technology is becoming a commodity, decreasing switching costs due to these being decreased by standards. This, in turn, makes it easier for actors and firms to try out blockchain. Nevertheless, expert 2 denoted that the switching costs in some cases might be large. This, above all when customer rating systems play an important role in the organizations or industries.

4.2.1.4 Industry forces

According to the experts, it is important that companies show that they are doing something blockchain based, for example working on blockchain projects. The incumbents will probably be affected by new entrants coming into the market with decreased thresholds. Thus, they will be challenged by young and fast moving companies. The new entrants might furthermore be more decentralized and with shared platform services, which will not prevent them from being blockchain based. An advantage for the incumbents regarding this uncertain technology would, however, be to work on consortium chains in order to decrease both costs and risks.

4.2.2 Business model canvas

Expert 2 explained that blockchain might affect all blocks within the business model canvas, although depending on what kind of blockchain that is successful. It was, by the other expert, furthermore explained that it is of importance that firms see themselves as *"somebody who delivers a service or a function to someone"* since blockchain leads to a diminishing role of the central authority. The elements within the canvas that, in general, are believed to be affected will, however, be further explained below.

Customer segments

With digitalization, and for example blockchain, the need for segmentation decreases. Expert 1 explained that if it is possible to measure everything that the customer does, and if selling something through the internet, which leads to the ability of measuring everything the customers do, *"then we basically have no need for segmentation"*. It was further explained that segments in that case become irrelevant and faulty, and the need for developing something specific for each segment is not needed.

Value propositions

Expert 1 stated that blockchain will not affect the value propositions directly, but potentially indirectly through the effects on the cost structures since a company will not be able to charge something that does not have a cost. The markets are changing and it is common to have value propositions not only towards the customers, but also towards the key partners. One example could be by giving the key partners a better offer than the competitors by, for instance, giving them 100% of the revenues, which in turn affects the company's revenue streams.

Channels

Limited attention was given to this element.

Customer relationships

Limited attention was given to this element.

Revenue streams

As mentioned previously in the *value proposition* element, expert 1 explained that companies might offer their key partners all the money. Hence, the revenue streams *"will be one-sided, not two-sided"*, which means that with blockchain, both the companies and their partners will earn value in different ways, and not only the companies as in many cases today. According to the other expert, the revenue streams are furthermore a question of economic value.

Key resources

The key resources are also believed to be affected since blockchain is a distributed ledger and companies aim to get a disintegrated firm, as explained by expert 1. Limited attention was although given to this element.

Key activities

Expert 1 explained that companies will start to externalize more of their activities. This, in turn, will lead to new key partners, as mentioned below. Nevertheless, this element was not discussed in-depth during the interviews.

Key partners

Both experts agreed that blockchain will have an impact on the key partners of companies. The technology is believed to lead to companies starting to see other partners than earlier, as a result of the externalization of activities that blockchain will lead to. Furthermore, it was stated that companies implementing blockchain so far have acquired new intermediaries instead of eliminating these parts of the processes, as the technology is argued to favour.

Cost structures

Moreover, the experts argued that blockchain also will affect the cost structures. The technology has a potential of decreasing transaction costs, especially if collaborating on a consortium blockchain with other partners. However, one expert stated that the decreased transaction cost must not be the case, according to what has been seen so far, and that increasing performance does not necessarily lead to decreased prices.
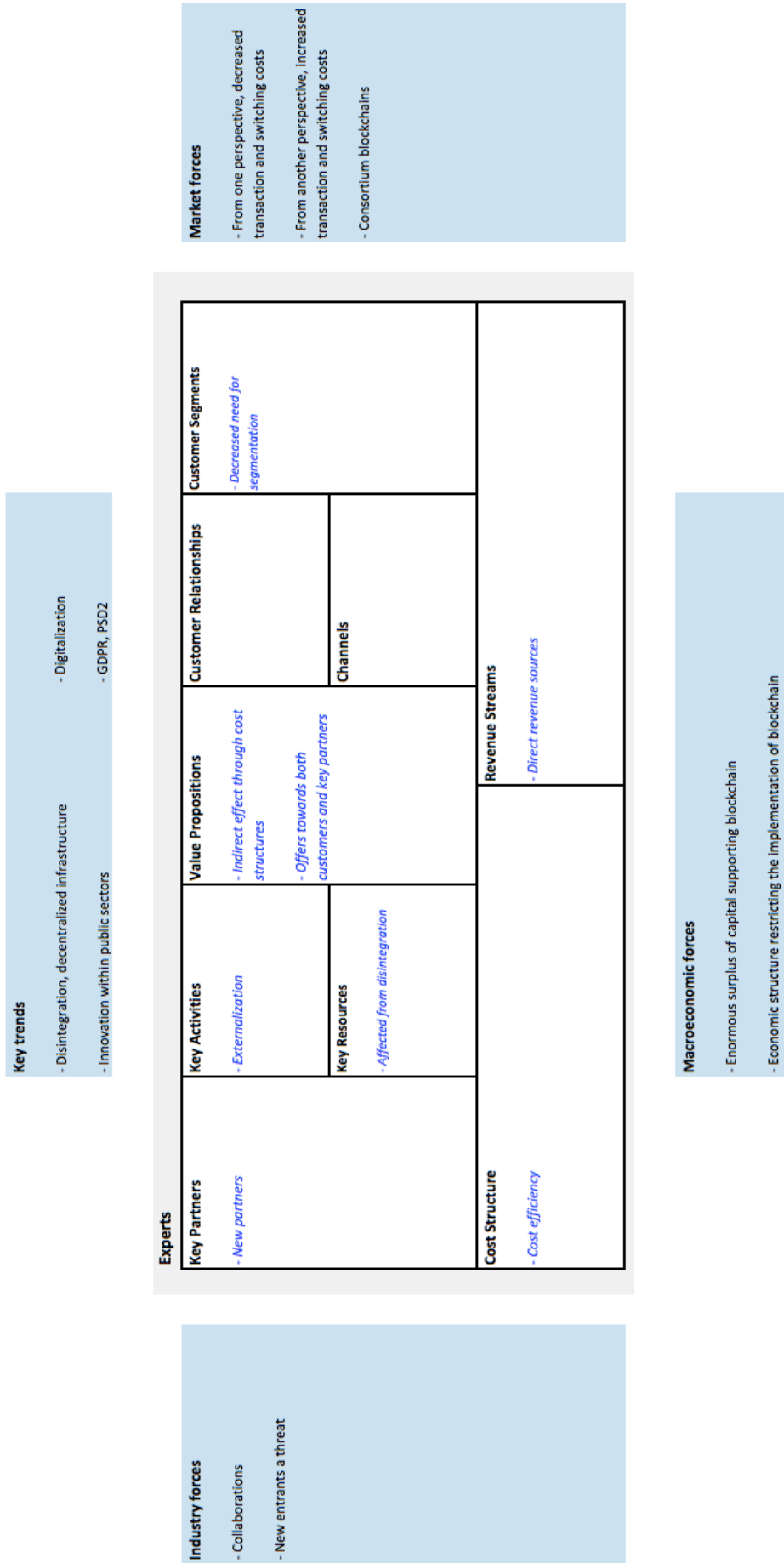
Key trends

- Disintegration, decentralized infrastructure
- Innovation within public sectors
- Digitalization
- GDPR, PSD2

Industry forces

- Collaborations
- New entrants a threat

Market forces

- From one perspective, decreased transaction and switching costs
- From another perspective, increased transaction and switching costs
- Consortium blockchains

Macroeconomic forces

- Enormous surplus of capital supporting blockchain
- Economic structure restricting the implementation of blockchain

Experts

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
- New partners	- Externalization	- Indirect effect through cost structures		- Decreased need for segmentation
	Key Resources	- Offers towards both customers and key partners	Channels	
	- Affected from disintegration			

Cost Structure	Revenue Streams
- Cost efficiency	- Direct revenue sources

Figure 12 – Empirical findings of experts

5. Analysis

Chapter 5 will present the analysis of the data collected from the interviews. The findings from the companies will firstly be compared to each other. The empirical findings considered most significant for each company will secondly also be discussed further in relation to the literature review, in response to the research questions. Expert opinions will be treated as additional information to the analysis.

5.1 Company analysis

5.1.1 Business model environment

5.1.1.1 Factors that potentially affect all studied companies

*From the empirical findings, the authors have found that companies are **all** concerning about regulatory trends, technology trends and industry forces in their business model environments.*

Regulatory trends

The regulatory factor has been found to have considerable effects on the implementation of blockchain. All participants from the three case companies mentioned how this key trend might affect blockchain. However, it is unclear if the impacts are positive or negative. GDPR were mentioned by experts and interviewees as a limitation for the implementation, due to the aim of the law to protect personal data, while PSD2 that aims to increase the transparency of transactions might be a driver for companies applying the technology. Moreover, funding activities like ICOs, which have not been regulated by taxation laws or other laws yet, could drive the implementation of blockchain in the near future. Companies might find ICOs as a more efficient and effective way to raise funds, rather than the typical exchange markets, which in turn supports the implementation of blockchain.

Technology trends

The technology factor, with the emphasis on digitalization, has been found to be another driver for the blockchain implementation as well. Similar to the regulatory trends, technology trends have been mentioned by most participants. Indeed, a trend of the physical and digital worlds becoming closer can be seen, for example, that material identifications are being stored in platforms, or that digital collaborations among different actors are emerging, which increases the possibilities to use blockchain. The distributed ledger characteristics of the technology might be appropriate to support companies that want to expand their control over the value chains, as well as companies that want to change their strategies towards digital organizations.

Socioeconomic trends

All the interviewees furthermore discussed the socio-economic trends. However, the general effects of these trends on the implementation of blockchain have been unclear, which is because the trends are recognized differently for different companies operating in various industries. In other words, the socio-economic factors found in this study are quite fragmented depending on the industry that each company is operating in. For example, younger generations in the

economy are considered to potentially affect the business environment of Stena AB and Volvo Cars, since they provide products for end customers, while this factor was not mentioned by the participants from CGI, since they mostly provide services to company clients.

Industry forces
Pressure from competitors has been found to be a significant factor for the implementation of blockchain under the perspective of the three companies. While participants from CGI mentioned blockchain as a tool to collaborate with other competitors and for differentiating products, interviewees from Stena AB and Volvo Cars stated that if their competitors apply blockchain, it would be a heavy pressure for them to implement the technology as well. In contrast, the new entrants' factor received different opinions concerning the pressure put on companies to adopt blockchain. For Stena AB and Volvo Cars, the threat from new entrants is considered low since they might not have enough initial investments in the beginning, in order to be able to disrupt entire manufacturing industries.

5.1.1.2 Factors that potentially affect particular companies
*In this section, factors in the business environment that affect only **particular** companies will be discussed.*

Macroeconomic forces
The economic infrastructure could be considered a driver for the implementation of blockchain. With the need for better mechanisms for real-time transactions as well as the handling of a vast amount of transactions, blockchain will be an appropriate tool to apply for this trend. Moreover, the proper blockchain level might be various for different infrastructures. As mentioned by an interviewee from Volvo Cars, the infrastructure in the European or the US markets, which are more mature, could be more supportive for the implementation of blockchain than for example the Chinese market. Other factors, such as global market conditions, capital markets or commodities and other resources, are not considered to affect the implementation of the technology significantly.

Market forces
Pressure from customers has not been considered a factor that is supporting the blockchain implementation from the perspective of Volvo Cars. This seems to be most reasonable for companies with customers that do not directly require or specifically demand particular technologies in the products. As the interviewees from Volvo Cars explained, the performance of products and the customer experiences are more important from the market side. The digital locks for cars were discussed, which could be obtained both by using other technologies than blockchain, as Volvo Cars themselves do, or by using blockchain, as Volvo Cars' competitor Porsche is developing, while delivering the same effects. From the perspective of a service provider as CGI, the implementation of blockchain could be due to pressure from customers. The company might, for example, use the technology for offering different solutions. For Stena AB, the market forces constitute the requirements for customers about the transparency of

information, for example for steel, and real-time information for shipping operations. However, the empirical findings of both Stena AB and CGI imply that customers currently do not seem to have direct demands for the use of blockchain, in particular, for the final products.

5.1.2 Business model canvas

5.1.2.1 Potentially affected elements in all studied companies

*This section will discuss the elements that are believed to be affected in **all** studied companies, however potentially in different ways.*

Revenue streams

Generally, manufacturing companies can move towards servitization with blockchain, like Volvo Cars with sharing services or Stena Metal with more transparent information provided for the steel. The revenue streams might although be more apparent for IT solution consultancy firms, like CGI, since the company might have more options for their customers, in turn resulting in winning more integration or consultancy contracts. This is, however, considered a challenge by some interviewees because the business case for using blockchain has not been practically clear so far for manufacturing companies. The reasons are related to the value proposition of the technology. As discussed later in the report, in the value proposition element, blockchain might possibly bring value for customers in terms of real-time contracts or information transparency, but the practical applications do not seem valuable for all types of companies. For example, one application of blockchain that was mentioned by interviewees is that it traces all information of materials, and it has been considered possible to apply in, for example, Volvo Cars and Stena Metal. The application might provide all types of information about where materials are produced as well as the information of all suppliers throughout the value chain. The difference in this situation is that it might be more crucial for Volvo Cars to keep track of that information, and to be able to provide it for their customers, than it is for Stena AB. This, due to the final customers of Volvo Cars usually being individuals who have less trust, while the customers of Stena AB typically are companies that mostly already have established long-term relationships. However, the common point is that benefits and costs have not been clearly recognized when applying blockchain, making the effects on revenue streams challenging so far.

Key activities

The fact that it is crucial for companies to adapt the key activities to emerging technologies was supported by all interviewees, which indicates that blockchain will affect this element. For consultancy firms like CGI, increasing in-house knowledge, as well as attending blockchain associations and communities, are becoming current activities to keep the company updated with new applications. Meanwhile, for manufacturing firms like Stena AB or Volvo Cars, it was discussed that the administration will be affected, at least in the beginning, when consolidating all data from the current systems into one big system of blockchain. This may take time, even years, but will favour the company when it has been done, making it easier to implement and work with blockchain. However, some companies might face challenges when

changing from their current processes to new ones, above all since blockchain has not indeed been proved to be effective and efficient yet - it has not reached maturity level and its real potential is still unknown. Furthermore, it may be hard for some departments to change in a short time due to long, and sometimes complicated, processes. It was moreover explained that blockchain, at least in the beginning, might be best to implement internally in some companies and industries, for example for the communication and internal transactions. This was above all stated by CGI and Volvo Cars. Nevertheless, some interviewees from Volvo Cars and Stena AB consider blockchain to have potential even externally, for example within the purchasing department, with the external suppliers, and with other customers.

Key partners
According to the interviewees, one aim of blockchain is to reduce intermediaries. It was argued that fewer intermediaries will be needed when doing transactions and when communicating with customers, leading to lower costs and improved and increased customization, as well as an easier management of the partnerships, which also is time-saving. However, interviewees from CGI and Volvo Cars discussed that the intermediaries might not be eliminated, but changed as an effect of blockchain.

One interviewee from CGI furthermore denoted the importance of creating an open market space to collaborate on blockchain, so-called consortium blockchain. Above all, since it is such a new and uncertain technology. When doing so, companies need to partner with competitors, and hence, new partnerships will be forced. An interviewee from Stena AB also suggested the sharing economy to affect the key partners. This was not discussed in greater detail, but might be interpreted as an effect of customization and the need of closer communication, reducing the numbers of intermediaries.

5.1.2.2 Potentially affected elements in particular companies
*This section will discuss elements that are believed to be affected in **some** companies/industries.*

Customer segments
The impacts of blockchain on the element of customer segments depends on the characteristics of the company. If the customers have been consuming traditional physical products like cars, it seems as they are less likely affected by the blockchain than the customers who are consuming services. The customer segments of Volvo Cars are hence not expected to change since blockchain primarily will be for communicating with other external parties than customers. In other words, the type of technology used in the final products does not really affect the current customers or attract new customers to the company. As the interviewees from Volvo Cars mentioned, customers assess the products more by the performance and experiences delivered than the technologies used. Hence, blockchain will primarily be for communicating with other external parties than customers. Similar to Stena AB, the technology might not bring new customers for the steel or shipping operations, since these customers

concern more about the efficiency and quality of the products, and not really about the technology itself. Nevertheless, other interviewees agreed that this element will be affected by the technology. Concerning CGI, the situation thereby seems to be different. The application of blockchain to current product portfolios might create more options for CGI's IT solutions for the customers, and also possibly attract more of them.

Value propositions

Some interviewees suggested that the value propositions will be affected by making the delivery of value more simple, increasing transparency and safety, and by new offerings to the customers. The value delivery may be made easier due to the transparency of blockchain. Furthermore, services will be more common. Since blockchain may be the underlying technology for services, both old and new ones, it may bring more value to the services and make them easier and more efficient, for example by the use of smart contracts mentioned previously. Hence, blockchain will also affect the offers, and thus the value, for customers.

Nevertheless, the value propositions might be different for different customers. On the one hand, value delivered to customers, in the form of companies, may be affected by a higher degree of transparency and traceability. As discussed by interviewees from Volvo Cars, the company might prefer to apply blockchain as a tool for tracking information of the materials they have used to their products, offering more transparent information for their final customers. Similarly to CGI, the company's customers have used their blockchain platform for trade finance, tracing and updating information throughout the transactions. On the other hand, value delivered to customers, in the form of individuals, will also be affected as a result of blockchain and the sharing economy that is expected to favour, and be favoured, by the technology. It thereby seems valuable for Volvo Cars to consider the implementation of blockchain for the sharing services. Nevertheless, in a company as Stena AB, there are many value propositions depending on the industries the organizations are operating within. Since blockchain still is uncertain and due to the variety of industries, not much was discussed for this element.

Channels

The shared economy that is becoming a trend was also discussed by some interviewees. This fact was explained to lead to the analysis and evaluation of the channels. One interviewee from CGI explained that the decentralized structure of the organization functions as their delivery channel of value, which also is corroborated by the company's annual report (CGI, 2016). Blockchain, that is aimed to among other things favour decentralization, may thereby be expected to favour the channels. An interviewee from Stena AB also mentioned social media as a channel, potentially being positively affected by blockchain that in this case may serve as an effective communication channel. This was further supported by other interviewees from Volvo Cars, believing that blockchain may lead to significant changes in the company's communication channels to their suppliers and customers. With its transparency, the technology is also believed to make the channels safer, potentially leading to disruptive effects.

Customer relationships

Interviewees from Stena AB and Volvo Cars agreed that blockchain might improve customer relationships, for example by improving operational efficiency. Stena AB explained that one way of maintaining and developing a good relationship with the customers could be by the use of mobile applications, feedback systems, and the Internet etcetera. When implementing blockchain, one of the companies' interviewees believes that the switching costs may be high, which creates lock-in effects for the customers. Volvo Cars, on the other hand, argued that processes will be facilitated with blockchain, while CGI put limited attention to this element.

Key resources

This element may be of different types, for example physical, financial, intellectual or human. However, the interviewees from CGI and Stena AB mostly focused on the human resources, discussing the importance of having people with knowledge about blockchain. Due to the technology being new and still immature, the demands for expertise and skills are believed to be high in the future. Younger generations, who usually are faster in the uptake of new technologies and who can implement new ideas faster, are believed to be of importance for this element. Concerning resources, blockchain is also expected to affect the platforms. In order to use blockchain as efficiently as possible, all the companies' data should be stored in one platform. However, limited attention was given to this type of resources, above all by Volvo Cars who was argued to already have people with knowledge within the field.

Cost structure

The studied companies are operating within different industries, making the cost structures different from each other. It was also explained that the cost structure, in general, depends on the partners and suppliers of an organization. This element was not discussed in detail during the interviews; however, it could be concluded that blockchain will decrease operational costs, generally, by also affecting the key resources, key activities, and key partners. Although not in the near time, but in the future when the technology is more mature.

5.2 Discussion

5.2.1 Business model environment

In relation to the literature, the empirical information adds up to the current theories suggesting that the business model environment affects the implementation of blockchain with both supportive and discouraging effects. Key trends have gained more attention than other forces both from academic studies and practitioners. The macroeconomic forces have not been clear yet concerning their impacts on the implementation of blockchain. Meanwhile, market forces and industry forces seem to be more dependent on the industry, in order to analyse the impacts on the blockchain implementation. Industry forces, with clearer movements of different actors within industries, might have more significant impacts than the market forces, where customer demands and needs towards blockchain have not been clear so far.

One common point from the literature and the empirics is that both appear more focused on the changes of ***regulatory trends*** in the key trends of the business model environment. In the empirical findings, it appears that companies are more concerned about recent regulations, like GDPR and PSD2, which might have opposite effects on blockchain. This agrees with Pila and Torremans (2016) who have provided more in-depth explanations, pointing out two trends in current regulations: data protection versus open access to information. Other direct regulations that directly aim towards blockchain have been discussed by both interview participants and the academic author Swan (2015). They all have the common opinion that regulations so far limit certain applications of blockchain, such as digital currencies like Bitcoins and funding activities like ICOs.

Industry forces, besides regulatory trends, are also believed to have significant impacts on the implementation of blockchain. Due to the situation of supply chain management, currently moving towards supply chain integration to control the whole processes rather than to control separate components (Rushton et al., 2014), suppliers, competitors, new entrants, and incumbents seem to collaborate more than previously. Interviewees from CGI stated that the company has an open platform, working with other actors to provide services to their customers. The company is also attending more to communities as well as collaboration projects. Stena AB and Volvo Cars described the industry forces from a different point of view, still considering competitors to be a driver for the implementation of blockchain. For Volvo Cars, the company needs to be upfront with the technology, indicating that pressure will be put on them when their competitors are going for it. For Stena AB, the need to control the whole value chain, working with many actors throughout the chain, puts certain pressure for the company to implement the technology.

Concerning the ***market forces***, the literature has not yet thoroughly discussed if customer demands might be a driver for companies to apply the technology; meanwhile, empirical findings seem to provide more information about this in relation to the customers of the studied companies. For example, while the customer expectations towards technologies were found unclear according to the literature, the empirical information from the three case companies provide a closer description. CGI's customers might be the ones who are quite clear with their expectations towards blockchain because they need a solution that helps them implement digital transformations effectively, and that protects data and integration of supply chains. In contrast, Stena AB and Volvo Cars stated that their customers' expectations towards blockchain are not clear because they mostly value experience and performance more than the technology within the product. To this extent, Atasoy and Morewedge (2017) explain that, in comparison to physical goods, equivalent digital goods might get less paid because of the psychological effects. Applying to the physical products of Stena AB and Volvo Cars, the explanation provides a reasonable reason for why these companies also see that customer demands towards digital functions of physical goods are not clear for them yet.

5.2.2 Business model canvas

5.2.2.1 Customer oriented

According to the literature (McKinsey, 2015a; Swan, 2015; Nowiński and Kozma, 2017), blockchain is expected to reduce the numbers of intermediaries that are needed and increase the use of smart contracts, which in turn will affect the customers that are classified in segments, depending on different factors. This was, although, by the interviewees considered significant for service providers, and not end-product providers. Hence, the ***customer segments*** of Volvo Cars and particular companies of Stena AB that were mentioned during the interviews, are not believed to be changed since blockchain primarily will be implemented internally and for the suppliers. It was argued that the customers of these companies care about the final product and the quality. CGI, on the other hand, is a service provider, and the interviewees agreed that the customer segments might be affected by blockchain. However, the impacts may be considered indirect since the technology above all is expected to create more optional solutions for customers, and thereby attract even more. Nevertheless, it can be discussed if Volvo Cars and Stena AB should consider implementing blockchain for their customers too. By reducing the number of intermediaries and using smart contracts, processes and documentation might be facilitated in different aspects, which potentially could attract more customers and change the existing segments.

Blockchain is also believed to affect the element by increasing and improving the opportunities for customization, as discussed in previous researches (Swan, 2015; Morabito, 2017). This may nevertheless be more significant for product providers than service provides, for example for Volvo Cars and particular companies within Stena AB. Implementing blockchain may thereby lead to the acquiring of new customers. If this will lead to new segments will although remain to be seen, if considering the point of view given by one of the experts regarding the decreased need for segmentation.

When affecting customer segments, blockchain will by nature also affect the ***value propositions***. This element may, however, differ totally among different companies and industries. Parts of the empirical findings share common ideas as the existing literature concerning blockchain and value propositions. One of them being that blockchain will facilitate the value delivery through its characteristic of transparency, and increase values by improving the traceability (Tapscott and Tapscott, 2016; Nowiński and Kozma, 2017). For manufacturing companies as Volvo Cars, the ability to track the components of the cars makes the information about them more transparent, increasing the trust and safety of customers. This may be crucial if a component breaks or turns out to be defective since the company in these cases may track the component throughout the whole process and detect where the flaws occur. When using blockchain, it also becomes difficult or even impossible to tamper different parts in the cars, for example, the software that is downloaded and the mileages since every step and every node is stored. By this, the risk of fraud is eliminated (Swan, 2015; Cai and Zhu, 2016; Tapscott and Tapscott, 2016; Nowiński and Kozma, 2017). Moreover, Volvo Cars will be affected by the sharing economy, which in turn is believed to both affect, and be affected, by blockchain (Sun

et al., 2016). By implementing the technology, solutions for the sharing services may be created, which facilitates the handling of processes and creates electronic, transparent and secure platforms. This element was not discussed thoroughly with Stena AB, but since some of its organizations are expected to be impacted by the sharing economy, the value propositions of them may be expected to partly be affected in the same way as Volvo Cars'.

Additionally, CGI expects to have their value propositions affected due to the trend of services becoming more demanded. As discussed earlier, blockchain may be an underlying technology for many services. Since CGI is such a big and international company, also being aware of technologies as stated in the interviews, blockchain has a potential of being used in the company, leading to the offering of more and new services. This, in turn, is expected to increase the value and result in improved and more efficient services. One suggestion by both the literature (Morabito, 2017; Nowiński and Kozma, 2017; Marsal-Llacuna, 2018) and the empirical findings is thus the use of smart contracts and to use blockchain platforms for trade and transactions.

With the impact on both customer segments and value propositions, the ***revenue streams*** will probably also be affected. Both the literature (Morabito, 2017) and the interviewees agreed on the impacts of blockchain on the revenue streams, which among others might be an effect of the increased servitization. The companies discussed the trend of services that are becoming more and more desired by customers, no matter industry. With increased demand for services, a pressure is put on companies to offer this. More offerings could then be provided for the customers, as also stated by CGI during the interviews. It is then believed to result in more integration and contracts, leading to positively affected revenue streams. Some interviewees, however, argued that this might be a challenge for manufacturing companies. Volvo Cars explained that their customers will not care so much about the technology itself, but value the quality and performance of the end-product higher. Nevertheless, it could potentially be solved by the increased customization discussed in the literature that might favour the revenue streams (ibid).

The data collected from previous researches (CGI, n.a.; Crosby et al., 2016; Maull et al., 2017; Xu et al., 2017) and interviewees from Volvo Cars and Stena AB is further in line concerning the transparency of blockchain. By implementing the technology, it is possible to track the components of the cars, and for example the steel within Stena Metal, all the way back to the first beginning of the processes. This is, however, considered more valuable for Volvo Cars whose end customers mostly are individuals with less trust.

Blockchain also increases the ability to have loyalty points programs and other activities with the aim of improving customer experience (Morabito, 2017), which in turn impacts the revenue streams. With its transparency, blockchain may furthermore contribute to the safety-feeling of customers, attracting even more of them to the company, thus resulting in increased revenues.

5.2.2.2 Company oriented

The literature (Chesbrough, 2007) states that it is crucial for companies to adapt their **key activities** to emerging technologies, which also was corroborated by all interviewees. Previous researches also argue that companies need to go through each process of the development and implementation carefully, stimulating interests and gaining insights along the way (Müller-Bloch, 2017). None of the companies explained that this is being done; however, CGI currently has various activities within the company to increase the in-house knowledge about technologies, which could be considered essential to be able to provide customers with updated services. From the points of view of Volvo Cars and Stena AB, the primary activities when implementing blockchain will be to consolidate all data into one big blockchain platform, which thereby, above all, would affect the administration. It may, although, not be considered painless since some companies might face challenges when going through such big adjustments. Because blockchain still is uncertain and immature, agreed on by both literature (Xu et al., 2017) and interviewees, challenges might be faced both within the companies and by the companies in general. By implementing blockchain without knowing its real potential, risks are certainly taken. To handle this, companies could, as mentioned in previous researches (McKinsey, 2015a; Tapscott and Tapscott, 2016) and by interviewees, collaborate with competitors or join blockchain communities, sharing both risks and costs in consortium blockchains. CGI and Volvo Cars also suggested starting implementing blockchain internally, at least to begin with, for example for communication channels and internal transactions.

One key activity that is common in companies is the documentation, which however was not discussed in-depth by the interviewees. It might although be an activity that may be affected significantly when companies implement blockchain. As mentioned by Crosby et al. (2016), the "*Proof of Existence*" characteristic of the technology might be beneficial to reduce papers for documentation, which is an essential activity across almost all functions of every company. This, for example when there are many accounting documents, manufacturing documents, research and development documentation, etcetera. However, the challenge when applying blockchain is the administration of uploading all current documents to a platform. As mentioned previously, it is a big adjustment, and the complexity of it might increase following the size of the firm.

Another key activity mentioned by Volvo Cars and Stena AB is that blockchain may have a potential externally, for instance in purchasing departments and supply chains. According to the literature (Olleros and Zhegu, 2016), supply chains are currently hard to understand for customers, which hinders them from active participation in relationships. However, this may, as stated by the companies studied in this report, be solved with blockchain, making the supply chains transparent and traceable. Also, aligned with Kshetri (2018), blockchain might help Volvo Cars and Stena AB with achieving their supply chain management objectives by reducing costs and risks, as well as improving quality and speed throughout the chain.

All of these, in turn, are also believed to affect the **key partners** of the companies. CGI explained the importance of the creation of an open market space where collaborations can take place, as mentioned earlier in consortium blockchains, in which the full potential of blockchain may be realized, as discussed in the literature (McKinsey, 2015a). When doing this, companies thereby need to cooperate with competitors, hence; new partnerships will be created, which also was supported by the experts. The literature, however, denotes the importance of being aware of the benefits and threats in this type of collaborations to be able to maintain or acquire competitive advantages, and quickly respond if another participant is faster in the implementation of the technology (ibid).

The empirical findings from all companies support the literature (McKinsey, 2015a; Swan, 2015; Nowiński and Kozma, 2017) regarding the reduced need of intermediaries resulting from blockchain. Above all, this is believed to be an effect concerning transactions and communication. With fewer intermediaries, transactions may be able to be handled by each actor directly. Due to the transparency and traceability of blockchain, this is believed to be safe for the partners. The communication will also be facilitated, leading to a closer and better relationship among them, which Volvo Cars considers to increase the trust with external partners. However, not only transactions and relationships will be impacted by the reduced number of intermediaries. By this, costs are lowered, and both improved and increased customization, as well as an easier management of partnerships, possible. Hence, several elements will be affected. The customization can, as mentioned earlier, result in strengthened ties with customers and the acquirement of more of them. Since fewer actors are involved in the relationships, the management of these and the key partnerships will also be easier and time-saving. Thence, all the mentioned impacts by nature affect the cost structures of companies.

The effect of blockchain on the **cost structure** element was not discussed thoroughly during the interviews; however, it may be analysed in relation to other discussed elements. The studied companies operate in various industries, indicating that the cost structures also vary. Nevertheless, some general impacts are believed to be resulting from the implementation of blockchain. By affecting the key activities, the operational efficiency is believed to be increased according to the literature (Beck and Müller-Bloch, 2017; Nowiński and Kozma, 2017; Friedlmaier et al., 2018). These costs are expected to decrease when shortening the time required to handle transactions and facilitating the handling of activities in general. The impacts on the key partners, making the relationships more efficient and easily managed, and the reduction of numbers of involved actors, are also expected to decrease costs. Some interviewees although stated that this might not occur in the near time, but potentially in the future when blockchain has reached maturity level.

Tracing back towards the theories of blockchain, the implementation of the consortium type seems to be the most appropriate application for companies. Taking supply chain management within the element of key activities of the business model canvas as an illustration, the

involvement of different actors as well as the level of control needed through the chain make consortium blockchains more advantageous to apply. Public blockchains might have certain risks of privacy when any participants can join the platform, assessing all information and even validating transactions with less control (Xu et al., 2017). This limitation of public blockchains might make it less beneficial to apply for the supply chain management since actors outside the chain might have negative impacts when being able to validate the transactions. Private blockchains, which are preferable for organizations in regulated industries, might hinder transactions across borders (Xu et al., 2017), in turn making supply chain activities more limited. Thereby, consortium blockchains, which could be considered a balanced format of public and private blockchains, allow the reasonable privacy when providing permissions for actors involved as well as maintaining the appropriate processing rates, costs and flexibility across the platforms.

Summarizing these factors, the company-oriented elements of the business model canvas seem to be more significantly affected by blockchain, especially consortium blockchains, than the customer-oriented ones. This, in turn, indicates that blockchain so far will have greatest effects internally.

6. Conclusions

The aim of this thesis is to contribute to the empirical knowledge of blockchain; how it might be affected by business environments, and how it might affect companies' business models. Previous literature has not discussed blockchain in relation to these business fields in particular, whereby the aim also is to contribute to the literature. Below follow the main findings related to the research question, divided into two sub-questions, of the thesis.

> ❖ ***How will the implementation of blockchain affect companies' business models?***
>   ➢ *What external forces will affect the implementation of blockchain?*
>   ➢ *Which elements of the companies' business models will be affected by blockchain?*

To be able to answer the research question, a qualitative approach with semi-structured interviews was used. Frameworks used were furthermore the business model environment, with its four areas, and the business model canvas, with its nine elements. In total, 11 persons, both internally from the companies and external experts, were interviewed. This, in order to find out how different business environments affect the implementation of a new technology such as blockchain, and also how the technology, in turn, affects different companies within various industries and their business models.

6.1 Answering the research questions

6.1.1 Effects of the business model environments on blockchain

Both the literature review and the empirical findings have shown diverse arguments and opinions about what factors, and how the factors, in the business model environment might affect the implementation of blockchain. Through the analysis that compares the three case studies and the experts' opinions to the literature, the authors have found that the impacts are various, depending on the company, the industry, and the business environment. However, three external factors that are believed to be most significant in the implementation of blockchain can be seen; regulatory trends, technology trends, and industrial forces.

- It was found that the ***regulatory trends*** might have both positive and negative impacts on the implementation of blockchain. Most interviewees discussed the GDPR and PSD2 regulations. The interviewees think that GDPR will have negative impacts on the technology, seen from the perspective of the regulation protecting personal data, while blockchain aims to increase the transparency of information. Simultaneously, the PSD2 regulation encourages companies to use customers' account information, which makes it transparent and goes in line with the aims of blockchain.

- When analysing the ***technology trends***, it was found that digitalization is becoming a significant trend, potentially supporting the development and implementation of blockchain. It may be ascertained that blockchain still is a hype and that it still is an

uncertain and immature technology, although, both the interviewees and the literature consider it to have a lot of potential to being applied within many areas, both internally and externally. Examples could be to implement blockchain within the supply chains or transactions, such as internal payments.

- *Industry forces* have also been found to be significant factors in the business environment, affecting the implementation of blockchain. These seem supportive to the implementation of the technology since companies might find more competitive advantages with blockchain, as well as collaboration opportunities on blockchain platforms. Moreover, new entrants implementing blockchain increase the pressure on incumbents to develop their knowledge and activities related to blockchain in order to keep their upfront positions in the industries.

6.1.2 Affected elements within the business model canvas

The analysis indicates that all elements within the business model canvas will be affected by blockchain. However, the study has shown that company-oriented elements are believed to be more heavily impacted than customer-oriented ones. The reason is supposed to be that blockchain seems to provide values to companies in terms of operations, rather than directly to customers. This does although not indicate that customer-oriented elements will not be affected at all. The two most significant elements from both sides of the business model canvas will hence be summarised below.

- Company-oriented elements: *key partners* and *key activities* are believed to be the most affected elements in the business model canvas when companies need to build relationships with other providers, as well as to change internal activities, in order to adapt to blockchain.
  - ○ Firstly, blockchain is expected to affect the element of *key partners* within the business model canvas in terms of creating new partnerships. Since blockchain is such a new technology, not many companies are currently experienced of working with it, and maybe not interested of doing so either. This, in turn, leads to the collaboration with others partners, such as other companies working with the technology, the academic world, experts within the field and other blockchain providers. In this use case, consortium blockchains might bring more advantages than other types of blockchain.

  - ○ Secondly, the *key activities* are also expected to be affected. Since blockchain is expected to have potential within supply chains and transactions etcetera, the activities and way of working might also change. Blockchain might even change the structure within companies, or at least departments, which might lead to changes in activities. Moreover, companies need to adapt to the technology. In order to do this, the case could be that the activities are affected both before, and when, the technology is implemented. Certain activities that might be changed

by implementing blockchain are, as mentioned earlier, supply chain management, documentation, and data administration.

- Customer-oriented elements: *customer segments* and *value propositions* are further expected to be impacted by blockchain, by supporting mass customization and delivering more value to customers.

  - Firstly, the *customer segments,* of above all service providers, are believed to be affected by blockchain by offering more optional solutions for customers, and hence, attract more of them. Impacts are also expected to be resulting from the increased opportunities for customization, potentially acquiring more customers. However, it may be valuable for product providers to consider the effects of blockchain on the customer segment element too, since the potential for changes, for example resulting from the decreased need for intermediaries, exists.

  - Secondly, blockchain is expected to affect the *value propositions* by making the delivery of value more simple. This element and its potential changes differ among companies and industries. However, it is in general believed to be affected by enabling new offerings to customers, and through its transparency and traceability, making processes safer.
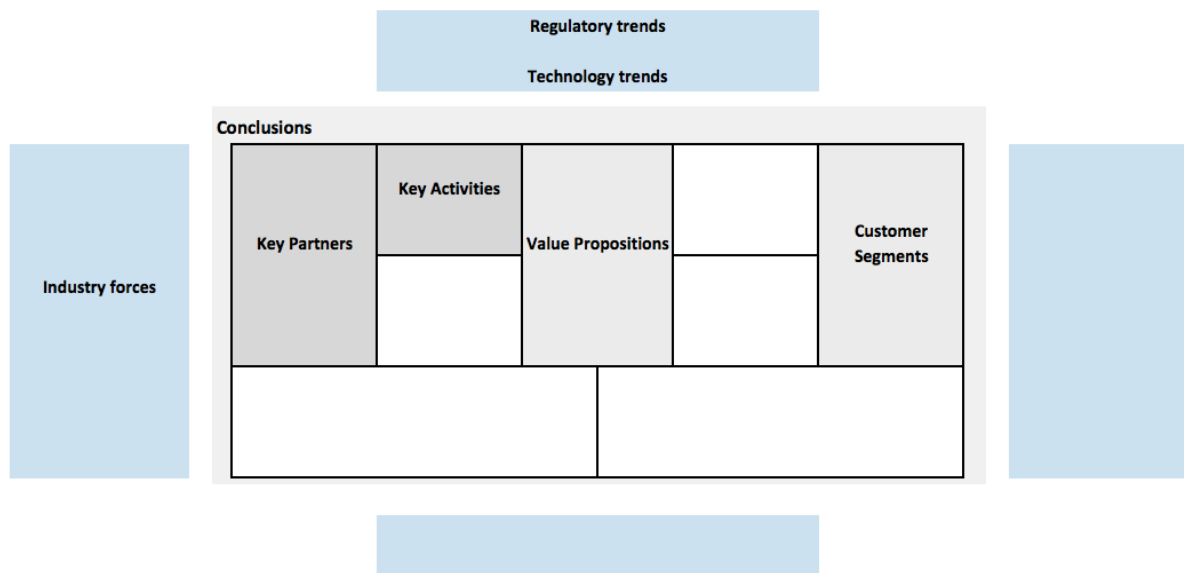
Figure 13 - Conclusions

6.2 Managerial recommendations

To implement blockchain properly, managers in companies need to be aware of how blockchain might be affected by factors in the business environment, in turn having ultimate effects on the business model of their own companies. From the findings of this study, the

authors would like to recommend certain directions for the implementation of blockchain, both in short-term and long-term time frames.

6.2.1 Short-term frame

In the short-term future, internal uses of the technology could be a reasonable starting point for manufacturing companies when applying blockchain in their operations. So far, the technology has a potential for many applications in certain areas, such as for the documentation or supply chains. Additionally, the regulatory and technology forces, as well as the industry forces, towards blockchain have been more straightforward than the market- and macroeconomic forces, whereby internal uses might be easier to control. For service providers, more well-defined business cases, such as which of the value propositions that may be delivered or how to implement more customization by blockchain, might be feasible in the short-term period. This is highly related to the market forces of service companies that are quite well-defined, which makes it easier to identify value propositions, and in turn having corresponding smaller customer segments towards customization.

6.2.2 Long-term frame

In the long-run time frame, manufacturing companies need to more clearly define the value propositions as well as the customer segments related to blockchain, which in turn might generate more revenues for the companies. The market forces might be clearer concerning how customers react to products and services based on blockchain, thus opening more opportunities for manufacturing companies to deliver more value with the technology. For companies who deliver services, new value propositions and new customer segments should go hand in hand with appropriate key activities and key partners, which might help the companies generate value and revenues in the long term.

6.3 Limitations

There are certain limitations that potentially might have affected the ability of the authors to answer the research question effectively. Firstly, when adopting the snowball method for selecting interviewees, the authors might have collected similar information and opinions. Secondly, due to the technology still being immature and the potential yet unknown, the experts were interviewed about blockchain in general and not in relation to any specific industry. Furthermore, the case companies operate in different industries, and even though they all are bigger companies, size may besides industry also affect the attitude towards different technologies. Moreover, the experience of blockchain differs among companies. Thereby, the empirical findings of the experts and the case studies may not be generalised across all industries.

6.4 Future research

The world keeps changing, and the technologies continue developing. Furthermore, blockchain is still uncertain and will, according to several interviewees, not reach maturity level until a

couple of years. Thereby, much may happen within this time, and the study seems to have risen more subjects that need to be investigated further. The following suggestions could be considered potential starting points for future researches.

(1) Based on the empirical findings, the authors have found contradictory points of view about how regulations might affect the implementation of blockchain. GDPR and PSD2 have been mentioned, which might not completely represent the impacts of regulatory trends on the blockchain implementation. Therefore, it could be interesting to study the combined effects of other regulations further as well.

(2) The authors expected to have a broad description of how the business model environments might affect the implementation of blockchain. However, due to the delimitations in number of interviewees and time etcetera, the impacts of each factor on the blockchain implementation might not have been investigated thoroughly. For example, the macroeconomic force might be various, depending on different countries and economies. Thus, there is room for future researches to provide more empirical findings about the effects of each force on the implementation of blockchain.

(3) Moreover, due to the focus of this thesis on three case companies, there are still many different opportunities left for future research outside this scope. Examining the effects of blockchain on each element in other contexts or within other companies might also be interesting to study. By collecting additional information from different contexts and different companies, the future research might provide more samples to re-evaluate the framework as well as the findings of this study, and hence, a result that may be generalised.

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8. Appendix

8.1 Appendix I - Interview guide

The authors present themselves, the topic, the study and the frameworks first and then come to the interview questions.

Introduction

We are Lina Asadi and Trang Hoang, from the master program of Innovation and Industrial Management at the School of Economics, Business and Law, the University of Gothenburg. We are writing our thesis about the impact of the business environments on blockchain and the ultimate impacts of all on the business model canvas. We will use two frameworks in our study (the Business Model Environment and the Business Model Canvas), so we would like to have a discussion with you around these models. Furthermore, we are writing the thesis in collaboration with Coboom (a project driven by CGI Sweden AB, Stena AB, and Volvo Cars AB). After discussing generally about blockchain, it would be very helpful if you could share some thoughts related to these companies, for example the Business Model Environment of each company. We would like to ask for recording the interview content if you are comfortable with that.

Interview questions

- Interviewee's background:
  - Name, position/role?
  - Relation/experience of working with business models?
  - Relation/experience of blockchain? Years of experience?
  - What potential does blockchain have?

- Description of the Business Model Environment, and how the four external forces of the Business Model Environment affect the blockchain implementation?
  - What are the current technology trends? What are the current regulatory trends? What are the social trends? What are the socioeconomic trends?
    - How do the current (1) technology trends, (2) regulatory trends, (3) societal and cultural trends and (4) socioeconomic trends affect the implementation of blockchain?
  - What are the macroeconomic forces?
    - How do changes in macroeconomic forces contribute to the implementation of blockchain?
  - What are the current changes on the market?

- - ■ How do changes on the market contribute to the implementation of blockchain?
    - ○ What are the current changes concerning competition within industries?
      - ■ How do changes in the industry or competitive environment contribute to the implementation of blockchain?
  - ● Description of the Business Model Canvas
    - ○ Which forces significantly affect companies' business models?
    - ○ How will blockchain affect business models?
      - ■ What elements within the business model canvas will be affected? (1) Customer segments? (2) Value propositions? (3) Channels? (4) Customer relationships? (5) Revenue streams? (6) Key resources? (7) Key activities? (8) Key partners? (9) Cost structures?
      - ■ What do companies need to do to adapt to the changes?

End of interviews

We are very thankful for your time. We might share our findings with you when we finish our thesis if that is interesting for you.

Interview setup

The interviews were conducted in experts' offices, in Coboom's office, or over the phone. The authors sent the experts the general interview questions and the summary of the thesis topic in advance.

8.2 Appendix II - Interview summaries

8.2.1 Business model environment

	Key trends	Market forces	Macroeconomic forces	Industry forces
		Business model environment		
Interviewee 1	* Innovation management * Digitalization * Collaborate with competitors * Blockchain disruptive * Blockchain immature * Scaling issue	* Blockchain consultant market * Customer demands		* Need for open innovation areas * Collaborations
Interviewee 2	* Increased interest of new technologies * Younger generations	* Collaborations with competitors	* Reduced barriers for new entrants * Banks focus on economic infrastructure	* New entrants emerging
Interviewee 3	* Digitalization * Regulations * GDPR * Younger generations * Collaborations	* Customer demands * Customer needs * Sharing economy	* Global demand for freight stable & will decline * Low prices for flights a challenge * Sharing economy	* No significant threat from new entrants
Interviewee 4	* Regulations * Rules	* High switching costs * Customer demands * Customer needs		* No significant threat from new entrants * Offers to customers
Interviewee 5	* Regulations		* Economic infrastructure	* Pessure from competitors * Threat from new entrants
Interviewee 6	* ICOs		* High volume of transactions	
Interviewee 7	* Regulations * GDPR * PSD 2	* High volume and high frequency transactions	* Economic infrastructure * High volume of transactions	* Pessure from competitors * Supply chains
Interviewee 8	* Digitalization * Changing customer behaviours * GDPR	* Customers not aware of the technology		* New entrants moderate threat
Interviewee 9	* Digitalization * GDPR * Fewer intermediaries	* Customer demands moderate * Customers not aware of the technology	* Efficiency	* Pessure from competitors * Threat from new entrants
Expert 1	* Disintegration * Blockchain platform * GDPR * PSD2 * Efficiency vs. Innovation * Need for innovation * Sweden early adopter	* Decreased transaction costs * Decreased switching costs	* Decreased costs * Enormous surplus of capital on the market * Extreme threat to blockchain	
Expert 2	* Digitalization * GDPR * PSD2 * ICOs	* High switching costs	* Global market * Market values * Banks * Economic infrastructure	* Blockchain projects * New entrants * Shared platforms * Consortium chains

8.2.2 Business model canvas

Business model canvas

	Customer segments	Value propositions	Channels	Customer relationships	Revenue streams	Key resources	Key activities	Key partners	Cost structure
Interviewee 1	* New segments		* Blockchain as a channel * Changes			* Expertise * Skilled people	* Blockchain associations * Communitites	* New partners * Collaborations	
Interviewee 2		* More possibilities * More offers	* Decentralization			* Expertise * Skilled people			* Decreased costs
Interviewee 3	* Changed segments * New segments * Sharing economy		* Communication channels		* Increased with increased demands * Sharing services	* Expertise * Skilled people * Younger generation	* Central blockchain database	* New partners	
Interviewee 4	* Changed segments * New segments			* Lock-in effects				* New partners	
Interviewee 5	* No new segments	* Better propositions * Transparency * Safety	* Changed communication channels * Changed delivery channels				* External communication	* Increased trust * Fewer intermediaries	
Interviewee 6									
Interviewee 7			* Consortium blockchains * Common blockchain platforms		* New mobility services				
Interviewee 8			* Payment services	* Facilitated processes			* Internal platform * Facilitated purchasing * Facilitated documentation	* Increased trust * Fewer intermediaries	
Interviewee 9	* No new segments						* More services		
Expert 1	* Decreased need	* Indirect effect			* Direct sources	* Affected by disintegration	* Externalization	* New partners	* Decreased costs * Cost efficiency
Expert 2	* No new segments	* More offers						* New partners * New intermediaries	* Decreased costs * Cost efficiency