Embracing Blockchain: The Challenges of Collaborative Innovation Within the Financial Industry

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Abstract
Creating standardized infrastructures for new technologies has become a frequent event in recent years, forcing competing firms to together collaborate in order to develop and mutually agree on a common standard. This is due to technologies such as blockchain (distributed ledger) technology that need interoperability to reach its full potential, making the collaboration aspect crucial for organizations that want to adapt to the technology. Therefore, this study's purpose is to identify and analyze the challenges of creating such a standardized infrastructure. A case study was used to analyze these challenges, which involved experts of blockchain technology and three Nordic banks connected to the blockchain consortium R3. First, a pre-study took place with the help of blockchain experts, who helped identify potential problems regarding blockchain (distributed ledger) technology. Secondly, a main study was conducted consisting of four interviews with key persons representing the banks, in addition to collecting secondary data via news articles, and press releases. With the help of co-opetition theory and a technical description of blockchain (distributed ledger) technology, an analytical model was developed to support the analysis of the data collection. The analysis focus on aspects of co-opetition drivers, co-opetition capabilities, co-opetition dynamics and blockchain aspects, which were used to showcase the challenges of collaborating on creating a standardized infrastructure. The result of this study highlights the importance of learning and educational aspects, the size of a cooperation and threats from other competing solutions, which generates challenges. In addition to the identified challenges, this study has also contributed to an understanding of how these aspects can come to affect a collaboration.

Keywords
Co-opetition, Standardized Infrastructure, Blockchain Technology, Distributed Ledger Technology (DLT), Consortium, R3, Financial Industry, Nordic Banks
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1. Introduction

1.1 Background

Blockchain has been described as the next digital paradigm and many even predict it to cause as much disruption as the internet itself (Tapscott & Tapscott 2016; Antonopoulos, 2017; O’Leary, 2017; Morabito, 2017). The development of the technology has come a long way since the first solution was introduced by Nakamoto in 2008, although it is still at a very early stage (Tapscott & Tapscott, 2016; Brühl, 2017). Nevertheless, an industry that has shown a lot of interest in the technology is the financial industry. This is a consequence of the capabilities of blockchain, which is being hailed as something that can democratize and decentralize the modern financial system (Cocco et al., 2017). Tapscott and Tapscott (2016) believe that these capabilities have the power to disrupt core functions within the financial system, changing the way banks authenticate identity as well as how they move, store and lend value.

The global financial system is seen as the most powerful system in the world which billions of people rely on daily to protect and store their value (Worldbank, 2015; Tapscott & Tapscott, 2016). But this is also an industry that in numerous cases consists of outdated regulations from the eighteenth century. In addition, these old technologies are oftentimes slow and unreliable, and as a result, generates a lot of problems and insecurity (Tapscott & Tapscott, 2016). One, for instance, is the SWIFT international payment messaging system, which is a technical standard that allows financial institutions to send and receive financial messages, exchanging over 5 trillion USD a day, and serving over 200 countries. Consequently, this is seen as the most important system in the banking industry today (Scott & Zachariadis, 2012; Morabito, 2017). Technical standards like this are considered to be a crucial aspect for all sorts of industries (Shin et al., 2014; Narayanan & Chen, 2012). However, SWIFT has its downsides and has been compromised several times by hackers who transferred money into their own accounts after hacking a SWIFT operator (Reuters, 2018). As a consequence of the vulnerability and slowness of these old technologies, banks now look to blockchain as a possible solution to address these issues. A solution built on this technology would mean faster, cheaper and safer global transactions (Khan et al., 2017; Mori, 2016).

Many organizations chose forms of alliances to collaborate on building common technical standards. The reason behind this is often due to forces of technological change, which leads to companies coming together to share knowledge and other resources (Kim et al., 2017). Technical standards also support competition because they create an opportunity for companies to innovate complimentary products which have interoperability with the standardized infrastructure (Shin et al., 2014). For instance, in the space of Internet of Things (IoT), standards are critical in making IoT devices communicate globally and give companies the opportunity to create products with interoperability. OneM2M is the name of the global initiative that is set to create this for IoT, which involves members like Amazon, IBM and Huawei (Kim et al., 2016; onem2m, 2018). In other words, technical standards are essential
in many aspects to foster a new market (Kim et al., 2016), as in the case of IoT, and there is no difference regarding the financial industry and their interest in blockchain technology (Mori, 2016; Tapscott & Tapscott, 2016). Subsequently, this led financial institutions to form a global consortium called R3, with the purpose of developing a shared standardized infrastructure built on blockchain technology (Gou & Liang, 2016; Mori, 2017; Paech, 2017).

R3 is the largest blockchain collaboration in the world operating within the financial industry, consisting of around 200 members that include some of the largest banks, regulators, trade associations and other financial institutes around the globe (Khan et al., 2017). The consortium was founded in September 2015 and consisted of nine banks at that time. In 2017, R3 would come to secure an investment of 107 million USD, the largest investment in blockchain technology to date (Corda, 2017). The members of R3 are all working towards a common goal: to develop a "global logical ledger", or in other words, a standardized infrastructure built on blockchain technology. This technical standard software is called Corda and is envisioned to enable all economic parties to record and manage deals or obligations with key activities through the use of smart contracts. In other words, a platform that will enable R3’s members to develop innovative applications for finance on the blockchain (Brown et al., 2016; Hearn, 2016).

Several Nordic banks are among those who in the last few years have shown a lot of interest in blockchain by joining R3. However, the level of interest varies across Nordic banks, which can be divided into two groups: those who participate and actively engage in blockchain projects, and those who are presently only interested in watching blockchain from a distance. Handelsbanken appears to be the clearest example of the latter. Handelsbankens CDO, Mr Stephan Erne (Computer Sweden, 2017) stated that the usage of blockchain is at least 3 to 5 years away from implementation and that the technology itself is not complicated. Instead, the challenges are related to how banks will cooperate on blockchain. On the other hand, three Nordic banks have been actively engaged in blockchain consortiums. They are Nordea, Danske Bank and SEB.

1.2 Problem statement

Mori (2016) argue that banks have to let go of some of their control and be cooperative if they want to succeed in adapting blockchain technology. This is why the three Nordic banks (Nordea, Danske Bank and SEB) have joined R3. However, Tapscott and Tapscott (2016) are skeptical of the R3 initiative and questions the seriousness of the project. Primarily, they point to the low barrier of 250 000 USD which is the commitment price tag to join. Secondly, this can also be questioned by looking at two of the founding members Goldman Sachs and JP Morgan which left the project in 2016 and 2017 respectively. According to Reuters (2017), it was due to their intention to pursue a different path of developing the technology. On the other hand, Tapscott and Tapscott (2016) also points out the vision of R3 and emphasize the importance of collaborating to create a universal technical standard to accelerate the usage of the technology.
At the same time, cooperating with your rivals is paradoxical, as there is both competition and cooperation taking place at the same time, also known as co-opetition. Jonas Leijonhufvud at Dagens Industri sees this paradox as a threat to the R3 consortium: "The financial industry has to cooperate to succeed, but they have a hard time cooperating, they are creating a situation much like the prisoner's dilemma." (Leijonhufvud, 2018-02-08). Mori (2016) also emphasizes the importance of collaboration by stating that 80 percent of the barriers to technology adoption within the financial industry are about cooperation within business processes, while only 20 percent are in regard to the technical aspects. Managing this paradoxical relationship will therefore be necessary for the financial institutions to find a successful, and most importantly, useful blockchain solutions.

Projects of this size are difficult to convey, and it is even more challenging to result in something concrete and useful. In fact, to implement a solution like this, the majority of the industry has to agree on a common standard, putting aside their own interest to prioritize a collective solution that benefits the entire industry. (Mori, 2016; Leijonhufvud, 2018-02-08). However, they are far from the only ones exploring this technology. Innovations like Bitcoin and Ripple are seen by many as a threat to the financial industries own solutions, and not to mention all the upcoming cryptocurrencies whose aim is to create an open source ecosystem for financial services (Neyer & Geva, 2017; Fanning & Centers, 2016; Mainelli & Milne, 2016). Subsequently, these two aspects add complexity to the challenges that the financial industry is facing.

The previous studies on blockchain technology have focused on providing an understanding of its technical processes. Some of the literature are connected to the challenges that are faced by numerous organizations in adapting to the technology. However, the majority of these studies are aiming to take on the challenges related to blockchain technology in a general perspective, which is oftentimes directed to the effect of blockchain adoption by the society at large (Tapscott & Tapscott, 2016; Cocco et al., 2017). In addition, many of these articles are focused on technical challenges, or issues related to the design and implementation (O'Leary, 2017). At the same time, as mentioned, Mori (2016) argue that this side of technological adaptation accounts for only 20 percent of the effort, which leaves 80 percent to challenges related to business processes and business models. Subsequently, this leaves an empirical and theoretical gap for this study to contribute with the challenges that organizations face related to business processes and business models when collaborating to adopt a technology as a part of their shared infrastructure, excluding challenges related to the technical side of the collaboration. However, standardization has been studied before, but not extensively in relation to co-opetition.

This study also sets out to contribute to the theory of co-opetition and close both theoretical and empirical gaps within this field. First of all, the financial industry has been studied from other perspectives related to collaboration but never from a co-opetition perspective, although the industry has many decades of co-opetition experience. This leaves an empirical gap within co-opetition to analyze an industry that is potentially competent within these collaborations, which also can bring insights for other industries by looking at this study’s
analysis of the financial industry. Secondly, Bengtsson and Kock (2014) called for a better understanding of the dynamics of cooperative interactions, how it evolves and what capabilities are required to succeed, leaving a theoretical gap for this study to give an understanding for this relationship. Thirdly, Gnyawali and Park (2011) saw the need to study the difference between regional and international co-opetition from a managerial perspective, which would provide insights from key personnel within the collaborations. Something that this study sets out to do by collecting data from key persons from three Nordic banks which are involved in the collaborative effort of creating a standardized infrastructure for blockchain technology.

1.3 Research question

What are the challenges of developing a standardized infrastructure for blockchain technology?

1.4 Purpose

This study aims to identify and analyze the challenges of creating a standardized infrastructure. The development and implementation of blockchain technology within the financial industry require collaboration. In fact, a common standardized infrastructure is a prerequisite for blockchain to succeed within the financial space. Based on the theory of co-opetition, technical descriptions of blockchain technology and the empirical findings, this study aims to close empirical and theoretical gaps from previous literature.
2. Technical description

The second chapter provides a technical description of blockchain and distributed ledger technology (DLT). (However, blockchain and DLT is commonly used interchangeably). This technical description is meant to contribute with an understanding of the core technology itself, in addition to the implications that it may have in the future. The chapter starts with a description of the capabilities of blockchain and further brings together its fundamental characteristics. In the end, a description of a DLT solution developed by financial institutions is provided.

2.1 Blockchain

In 2008, a pseudonym by the name Satoshi Nakamoto published a white paper with the title: Bitcoin: A peer-to-peer Electronic Cash system (Nakamoto, 2008). This was the first time someone published a technical solution with a set of rules that had the potential of transforming many peoples vision of exchanging money online in a decentralized and trusted way, or in other words, without having to rely on a third party (Tapscott & Tapscott, 2016). Nakamoto had created the Trust protocol, the underlying code to what we today know as blockchain technology. Blockchain is a distributed database that enables production, development, and registration of data transactions and digital events in chronological order. Blockchains are most commonly public, which means that anyone can access the transactions recorded on the ledger (O’Leary, 2017). The technology is built through distributed ledgers, which are stored and maintained on a distributed network: the peer-to-peer system (Drescher, 2017). These ledgers are secured and linked to each other using a cryptographic signature, also called a hash. This is a randomly generated number that is unique for each block that consequently makes the entire blockchain immutable and links the ledgers (Weber et al., 2017; Hackius & Petersen, 2017). Nakamoto (2008) called this process the Timestamp Server (Figure 1).

Moreover, blockchain is a continuously changing technology because of new functions and solutions continually being introduced. However, according to Antonopoulos (2017), the core capabilities will remain the same. This states the fact that blockchains can differ a lot from one another in their characteristics, although they all share the core technology originated from the Bitcoin protocol. But, it is important to emphasize that not all blockchains obtain capabilities similar to a solution like Bitcoin, in particularly not solutions developed by consortiums within the financial industry. This is due to many of the capabilities of blockchain being a possible threat to the current centralized financial system. For example,
the need of clearing houses and other intermediaries to validate and secure transactions is no longer needed in a peer-to-peer network. Instead, these networks can approve and verify each recording on the blockchain (Antonopoulos, 2017; O’Leary, 2017). As a consequence, the financial industry has rebranded blockchain and innovated a similar technology called distributed ledger technology (DLT) as an attempt to privatize blockchain technology and build a closed system that still requires them as an intermediary to be used by their stakeholders. (Although, as mentioned, blockchain and DLT is commonly used interchangeably). They take the best suitable capabilities out of blockchain technology but turn their back on features like decentralization, openness and new currencies (O’Leary, 2017).

2.1.1 Decentralized vs centralized blockchains
An essential characteristic regarding architectural approaches of blockchain technology is the degree of decentralization versus centralization. This distinction is often related to the blockchain being public or private, although these features do not always have to go hand in hand. Instead, this characteristic is solely connected to the blockchain being permissionless or operating permissions for participants to be able to use it (Paech, 2017). Decentralized blockchains operate with the same accessibility to all parties whereas centralized blockchains determines who gets access from a central authority (O’Leary, 2017). In other words, centralized systems have a central point of control in contrast to decentralized systems that has no single point of authority (Figure 2) (Drescher, 2017). Furthermore, these contraries of architectural approaches have both its advantages and disadvantages. For instance, one of the significant advantages of a decentralized system is the possibility to operate without an intermediate having to mediate trust. However, disintermediation is a challenge and especially within the financial industry where the system consists of financial institutions acting as intermediates everywhere (Guo & Liang, 2016). Guo and Liang (2016) argue that true disintermediation within the financial industry is hard to achieve due to the importance of having a central authority to safeguard agreements.

![Figure 2. Centralized vs Decentralized model illustrated by the authors.](image)

2.1.2 Private vs public blockchains
Private blockchains have recently become a frequent topic within the blockchain technology space. This is a solution that allows the owner to restrict the access to the system and control
who is using it (Brühl, 2017; Morabito, 2017). Features that distinct private from public blockchains can be characteristics of the execution of consensus and the access to information for viable transactions (O’Leary, 2017). In public blockchains, anyone can participate in the consensus process in addition to having the rights to read the transactions. Whereas in private solutions, the consensus is reached by the involved parties operating nodes and oftentimes also limiting the permission of reading the blockchain to its participants. Moreover, private blockchains have especially gained attention from the financial industry and have resulted in projects like the R3 consortium now developing a solution that is restricted (ibid, 2017). However, many have discussed if this solution still really is blockchain technology because of its characteristic features like being centralized, cloud-based and having identification requirements to gain access. Unlike public blockchains that usually are decentralized, peer-to-peer and have anonymity. As mentioned before, R3 has commented on their solution not being a blockchain, which is due to its core data structure not being grouped into blocks (Khan et al., 2017).

![Blockchain quadrant](image)

*Figure 3. Blockchain quadrant illustrated by the authors.*

### 2.2 R3’s Corda

Corda is the distributed ledger solution developed by the R3 consortium to execute, manage and record financial agreements. This is the outcome of two years of R&D by its members and the R3 software enterprise, who envision this solution as a standardized platform for financial institutions to develop user-facing applications on a single global ledger (Khan et al., 2017; Guo & Liang 2016; Brown et al., 2016). It is also a solution inspired by blockchain technology but does differ a lot compared to the likes of a solution like Bitcoin. For instance, Corda does not use native cryptography or have miners who confirm the transactions and leads it to consensus. Instead, it uses a service called notary to guarantee the transactions throughput (Hearn, 2016). This is the consensus service of Corda which makes it possible not having to trust one specific party. Instead, it is operated by a cluster of servers consisting of the banks themselves, who ensures the sign of transaction throughput and the reach of consensus between parties (ibid, 2016).
Another important feature, inspired by the Ethereum platform (a public and decentralized blockchain solution), is that Corda can run smart contracts to enable key activities between users, a solution that simply put is a digital contract. For instance, this feature enables the Corda platform to record and manage financial agreements, share data between two or more parties and manage choreographic workflow without intermediaries (Brown et al., 2016). Corda is a private system, which means that the user has to be permitted and obtain a signed identity to use it (Khan et al., 2017). Moreover, the developers at R3 argue that Corda has capabilities which makes their system different to blockchain solutions. First, and most importantly, R3 argue that their Corda solution is not a blockchain, simply due to their data not being stored in blocks (ibid, 2017). Secondly, Corda is developed with legal and existing regulations and standards in mind when recording and manages financial agreements, something that the majority of blockchains and their cryptocurrencies does not (ibid, 2017). Thirdly, the Corda platform is limited to financial contracts and does not support other categories of agreements, as, for instance, the Ethereum platform does. In addition, the access to the data of the transaction is restricted to parties within the agreement when validated (ibid, 2017). Last, the Corda system is centralized, or "multi-centralized" as Guo and Liang (2017) expresses it since the system is operated by multiple financial institutions. Together these institutions form a central authority who has the power to hand out permission or deny users to use Corda.
3. Theory

This chapter mainly presents co-opetition theory and related cooperative strategies which is the basis for the study's analysis. The first section introduces cooperative strategy and different ways to pursue it. This is followed by an overview of the co-opetition field. Next, the co-opetition framework is presented which consist of co-opetition drivers, co-opetition capabilities, and co-opetition dynamics. These three sections combined with blockchain aspects are central parts of the analysis model presented at the end of the chapter.

3.1 Cooperative strategy

A common way to apply a cooperative strategy is to create a strategic alliance. This is a method used to gain a competitive advantage by pursuing a common strategy and share resources and activities within the alliance (Grant & Baden-Fuller, 2004). According to Johnson et al. (2015), a strategic alliance can either be equity or non-equity. An equity alliance is a creation of a new entity with ownership distributed by its actors. The most common form of this type is joint ventures, where all the actors remain independent within the alliance. Moreover, an equity alliance could also be a consortium, where the actors set up a new venture to pursue a shared vision (ibid, 2015). On the contrary, non-equity alliances like franchising and licensing is also a common type of strategic alliance (Grant & Baden-Fuller, 2004). However, these types are often based on contracts because of the lack of ownership and oftentimes results in poor commitment (Johnson et al., 2015).

Furthermore, strategic alliances can imply benefits for the parties involved in most cases. However, this kind of commitment to each other is not seamless, although the parties agreed to cooperate the fact remains that they are oftentimes competitors. This can raise an internal dilemma, on the one hand, the firm has to contribute to the strategic alliance, but most importantly, prioritize their own interests (Porter, 1980). Fonti et al. (2017) emphasize this as the "classic collective action problem", which points to the situation where actors in the alliance have a hard time committing their limited resources to benefit the collective per se. By withholding their resources, a free-ride situation is created where the overall resources become limited and untapped (Fonti et al., 2017). However, theory regarding strategic alliances mostly showcase why and how firms can form alliances within their industry. It does not explain the complexity of alliances or collaborations.

3.2 Co-opetition

The complex relationship between organizations who cooperates and at the same time compete in different areas is called co-opetition, which tries to explain the horizontal relationship between two or more organizations (Bengtsson & Kock, 2000). Cooperation between competitors is becoming a more occurring event as the business world accelerates globalization. To cope with higher uncertainties, many companies have turned to co-opetition (Bouncken et al., 2015; Bengtsson & Kock, 2014; Gnyawali & Park, 2011). It has also given rise to increased research on co-opetition, as the academic world tries to describe the phenomenon of this complex relationship. The increased interest in the subject has also
brought different perspectives as some researchers apply a game theory approach, resource-based, and other network-based approaches (Bengtsson & Kock, 2014), which makes co-opetition quite a broad field as different perspectives on the same phenomenon is present. Brandenburger and Nalebuff (1996) were first to use co-opetition in a academic context when they made a case for using game theory approach in business decisions, and not just for mathematical problems in the academic world. According to Bengtsson and Kock (2014), co-opetition should not be described as a trade-off between cooperation and competition, since that does not capture the complexity and the inherent paradox of companies both cooperating and competing at the same time.

3.2.1 Risks
Risk within co-opetition is inevitable since, after all, the involved firms are competitors. So even though much of the research focuses on positive aspects such as innovation, lowered costs etc., there are risks being involved that have to be taken into account. Opportunism by the firms involved is often cited as a risk since it may damage individual competitive advantages (Bouncken & Kraus, 2013). Having to disclose vital information for the success of the project is a necessary evil as it may have a negative effect on the firm. However, sharing information is required when collaborating on a new product (Lee & Johnson, 2010). Conflicting ideas when it comes to design aspects can also pose a risk as it may force a dismantling of the relationship if an agreement is not found (Bouncken & Kraus, 2013). In addition, this adds to what many describe as the paradoxical nature of co-opetition, which is also a source of tension that often arises within co-opetition and is something that may endanger the whole relationship.

3.2.2 Tension
Cooperating with one’s rivals has, of course, some challenges that need to be taken into account to see the relationship thrive. These challenges are multi-layered according to Fernandez et al. (2014) and can be found on an inter-organizational level, down to an individual level. The authors found that the involved parties had difficulties when deciding on what information to share and protect, after all, they were involved with a competitor. What information to share can be a source of tension between both organizations and individuals, nobody wants to share too much and give away information that can damage their own organization. But at the same time, it is essential to provide enough information for the project to succeed, but without giving away sensitive strategic details (Fernandez & Chiambaretto, 2016; Bouncken & Kraus, 2013). This makes co-opetition something that has to be carefully managed by all involved parties, the shared and created knowledge within the collaboration runs the risk of being exploited for one organization gain, but at the loss of others (Lee & Johnson, 2010).

Bengtsson et al. (2016) distinguish between two types of co-opetition tension: external and internal tension. Managers having to engage in both cooperation and competition creates a difficult situation when trying to balance the two, when trying to create joint value in addition to maximize the value generated. Internal tension concerns the lower levels of co-opetition, in
which the daily work is done. This kind of tension can occur between engineers who do not see the need for cooperating with engineers from their rivals, which can possess an obstacle to the vision because of a difference of view between the top management and the lower levels (Bengtsson et al., 2016). Therefore, managers have to make sure that the objectives and missions among the parties involved are mutual, any differences can lead to tension as they are working towards different sets of goals (Fernandez et al., 2014). As a result, this can lower the level trust and create a situation where the firms are pointing fingers at each other. But they found that it could lead to opportunistic behavior where the firms only saw to their own interests.

It is likely that a collaboration includes some firms that are more prominent and more influential than others. This can create a power dependency in the relationship where the stronger actors exploit at its own gains at the loss of the weaker parties. The power can come in the form of financial and technological power, where the stronger party has the upper hand in the negotiation (Tidström, 2014). But it can also come in the form of just being a larger organization, which can cause problems when it comes to pricing a product as the larger organization can work with lower margins. This puts the smaller or weaker organization in a situation where it has to make decisions that are not optimal for themselves and that in the long run might hurt them (ibid, 2014). There is also a risk that the big firms force small firms to share information to grant them access to their value chain, where the big firm gets access to the small firm core competence making it easier for them to replace the small firm (Osarenkhoe, 2010). Osarenkhoe (2010) likened it to a healthy and sound relationship turning into a controlling relationship that consequently is hurting the small firm.

How co-opetition projects should be governed can be a source of tension, as most firms do not want to let a competitor lead a joint project. This can create the perception of one firm being more capable than the others, catching more attention from potential customers. But even though leading the project comes with higher levels of risk, many firms find that a risk worth taking (Fernandez et al., 2014). However, managing this and not letting it become a source of tension is an important factor in maintaining the relationship. This has the potential of creating opportunistic behavior that might push a member to walk away with sensitive information (Lee & Johnsson, 2010).

3.3 Co-opetition framework

Gnyawali and Park (2011) developed a framework for future research into co-opetition between, as they called it, “giants” focusing on cooperation between large companies. The framework lays out three different aspects which together forms and, in the end, affects the outcome of the collaboration. These are co-opetition drivers, co-opetition capabilities, and co-opetition dynamics.

3.3.1 Co-opetition drivers

Gnyawali and Park (2011) identified the main drivers as challenges and opportunities in an industry which includes technological change, the convergence of technology and investment
in R&D. Bengtsson and Kock (2000) stated that companies were forced to cooperate because of innovative performances in the industry, thus collaborating is a way of preventing falling behind. If rivals find common ground for cooperation, it can have the potential to benefit all involved parties and might even benefit the industry as a whole. Change in technology is often identified as a driving force as it requires significant resources in forms of both knowledge and investments (Bengtsson & Kock, 2000; Gnyawali & Park, 2011; Bouncken & Kraus, 2013). It is possible to save both time and money by sharing the cost of development for new technology. Technological breakthroughs in recent years have not been the outcome of one isolated firm's work, but rather from multiple firms working together (Nieto & Santamaria, 2007).

A partner of the cooperation often has superior or relevant resources and capabilities, making a partnership attractive for both parties if each actor has something the other one is lacking (Gnyawali & Park, 2011; Lee & Johnson, 2010). But resources in the form of knowledge is not the only driver of co-opetition. Collaborating on innovation is also motivated by lowering the costs, as it leverages economies of scale (Bouncken & Kraus, 2013). In addition, risk can be reduced when developing new technology or entering new markets as it is shared among the members of the collaboration, as the cost can be too high for a single firm (Luo, 2007). Sharing strategies and aspirations can be making a specific technology the standard, as it forces firms to collaborate to create a new technical standard. To maintain and continue to evolve the relationship, these drivers are essential since they are the foundation of the whole relationship (Gnyawali & Park, 2011).

Czakon and Czernek (2016) proposed that firms should engage more actively in co-opetition because of their finding of it benefiting the cooperation, they found that the collaboration was able to maximize the common benefits the more companies who joined. But also, since the benefits increased the more engaged the firms become in co-opetition. However, the positive impact of co-opetition is not only limited to the participants of the specific cooperation, but also the industry as a whole since it drives up the overall competition and innovation. It also forces other companies to find possible relationships within the industry (Gnyawali & Park, 2011), making the co-opetition relationships of others a potential driver for those who are yet to become engaged.

### 3.3.2 Co-opetition capabilities

The capabilities of the firms involved are important factors because of the stressful and challenging nature of co-opetition, where managing the relationship internally and externally is one the most critical factors. Even though firms are engaging in cooperation, they still have to prepare for competition and beware of the fact that the relationship might strengthen their rival. The skills a firm has internally is not the only factor in facilitating innovation and competitiveness, but also how well the firm absorb external technological knowledge and skills plays an important role (Nieto & Santamaria, 2007). These are the internal capabilities of a firm and includes the ability to learn and cooperate with other firms, as it puts the company in a better position to extract the benefits (Gnyawali & Park, 2011). By internalizing the partner's skills and knowledge, it can be used to create future value outside
of the cooperation (Luo, 2007), which can be used for other technologies or markets in the future. Moreover, having experience of co-opetition has been proven to be an essential factor in the success of individual firms when it comes to managing the inevitable tension and extracting value from it, which makes the experience one of the most important capabilities. This means that those firms who have engaged in co-opetition are better set up for handling the paradoxical nature of it (Bengtsson et al., 2016). Other important aspects of co-opetition are that managers have to be able to think paradoxically, constantly managing the dual relationship and letting either side get the upper hand. But also, having a shared view on the benefits and reasons for engaging in co-opetition can help reduce tension, both externally and internally, which makes the capabilities of the managers vital (ibid, 2016).

International co-opetition adds layers of complexity to co-opetition, even though it might be fruitful, it will also be a demanding relationship for the involved parties. For instance, cultural differences can pose a problem with differing perceptions of trust, innovation practices, and organizational processes, which increases the risk compared to domestic co-opetition. There is also increased risk connected to the uncertainties of different political, economic and legal systems varying internationally (Vanyushyn et al., 2018). Therefore, the risk and complexity increase as companies choose to engage in international co-opetition, however there are also benefits of international co-opetition. Through international co-opetition, it is possible to combine more diverse resources and unique knowledge from across the globe. Vanyushyn et al. (2018) also found that international co-opetition was more likely to support radical innovation, whereas domestic co-opetition is more likely to support incremental innovation. When pursuing radical innovation through co-opetition, companies must focus on protecting their core knowledge and provide a safe exchange of knowledge. In the end, how well prepared a company is to profit from innovations sets them up for succeeding with co-opetition (Ritala & Hurmelinna-Laukkanen, 2013).

3.3.3 Co-opetition dynamics

The dynamics of co-opetition is about how the relationship forms and later evolves as the firm’s get more involved in the relationship. As the relationship progresses, it changes both external and internal parameters. For instance, environmental changes surrounding the relationship. But it can also mean conflicting goals, as all members aim at becoming the market leader (Gnyawali & Park, 2011). This will cause the balance to change between cooperation and competition depending on what the market demands, forcing the relationship to adapt and evolve following new demands (Luo, 2007).

Most companies who engage in co-opetition do so in projects regarding R&D, far away from the customer which is deemed to be the least problematic area (Bengtsson & Kock, 2000). Activities concerning the sales channels are rarely involved in co-opetition since this is too close to the customer. On the other hand, Rusko (2011) found production were more often the subject of co-opetition, but, as mentioned, rare when it comes to customer interactions. The strategic importance of sales is too essential to maintain the business, making it difficult to cooperate in that area. The view of the competitors can also vary within the same
organization, where one business unit can have a close collaborative relationship, and another one, a very competitive relationship (Bengtsson & Kock, 2000).

According to Akpinar and Vincze (2016), the difference in power is what decides the level of competition and according to them, firm’s will avoid competing if there is not a balance of power among actors within the collaboration. Powerful firms tend to take advantage of smaller firms to increase their position within the competition. But if the power dynamic changes within a collaboration, it could also change the level of competition. An important factor in avoiding this kind of exploitation is the governance model, how the relationship is structured to safeguard and keep it balanced (Akpinar & Vincze, 2016). Gnyawali and Park (2011) observed that engagement from top management played an essential role in the formation of the partnership when they were making strong commitments to it. This may also prevent opportunism from both parties. Competition does not come with a governance model between the firms involved (apart laws regulating), but cooperation has to be governed through contracts and formalized policies to prevent unintended outcomes (Luo, 2007). This changes the dynamics between firms in at least one aspect of the relationship, such as R&D, but keeps most of the interactions, those that occur through ungoverned competition. The partnership also has to be set up in a way that facilitates knowledge sharing and product development, supporting the creation of value, but still competing and trying to get the upper hand. Or as Gnyawali and Park put it: "creating a bigger value together while competing to gain a larger portion of the value" (2011, s.6).

Bouncken and Kraus (2013) studied co-opetition effect on innovation and what kind of innovation is fostered. They distinguished between revolutionary and radical innovation, where the latter is adjustments to already existing products. Revolutionizing innovation, on the other hand, is ideas and products that are new to the market, which also is the hardest one to achieve. Through a study of the innovations performance made of SMEs, the result showed that co-opetition had an adverse effect on revolutionary innovation, but a positive impact on radical innovation. Especially under specific conditions where learning and technological uncertainties are high (Bouncken & Kraus, 2013).

### 3.4 Analytical framework

A combination of co-opetition and blockchain composes the study’s analytical framework, as it aims to discover the challenges of the complex relationship of co-opetition, but in the context of blockchain. Co-opetition is a field of study that tries to explain dualistic relationship when engaging in cooperation and competition at the same time, which is why it is a relevant field of study when identifying the challenges of such a relationship. The previous chapter concerning blockchain aims to explain the unique features of the emerging technology, which is related to the development of a common infrastructure.

The analytical framework is constructed in a sequenced manner in which the outcome is the challenges. Co-opetition drivers are the starting point, it is the motivation for engaging in
such collaborations, as presented in section 3.3.1, co-opetition drivers consist of different variables. These variables are summarized in the framework as:

- Technological challenges and opportunities
- Superior and relevant partners capabilities and resources
- Firm strategies and aspirations

The variables aim to explain the underlying reasons for joining the collaboration but also how it plays a role in the challenges of the collaboration. Joining a collaboration for different reasons or having conflicting aspirations can have a negative effect on the relationship, therefore posing a challenge down the road. But co-opetition drivers mostly provide a foundation for understanding the formation and evolution of a collaboration, in addition to the involved firm’s capabilities.

Co-opetition capabilities relates to how well suited individual firms are for engaging in co-opetition relationships. These capabilities are further discussed in the previous section 3.3.2 in the analytical framework and are summarized as:

- Co-opetition experience
- Resources

Each individual firm’s capabilities affect co-opetition relationships. This can be affected by the formation and evolution (co-opetition dynamics) as experience and resources plays an important role. Firms with little experience and resource are more likely to fall victim to opportunistic behavior. They are also less likely to be able to handle the paradoxical nature of co-opetition, therefore negatively affecting the collaboration. But this also affects the outcome of the collaboration as firms with low co-opetition capabilities are less likely to succeed and extrapolate the value created.

The formation and evolution are called the co-opetition dynamics as presented in section 3.3.3. Co-opetition dynamics is affected in two ways, as both drivers and capabilities play a role in how the relationship forms and evolves. The co-opetition dynamic variables in the analytical framework are:

- Formation of the relationship
- Evolution of the relationship

As the relationship progresses, it is bound to at some point face challenges. This can, for instance, relate to shifts in market demand but also be an effect of differentiating drivers and capabilities among the participating firms. The co-opetition dynamics is to a large extent what decides the challenges of co-opetition relationships, as it is here most variables comes together and later plays out.

Blockchain aspects are meant to capture the unique aspects of the technology and the challenges it poses. This is done through the use of a technical description of decentralization and centralization, in addition to public and private blockchains. The use of these essential blockchain characteristics contributes to the analysis of identifying challenges of creating a
standardized infrastructure, which for instance, is meant to capture possible external challenges related to competing blockchains to the financial industry’s solutions.

- Decentralized vs centralized blockchains
- Public vs private blockchains

The combination of these four categories lay the foundation for this study’s analysis model:

![Diagram of co-opetition model](image)

*Figure 4. The analytical model illustrated by authors.*

### 3.5 Why co-opetition

Since this study sets out to identify and analyze the challenges of collaboration when developing a shared infrastructure, co-opetition theory deemed to be the best-suited field of study. Co-opetition studies the paradox of cooperation with your competitors, both the effects of the involved firms and outcome of the relationship (Bengtsson & Kock, 2000; Gnyawali & Park, 2011; Bouncken & Kraus, 2013). However, power dependence theory and network theory were considered but fell short for different reasons. Power dependence theory is mainly concerned with the structure of power within relationships and how it is formed (Emerson, 1962). This would have been an interesting aspect, but it does not capture the complexity of collaboration as the theory is too focused on power. It would have been a good alternative if, for instance, studying the structure of power within consortiums. Furthermore, network theory was also considered as it can highlight the social relationships between the involved firms and how it affects the collaboration (Salancik, 1995). But focusing on relationships and the interplay between actors does not quite capture the larger picture and the complexity of cooperation between competitors. As a result, co-opetition theory was chosen as the foundation of the analysis model.
4. Methodology

The fourth chapter presents this study's methodology. First, the approach and strategy of the research are presented. Secondly, the methods of primary and secondary data collection are reviewed and discussed. Finally, the study's operationalization is described in addition to the critical considerations of the methods used.

4.1 Research approach

This study sets out to identify and analyze the challenges of developing a standardized infrastructure built on blockchain technology. This was done through a comparative case study, more specifically, through a pre-study and a main study. The focus of a case study should not be on the outcomes and results, instead, the focus lays on the relationships and processes that led to those outcomes, explaining why something happened (Denscombe, 2010). First, a pre-study was conducted through interviews which had the purpose of providing insight into the status of blockchain technology within the financial space. These interviews were made with three respondents, one professor and two journalists. Secondly, the main study involved four respondents representing the three banks Nordea, Danske Bank and SEB. These interviews provided information about the collaborations that these banks are involved in, which then was used to identify and analyze the challenges that each individual bank experienced.

Cooperation is necessary to develop a technical standard, forcing rivals to form alliances. Blockchain is deemed by most banks as something that demands a collaborative effort, making the challenges of collaboration an important factor to in the end succeed. Studying how different actors view both blockchain and cooperation will shine the light on the challenges regarding both matters. In order to seek these insights, an exploratory approach was adopted which enabled this study to change direction when new data appeared that challenged the current path. In addition, an exploratory approach can bring more flexibility to a study as it can provide a broader focus on the approach initially, and eventually narrow it down (Saunders et al., 2007). This approach enabled the study to adapt to the data collection process and potential challenges that needed further examination. Flexibility is also beneficial as blockchain is an emerging technology with insufficient research made on the collaboration aspects of it, making it essential to re-evaluate past positions continuously.

4.2 Research strategy

A qualitative research strategy was found to be best suited for this specific study. According to Saunders et al. (2007), this method contributes to a multidimensional description of the phenomena being studied and enable data to be gathered in many different forms. The study's research is practice-oriented since the aim is to contribute with the knowledge to the practitioners, i.e. the banks. By identifying the challenges of developing a standardized infrastructure, it provides insights into management practice in the context of cooperation among banks, not verifying a specific theory. According to Dul and Hak (2008), the success of practice-oriented research is reaching an empirically correct conclusion about the studied
object. The studied object, in this case, being R3 and three of the banks participating, which was done through the lens of employees directly involved in the consortium. Furthermore, collecting data from two or more instances are called a comparative case study, which is used when one instance is not enough to answer the research question (Dul & Hak, 2008). It was necessary to collect data from more than one instance in this study since collaboration takes part between two or more parties, which also brings different perspectives to the same case.

As the study's main data collection consist of semi-structured interviews and thus limiting the number of participants, it was important to choose respondents who had been directly involved in R3, in addition to respondents that work with blockchain solutions at their respective banks. Also, finding respondents with similar roles to each other provided similar perspectives from each bank on the collaboration, as it could have affected the data collection if the respondents had different roles and thus not working on the same types of projects.

A comparative study can show any discrepancies between two or more cases, providing a more comprehensive view of a phenomenon (Bryman & Bell, 2013; Dul & Hak, 2008). As cooperation is a central part of developing a standardized infrastructure, a comparative case study was preferred over a single case study to understand better the challenges posed. Also, going in-depth with three banks provided a comparative view because of their different views on the collaboration and the technology itself. However, it could be argued that the study is a single case study since it mainly focuses on one case (R3), but with multiple perspectives from three of the participating banks within the R3 consortium. Also, using multiple sources is encouraged when using a case study approach, since it allows the researchers to use a variety of sources and data (Denscombe, 2010).

4.3 Methods

The study mainly focuses on the challenges of the consortium so far. This is why it was essential to receive knowledge about the phenomena from actors who are involved in blockchain consortiums, but also to get an outside perspective from experts within the blockchain space. Therefore, a pre-study consisting of journalists and senior researchers was conducted who could provide knowledge of the projects and the technology. But also, and more importantly, a main study consisting of respondents directly involved in the consortium, representing the three Nordic banks. A more in-depth approach through interviews was best suited to provide a better understanding to be able to analyze the challenges, which enabled the interviewee to share how they experienced the collaboration and other opinions regarding the technology and the collaboration. Moreover, the data collected through the interviews were semi-structured during the interviews with the actors within blockchain consortiums, and unstructured during the pre-study with the blockchain experts. The semi-structured strategy was chosen in order to enable more flexibility and therefore conduct better data with the right to change the order of the questions, in addition to adding supplementary questions. This structure also enabled the respondent to elaborate on the more interesting topics (Denscombe, 2010). Moreover, an unstructured strategy gives the interviewee the chance to talk about a topic in a non-directive way (Saunders et al., 2007). This method was applied
during the pre-study to enable the informant to talk freely about our area of topic. The semi-structured interviews were later transcribed, this enabled an analyzation of the tone of the participants and other verbal communications.

![Figure 5. Structure of method illustrated by the authors.](image)

### 4.4 Data analysis

The analysis of both the primary and secondary data was done according to the analytical model presented in 3.4. Coding the material help making sense of large sets of data, which is usually generated through qualitative research (Bryman & Bell, 2011). But they also point out that coding has its downsides, as it removes the data from its social context which can lose the narrative of the respondents. This is an issue that has to be considered and addressed through creating a storyline that puts the words of the respondents in the correct context. First, the data were coded and grouped into categories, a technique used to distinguish the parts of the data that were best suitable for the analysis. The collected data were then grouped into co-opetition drivers, co-opetition capabilities, co-opetition dynamics and blockchain aspects, and later color-coded. According to Denscombe (2010), the importance of each part of the data should be considered in addition to which parts that could be merged. Secondly, the data of each category were assessed and rated upon its importance according to the aim of the study, whereas the essential parts were used in the empirical findings and the less significant remained unused. Thirdly, co-opetition theories and a description of blockchain were used to catch the aspects of cooperation between the banks to discover challenges related to cooperation. These components helped to showcase the unique aspects of collaborating in developing a shared infrastructure, but also to analyze the external threats to this solution coming from blockchains with other capabilities. These categories are represented in Figure 4, which together contributed to identifying problematic areas within each category that was used in the analysis of the identified challenges.

### 4.5 About R3

R3 is an enterprise blockchain software company consisting of more than 180 employees in eleven countries. But it is also a consortium network, which includes over 200 financial institutions, regulators, technology companies etc., around the globe (R3, 2018). These are all the members of R3 who have either paid the commitment price tag of 250 000 USD (Tapscott & Tapscott 2016) or taken ownership of the company by becoming an investor, all to be part of the collaboration around building Corda. The Corda software is being developed by R3
themselves together with these members, but also together with their partnerships, which consists of over 80 partners including companies like Microsoft, Oracle, Hewlett Packard and Intel (R3, 2017). Together all the members and partnerships contribute to realizing the vision of creating a standardized infrastructure for financial agreements, an open source platform where they or anyone who wishes can develop interoperable applications (called CorDapps) on Corda to bring more value to their customers (Hearn, 2016). The third version of Corda was released March 2018, which included features that, according to Mrs Katelyn Baker Software Engineer at R3, is an important step to in the future creating a DLT system that will deliver the promise of the technology (Medium, 2018).

4.6 About the banks

4.6.1 Why these banks?
As the study sets out to discover the challenges of creating a standardized infrastructure for blockchain, the financial industry was chosen as they have invested heavily in the technology. With R3 being largest and one of the consortiums, it was then narrowed down to the three Nordic members of R3, as it would be too complex to examine all members. There are in addition to these banks two additional Nordic banks that are members of R3: Finish OP and Norwegian DNB. However, the study chose to focus on the three largest Nordic banks, as they have similar resources and engagements within R3. They had also been most outspoken in the Nordic financial press. This resulted in Nordea, Danske Bank and SEB being the banks chosen to participate in this study.

4.6.2 Nordea
Nordea is the largest financial institution and third largest corporation in the Nordic region. They are active in 17 countries, but their main markets are Sweden, Finland, Denmark and Norway. Nordea is a full-service bank with four business areas: Personal Banking, Commercial and Business Banking, Wholesale Banking and Wealth Management. Nordea had around 30 000 employees and 9,5 billion EUR revenue in 2017 (Nordea, 2018).

4.6.3 Danske Bank
Danske Bank is the largest bank in Denmark and one of the largest financial corporations in the Nordics. They are a full-service bank and is active in 16 countries, prominently in Europe. They are providing services ranging from life insurance to wealth management and serves private, business and institutional customers. Danske Bank’s headquarter is in Copenhagen, Denmark, employing around 19 000 people and had 6,4 billion EUR in revenue in 2017 (Danske Bank, 2018).

4.6.4 SEB
Svenska Enskilda Banken (SEB) is the smallest bank of the three with the majority of their business concentrated in Sweden and the Baltic region. SEB has a strong affiliation with business and entrepreneurs, almost like a niece, especially in Sweden. SEB provides the same
kind of services as the other two banks and has their headquarters in Stockholm, Sweden. SEB have almost 16 000 employees and had 4.4 billion EUR revenue in 2017 (SEB, 2018).

4.7 Data collection

4.7.1 Pre-study
To get an overview of both the financial industry and blockchain, a pre-study was conducted containing three interviews with experts on blockchain. First, Dr Rickard Grassman at Uppsala University was interviewed as he is an expert on the emerging field of blockchain, an interview that provided insights on the possibilities but also challenges that lays ahead for the technology. Two journalists were then interviewed regarding both the financial industry and blockchain, sharing their insights and pointing out challenges for implementing blockchain in the financial industry. One of them wanted to remain anonymous, as he felt it might be a sensitive subject for the banks. The other one was Jonas Leijonhuvud at Di Digital. Both journalists pointed to the collaboration aspect of blockchain and particularly among banks. This gave the study direction to examine the financial industry and the possible challenges of adapting blockchain within this space.

4.7.2 Main study
The main data collection consisted of interviews and follow-ups with four respondents regarding blockchain technology, representing Nordea, SEB and Danske Bank. All of the respondents have been actively involved in collaboration in the form of consortiums with other banks regarding blockchain. However, there are not any finished projects or released products in this space since this technology is a rather new phenomenon. Therefore, the interviews mainly focused on the work done so far within the blockchain consortium R3. Moreover, focusing on the collaboration in a perspective of the work done up to the point of the interviews provided insights into challenges of the paradox of collaboration among competitors. The participating respondents interviewed were chosen because they were deemed as best suited due to them being the most experienced of involving in activities related to blockchain consortiums in their respective bank. The chosen respondents actively work in collaboration with other banks and are often quoted in the press when there is an article regarding blockchain in the financial industry. In addition, the respondents have also worked on the same projects within R3 and can thereby complement each other on this topic. This will bring different perspectives from four different respondents, but also from three different banks. Moreover, making sure that the four respondents had experience of blockchain cooperation was important as the study aims to identify the challenges of such collaborations. However, the number of respondents is limited as activities related to blockchain is a small area within the financial space, with a small number of personnel working with blockchain at the banks and an even smaller number working directly within R3. Add to that the fact that the number of Nordic members is limited, which also limits the potential number of respondents and describes the reason to why there are quite a few respondents to this study.
The first interview of the primary data collection was conducted with Nordea’s Head of DLT & Blockchain, Mr Ville Sointu. Since Mr Sointu is situated in Helsinki, the interview was conducted through Skype on the 9th of April 2018. Mr Sointu is involved in both R3 and we.trade, another blockchain consortium within the financial space (a joint venture initiative consisting of nine banks around Europe, including banks like HSBC, Deutsche Bank and Banco Santander), which he has lately been seen in the press lately talking about. This interview provided the foundation for the primary data collection, as it gave the fundamental insights and how to pursue the study further. The second interview was conducted through Skype on the 13th of April 2018 with Danske Bank’s Global Head of Blockchain, Mr David Grundy. Since the interview with Mr Grundy also took place via Skype, it had a similar form as the one with Mr Sointu and provided a second opinion on the same questions. A face-to-face interview was later done with Mr Kristian Gårder Head of Digital Banking at SEB, which took place at SEB’s headquarters on the 18th of April 2018. The interview with Mr Gårder was conducted to further deepen the data provided by Mr Sointu and Mr Grundy and fill blanks areas where it was deemed as necessary. The interview with Mr Gårder was more in-depth in character compared to the previous ones since it was done face-to-face. A physical interview allows both the conductor and respondent to read each other’s body language that might nuance the interview (Bryman & Bell, 2013). Mr Gårders interview was then followed by another interview with his colleague Mr Johan Hörmark, operating in the Large Corporations and Institutions CIO Function at SEB. He was recommended as a person of interest by Mr Gårder as Mr Hörmark has worked closely with R3. The interview took place on the 9th of May at SEB’s office at Kungsträdgården in Stockholm. This allowed for the study to gradually make the data collection more specific as certain areas of the initial interview were more interesting and relevant, which therefore demanded further investigation. The interviews were then complemented with follow-up questions through email and telephone. These took place after the initial analysis of the data and therefore provided insights on areas that were in need of a further collection of data. A summary of the interviews is shown in table 1.

<table>
<thead>
<tr>
<th>Information</th>
<th>Respondent</th>
<th>About the respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interview 1</strong>&lt;br&gt;(Skype)&lt;br&gt;2018-04-09&lt;br&gt;Nordea, 50 min</td>
<td><strong>Mr Ville Sointu,</strong>&lt;br&gt;Head of DLT &amp; Blockchain</td>
<td>Mr Sointu led the blockchain team at Nordea and has been involved in both R3 and we.trade.</td>
</tr>
<tr>
<td><strong>Interview 2</strong>&lt;br&gt;(Skype)&lt;br&gt;2018-04-13&lt;br&gt;Danske Bank, 40 min</td>
<td><strong>Mr David Grundy,</strong>&lt;br&gt;Group head of Blockchain &amp; DLT</td>
<td>Mr Grundy leads all of Danske Banks blockchain initiatives and works closely with other business units.</td>
</tr>
<tr>
<td>Interview 3</td>
<td>Mr Kristian Gårder, Head of Digital Banking</td>
<td>Mr Gårder has been working with R3 since SEB joined the consortium in 2015 and has had central role in SEBs participation since.</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>(face-to-face) 2018-04-18 SEB, 60 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interview 4</th>
<th>Mr Johan Hörmark, Large Corporations and Institutions CIO Function</th>
<th>Mr Hörmark is the head of operation and supervises all of SEBs projects within R3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(face-to-face) 2018-05-09 SEB, 60 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Data collection respondents.

4.7.3 Secondary data
Secondary data was gathered from press releases from Nordea, SEB and Danske Bank and news articles containing direct quotes with representatives of the Nordic banks. This was used to create an overview of the Nordic banks work with blockchain and past statements regarding the blockchain consortiums. In addition, the secondary data was used as a compliment to the primary data. It helped to get a better understanding of the context and painted a picture of the landscape in which the banks were active in. The secondary data also provided a starting point for the interviews as there was quite a lot of information to be found online, especially regarding R3. This helped to formulate the interview questionnaire as to highlight certain key points to be further explored.

4.8 Operationalization
The interview questions were grouped into five different categories: Background, Co-opetition Drivers, Co-opetition Capabilities, Co-opetition Dynamics and Blockchain aspects. Questions regarding the background provides a backstory of the respondent, while the remaining four categories are based on the analytical model presented in the analytical framework (Figure 4) used to identify challenges. First, co-opetition drivers are the underlying reason for rivals to engage in cooperation, what motivated the banks to join a global consortium? The questions in this category were related to the variables of co-opetition drivers, consisting of technological challenges and opportunities, partners capabilities and resources and strategies and aspirations. An understanding of these variables can give further insights into the respondent’s sentiment towards a collaboration, but more importantly the main drivers behind the reason for joining it. Secondly, managing a co-opetition relationship is an important factor and questions regarding this fall under the co-opetition capabilities category. The capabilities of handling a relationship are deemed as an important factor of success, as securing and appropriating information can create value in the future. This category was structured from its variables: co-opetition experience and resources, as these play an important part in both the success of the partnership and the success of the individual firms. Thirdly, is the co-opetition dynamics, which looks into the variables of how the cooperation is formed and how it has evolved. The questions related to this category is meant to investigate the structure of a collaboration and if has there been any changes to its
formation as it progresses. Fourthly, the last category aims to examine any challenges specifically related to the blockchain technology. These questions were related to two of the technology’s main characteristics, namely decentralization vs centralization and public vs public. Examples questions of each category are given in Table 2 below and which theory it is based upon.

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples of Questions</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Background</strong></td>
<td>What is your background? What is your role at the company?</td>
<td>Bryman &amp; Bell, 2013</td>
</tr>
<tr>
<td><strong>Co-opetition Drivers</strong></td>
<td>What was the purpose of joining R3? How would you describe the view on cooperation within the consortium? How do you sense the competition within the consortium?</td>
<td>Gnyawali &amp; Park, 2011; Bengtsson &amp; Kock, 2000; Bouncken &amp; Kraus, 2013; Nieto &amp; Santamaria, 2007; Lee &amp; Johnson, 2010</td>
</tr>
<tr>
<td><strong>Co-opetition Capabilities</strong></td>
<td>What makes your organization capable of cooperating? How do you make sure to learn from R3?</td>
<td>Gnyawali &amp; Park, 2011; Nieto &amp; Santamaria, 2007; Bengtsson et al. 2016</td>
</tr>
<tr>
<td><strong>Co-opetition Dynamics</strong></td>
<td>How do you come to mutual understandings? Can you describe your banks work within R3? How has the collaboration evolved?</td>
<td>Gnyawali &amp; Park, 2011; Luo, 2007; Bengtson &amp; Kock, 2000; Akpınar &amp; Vincze, 2016; Bouncken &amp; Kraus, 2013</td>
</tr>
<tr>
<td><strong>Blockchain aspects</strong></td>
<td>What threats do you see from decentralized blockchains? What threats do you see from public blockchains?</td>
<td>O'Leary, 2017; Tapscott &amp; Tapscott, 2016; Antonopoulos, 2017</td>
</tr>
</tbody>
</table>

*Table 2. Operationalization.*

### 4.9 Critical considerations

There are several to made critical considerations regarding the choice of method. First, the data collection method used could be discussed if this was the best approach to collect data that is a correct depiction. It is important to consider that the approach of collecting data
through interviews could have limited the study and excluded insight that could have been collected by the use of another approach. For instance, a survey directed to include personnel at the three banks SEB, Nordea and Danske Bank could have provided the study with other perspectives which also could have caught the challenges perceived from a lower level, not only from leading personnel. Instead, the strategy used of interviewing representatives who have a leading role within the blockchain technology space could have limited this study’s findings, resulting in challenges perceived at other levels getting left out. In addition, a survey could also have been used to involve actors outside the Nordics, which could have given the study a broader perspective, providing different challenges than those experienced by the Nordic banks as mentioned earlier, the actors representing the Nordic in these collaborations are limited. Which only represent a small fraction of the financial institutions that are involved in these collaborations, which in fact consist of over 200 more actors worldwide. Another method that could have been used is observations. This method could have given more insights into how the banks daily work with blockchain technology, in addition, to collect more data about the interaction with R3 and the other members of the consortiums. But this type access was not obtainable unfortunately. Furthermore, another thing that is important to acknowledge is that the study does not have any respondents from R3 themselves, which is due to them turning down our invitation to take part in the study. This leaves a question if respondents in form of employees at R3 could have contributed with valuable insights to the study.

Secondly, the data collected consist of subjective opinions as the study mainly relies on the interviews with representatives from the banks themselves, which makes it possible that the data would have been different with a different set of respondents. For instance, an observational approach could have provided a more objective depiction of the study as it would rely on first-hand experience. Also, important to acknowledge is that the relevance of the questions asked during the interviews could have been better structured, especially in the earlier interviews that were made. Each interview gave deeper insights on what to put more focus on and which questions that were more relevant to ask in relation to the purpose of this study, which led to each interview being different from the previous one and affected the overall continuous structure of the data collection. However, many triangulations where made and each interview builds on the previous one, which in the end resulted in the data collected having good relevance to answer the research question. Furthermore, the interview where also audio recorded and was transcribed shortly afterward to make sure all details were identified. This helps the collected data being used and depicted in the right way as it is an important ethical consideration to use the data provided by the respondents correctly (Bryman & Bell, 2013). Furthermore, it is also important to carefully considered research ethics to minimize the risk to harm the participants (Denscombe, 2010). To do this, information was given to the respondents about how their involvement would be used and how their contributions would be handled. Consequently, the participants of this study gave their consent to be interviewed and to be recorded.

Thirdly, and maybe most importantly to acknowledge is that the persons who were interviewed work for the banks who are a part of the consortium, but also close to R3. These
persons are therefore biased which could question whether they always answered the questions with the deepest truth, or sometimes withheld information to keep a good image. For instance, the competitive aspects of the consortium were nothing that the respondents felt was affecting the collaboration. This could be questioned whether this is true or if they truly have not entered the competition space yet and therefore not started to explore possible ways to get competitive advantages over the other bank members of R3. Also, two out of four respondents of the main study are representing SEB, whereas Nordea and Danske Bank have one respondent each. This is due to the two latter having a “Head of Blockchain & DLT” who has the main responsibility for blockchain related activities, while SEB has a more spread out responsibility that is shared by more than one person.

Last, press releases and company websites can sometimes be constructed out of the purpose of mediating internal communication, it is therefore crucial to critically review all data collected from secondary sources. This was done by carefully validating the source of the articles and press releases, which resulted in this study only using secondary data from reliable newspapers and press releases made by the banks themselves. One for instance being the largest financial newspaper in Sweden: Di Digital, which is a subset of Dagens Industri.
5. Empirical findings

The fifth chapter describes the empirical findings acquired from the interviews and collection of data from secondary sources. This section is divided into two parts. First, an overall presentation of the Nordic bank's involvement in blockchain consortiums is described. Secondly, a more in-depth description of the findings related to co-opetition is made. This part is divided by the principles of this theory, namely: co-opetition drivers, co-opetition capabilities and co-opetition dynamics. The last section provides the blockchain aspects of the empirical findings.

5.1 Drivers

The possibilities of the technology are believed to be vast and there are many different areas where it can be applied, some more exciting than others. Mr Grundy says that "cross-border side of things is maybe not the most revolutionizing, but it is of course still very interesting.", which is the main focus of R3. According to him, blockchain aspects of trust and administration will maybe become more revolutionizing. Overall, the interest for the technology is shared across the banks and is something they claim as a reason for engaging in the consortiums. There is also a fear of missing out, or "FoMo", as the banks do not want to repeat the past mistakes of companies who stood by and watched as the internet swept across the business landscape in the late 90s and early 2000s. But this is at the same time applicable to any new technology according to Mr Grundy. He then goes on to say that many projects will likely be overhyped and fail to deliver, as many companies during the dot-com bubble.

The risk of being left behind ... like with the internet some did not engage, and some did. But most banks engage with blockchain. But the risks are the same as with any technology, if you do not engage you risk on being left out.

- Mr Grundy

Both Mr Sointu and Mr Grundy stated that the banks a couple of years back did not really know what blockchain was and how it could be applied in the financial space. For them, the educational aspects of the consortium were the most important aspect of joining a consortium, at least in the beginning. Mr Sointu even described it as “group therapy” for banks, where they could come together and discuss this new technology to find out how it could be applied in the regulated financial space. In addition, he felt that the banks were not sure what this new technology would mean for the industry, and that made them come together. As for Mr Grundy, he described a similar need as Danske Bank felt the need to educate themselves regarding blockchain which R3 was the perfect starting point for.

R3 was formed as almost like this group therapy type of thing for banks because none of the banks really understood what was going on in the Bitcoin and blockchain space and they needed a place to come together to talk about this, and that turned out to be R3.

- Mr Sointu

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Mr Gårder said that SEB’s main reason of joining R3 was to fast-track the standardization process. He further explains that the opportunity to develop solutions based on DLT would most likely get lost if they failed at creating the infrastructure. This is due to the importance of the network effect, as he explains "the more participants that join R3, the more interesting it gets." The network effect or cooperating aspect of joining R3 is something that all respondent's points to as important. Mr Grundy cannot see blockchain succeeding without fixing the network first since banks have to collaborate on the network and then compete in other areas. He goes on to say that a single bank cannot come up with a solution on their own, it will not work for blockchain as it is a technology that forces the banks to collaborate. A monopoly is impossible, and anyone that tries to create one will fail in the end according to him. Furthermore, Mr Hörmark says it is unlikely that an "exclusive club" would succeed since it is an infrastructure that everybody needs to agree upon. He likens it with SWIFT: “...it would not be SWIFT if it were not available for most banks”. Even JP Morgan who left R3 to develop their own blockchain recently realized that they cannot keep it by themselves and needs to get other parties involved according to Mr Hörmark. That shows, according to him, the importance of getting as many banks as possible involved if blockchain is to succeed, and that is also why he believes in R3.

Even if a bank wanted to dominate the situation... it will not work. You have to cooperate in this context since you need other banks to use your network for it to work. So, there will not be a single solution that everyone uses…

- Mr Grundy

5.2 Capabilities

The financial industry has a long history of cooperating, especially in creating common types of infrastructures. Mr Sointu, Mr Grundy and Mr Hörmark point to common solutions like SWIFT, the ATM network and Swedish solutions like Bankgiro and BANKID. These are all cases that started as a collaborative effort and resulted in a common implemented solution. A lot of these types of standardizations exists and Mr Sointu argues that this has led to an existing mentality of collaboration within the financial space. Mr Sointu and Mr Grundy comment that the financial industry's experience with collaborating makes it easier to find common ground in the current blockchain collaborations. They both also say that banks have a clear understanding of what they cooperate and compete on, making it a relatively smooth experience for the banks involved. Mr Gårder also shares this view of the cooperation and adds that the Nordic banks are good at speaking to each other, even though they are main competitors. However, he also says that it would be an advantage if any competitors would fail at some point:

In our position, we are completely open to what we would call cost-effectiveness, it is clear that there is a competitive edge if a bank succeeds and the others fail…

- Mr Gårder

Although R3 is composed of around 200 banks from all over the world, the Nordic banks quickly identified their respective counterparts at each bank and began talking about how to
apply blockchain in a Nordic context, which led to their Nordic subset to be praised by R3 for its high level of cooperation, which also according to Mr Gårder is viewed as a role model by other banks. Mr Hörmark points out that some countries might not have the same capabilities of collaboration like the Nordic actors and takes the US as an example where bank payments take a long time. He further describes that it simplifies thing when the actors come from a similar culture and speak the same language, like in the Nordic subset of R3. In addition, Mr Gårder believes that the previous experience of collaboration among Nordic banks on BankID and Swish makes the Nordic bank especially capable and willing to cooperate since they had previous success. Mr Hörmark comments that the Nordic subset has been testing prototypes together. But, how far this has come is yet to be announced. However, the press and comments made by Mr Sointu and Mr Gårder imply that something is about to be announced very soon.

Danske Bank makes sure they absorb the information created from the collaborations according to Mr Grundy. He points to the portals provided by R3 as a tool they use related to learning from the cooperation, which is also their main form of communication and is something that is frequently used at Danske Bank. Through the portal, the banks can access labs, framework and get support on development processes. SEB, on the other hand, has to become better at learning from the cooperation around R3 according to Mr Gårder. He points to the fact that very few people are involved in this cooperation from SEB's side. However, they do have informative meetings, in addition to an interest group related to blockchain technology where anyone working at SEB can join. His colleague Mr Hörmark further emphasizes that learning-by-doing is essential for SEB and that it is important to spread information and knowledge about the project they are involved in throughout the organization, but he also says that they do not have a clear process for this. Mr Grundy continues on the learning from the cooperation topic by stating that R3 is very active in their client engagement and are actively working to support their members. Furthermore, the importance of education and learning about blockchain is something that Mr Grundy comes back to and comments on how important it is to educate not only within specific blockchain projects, but also the business units. He further says that his team has spent time educating internally but also that this is nothing different from the way they work with AI or another type of projects. All new technologies demand education for it to succeed and become broadly accepted within the organization according to him.

We spent a lot of time educating internally. With any innovation you have to educate the business, it is nothing different from AI projects...

- Mr Grundy

Finding relevant business cases is something that has shown to be challenging. For instance, to find ways to both lower costs and create value for the customers. Business cases that either create value for the customers or make internal processes more efficient are something that all three banks have had a hard time finding. In theory, they have all found useful business cases, but it has been harder to implement them. They all feel that the technology shows great promise, which they are heavily invested in it but at this moment, nothing in place working
on a larger scale. Moreover, it has been hard to find business cases where blockchain can have a significant effect to lowering the costs. Mr Gårder showcases this by saying they had a business case for currency trading that showed a lot of promise, but when it came down to it, it only lowered the cost by 70 000 SEK a month. Because the old system already had such low margins, this made the investment impossible out of a business perspective. He goes on to say that this change needed ten more in addition for it to be sufficient, but if they could not guarantee all ten, it would not be worth the effort. That showcases according to Mr Gårder the difficulties of implementing blockchain, because most solutions demand changes throughout the whole value chain.

Nordea addressed this problem through applying a business first approach, where they no longer take an idea just on the merit that it is blockchain. Instead, they have re-organized and now look at specific business problems or new business areas that they could enter, and if blockchain is the best solution, then that would be great according to Mr Sointu. But their focus is not finding ways to implement blockchain anymore, but to find the best possible solutions for business problems. All three banks have had a hard time finding ways to implement blockchain on a larger scale, and as for now, there are just smaller use cases which are mostly internally. However, they are applying a more business-specific approach which all four respondents believe to be the way forward.

…we never take an idea just on the merit that it is blockchain or distributed ledger technology, as we prefer to say, and then just push forward just because of that. We rather look at a specific business problem or a new business area that we could enter that is interesting and if it happens to use blockchain/DLT, then we evaluate if this actually is the best solution for the particular problem.

- Mr Sointu

5.3 Dynamics

All the respondents have a shared view that collaboration around a shared infrastructure is a challenge, but also something that is required. For instance, Mr Gårder points to the challenge of finding a mutual governance model for the banks to reach their vision. He further comments that this is due to the number of different projects within R3 and the amount of financial institutions being involved, which in the end makes the governance structure challenging. Mr Hörmark says that there have not been any issues when it comes to working on specific projects within R3, it has more been about getting things done. He further comments that a project can involve as few as 5-10 banks, with as many representatives during meetings. Moreover, subsets within R3 is a very common thing, where a few members of R3 come together to form a network for more focused projects. For instance, some are focused on payments, securities trading etc. As mentioned, even a collaboration between banks in the Nordic has been formed to work on a common infrastructure. However, the rights to the products that are being developed within the subsets only belong to the involved parties and are the ones benefiting from that project. In addition, the board from R3 act as support to the projects and to make sure that their Corda platform facilitates their requirements. In other words, they are the platform provider that operates in the background of these projects. Nevertheless, the parties involved in the project are the ones that set the
collaborative rules and the governance of that specific project. They have their separate contracts, as an overall one that covers all of the individual projects connected to R3 does not exist.

At a strategic level, the governance model is complex on how to structure the consortium. For instance, when the members of R3 had to decide on whether Corda should be open source or not, which divided the members into two different camps. Both Mr Gårder and Mr Hörmark says that the governance of R3 has evolved, it went from a start-up to now having banks actually owning shares in it. Through that process, R3 now has a much more structured corporate governance through stock ownership agreements and the governance has gone from zero to something much more defined according to Mr Hörmark. R3 now has a process for how new projects should be done and committees that reviews and asses if the projects are likely to succeed.

Also related to R3 governance model, a democratic process is the solution used to come to a settlement on the business processes and the common rulebook within a project. According to Mr Gårder, this process is structured through a voting system where each member of a project gets a degree of voting power in relation to their ownership. However, there is a limit on how much power each member can have. The feeling of R3 being a democratic organization between the members is also shared by Mr Grundy, Mr Sointu and Mr Hörmark, they all comments that finding a mutual understanding is something that most members values as they work towards a common solution.

It is participation rather than dictatorship, where there is not one who decides it all, but we rather find a mutual understanding on how to move forward.

- Mr Grundy

Despite this, Mr Sointu says that the parties fight over the requirement specifics all the time and oftentimes have different opinions regarding the end-product. He points to the we.trade meetings, which is another blockchain consortium that Nordea is involved in, as an example where they together define the processes, the rulebook and the governance structure:

It is pretty heated fighting, but that is just work, I mean that is how anything gets done. You express your requirements and then you come to a consensus on what does this thing look like and then everybody agrees to that. Or if they do not agree, then they go away.

- Mr Sointu

Mr Sointu says that R3 served a great purpose, but now as they move forward he sees more fragmentation where the banks split into different groups. He feels, as mentioned above, that specific uses cases will be the way forward. However, he also says that Nordea is and will continue to be a dedicated member of R3, but we.trade being their main focus in the coming time. Mr Sointu feels that we.trade is the most interesting project as it is more focused on delivering a finished product. On the other hand, Mr Hörmark is not sure if these kinds of projects will bring success as they are small and will need to bring other actors in to succeed. But he also feels that R3 has been to slow in releasing a product as it, after all, is a start-up
and should be quicker. He further explains that these types of projects like we.trade will have
a hard time working on a larger scale because of the difficulties of attracting other banks.
However, Mr Sointu firmly believes in the importance of putting out a working product.

In addition to the requirement of banks cooperating on the development of a common
infrastructure, SEBs Head of Transaction Services Paula Da Silva (SEB, 2016) also stresses
that certain competition surrounding the standard connected to blockchain exists:

We face huge leaps in technology and many players compete to create standards that enable global
solutions. It is not possible to predict who will be successful and therefore we have to experiment and
try different solutions. (SEB, 2016).

- Mrs Da Silva (SEB, 2016)

This can be related to the events of former members of R3 such as JP Morgan, Goldman
Sachs and Morgan Stanley leaving the consortium due to their intentions of developing their
own solutions. However, this is neither something that worries Mr Grundy. According to
him, the consortium has not been hurt by this and it will not affect the future. He further
comments that it is the technology that matters and not any individual banks. In addition, he
also points to the CEO of R3, Mr David Rutter, whom himself says that there will be a lot of
different solutions in the market and not a clear winner. On the other hand, Mr Gårder (Di
Digital, 2016) has raised former members leaving R3 as something that worries the remaining
actors of the consortium. This is due to actors like Goldman Sachs and Morgan Stanley
applying for patents after leaving R3, which he sees as a threat to common solutions like
Corda. He further explains that this has created a situation where actors are worried about
other members of R3 applying for patents on their own without discussing it with their
colleagues (ibid, 2016).

Mr Gårder, further comments on this by saying that certain financial interests exist of trying
to own the infrastructure due to the high value of the platform. He also points to Nordea and
Danske Bank developing their own platforms connected to some application areas of
blockchain, which he further thinks would be more advantageous if they instead focused on
building common natural platforms due to the value of the network effect. He again stresses
that the more banks that get on a blockchain, the better and more interesting it becomes. On
the other hand, he says, the stronger the private interests are, the more difficult it will be to
get along with developing common solutions (Mr Gårder). At the same time, SEB is also
developing solutions outside R3. For instance, they are building a solution for mutual funds
together with Nasdaq. However, Mr Gårder and Mr Hörmark point to this solution to be open
for everyone to join and be a part of, even their competitors. In the same way, Mr Grundy
also talks about banks developing their own solutions to reach a dominant position, similarly
to Mr Gårder, he neither think this is the best approach:

Even if bank a wanted to dominate the situation, it will not work. You have to cooperate in this
context since you need other banks to use your network for it to work.

- Mr Grundy
5.4 Blockchain aspects

The DLT solutions developed by R3 and we.trade are private and centralized. However, Mr Gårder expresses that public and decentralized forms of blockchains in some regard could be a threat to the financial system as we know it today, in addition to a future solution like Corda. He points to the need of a middleman being reduced in a blockchain-world and that this can come to challenge some functions of the current financial system. Mr Hörmark also says that other forms of blockchains can one day come to change the bank's position in the financial system, although he believes it will be long until that day arrives due to safety measures. He further says that a tipping point could be the day when countries start accepting cryptocurrency as tax payments, if that day arrives. But he believes in the end, that if the customer wants it that way then that day will come, even though he is a bit skeptical if they will want this degree of transparency. On the other hand, Mr Gårder comments that they as a natural intermediate will remain. For instance, he points to areas related to advisory like deposits and lending activities as a space that customer will still want to have a third party to trust. Mr Grundy further comments on this and says that the trust aspect of loans and financial guidance cannot be replaced by blockchain. However, he also says that he is aware that the banks will not be able to charge as much for services provided through blockchain, forcing banks to adapt to a future with smaller flows of income. This would especially hit the banks that dominate transnational transactions, as it would lower their streams of revenue according to Mr Hörmark.

If customers want it, then it will be so, but the question is whether you are prepared to have your shareholding transparent on a blockchain?

- Mr Hörmark

Moreover, Mr Gårder says that he prefers a public design and further refers to the pros and cons of both solutions. For instance, adopting a public solution will bring transparency for the customers to get insight into the network. Mr Gårder explains that the members of R3 had many discussions related to the private/public principle when deciding the design of Corda. This is something that Mr Grundy also touches on. He further believes that there is room for both solutions and does not see a competition between public and private blockchains. However, Mr Sointu stresses that a public solution is not an applicable solution for enterprises due to the nature of them being open and replicating data across the network, in addition to the transparency aspects of it. A reason to why solutions like the Bitcoin or Ethereum blockchains was not applicable in the first place (Mr Sointu). According to Mr Gårder, a private solution will let the banks have a higher level of control, run backup checks on third-party products and sort out the fraudulent elements. But at the same time, the customers could see this solution like them trying to get higher kickbacks by remaining the power to choose the third parties that the banks themselves prefer (Mr Gårder) Mr Sointu points out that the public and permissionless solution is something to watch out for. He comments that blockchains with these capabilities could be a threat to their customers due to it being a space that involves bad actors. Therefore, Nordea guides their customers to steer clear from everything related to public blockchains and hopes to see regulations that will
allow legal actors to grow in the public space, as well as, allowing financial supervisors to help with removing the criminal elements.
6. Analysis

The sixth chapter consists of this study's analysis. This section has the same structure as the previous chapter grouped by the co-opetition theory's principles: co-opetition drivers, co-opetition capabilities, and co-opetition dynamics. In addition, the last section provides the analysis of the blockchain aspects.

6.1 Drivers

The reasons or driving force behind the banks joining R3 varies, but they all point to a change in technology that they do not want to be left out of. Realizing that it is not something they can pursue on their own but instead must engage in co-opetition. Gnyawali and Park (2011) found the main reasons for participating in co-opetition being a technological change and lower cost of the development of it. This has been proven true in the case of the banks in this study, especially with Nordea and Danske Bank who stressed that the reason why they used R3, in the beginning, was to learn and understand the technology. Mr Sointu even described it as "group therapy" which served an important purpose in the beginning as the banks felt the need to come together as they did not know what to make out of blockchain. Dealing with uncertainties has been cited as one of the main reasons for the growth of the co-opetition phenomenon, as it provides the opportunity for the firms to meet on challenging subjects, such as new technologies. Letting the involved firms share the costs and saving time by coming together (Bengtsson & Kock, 2000; Gnyawali & Park, 2011; Bouncken & Kraus, 2013). The banks seemed to have valued the aspect of coming together and finding a mutual way forward rather than what has been shown in previous studies, where their drivers have
more been related to the lowering cost and saving time. Mr Gårder did say that speeding up the standardization process was one of the main reasons for joining R3, but none of the respondents expressed the cost aspect as one of their main drivers.

The case of JP Morgan first trying to develop on their own but now opening up shows that blockchain is a technology where collaboration is needed. It is apparent from the collected data that the view of cooperation is that of an absolute necessity, regarding both the interviews conducted but also the secondary data collected. This has been one of the primary co-opetition drivers since none of the respondents believes that any bank can successfully create their own blockchain solution. Instead, they all proclaim the need for collaboration and together building the standard, which has driven them all to become heavily invested in the consortiums. Leveraging the power of collaboration is something that Nieto and Santamaria (2007) pointed to as a way of achieving technological breakthroughs. Moreover, the network effect is something that both Mr Grundy and Mr Gårder felt necessary for blockchain to succeed, which is also why they felt the need for the consortiums. The more banks who joined, the more interesting it gets as Mr Gårder put it. This is shared by Czakon and Czernek (2016) who found that benefits extrapolated rose as more firms got involved, the level of engagement also had a positive effect on the outcome. This makes a case for engaging in such a large co-opetition project as R3, since it would at least, in theory, be able to leverage the power of over 200 of the world's largest financial institution. But there are also difficulties connected to the high number of firms involved in the cooperation, this is shown in the following section 6.3. The challenge is not understanding the value of collaboration, but to move forward at a fast-enough pace and come up with a finished product. So even though the banks are motivated by in large the same reasons, it has not been enough. But sharing strategies and aspirations can help maintain and evolve the relationship according to Gnyawali and Park (2011). Therefore, R3 still has the necessary co-opetition drivers to maintain the relationship, even though it is moving slow. If R3 can leverage the benefits of having this many banks involved, it is possible that the entire industries innovation and competition will get enhanced in the years to come.
6.2 Capabilities

According to Bengtsson et al. (2016), one of the most essential capabilities is the experience of previous co-opetition engagements, which make the organization better prepared for handling the paradoxical nature of it. This view is very much in line with the Nordic banks and their approach towards their co-opetition capabilities. All the respondents raised the history of international collaboration right away and pointed to common innovations like SWIFT and the ATM networks. For instance, Mr Sointu, Mr Grundy, and Mr Hörmark all addressed that the experience of collaboration within the financial industry makes it easier for them to find common ground in the current blockchain projects. This attitude shows that all three Nordic banks feel an existing mentality towards collaborating within the financial space. Therefore, this has created strong internal capabilities among the banks, which according to Gnyawali and Park (2011) relate to an organization’s ability to learn and cooperate with other firms. The history provides them with previous successful co-opetition situations to look back into and learn from, which in the end creates essential capabilities to manage new co-opetition situations. But as analyzed in the following sections, the banks internal capabilities when it comes to learning is low.

The Nordic subset within R3 shows that experience of co-opetition benefits the relationship, it has even been praised within R3 as a leading example for other regional collaborations. Through Swish and BankID, the Nordic banks have shown that co-opetition can be successful and create something that benefits all firms involved. Even though the ongoing collaboration it is yet to result in a product or application, it does not change the fact that they quickly started talking to each other and exhibited a will to cooperate. Bear in mind these banks are
fierce rivals in the Nordic markets. Moreover, by forming a Nordic subset, the banks avoided the risk connected to international co-opetition of different political, economic and legal systems identified by Vanyushyn et al. (2018), lowering the complexity in domestic co-opetition (which the Nordic subset arguably can be seen as). Sentiments were also expressed that the Nordic banks have had it easier to collaborate than in some other regions within the consortium. But as R3 aims to create a shared infrastructure the success of regional subsets is not enough, which makes international co-opetition a must. This means that the collaboration is facing the risks connected international co-opetition, domestic collaboration might work in specific projects or subsets but not when it comes to creating the shared infrastructure. So even though all respondents pointed to the fact that the Nordic subset has been getting praise, it is not proof that the cooperation is running smoothly. But rather indicate the opposite that the international is proving a difficult factor to cope with. Moreover, Vanyushyn et al. (2018) also state that international co-opetition better fosters radical innovation through leveraging more diverse resources and unique knowledge when firms form global collaborations. In other words, the Nordic subset might bring incremental innovations leaving the radical innovations to a more geographically diverse subset.

Another factor of co-opetition capabilities is the ability to absorb external technical knowledge and skills (Nieto & Santamaria, 2007). This was found to be one of the primary drivers that all the respondents raised as an explanation for why they joined the consortiums in the first place. However, the benefits the collaboration offers have to be properly extracted to put the organization in a better position (Gnyawali & Park, 2011), which the respondents had a different approach to. Mr Grundy is straightforward in this sense and almost quotes Nieto and Santamaria (2007) by stating that Danske Bank makes sure to absorb all the information created from the collaboration and then educate the business units. He further describes how they use the learning tools provided by R3 in addition to having frequent conversations within the organization. Mr Sointu describes a similar approach and comments that Nordea is trying to observe everything that goes on in the blockchain space. He points to them using a system where they run all the blockchain activities through to ensure they do not repeat previous mistakes. On the other hand, Mr Gårder, says that SEB must become better at learning from the R3 collaboration and points to that very few people are involved in the consortium from SEB’s side. However, he also points to SEB having information meetings regarding blockchain technology in addition to interest groups that anyone working at SEB can join. His colleague Mr Hörmark also gives an impression that SEB do not have a clear process to make sure to learn and take optimal advantage from the collaboration. But although he says that they try to involve people in the projects and spread knowledge internally, to not have a structured approach to do this could question how much they value the learning side of the collaboration. It seems like Nordea and Danske Banks has come the furthest in aligning their internal capabilities with blockchain, they both have internal processes for learning and created the position of “Head of Blockchain & DLT”. Which is something that SEB is currently lacking. Even though Nordea and Danske Bank seems to have superior internal processes of absorbing knowledge from the collaboration, it has not been shown in actual outcome. Therefore, the efficiency of these processes can be questioned as relevant business cases is yet to be found.
Finding relevant business cases have been proven difficult according to both Nordea and SEB, even though it is vital for both the technology and the consortium. Although this is not something that was expressed by Danske Bank, they have not presented any products suggesting they have come any further than the other two banks. Extracting knowledge from collaborations and thereby creating value for internally, can put individual firms in a better position (Gnyawali & Park, 2011). But in the case of R3, this would not only help individual firms but also the collaboration, since blockchain technology has had a hard time being adopted. Therefore, internal progress and working applications would benefit not just the individual banks but also R3 and blockchain at large. All three banks are trying to solve this through educating internally as the general knowledge on blockchain is low. The banks must make sure they absorb both technological knowledge and skills, as this can help facilitate innovation according to Nieto and Santamaria (2007). As mentioned, this is not just an internal issue in the case of R3 or blockchain, the banks have to find applicable business cases in order for both to thrive. But this has not been the case and might be a consequence of low internal capabilities in each bank, as none of them has been able to create value. This is in line with Luo (2007) and how internal capabilities can create future value in other applications.

6.3 Dynamics

According to Bengtsson and Kock (2000), it is common that co-opetition is performed around R&D activities that have a distance from the customers, due to it being deemed as a less problematic area. Proving to be correct in this case, as a final product remain to be
implemented, in other words the R&D stage still in progress. According to all the respondents, the R&D phase belongs to the cooperating space, and the competition space first begins when the applications and the offers to customers should be drafted. This raises the question whether the critical phase within the cooperation is yet to come when the implementation gets closer and the actors shift focus from cooperation to competition. Furthermore, according to Bouncken and Kraus (2013), risk can appear when agreements of design aspect is to be made, which can create tension between the actors. They further stress that this is a factor that could get a negative effect on innovation and in the end tear apart relationships. However, Bouncken and Kraus (2013), also stresses that this kind of tension could lead to new insights and push the cooperation forward, or with other words, it does not have to be negative. In the end, the ongoing R&D phase still leaves questions whether the design principles of the final product remain to be agreed upon and if this can come to create turbulence within the consortiums.

Dynamics connected to co-opetition is about how the relationships are formed and evolves over time (Luo, 2007). All three banks started their blockchain journey about the same time which was done through joining consortiums and by exploring the technology independently. This is where they engage in co-opetition, where competitors got together to form a vision to try and strive towards. Since then, it has been three years since SEB, Danske Bank and Nordea joined R3 in 2015, and so far, no product is set to be implemented as a part of their shared infrastructure. On the other hand, according to Mr Sointu, we.trade has a product that is almost ready, which he stresses is due to we.trade being smaller and therefore more efficient then R3. The size of R3 is something that all respondents have raised as an issue, especially when it comes to finding a suitable governance model for the cooperation. The governance model is one of the most significant aspects of co-opetition according to Akpinar and Vincze (2016), as the governance is supposed to safeguard and keep the relationship balanced for it to thrive. But as Mr Hörmark pointed out, the smaller projects do not have the reach that is needed for it to become broadly adopted. Moreover, the subsets within R3 adds to the complexity of the governance, which makes it difficult for the members to value which projects to join and prioritize. However, these challenges are something that they must overcome to develop a common infrastructure. There are also different opinions on how to move forward with the consortium and blockchain, as Mr Sointu feels the way ahead is through smaller and more focused efforts. Mr Hörmark, on the other hand, still feels the need for working on a larger scale. The evolution of a collaboration depends on changes in markets demands or if one or more members aims at becoming the market leader (Gnyawali & Park, 2011). But becoming a market leader does not seem to be the reason for Nordea putting more time and effort into we.trade. Instead, they value a quicker collaboration and value that a product is soon about to be launch. Which more likely is because of a shift in market demand of blockchain solutions, as this has been in the spotlight in recent months. Compared to we.trade, R3 has been slow when it comes to releasing a working product and as market demand and awareness is on the rise, getting first might be a competitive advantage. We.trade is about to launch their product and depending on the success of that project more banks might join, causing it to grow and achieving the needed reach.
All the respondents mediate that cooperation with other banks is required to reach their shared vision. This is due to the value of the network as Mr Gårder expresses as, the more actors that use a blockchain, the better and more interesting it becomes. On the other hand, as mentioned, he also points to Danske Bank and Nordea developing their blockchain ecosystems, which he further expresses as cynical as he thinks focusing on their shared solutions would be more advantageous for all of them. Mr Gårder and his colleague Mrs Da Silva have both expressed on different occasions that many actors compete at creating standards and the incentives of owning the platform. This could be a part of the reason why we have witnessed former members of R3 leaving the consortium to create their own blockchain solutions, which can be further connected to Mr Sointu’s statement that members leave the consortium if they do not agree to the terms. Lee and Johnsson (2010) relate to this scenario by stating that members leaving a cooperation can walk away with knowledge and sensitive information. This could be the case of Morgan Stanley and Goldman Sachs and the reason they applied for patents after leaving the R3 consortium, which further has affected the mood within R3 and also led to actors worrying about members within the consortium applying for patents. It has the potential to damage the members of R3 as firms leaving might pose sensitive information, which they actually did in the case of Morgan Stanley and Goldman Sachs. Opportunistic behavior is often cited as the number one risk when engaging in co-operation, Bouncken and Kraus (2013) says that it can damage the remaining firm’s competitive advantage. Even though all respondents in this study did not express any concerns regarding firms leaving, but as expressed in the interview in Di Digital (2016) members did worry when Morgan Stanley and Goldman Sachs left, which therefore seemed to have had a negative effect on the collaboration.

Another question that could be raised is about whether it will be possible to please all the members when the R3 consortium gets closer to an implementation of Corda, or if it will be the banks with more power in regard to their investment that will first and foremost get their way. Akpınar and Vincze (2016) touch on the question of power within a cooperation and stresses that differences in power are what decides the level of competition. They further point to the importance of balance in power among the actors to avoid competition. Tidström (2014) also describes this scenario as complicated and points to the creation of a power dependence situation where the stronger actors take advantages of the weaker. On the other hand, R3 has a limit set regarding the strength of voting power each member can have, but in the end, this still creates an imbalance in power within the cooperation and can come to affect the outcome of the product.
6.4 Blockchain aspects

Decentralized and public blockchains raise the questions for the need of intermediaries and whether these types of blockchains are a threat to the current financial system. Nakamoto’s vision was to create a technical solution that people could use to exchange money in a decentralized and trusted way (Tapscott & Tapscott, 2016). As a result, this could jeopardize many current functions of the financial system if consumers would find this solution more beneficial than using the bank's services. That scenario raises the question whether decentralized and public blockchains is a threat to solutions like Corda, and if so, to what extent. Mr Gårder believes that their function as a natural intermediate will remain as they provide value to the customers of being the third party. However, it seems like some influential people in the financial industry would prefer the public model, one being Mr Gårder himself which brings questions on whether the private and centralized model as we know it today will live on forever, or if we will see a change in the future where the power of the current private and centralized financial systems changes and becomes more open and decentralized. This is something that Mr Hörmark thinks could happen if it is what the customers want in the future. In other words, this could mean that the financial solutions owned by the banks today would apply characteristics of Bitcoin and Ethereum. However, it is important to remember that these characteristics also comes with negative aspects in areas such as security and trust. Mr Gårder’s argument of the banks remaining an essential part of the system due to aspects like these are therefore solid. On the other hand, Mr Grundy does not see a competitive space between public and private blockchain. However, this could be a question where Mr Sointu thinks differently due to his sentiment towards public blockchains, being something that Nordea's customers is recommended to stay away from. But this is also
a space where he hopes to see regulations in the future that will benefit public solutions, like Corda.
7. Discussions & Conclusions

The aim of this study was to identify the challenges of creating a standardized infrastructure through cooperation. To identify and analyze these challenges, theories of co-opetition and a technical description of blockchain technology was used to create a model to support the analysis of the data collection. The analysis highlighted aspects of co-opetition drivers, co-opetition capabilities, co-opetition dynamics and blockchain aspects, which then interrelated in showcasing the challenges of collaborating on creating a standardized infrastructure.

The conclusions presented in the list below consists of the three challenges that were identified throughout in this study. These are then followed by a section where the factors behind the challenges are discussed.

- Learning and educational aspects
- The size of a collaboration
- Threats from competing solutions

According to Gnyawali and Park, (2011), learning is an important aspect of extracting knowledge and benefiting from a cooperation. This study has identified learning and education as a challenge to the success of developing a standardized infrastructure. This conclusion was reached by analyzing the learning approaches used by Nordic banks in blockchain consortiums, in addition to how they used the knowledge gained from the collaboration to educate the rest of their organizations. Learning to gain new knowledge is an essential factor in order to facilitate innovation (Nieto & Santamaria, 2007). Therefore, to develop a successful standardized infrastructure, the actors within the cooperation have to absorb and seize knowledge to benefit their common interest. Education within each firm affects the dynamics of the co-opetition relationship, as knowledge sharing helps the end product. Especially in this context, where the actors within the consortiums are contributing with resources to the development of it. This makes it essential for the actors to find good ways to absorb knowledge and have clear processes of how they can further educate and share knowledge with the rest of their organizations, in addition to other actors within the cooperation. This has shown to be a challenge as it limits the process of finding applicable business cases, which has a negative effect on the collaboration as it is dependent on creating an actual product. If the technology is not applied throughout the members of the collaboration, the shared infrastructure will be useless. Therefore, it is essential for individual firms to make an effort to absorb knowledge in the best possible way to apply it internally and then use it to contribute to the collaboration.

The size of a consortium has also been discovered as one of the main challenges as it puts pressure on finding a suitable governance model. Therefore, the governance must be designed in a way that does not let size slow down large collaborations or creates an imbalance of power, but instead fosters it and keeps it moving forward. According to Akpınar and Vincze (2016) structure is important to safeguard and maintain the collaboration balanced. The large extent of members in the collaboration is seen as a necessity for creating a shared infrastructure, which puts large collaborations in a near catch-22 situation, needing the size to
succeed, but at the same time slowing it down. Moreover, keeping members focused and engaged is challenging, but necessary to make a lasting relationship between competitors. It has also shown that members feel the need to venture outwards of the consortium when the project gets too large and takes too much time. They then look elsewhere to find more focused collaborations, as it is natural for them to search for anything that might bring a competitive advantage. This can also create uncertainty and tension within a collaboration where members have to consider the risk of members leaving with sensitive information to benefit other projects, as in the case of Morgan Stanley, Goldman Sachs and JP Morgan. Another aspect that adds complexity is that of global collaboration, something that also deemed as essential. But as shown, collaboration within the same region has been preferred and even hailed as a role model. This has to be taken into account when engaging in large international collaborations. In this case, achieving regional success in the past, but when it comes to developing a shared infrastructure regional success is not enough. In summary, small vs large and domestic vs international adds to the risk of creating a catch 22 scenario, a challenge that could jeopardize an entire collaboration.

The success of the consortiums is not only affected by the internal challenges within the collaboration, but also external like the threat from other types of solutions that are looking to solve the same kind of problem. One of these that has been outlined in the study is the threat from public and decentralized blockchain solutions, a solution that has very different capabilities than a product like Corda. Many solutions of this form are being developed with the vision to create a public and decentralized financial system and with the purpose of disintermediating financial institutions, Bitcoin is one of these that was developed with this purpose. The respondents representing banks throughout this study have different sentiments towards this question, but their opinion does not change the fact that solutions are being developed to challenge the banks position in the financial system, which also makes these solutions a competitor and challenges their shared infrastructure. However, to what degree remains to be seen.

7.1 Contributions

This study has several contributions. First, learning and educational aspects of cooperation are essential for a collaboration. This study has contributed to an understanding of how these aspects can come to affect the collaboration if the actors do not carefully consider them. Secondly, it also contributes with the perspective of managers within co-opetition relationship, particularly with those that have both regional and international experience, providing empirical data that has been missing in the past and the insights of these managers. Also combining both the international and size aspect showcased how both adds complexity to co-opetition relationships. Thirdly, the financial industry had not been studied through the lens of co-opetition even though it has had plenty of experience of it, closing an empirical gap on a capable and untapped industry. This study, therefore, provides insights into the co-opetition capabilities and dynamics that can benefit other less experienced sectors, as there is much to learn from the financial industry. Fourthly, this study has also contributed with an understanding for differences between blockchain and DLT, in addition to how the financial
institutions plan to adopt this technology to benefit their position in the financial system. Fifthly, cooperation and competition aspects within the financial industry is a recurrent event whenever a technological change appears. Consequently, this leaves the study relevant for future cooperation surrounding new technologies, contributing to the insights of past challenges connected to blockchain technology. Lastly, this study has contributed to the field of co-opetition by expanding the framework presented by Gnyawali and Park (2011) through adding technological aspects which in this case was blockchain aspects. An aspect that has been overlooked in the past even though it has an effect on co-opetition relationships, this is important as many collaborate on developing new technology.

7.2 Limitations

There are several limitations of this study. First, it has shown in previous studies on co-opetition that most companies are more comfortable in collaboration far away from the customers, which is the current case within the R3 collaboration. This could be the reason why this study has not been able to identify the co-opetition paradox, when firms have to cooperate and compete at the same time. Therefore, a study conducted at a later stage when a product is released and the collaboration starting to involve customers, would potentially showcase more intense competition in this specific case, and therefore also identify challenges that is related to the co-opetition paradox. This would most likely affect the challenges and add aspects that this study was not able to identify. Secondly, this study has mainly focused on a single case within the financial space which involved three banks connected to collaborations regarding blockchain. It is therefore important to consider that this study has a very limited focus and only include three out of more than 200 financial institutions collaborating around the technology within R3. But also, more importantly, is to consider that this is limited to the financial space and does not include other markets where it is also common to form consortiums with the purpose of developing other kinds of standardized technologies, like in the case of IoT. Thirdly, the difficulties of scheduling interviews and finding relevant respondents constrained the amount of time available for follow-up questions. If the interviews had been performed at an earlier stage of the study, it would have enabled a more in-depth analysis. This is related to blockchain being such a new phenomenon and the number of available respondents working with the technology within the Nordic banks being limited. But also related to this, is the respondent limitation due to not having any employees of R3 included as respondents in this study. It is important to acknowledge that these could have given the study another perspective to the collaboration and therefore added additional challenges perceived by the software enterprise R3. Fourthly, it has shown through the study that the Nordic banks have been praised for their collaborative efforts, something themselves believe stems from experience. Therefore, a study with banks that has no prior relationships might identify other challenges and a less positive outlook on the collaboration. There are also members that have left R3 which would provide another perspective as they no longer have a stake in the success of R3. Additionally, giving insights into what made them leave and if there were any challenges related to their exit. Fifthly, it is a fact that blockchain is a new technology, but more importantly concerning this study is to realize that it was not long ago since the financial industry started to gain interest in it and
created consortia around the technology. Subsequently, solutions like Corda is still in the development stage and implementation is yet to come, meaning that the financial industry still has a part of their journey left and more challenges will appear before, during and after the implementation of their standardized infrastructure built on blockchain technology.

7.3 Managerial implications

Our study suggests that managers should value the learning and educational aspects of collaboration more. This is an important aspect that should not get overlooked if firms are looking to succeed with larger collaborations when developing new technologies. It affects both the outcome of each firm and the overall cooperation. We therefore suggest that managers formulate a clear strategy of how to absorb knowledge from the collaborations they are involved in, in addition to making a process of how this knowledge can further educate the rest of the organization. Also, large collaborations run the risk of being slow and not producing results quick enough, thus making members look elsewhere for potentially faster and more focused projects. We therefore also suggest that managers should make sure that the collaborations have a functioning and effective governance model.

7.4 Future research

As mentioned, the standardized infrastructure that this study focuses on is yet to be implemented. Therefore, future research about the remaining stages could compliment this study by focusing on implementation and post-implementation challenges, both from a cooperation and competition perspective, but also challenges related to technical side of the technology itself. Future research could revolve around creating frameworks that combine co-opetition and technological aspects, to fully catch the complexity of cooperation on new technology. There is also a gap when it comes to the size and international elements of co-opetition. These have been studied separately in the past, but the result of this study indicates they might be interrelated and therefore should be examined further. For instance, a study that compares at least two different consortiums, one large and one small, would be a good starting point to unravel the potential interplay between size and internationality. This study has also touched upon the potential threat from other types of blockchains that is now being developed to challenge the financial industry's solutions. However, the degree of this threat remains uncovered and what impact this might have on financial actors like the banks themselves. There is, therefore, a need for more research in this area. For instance, future research could examine how well prepared the banks are on the organizational change that these external threats may imply, but also, give insights on how banks could respond to this potential threat to defend their position that they today hold in the current financial system.
References


Hackius, N. & Petersen, M. (2017). *Blockchain in Logistics and Supply Chain: Trick or Treat?* Hamburg International Conference of Logistics (HICL)


**Electronic references**

Appendix 1.

Interview guide

Background
Can we do a quick follow up in the near future?
Are we allowed to quote you in our master’s thesis?
What is your professional background?
What is your role at the company?
- What is your role in R3?
How come you started working with blockchain? And how do you work with blockchain technology today?

Co-opetition drivers
Since 2015 you are engaged in two different blockchain consortiums with other major international banks: What is the purpose of joining these blockchain consortiums?
What risks are there of not engaging in blockchain?
How do you feel the other members of the consortium value the cooperation?
Even though you are all cooperating it is still a fact that you are competitors - how do you sense this competition?
- Could you give an example?

Co-opetition capabilities
What makes your organization capable of cooperating?
Has the organization had success in previous collaborations?
- Could you give an example?
Who is in charge of the research and development of blockchain technology within the consortium?
How do you share resources and activities within the consortium?
- What resources do you contribute with?
How do you balance sharing enough for the cooperation to thrive but at the same time not sharing sensitive strategic information?
Do you develop and research the technology by yourself outside the consortium?
- If yes - do you share your own findings with the consortium?
How do you make sure to learn and benefit from the cooperation?

Co-opetition dynamics
What activities are you involved in regarding the blockchain consortiums?
Can you describe how you work within R3?
- Are there frequent meetings? Do you write reports?
How many employees are directly involved in projects such as R3?
How does the connection with R3 and your company’s board look like?
When developing new innovations within the consortium, who has the rights to them? Is it the consortium or individual parties?
With so many parties involved in the project, how do you come to agreements within the consortium?
- If you come to a stalemate, how is it solved?
- Do any members have some sort of veto?
Do you have any examples of when the cooperation has been constrained?
What downsides do you see with cooperating when developing a new technology?
What risks are associated with this particular cooperation?
Would you say that there is a shared view on what the outcome of the cooperation should be?
How has the cooperation evolved over time?
- Have any parties left and if so why?
How did you come to a mutual understanding of the vision of the cooperation?
Are there any leanings within the consortium to specific solutions? Ideological differences?
Do you feel that there is a risk that some banks leave if they do not get their way?
- If yes: how is this avoided?
- If no: are examples of banks such as JP Morgan, Goldman Sachs and Banco Santander leaving R3?

Blockchain aspects
What possibilities do you see for blockchain technology within the financial industry?
Why the interest from the banks?
Can you give an example of how you work with blockchain technology?
When did blockchain catch your attention? When did you start researching the technology?
What could be the consequences if you wouldn’t engage in blockchain solutions?
Why do you develop DLT solutions by yourselves?
What role does cooperation play in the success of blockchain within your industry?
What threats do you see from decentralized blockchains?
What threats do you see from public blockchains?