The link to lending: Blockchain

Selecting what type of blockchain to deploy for a cooperative lending platform

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Abstract

A new foundational technology is emerging expected to bear great impact and reshape the financial industry. This technology is called blockchain. Further, blockchain is challenging the status quo of business models by distributing the control of data, opposing the currently reigning platform logic which seeks to centralize control, consequently, a tug-of-war of control emerges between the two logics. This dichotomy is reviewed through a case study with an abductive approach in the context of a financial institute owned by municipalities where our purpose is to answer what blockchain structure that should be deployed to support a cooperative lending platform. Our findings show that a blockchain consortium is the most supportive structure to apply in this type of platform. Our theoretical exploration of the private, public and consortium blockchain types aims to contribute to the blockchain literature. Consequently, as our findings explore business impacts of a financial institution they can be operationalized by cooperative organizations.

Keywords: Blockchain, platform, lending, cooperative, municipality

Acknowledgments

Introduction

Background

The average lifespan of companies listed on the Standard & Poor 500 index has decreased from 67 years in the 1920's to merely 15 years in 2012 indicating that new market conditions force businesses to reassess their business models (Gittleson, 2012). Anthony, et al. (2018) argue that the 'unicorn phenomena', firms such as Uber or Airbnb, will continue to disrupt industries and thus accelerate *creative destruction.* However, most organizations are poorly prepared for this transition and therefore struggle with adapting their business models to these new market rules (Magnusson, 2017). Aforementioned firms in their respective industries, transport and lodgings, have questioned the role of incumbents by applying the platform logic (Anthony et al., 2018; Kenney & Zysman, 2016). Furthermore, since 2015, a large number of the most valuable companies by market capitalization has been platform owners, amongst these are Apple, Microsoft, Google, Amazon, and Facebook, thereby further confirming the prevalence of the platform logic (Zhu & Furr, 2016). In the platform economy, the platform owner becomes the locus of the value chain by acting as an intermediary, orchestrating multiple business actors and resources rather than producing and refining resources as in the traditional pipeline business (Kenney & Zysman, 2016). This severe concentration of power to one focal actor puts high demands on trust from affiliated partners, expecting that the platform is managed in an adequately balanced way to comply with the interests of the platform and its stakeholders (Parker & Alstyne, 2014). Trust is a central part of the longevity of a platform, without a sophisticated mechanism to build consensus, no trust can be established between the parties, or the platform owner (Botsman, 2017).

In the wake of the 2008 global economic downturn, the trust for financial institutions hit a new all-time low. Further, due to the revelations of mass-surveillance by Edward Snowden in 2013, and the subsequent leaks affiliated to political actors, secret services, and internet corporations, trust to governmental institutions has also decreased (Radu, 2015). This year, the CEO of Facebook was summoned to the US congress due to misconduct of the platform users' data. Consequently, this severely damaged the trust of the platform owner with a reported decline of trust from users by 66% and other reports say only 15% of consumers are confident that Facebook keeps their data secure (Rolfe, 2018; Weisbaum, 2018). Botsman (2017) argue that digital business models that facilitate peer to peer transactions, thus enabling trade between strangers, such as eBay, Airbnb and Uber constitute a new paradigm of networks based on trust, empowering the end-user, where the reputation capital these networks generate will redefine wealth, power relations, markets, and integrity.

One technologic innovation that is argued to be able to reconfigure our systems of trust is Blockchain, a distributed database or ledger that is cryptographically warranted, transactionally immutable and transparent (Morabito, 2017; Radu, 2015; Tapscott & Tapscott, 2017). One of the key principles to this technology is eliminating the middleman, one example is Bitcoin, the first cryptocurrency based on blockchain, that renders central institutions such as banks obsolete (Radu, 2015). This is possible as the trust mechanism necessitated to conduct trade is embedded within the technology itself, achieved through cryptographic algorithms that ensure consensus between the nodes in the distributed database by continuously validating transactions (Ibid). Swan (2015) argue that blockchain, a public

ledger, has potential to become a globally distributed record for all assets, financial, property, software, health data or votes to name some. Morabito (2017) means that these properties have potential to save $20 billion through eliminating trust agencies that today are heavily centralized, motivating the investment potential in blockchain. The decentralized nature of blockchain is likely to have a significant impact on the digital economy due to its potential to ensure trust without relying on heavily centralized and proprietary platforms, which today is the paradigm of e-commerce and governmental institutions (Collomb & Sok, 2016). Decentralized platforms such as Uber, that are enabling P2P interaction at the expense of a centralized transaction model and trust function seem disparate to blockchain and its distributed nature. Thus, blockchain could pose a serious threat to such a model, conversely, due to its distributed nature, it could enhance value sharing between peers even further; *uberizing uber* (Collomb & Sok, 2016). Henceforth, we argue that this technology poses a threat to incumbent platforms featured by great levels of centralization drawing attention to how blockchain should be governed.

According to Xu et al. (2017), blockchains can be governed in three primary types; public blockchains are permissionless and democratic ensuring solid verity of data and is useful in adversarial contexts, private blockchains which are cost-efficient and flexible avoiding the inertia decision-making of large communities and finally consortium blockchains (a hybrid) which stands somewhere in the middle but delimiting control and insight to the group of actors involved in the network. Each has different decentralization properties and can moreover substantially limit or facilitate business value making the choice of blockchain type an important consideration. Despite clarifying the characteristics of blockchain, being decentralized, the nature of blockchain and how it can be applied and configured to bring value in a business context is nebulous and yet to be explored to bring about insight to its feasibility. Similarly, Kenney & Zysman (2016) argue that the nature of a platform itself is ambiguous, it is not clear if platforms are enablers of peer-to-peer value exchange, or simply a centralizer of control and interposer of a digital intermediary. Lindman, Rossi & Tuunainen (2017) call for further research to clarify the practical applicability of the blockchain technology in relation to platforms of financial exchange and motivates IS studies on open platforms as highly useful in order to crystalize possible governance options. Thereby, we argue that it is highly relevant to study the spectrum of centralization vs decentralization, balancing the properties of blockchain and platform logic to identify their convergence and potential synergies. Further Normark (1996) argues that cooperative organizations are important tools for counteracting monopsonies and monopolies and defines a cooperative as a business that is owned by one or several categories of users. This presents a fruitful context for evaluating the balance between how such structure would fit between the dynamic of blockchain and platform logic, and how blockchain should be governed in such context.

Purpose and research question
The focus of this study is to examine what blockchain structure that would support the governance conditions of a lending platform in a cooperative context, thus the following research question aims to guide this study:

What blockchain type supports a cooperative lending platform?

Limitation

For the scope of this study, we have chosen to focus on governance structures or types of blockchain. There are many elements that make up distributed ledger technology or blockchain where consensus mechanisms and the deeper nature of cryptography are some, yet, our focal point of research is applied IT, therefore diminishing the relevance to study the technical depth of this data scientific topic. Thereby, we have chosen to exclude this from this study.

The concept of blockchain

Merriam-Webster defines blockchain as a database containing information, that can simultaneously distribute data to an *open* network (Blockchain, 2018). Similarly, Crosby et al. (2015) define a blockchain by essentially being a distributed database for records or a public ledger of all transactions conducted between participating parties. Moreover, Yli-Huumo (2016) argues that blockchain is a technology for decentralized transactions and data management. He further means that the main interest of this technology is due to these central attributes gained from the distributed data mechanics, such as anonymity, security, and data integrity without any third party organization in control of the transactions.

Blockchain, or distributed ledger technology (Tapscott & Tapscott, 2017) is a technology that was created as a technique to enable peer-to-peer transactions without the need of a middleman or validator i.e. banks (Radu, 2015; Yli-Huumo, 2016; Nakamoto, 2008). Blockchain is a decentralized and secure network that is generally characterized as open, inclusive and immutable (Tapscott & Tapscott, 2017). Blockchain also sustains equal rights by granting participants equal ability to access the network, further it also ensures data integrity through the utilization of cryptographic tools confirming the verity of transactions (Xu et al., 2017). Iansiti & Lakhani (2017) have summarized the core properties of blockchain into five basic principles that underlie the technology.

First, it is founded on the concept of a distributed transactional database where computers constitute several nodes, this distinguishes blockchain from traditional, centralized networks where servers and variables are stored on one single computer (Morabito, 2017). Distinctive for centralized networks is that other systems in need of computational power have to connect to a single point i.e. computer system. This grants control in regards to concentrated governance but conversely lacks transparency and democratic properties. Further, by distributing the nodes of the network, security issues related to one focal point of hardware is averted. Hacking a distributed database would require breaching a majority of the nodes in the network in order to gain access to be able to alter data.

Second, blockchain enables peer-to-peer transmission meaning that data exchange occurs between peers unlike central networks necessitating a central node. Further, Radu (2015) argues that this logic differs from traditional centralized technologies by facilitating a democratized and shared infrastructural logic, which in turn has the potential to reduce the need of trusting otherwise designated institutions to administer records (Botsman, 2017). Third, transparency with pseudonymity means that all transactions conducted are visible to all actors granted access to the network. All nodes in the network have unique addresses constituted of 30-plus alphanumeric characters which are public, however, anonymity is enabled through that the owner of a node is optional to reveal (Iansiti & Lakhani, 2017).

Fourth, irreversibility of records or immutability means that all transactions conducted in the network are permanently stored and unable to be altered since they are linked together with every previous block forming the blockchain (Tapscott & Tapscott, 2017). Through various cryptographic algorithms, the validity of the records on the database can be ensured chronologically and warrant their unity (Iansiti & Lakhani, 2017).

Fifth, computational logic allows for advanced programmability to be executed and automate transactions between nodes in a way that is inoperable in contemporary systems such as the centralized banking ledgers which is part of why Iansiti & Lakhani (2017) argues that the need for intermediaries like lawyers, banks or brokers are disputed.

Theoretical framework

The theoretical framework is distributed in two themes. The first theme illuminates studies and research important to take into account in order to understand the concept of blockchain technology. The essential characteristics of blockchain are presented whereupon we further elaborate possible governance structures. We argue that there is value in studying governance structures or blockchain type further to enrich the understanding of how blockchain can be applied in environments with complex stakeholder relations. This is to understand the effects such disintermediating technology can bring to power relations and its impact on the business model it is meant to support. To further nuance this understanding we have complemented blockchain type theory with a second theoretical theme, platform logic, due to their contrasting yet converging nature. We draw upon extant research and shed light on how platform logics change market structures and forces that alter power dynamics rendering the platform a centralized entity. To clarify the intersection between blockchain type and platform logic, platform governance regarding the degree of openness is reviewed.

The nature of trust within the context of blockchain can be separated into actor and action. Validation of an actor is established in the type or permission of participation in a blockchain which we will review in more detail in this theory section. Further, validation of an action, the validity of transactions, on a blockchain is determined by a so-called consensus mechanism. However, the matter of consensus mechanisms is delimited from this study where instead permission of participation, referred to as type, is the focal point of this study of blockchain.

Blockchain governance types

Blockchain, a distribution solution that annihilates the need of any third party organization in the middle. Every transaction ever completed in a blockchain is shared and available to all the nodes (Yli-Huumo, 2016). In order to set a governance structure for a blockchain there are conditions that require careful consideration. Depending on the purpose of a blockchain network, different conditions will apply when determining rules of participation. The two fundamental poles governing the distribution of authority, i.e. level of centralization, of the so-called *type* can be divided into permissioned and permission-less (Xu et al., 2017). Permissioned blockchains utilize one or more 'gatekeepers' for users' participation whereas permission-less are completely open: new users can join the network at any given time, generally governed by a validation scheme to ensure stability and trust (Morabito, 2017). Permissioned blockchains may be more suitable for regulated industries, on the other hand, permission-less are generally considered more resilient to hostile intentions. There are many trade-offs between permissioned and permissionless blockchains including costs, transaction processing
rate, reversibility, censorship-resistance, finality, modularity and optimizing the network rules.

Public Blockchain

The first blockchain network to be introduced was bitcoin in 2008. This blockchain was public in nature and introduced the concept of electronic peer-to-peer transactions without the need of an otherwise centralized authority validating data exchange (Nakamoto, 2008). A public blockchain is a permissionless network allowing anyone access needless of an authority granting participation regarding both rights to write and read from the blockchain. Instead, validation of participants is a

continuous process driven by comparing that the nodes (actors) of the network contains the same data, thereby assuring consensus in the blockchain (Xu et al., 2017). Despite this process being prevalent in all blockchains, this process becomes critical in a public chain since the absence of an authority regulating access potentially allows for corrupted actors in the network. Xu et al. (2017) argue that by distributing authentication of transactions, the public blockchain achieves the strongest integrity since the cryptographic mechanism becomes the strongest in a vastly distributed network. This is carried out through monetized incentives incorporated in cryptoeconomics such as Bitcoin, Ethereum or Litecoin, transactions inconsistent with the blockchain can be ruled out thus eliminating the risk of disproportionate influence in the network. This is considered to ensure long-term stability and the trustless principle of continuous validation through cryptoeconomics is also what attributes a blockchain to be deemed as completely decentralized (Buterin, 2015). Further, Xu et al. (2017) mean that public blockchains support unrestricted data transparency and therefore auditability but on the expense of cost efficiency since the network can consist of a huge number of nodes, all required to sign the transactions which further decelerates transaction speed.

Private Blockchain

Unlike public blockchains where participants are neither necessarily known or trusted, in private blockchains the participants are selected through already pre-established trust. Private blockchain networks delimit governance and development to one single organization, however this organization can consist of multiple divisions constituting the nodes of the network (Xu et al., 2017). This single point of authority is the only actor allowed to write in the chain, yet reading the data depends on the choice of governance and may be either private or publicly accessible (Buterin, 2015; Morabito, 2017). Further, Xu et al. (2017) argue the performance of a private blockchain is higher than in a public. This is because the time required to finalize each subsequent block to the chain is reduced due to less rigorous authentication requirements with pre-established trust. Further, by only having one organization governing the network, high configurational flexibility is acquired, however, this is somewhat proportionally relative to a decline in the democratic properties of a public blockchain. Opposed to a public blockchain constituting unconditional data access, a private chain ensures privacy allowing its owner to be selective in transparency (Xu et al., 2017). Private blockchains seem to fit well with corporations in need of control and integrity for sensitive data such as business strategies or financial information that would be inappropriate to expose to business competitors (Morabito, 2017). However, there may exist a reason for public readability for auditing agencies and governmental institutions.

Consortium Blockchain

A Consortium blockchain is a permissioned network applied by multiple organizations, where each organization operates a node, the majority of nodes has to sign each block in order for it to become valid (Xu et al., 2017). A consortium blockchain is a hybrid between a public blockchain and a private, where, it has never a single point of authority as a private, nor is it a fully decentralized blockchain as a public (Buterin, 2015). Xu et al. (2017) mean that in order to authorize the participants of the network, permissioned blockchains require a permission management component. This component and the fact that the consortium consists of an agreed set of members means that it becomes far more flexible and transformable in comparison to a permissionless public chain where inertia will arise due to the more comprising democratic processes. The consortium type is beneficial to apply where the integrity of data is sensitive and thus unsuitable for public insight, inherent to a

public chain, and therefore requires actors to be selected through pre-established trust, as in a private chain. However, due to multiple actors, adversarial interests might exist such as in a business consortium and thus necessitating the distribution of control from a central point (Xu et al., 2017). Buterin (2015) means that a blockchain consortium can be distributed amongst a number of selected organizations but at the same time offers the opportunity to enable access to read the blockchain to the public meaning that it can allow public insight whilst maintaining decision making to the consortium. The spectra between private and public is wide and still to a great extent undefined as the technology is still developing, no matter the type of blockchain, it comes with advantages and disadvantages, there is no true way of *blockchaining* (Buterin, 2015; Lin, 2017). Below, we have made an effort to solidify the consensus of the types and their benefits.

The table presented below is inspired by Xu et al. (2017) and discriminates the conditions for the three blockchain types and aims to conceptualize the elementary properties of blockchain. X represents how well each property is accommodated in each type. Trust is generated from the cryptographic interaction between the nodes meaning that the blockchain network itself can be trusted instead of relying on an intermediary actor, thus the greater the network the more stable and more trust can be bestowed this mechanism. However, conversely, the decision to establish a permissioned blockchain necessitates pre-established levels of trust since the relationship between the involved actors becomes more directly interdependent. Transparency refers to the readability to the blockchain, the less permissioned the more transparent. The integrity of data is ensured through cryptographic tools confirming the verity of transactions. Equal rights concern participation and based on its level of openness it can be more or less democratic, however, it provides the same rights to alter the blockchain for all of its nodes. Cost efficiency is defined as the cost of operation and computation in the blockchain. Flexibility concerns how agile the blockchain is in regards to changes in its governance.

Properties	Type		
	Private	Consortium	Public
	(Permissioned)		(Permissionless)
Trust	X	XX	XXX
Transparency	X	XX	XXX
Integrity	X	XX	XXX
Equal rights	X	XX	XXX
Cost efficiency	XXX	XX	X
Flexibility	XXX	XX	X

Figure 1. Review of the elementary properties of the three blockchain types.

Platforms

Platform logic changes market conditions and the coordination of economic activity from traditional "pipeline" business featured by the classic value chain model presented by Michael Porter (1985) (Alstyne, Parker & Choudary, 2016). Pipeline business is constituted by a process where an input of

resources undertakes a number of activities in the value chain where it is incrementally refined and channeled into an output which is the product of the chain. The internet changed these dynamics and lead to a restructuring of the market forces such as decreasing the barriers of entry, enforcing the bargaining power of buyers and provided suppliers greater access to customers (Porter, 2001). Kenney & Zysman (2016) argues that the emergence of the platform logic further changed the market rules, disrupting incumbent businesses by centralizing power to the intermediary and thus resetting entry barriers and regulatory conditions making the dependence of the platform ubiquitous (Edelman, 2014). Whilst asserted to be ubiquitous, Kenney & Zysman (2016) argue that the role of a platform is concurrently ambiguous i.e. it is not clear if platforms interpose a digital intermediary or a catalyst of peer-to-peer value exchange, and how we attribute the platform matters as it serves as a stepping stone for interpretation, usage, and regulation.

Platforms are diverse, both in function and in structure (Kenney & Zysman, 2016). According to Boudreau (2010), a platform could include physical components, rules and tools to facilitate development, and technological standards to support interoperability. Operating as a nexus, a platform can organize the constant interchangeability of technological development and its complementary components. Parker & Alstyne (2014) argues that platforms provide building blocks that construct the foundation for products and services. Further, Ahmed (2018) argues that a platform also acts as an enabler of business models and facilitator of value exchange.

Platforms expand and/or disrupt business models (Kenney & Zysman, 2016; Ahmed, 2018). By being the enabler of new models and practices, Boudreau (2010) argues that inherently this implies that platforms also act as the bottlenecks for organizations. Thereby, the governance of one is paramount to understand the dynamics of platform logic (Boudreau, 2010). The platform owner possesses "bouncer´s rights"; the ability to exclude any outsiders unfit to be an actor in the system. Inherently, the platform owner dictates the restrictions of the platforms' usage, development and commercialization, likewise, gains the inverse ability: to open or remove any restrictions (Boudreau, 2010). The level of openness can significantly affect participation and motivation of investment from platform partners (Parker & Alstyne, 2014). This will be further elaborated in the following section.

Platform governance (degree of openness)

One central question for platforms is that of adequately balanced control designed to accommodate involved stakeholders and maximize the value proposition of the platform (Boudreau, 2010). The degree of openness concerns patency of intellectual property and the inclusion of external actors to the platform owners systems (Parker & Alstyne, 2014). Being an intermediary, platforms, two- or multi-sided markets often host a variety of actors whose utilities are dependent on each other for a balance in supply and demand. Parker & Alstyne (2014) emphasize that a well-orchestrated interplay is paramount since failing to balance buyers and sellers for an auction or mismatching game developers and gamers will make the intrinsic value of the platform insufficient to drive adoption. Two forces being present here are *adoption*, which is the drive for opening for participation and attraction of users to expose the platform to the market and *appropriation* which aims to regulate and capture the value generated on the platform in order for the owners to capitalize upon (Parker & Alstyne, 2014).

Opening enables swift adoption of users generating momentum for the platform required to claim market presence (Boudreau, 2010). Cusumano (2010) argues that in order to become an industrywide

platform, companies must, through their strategy, financially incentivize complementors, which can be done by subsidizing or having low or no fees to join. Fostering openness can facilitate rapid content growth which is a strong tool for building platform dominance (Cennamo & Santaló, 2015). Further, high levels of openness stimulate innovation by allowing third parties to create novel content on the platform due to modest conditions further empowering the platforms value proposition. Parker & Alstyne (2014) argue that third party complementors have more successful initial public offerings and greater negotiating influence to prevent their value from exploitation if they are provided stronger intellectual property rights by the platform owner. Conversely, if unilateral conditions are perceived suggesting appropriation by the platform owner, third parties can be deterred from sharing their value or from committing to the platform which can weaken the value proposition of the platform (Parker & Alstyne, 2014).

A different strategy is to regulate the quality of the content and aim to offer state of the art content that is exclusive to the platform (Cennamo & Santaló, 2015). This regulation relates to the problem of multi-homing which demands third parties to delimit their content to the platform to make it exclusive i.e. single-home. Less conditioned platforms abstain from such coercion and allow third parties to offer their content on competing platforms i.e. multi-home, however, research shows that this strategy decreases the revenue of the platform (Parker & Alstyne, 2014).

Cennamo & Santaló (2015) emphasize that a combination of these strategies, facilitating rapid content growth through modest regulation conjoint with offering exclusive state of the art content might be appealing as a concept but is problematic in reality. This is because it evokes unfocused growth including both the issue of enrolling many comparable content providers offering the same value which can render a price war and furthermore due to brand diminishing where the capability to differentiate becomes undermined (Cennamo & Santaló, 2015). Additionally, if the platform is to be devised from a currently existing product, this presupposes a great or defensible original product since a platform itself is no care package for a struggling product (Zhu & Furr, 2016).

Aforementioned phenomena constitute the poles in the platform tug-of-war between adoption, necessitating openness in order to gain a critical mass of users (Zhu & Furr, 2016) and appropriation, addressing the capability to absorb value facilitated and brought to the platform by complementors (Kenney & Zysman, 2016; Parker & Alstyne, 2014). The platform concepts presented in this section are meant to complement the evaluation of the different blockchain types and how their applicability will necessitate a more pipeline-oriented or more platform-oriented business model.

Methodology

Research approach

Based on the type of the study, the research question and the theoretical background, we have chosen to conduct an abductive approach as it provides the opportunity of iteration consequently, support a more in-depth analysis (Alvesson & Sköldberg, 2008; Dubois & Gadde, 2002). We have alternated between the theoretical and empirical data, which has helped us to interpret the material, find new patterns, and gain a deeper understanding. This process is called *systematic combination* (Dubois & Gadde, 2002).

The study is based on a qualitative research effort where the aim has been to create a holistic overview of how the focal business and its member companies could use a blockchain platform to leverage business value. To review this, we have conducted a single case study with a holistic approach. According to Merriam (2009) case studies are beneficial to genuine and thorough results of a current situation. Moreover, Yin (2014) argues that a single case study allows the researcher to question old theoretical relationships and explore new ones, further the single case study has synergies of the juxtapositioning nature of an abductive approach. A holistic approach is considered highly beneficial to answer *how*, *what*, or *why* questions. As we aim to provide genuine and thorough results, we applied our theoretical model to a specific organizational structure (cooperative), to answer a "What" research question, we argue that a single case study with a holistic approach is the most beneficial for our research.

We have solidified our theoretical framework, abstracted the essence aligned with our research question and subsequently formulated two interview frameworks, one for each side of the cooperative, this will be elaborated further on in the section below called "selection". This procedure of constructing interview questions based on the theoretical framework is known as operationalization, and enhances the relevance of the data and generally supports the alignment of a research question(s) (Patel & Davidson, 2011).

Selection

We have made a targeted selection, described by Bryman (2011) as a strategic selection, where our starting point has been to identify an actor within the financial industry that is exploring potential business areas with blockchain technology. Aiming towards actors within finance is motivated by that the sector has the most blockchain applications to date and would thus more likely than other industries offer an organization suitable to our study of blockchain governance. Our intention was to conduct a study of a cooperative organization as it is deemed to be an equilibrium in between centralized platform logic and the decentralized blockchain technology. On the individual level of informants, we strived to identify key positions in the organization in question of various competence areas since they would have the most insight and influence on the business and the organization suitable to answer questions regarding power relations and integrity of proprietary data. When identifying the informants we applied what Bryman, (2011) refers to as snowball sampling meaning

that each informant was able to personally recommend us further informants deemed suitable, in order to find the most useful informants.

Research context

This thesis constitutes decision support in the project "blockchain-based provisioning of financial marketplace services" hosted by blockchain lab at the department of applied IT at the University of Gothenburg. The project discovered that the Swedish local government funding agency called Kommuninvest (KI) were exploring whether blockchain technology would be feasible in their organization. KI is a cooperative organization where the members and customers are swedish municipalities which together constitute an economic association that owns the company. The business model of KI is based on providing low-cost financing for municipalities, they are however exploring whether blockchain can be used to build a platform where KI becomes more of a matchmaker. The organization Kommuninvest aligns well with the scope of this thesis due to their structure and ambitions, thus many synergies were gained by the participation in the project, and the organization was a great source of data collection in the process of answering our research question.

Data collection

The empirical evidence that has been the basis for this study has been collected through workshops and interviews. The workshops have been designed to guide the direction of the project and reveal key positions within the organization in order to identify what perspectives and topics to be reviewed in the interviews.

Workshops

Three workshops were conducted intended to establish a deep understanding of the organization in order to identify adequate informants and ensure a qualitative data gathering. The first workshop was structured to enhance our ability to gauge the different stakeholders and how to accommodate their perspectives, and thus crystallising the cooperative company structure. The project group expressed potential business applications and related requirements and limitations. The second workshop was used to further introduce the project group to blockchain technology in order for them to closer assess its properties where an associate senior lecturer from the department of applied IT of the University of Gothenburg demonstrated the basics of cryptographic features and how blockchain could be applied in a supply chain. We also used this session to review which key persons within the company we could interview in private sessions for a deeper understanding of the organizational conditions of how a blockchain based platform could be governed. At the time of the third workshop we had conducted the individual interviews and chose to control our empirical findings with the project group in order to confirm that we have made correct assumptions and to ensure that we had covered the relevant perspectives on the case, consequently confirming the validity of our data.

Repstad (1999) argues that allowing the informant to think about and reflect on their answers ensures purposeful answers whereby we encouraged the members of the project group to express personal opinions to give them room for personal reflections. We have continuously conducted analyses of collected data to get a picture of which aspects of the problem area we needed to complement as Patel & Davidsson (2011) illuminate this as an approach to incrementally improve the interview templates.

This knowledge has then iteratively been used to improve the two variants of interview templates for subsequent interviews (Repstad, 1999).

Workshops	
Workshop #1	**Duration 4h Date 2018-03-19**
organization	**Participants**
Kommuninvest	Business developer
	Client manager
	Research and education manager
	Chief analyst
External consultant	Interaction designer
University of Gothenburg	Associate senior lecturer
Large municipality #2	Chief financial officer (CFO)
Workshop #2	**Duration 6h Date 2018-04-17**
organization	**Participants**
Kommuninvest	Business developer
	Research and education manager
	Chief analyst
External consultant	Interaction designer
University of Gothenburg	Associate senior lecturer
Large municipality #2	Chief financial officer (CFO)
Workshop #3	**Duration 4h Date 2018-05-08**
organization	**Participants**
Kommuninvest	Business developer
	Client manager
	Chief analyst
External consultant	Interaction designer
University of Gothenburg	Associate senior lecturer
Large municipality #2	Chief financial officer (CFO)

Figure 2. Workshops

Interviews

We have used a qualitative semi-structured approach to construct our interview questions (see appendix I & II) where the questions were designed in alignment with Trost´s (2010) interpretation of a qualitative semi-structured interview, i.e asking primarily open questions to be comprehensible without requiring profound technical insight, thereby allowing the respondents to talk broadly about the subject. If the respondents deemed a question too broad, unclear, or off-topic, more specific follow-up questions were asked to clarify and obtain relevant data. Moreover, once an especially

relevant and/or insightful piece of information arose, more follow-up questions were asked to obtain an in-depth perspective of the context in question. The individual interviews were eight in total, where five were internal positions at Kommuninvest and three from the municipalities. To facilitate the different stakeholders' perspectives we chose to include three municipalities of varying size and geographic location, the informants were composed as presented in the tables below.

Individual interviews				
organization	Role	Time	Date	Format
Kommuninvest	Chief information officer (CIO)	1h	2018-04-18	Personal meeting
	Chief operations officer (COO) & Vice president (VP)	1h	2018-04-18	Personal meeting
	Head of business development	1h	2018-04-18	Phone
	Senior portfolio manager	1h	2018-04-18	Personal meeting
	Chief analyst	1h	2018-04-18	Personal meeting
Large municipality #1	Treasury manager	1h	2018-04-19	Phone
Medium municipality	Financial manager	1h	2018-04-20	Phone
Large municipality #2	Chief financial officer (CFO)	1h	2018-04-23	Personal meeting

Figure 3. Individual interviews

Analysis

After we transcribed the interviews, we processed the transcripts and performed a data analysis in accordance with Braun & Clarke´s (2006) thematic analysis. During this process, we identified recurring patterns in the data that were categorized under six prominent themes adopted from Xu et al. (2017). The themes were: *trust, transparency, integrity, equal rights, cost efficiency,* and *flexibility*.

We have chosen to create categories for the data in advance in order to prevent our own thoughts and opinions affecting the results. This approach allowed us to evaluate the results of our data collection in a clear way, with the starting point of creating a solid foundation based on the data we acquired with the objective of answering our research question. The process of categorizing the collected data was inspired by Sharp, Rogers, and Preece (2011) who highlights the value of two persons working simultaneously to determine that the result reflects the data and that both persons analyzed the data concordantly.

Validity

Yin states (2014) that it is of utmost import to establish high validity throughout any research process as the data gathered could greatly affect the information output of the study. We have used the same

interview framework for each part of the cooperative, i.e. one for Kommuninvest and one for the municipalities, further the interview frameworks can be found in the appendix (I & II).

During a qualitative interview study, there is a risk that the interviewer will affect the informant and color his or her answers through body language, facial expressions or similar behavior (Sharp, Rogers & Preece, 2011). This is primarily a risk that occurs in personal contact, where we have had this in mind in order to remain objective and neutral towards the informants. The qualitative interviews we conducted have also provided room for clarification, if an answer to a question has been unclear, we have had the opportunity to receive feedback from the informant at a later stage to request clarification of any answers such as remained unclear, which positively affected the validity of the data.

Patel & Davidson (2011) argues that utilizing different methods of data collection can increase validity, whereby we have aimed to ensure this by collecting data from both personal interviews and through workshops. The data analysis was carried out through individual thematization whereby it could be determined that the results reflected the data and that both researchers of this study had analyzed the data concordantly. Finally, once the data was collected and thematized, the result was presented during a third workshop and verified that it had been correctly interpreted, thereby increasing our validity further.

The research process

The research process was initiated with the formation of a theoretical framework draft. Drawing from existing theories, the research question was formulated. Subsequently, the research question and the theoretical framework served as foundations for the interview questions and the data gathering.

During the period of solidifying the theoretical framework, one workshop was conducted to align the theory better with the context. Once that sufficient theoretical material was gathered and aligned with the research context, a second workshop was conducted followed by individual interviews. Subsequently, the findings were structured in accordance with relevant themes and presented during a third workshop to receive feedback and increase the validity of our empirical data.

The analysis was developed by constant comparison of the theoretical framework and the empirical findings, ultimately presenting the most insightful and relevant findings in accordance with the research question. The essence of the discussion revealed a clear conclusion which answered our research question. Throughout the process, we have received guidance from our supervisor, as well as constructive criticism from other members of the IT-faculty at the University of Gothenburg.

Results

Throughout this section, the results of the interviews are presented. The chapters are based on the thematization from the data collection entailing the six themes; *trust, transparency, integrity, equal rights, cost efficiency and flexibility*. The first five themes correspond to the elementary properties of blockchain whereas the sixth and final theme identifies concepts from platform governance. In concert, the insights and standpoints of the respondents reveal how the different blockchain types would be applicable to a cooperative lending platform.

Trust

The topic of trust was discussed by the respondents and there was a consensus that high levels of trust were permeating the organization, however, a perspective that affect trust in practice surfaced from the financial manager regarding the alignment between KI's agenda and that of the cooperative. The chief operations officer/vice president of kommuninvest (KI) describes the owner conditions of kommuninvest to be special since it is a cooperative enterprise owned by municipalities meaning that there are in principle no conflicting stakeholder relationships which allow the enterprise to substantially serve the interests of the public. She means that they as a financial institution have a setup for great trust from the member municipalities since they, unlike a bank, do not have to produce returns to shareholders nor generate return in various bonus programs. The chief analyst confirms this but points out that there are some inquiries regarding their pricing of loans. She further comments that the municipalities do entrust kommuninvest but they, unfortunately, aren't always completely discriminated from a bank in their eyes and that some additional trust could potentially be achieved through increased transparency of their pricing. This statement is confirmed by the financial manager of the medium municipality who currently utilizes a private consultancy to seek financial advisory despite that this service is actually offered by KI.

> *"I would probably really have to grasp that they [KI] are an independent advisor and do not prioritize themselves. I have absolutely not seen any signs that they do not would be independent, but it is more that... I have never seen them as an advisor. To me, they are someone I'm asking for ... I want to borrow from them and want to know what conditions they have"* Financial manager, medium municipality

In order to gain trust from the municipalities when they operate a financial planning tool called KI finance offered by KI to observe the finances of their members, the chief analyst addresses that access to the user data is limited to only account managers and the research department and that the business department is excluded from access. The CIO expresses that KI controls their members to a high degree which they aim to reduce in the future since it is out of their mission, rather KI should focus on providing the best loan terms for municipalities, and entitling them to trust that they are professional enough to manage their own finances.

> *"Today, we monitor very, very much [the prerequisites of making a loan], and our ambition is to decrease the level of control to a large extent because it is not our mission to do so. Instead, we should be able to trust when they [municipalities] request new a loan, that it is correct. [...] In reality, our mission is only to lend as cheap as virtually possible."* - CIO

The head of business development and the senior portfolio manager further argues that KI has earned a substantial amount of trust, both from municipalities and investors, since the 2008 financial crisis, due to well-managed placements of funds. They argue that a high trust also corresponds in high creditworthiness, thereby providing municipalities even better loan terms. The treasury manager and the CFO of the large municipalities confirms a great relationship and perceives great transparency and values the simplicity in the services offered which is echoed by the financial manager of the medium-sized municipality asserting great confidence in KI. However, the financial manager points out that she would have to comprehend further that they are independent advisors and do not prioritize themselves. Thus, the definition, and the level, of trust varies between the respondents, however even if the level of trust varies between the perspectives, collectively all respondents have confirmed that the level of trust is high within the cooperative.

Transparency

All the respondents have had a similar view that greater transparency generally benefits everyone, however, the financial manager of the medium-sized municipality expressed some doubts of the potential malevolence of external actors. The COO/VP argues that there is a strength in risk spreading which can be achieved through transparency and states that they intend to accomplish this through continuous insight from their board of directors. She believes that it would be beneficial if the data on KI finance would be completely open but that it would require municipalities to be prepared to defend their positions if put under the loupe by external actors. The COO means that they intend to increase their transparency and that their vast market share of 50% and currently increasing, demands it when they are such a dominating actor.

> "It's quite simple. The more transparent you are, the clearer you are, the better the terms you will get simply, I think. That is the basic philosophy" Senior portfolio manager

The senior portfolio manager means that the greater transparency the better investor relations and that everything that deviates from planned loans and drives prices up. The CIO argues that it would be beneficial if the data from KI finance would become open which is agreed upon by the chief analyst and senior portfolio manager stating that they currently in practice are forced to be transparent due to the principle that everyone should be entitled access to public documents that are not confidential (offentlighetsprincipen). However the chief analyst refers to KI finance, their financial planning tool offered to municipalities, and means that since municipalities can enter loans from other issuers (banks) than KI, these would not appreciate an exposed pricing since it would allow KI to undercut them. However, the CIO addresses that they should handle the data with respect meaning that they should track who has gained access to any financial records. The CFO of the large municipality argues that none of the records on KI finance are secret and that transparency would not be a problem and the treasury manager of the other large municipality means that it would be beneficial to be able to study how other municipalities plan their debt management. The financial manager of the medium-sized municipality concurs with perceived value in access to other municipalities finances and means that it would allow them to question their margins. However, she expresses doubt regarding that external actors might potentially be able to use the records of the municipality owned companies in a strategic purpose.

Integrity (immutability)

The respondents have expressed a great enthusiasm in making the data immutable, however, the head of business development sees concerns as it could have undesired effects on the balance of trade power. The COO means that a permanent record history, the feature of immutability, would be beneficial since it would allow a greater traceability of decision making. The chief analyst mentions that this has value besides than strict monetary and means that immutability would simplify traceability of loans and various certificates such as green funding, funds that are considered socially and environmentally conscious, to be better validated. The CIO and senior portfolio manager are positive but the head of business development problematizes the feature in the case of a peer-to-peer platform where municipalities would be able to provide offers to investors and these would be permanently recorded.

> *"...as Alingsås (a small municipality) announce a request to borrow and [...] when it's been 13 days and then one day, if they have not received a single bid, ie no one wants to buy [trade with] Alingsås. What are they doing then? [...] the market will remember that the last time Alingsås tried to borrow money through the platform, no one answered. How does that affect Alingås leverage?"* Head of business development

He means that in the case of a municipality offering a price for an obligation or loan and no investors would bid, this could potentially damage their price over time. The treasury manager of a large municipality and the financial manager of a medium municipality do not see any issues with permanent record history, conversely, the CFO of a large municipality sees that this could simplify auditing since they always request changelogs.

> *"Could you lock such a system, then it would be worth gold, because then you could close those questions [access logs required for auditing]"* CFO, large municipality.

He expresses that it would solidify their security with rating institutes if it would be possible to guarantee that their financial records were immutable.

Equal rights

All of the respondents have demonstrated a willingness to participate in the developing of a blockchain based platform and that both parties of the cooperative (KI and municipalities), should be involved to some extent. Yet, the chief analyst, CIO, Treasury manager and CFO of the large municipalities express limitations of said involvement. The chief analyst means that if a blockchain platform is to replace the current loaning process it is important that the municipalities are involved in the development of it in order to assure that they feel involved. However, she stresses that it is not certain that the municipalities should be involved in the governance and maintenance of such platform.

> *"I think they need to be very involved [in the development] [...] The governance issue is more difficult though. [...] What is best? Is it some technocrats who are sitting and doing their thing or is it the commonalty trying to compromise something?"* Chief analyst at KI

The CIO argues that the municipalities should be involved somehow but since their board of directors already consist of the municipal councils it is sufficient to consult them, he further argues that it is not certain that it is KI:s mission to be such an intermediary it would situate to host a blockchain platform. He states that they currently are working to automate their loaning processes which is an initiative the member municipalities have been involved in but clarifies that they are not granted governance rights regarding how the process should be carried out. The treasury manager of one of the large municipalities is positive to an involvement in the development given that they are provided clear demands and instructions unlike the financial manager of the medium municipality who is uncertain if their involvement in the development would be beneficial. The CFO of one of the large municipalities is convinced it would be inefficient to involve all of the municipalities and suggests that a composition of various sizes of municipalities should represent the overall requisites.

Cost efficiency

The COO/VP, chief analyst, and head of business development sees that the primary value of KI is the benefits of economy of scale, however, the CFO and the treasury manager of large municipalities sees clear benefits of their relationship besides monetary. Yet, the head of business development highlights the potential of havoc in the financial industry if KI would change their focus and business model.

The CFO of one of the large municipalities points out that the perceived value from KI has changed over time, after various collaborative projects and through the development of the financial tool KI finance they are very positive to these returns that are beyond strictly monetary. Additional value desired from the treasury manager of a large municipality is the possibility to exchange knowledge and insights regarding municipal debt management. The COO/VP means that a primary value of KI:s business model is built on economies of scale where borrowing of significant size generates possibilities to offer non-volatile pricing over time. However, the head of business development points out this feature has gradually diminished due to market regulations allowing more swift access to funding meaning that their own financial reserves are being downsized. The chief analyst argues that the economies of scale benefits are valuable to a certain limit and means that a blockchain platform allowing municipalities direct access to investors could be a complement and not a substitute for their current business model. The head of business development emphasizes that this would eat into the profitability of the market makers, the banks who acts matchmaker between investors and borrower, with consequences. He argues that this would reduce their incentives of facilitating this process meaning that another actor would have to take this over, something the business developer questions whether KI would be able to host themselves. Further, the head of business development means that if the market makers abstain from facilitating a primary market nor will they likely host a secondary market, which is where bonds are exchanged after initially being sold thus inhibiting fluent trading which he means could hurt terms and conditions for municipalities.

The senior portfolio manager points out that the Swedish investment collective is small and strictly homogenous meaning that their agendas and actions are aligned, unfortunately rendering them great power to influence conditions and pricing for borrowers. However, even if the head of business development points out that they most often counteract innovation and likely would intend to thwart such initiative, both he and the senior portfolio manager agrees that an endeavor to include them would be worth a try. If a blockchain-based peer-to-peer platform allowing municipalities to interact directly with investors both the head of business development and senior portfolio manager argues

that a standardising of possible trade would be necessitated. They mean that a peer-to-peer situation would lead to a great fragmenting of offers and bids rendering great volatility which would be undesired from investors leading to unfavourable borrowing terms. In order to regulate this, a standardized set of conditions for borrowing would be required. The possibility to standardize such platform is partly dependant on how corresponding processes currently work according to the chief analyst who points out that the processes for the account managers, handling borrowing requests, is highly ambiguous and independently established inhibiting a shared benchmark.

Flexibility

The COO/VP and CIO, as well as the CFO and treasury manager of the large municipalities are all positive to the situation where KI would become less of an intermediary through a blockchain platform. However, the financial manager, senior portfolio manager and the head of business development points out challenges such transformation would generate.

KI is a member-owned enterprise where the parent company consists of an economic association with the municipal councils as the board of directors. The company also has a smaller board of directors for the company to handle the operative business. The personnel managing the interaction with KI regarding finances and borrowing from each municipality is however handled by public servants which creates a dynamic power relation. The COO/VP means that this sometimes surfaces when the public servants from the municipalities have expectations and requests that are conflicting the directives of their directors regarding how their finances should be carried out, sometimes meaning that KIs account managers have to contest their requests. The COO/VP points out that despite them working closely founded on their owner directives, they also have to be able to make business decisions generating value to the members without them asking for it. The chief analyst mentions that, if need be, they have to intervene when an unhealthy debt growth is identified in the municipality, which is a process necessitating a central governance structure. She further necessitates a central governance if they are supposed to be able to counteract a high price dissemination in borrowing terms in order to nurse the cooperatives best intentions. In contrast to central governance, the CIO presents that a goal has been set to automate the borrowing process to the year 2020 further arguing that they have an ambition reduce their level of controlling how municipalities borrow. He means that if a blockchain-based platform that allows municipalities to borrow from either investors or other municipalities without KI:s intermediation, it has to be motivated with economic benefits for the municipalities and that if KI isn't the one to host such platform he is doubtful that someone else will. The COO/VP argues that one reason for allowing municipalities to borrow among themselves is because there exists a surplus of 20-30 billion SEK in the municipal sector which could be more efficiently distributed. She further states that a previous attempt to solve this, where KI intended to channel the accounts of their municipalities into a national account failed when the bank, SEB, realized that this idea would eat into their business model whereupon they withdrew from the negotiation. When the COO/VP treats the topic of disintermediation she says that their existence is based on an added value and that if it turns out that there is a more pragmatic way to ensure efficient borrowing for municipalities, that should lead the way.

> *"If this technology [blockchain] really takes over all that [the current business model], then there is no value in Kommuninvest's survival, then the world has taken a step forward to finding something better."* COO/VP

This pragmatic view is echoed by the CIO claiming that if that if they are able to offer better financing even if they disintermediate themselves, that automatically becomes their mission. However, the chief analyst points out that the current market conditions wouldn't make it feasible for municipalities to borrow between themselves due to the negative interest rate, however, this is something that will change over time. The senior portfolio manager points out that the market makers, the banks that KI borrows money from in their current structure, acts as a type of shock absorber meaning that they acquire their liquidity over a long period of time in order to level out irregular market situations. However, he argues that the market has unfortunately progressed towards a situation where less market making actually is taking place due to smaller reserves at the banks and this process has become more of a mediating feature wiring funds from one place to another and thus not being that shock absorber they once were. He means that these underlying conditions would make it less difficult for KI to become a market maker and facilitate investors themselves. Although, if a blockchain-based platform would replace this structure by directly matching municipalities with investors he means that a volatility would arise due to large fluctuations in the offers put up by municipalities caused by insufficient financial expertise among the public servants. This expectation is confirmed by the financial manager at the medium municipality who thinks the concept of such platform, directly matching municipalities to investors, sounds complicated and would exceed her financial competence level requiring external consultation. The chief analyst points out that a trend has been observed on the west coast where an external consultant has been too-short term in their analyzes and made recommendations to municipalities that are in conflict with KI:s view of sound capital management. The CIO argues however that one of the reasons with their goal of automating the borrowing process until 2020 is to free up resources to their consultancy department. The treasury manager of the large municipality is positive to a blockchain-based platform, further, the CFO of the large municipality also sees great efficiency potential but has an opinion about how the matchmaking should look.

> *"I imagine that you have some form of a platform where I do not need to contact the investors. In some way, it is taken care of by the platform. Should you make bilateral agreements directly with the investors, then there are a lot more legal costs"* CFO, large municipality

The senior portfolio manager means that if municipalities would be directly matched with investors representing themselves they would face a problem regarding recognition in the international market.

> *"It works to issue bonds for a smaller municipality in the Swedish capital market, because everyone knows who Västerås (small municipality) is, who Västerås city is. But you may not know if you are at a central bank in Brazil."* Senior portfolio manager

Further, the head of business development points out that placement limits (a financial restriction determining how much that can be traded with an actor) is an issue if the municipalities are meant to represent themselves since investors might have generous placement limits for a low-risk actor like kommuninvest and larger municipalities but might have less generous placement limits for smaller municipalities with lower liquidity and credit rating.

Discussion

As a starting point, we address the potential impacts of the blockchain technology to our research context by discussing statements of the respondents from KI. The COO/VP mentioned that their existence is based on a value-added primarily from a economy of scale model suggesting a more pipeline oriented business (Alstyne, Parker & Choudary, 2016). However, if the distributed nature of blockchain, facilitating peer-to-peer transmission, would render the organization obsolete for the better of the municipalities, then she argues that this should be the way forward. This pragmatic view was echoed by the CIO claiming that if they would be able to offer better financing despite disintermediating themselves, that automatically becomes their mission. The chief analyst argued however that a blockchain-based platform could be a complement and not a substitute for their current business model, suggesting that they should be operated in tandem. This is consistent with Zhu & Furr (2016) arguing that a common denominator for companies who are successful in the transition from pipeline business (product producing) to becoming platforms is the employment of a hybrid model.

The decentralized nature of blockchain is likely to have a significant impact on the digital economy due to its potential to ensure trust without relying on heavily centralized and proprietary platforms which today is the paradigm of e-commerce and governmental institutions (Collomb & Sok, 2016). A challenge on the horizon that a blockchain-based lending platform, allowing peer-to-peer in between municipalities and towards investors, would raise in this situation is that it would excavate the profitability of the so-called market makers, the matchmakers between investors and borrowers, reforming conditions in the financial industry. This is because such platform would enable borrowers, municipalities in this case, direct access to the investors without liaison with the market makers. According to the head of business development, this would likely also delimit the market makers incentives to host a secondary market, which is where bonds are exchanged after initially being sold which would require this operation to be shouldered by another actor or system. Furthermore, Iansiti & Lakhani (2017) argue that blockchain is not a disruptive but a foundational technology meaning that it will settle a new foundation for our economic and social systems. These viewpoints of the potential impact of the technology, and the perspective of Iansiti & Lakhani (2017) demonstrate the significance and necessity of further analysis of the context rooted in blockchain and reconfirms the importance of our research question; *What blockchain type supports a cooperative lending platform?*

Proceeding, the blockchain types will be further discussed below in the following section where six elemental properties adopted from Xu et al. (2017) will be addressed; *trust, transparency, integrity, equal rights, cost efficiency,* and *flexibility.*

Public

A notorious feature of a public blockchain is its' unconditional transparency visible to anyone connecting to the network (Xu et al., 2017). This is feature can be used to generate trust, however, the members within the cooperative, both KI, and the municipalities, already have high levels of trust in between them. However, it was made apparent that the COO/VP believed that it would be positive if the data on their financial platform would be completely open since their great market share demands a high level of transparency to ensure public trust. This would, however, require municipalities to be able to defend their positions if inquired by external actors.

Xu et al. (2017) argue that a public blockchain strongly enables equal rights, which in a public context would support democratic properties allowing insight into financial terms and conditions. The senior portfolio manager argued that a munificent transparency would be positive for their pricing since investors would be ensured a credible borrower suggesting that their data should be available for investors outside the cooperative. Further, the senior portfolio manager emphasized that public transparency is in practice enforced due to the principle that the public should be entitled access to public documents that are not confidential (offentlighetsprincipen) meaning that a public type would empower the applicability of the principle. Regarding the public exposure and immutability of financial records, this is something the chief analyst argues would simplify traceability of loans and various certificates such as green loans, funds that are considered socially and environmentally conscious, to be better validated. Xu et al. (2017) argue that a public blockchain has the strongest integrity ensured by cryptographics due to the large distribution of nodes which decimates the risk of disproportionate influence in the network, further suggesting that a public type is the best suited to achieve credible auditing. The property of immutability is also promoted by the CFO of a large municipality who argued that this would simplify and streamline auditing. This aligns with Morabito (2017) claiming that blockchain could save vast amounts of money by eliminating trust agencies that currently are heavily centralized. On the contrary, the head of business development emphasized a potential negative effect the feature of publicly exposed immutability could render. In the case of a peer-to-peer platform allowing municipalities to submit borrowing offers he stated that if they would be left unanswered, this residual record could harm their price terms since it would imply to investors that this municipality is unfavorable to trade with. Further, the CIO points out that the financial data of municipalities should be handled with respect meaning that a record should be made of who has accessed such documents, which would require a system handling this, restraining the feasibility of the public type. The financial manager from the medium-sized municipality was concerned that competitors to the municipal companies could potentially utilize the access of their financial data in a strategic manner suggesting that a public type could be difficult to implement.

Continuing on the track of openness, Boudreau (2010) argues that an open platform governance enables swift adoption of users generating momentum for the platform required to claim market presence. However, in the case of KI, a vast majority of their customers, Swedish municipalities, has already adopted to their cooperative, diminishing the need for such adoption. Cennamo & Santaló (2015) means that an aggressive launch strategy, facilitating many comparable actors (investors in this case) could evoke a price war, the cooperative as a force leveraging the bargaining power of the clients could further be argued to increase this effect. This could be seen as an alternative mechanism to make use of in order to regulate prices in favor for the municipalities, further motivated by the pragmatic view of the COO/VP meaning that whatever is economically lucrative for the municipalities is plausible. However, in the wake of such evolution, a condition limiting the feasibility of the public type is how to incentivize investors outside the cooperative to participate. Cusumano (2010) argues that in order to become an industrywide platform, companies must, through their strategy, financially incentivize complementors, which can be done by subsidizing or having low or no fees to join. This notion of providing economic incentives for participation is also true for public blockchains and Buterin (2015) means that this is manifested through cryptoeconomics which most commonly is carried out through a cryptocurrency, raising the question whether it is in KI:s interest to host such. Finally, distributing nodes in a blockchain outside the cooperative might conflict with the business model, meant to serve the public institutions (municipalities) as well as it reduces the

flexibility of the blockchain when involving other members than those of the cooperative. According to Xu et al. (2017) the public option is also the least cost-effective seen to its democratic properties entailing inertia in decision-making. Further, the chief analyst argued that a central governance is necessitated if KI is supposed to be able to counteract a high price dissemination in borrowing terms in order to nurse the cooperatives' best intentions which reduce the applicability of the public type.

To summarize the applicability of the public scope we have addressed the elemental properties inspired from Xu el al. (2017); trust, transparency, integrity, equal rights, cost efficiency, and flexibility. First, trust, where KI has a remarkably high level of trust, which mean they lack the necessity to construct a mechanism to establish trust, therefore, a public blockchain is not the optimal solution. Regarding transparency, this is prominent in the public blockchain type allowing for great audibility as well as empowering the applicability of the principle that the public should be entitled access to public documents that are not confidential (offentlighetsprincipen). In order to ensure the verity of the data on the blockchain, the elementary property of integrity is the strongest in the public type due to the great number of nodes verifying the blockchain making the public type the strongest option. Regarding equal rights, the public type can be argued to be the best option due to its democratic virtue, however, in the context of KI these rights should be delimited to the members of the cooperative. The public type is the least cost-efficient due to the inertia from the vastly distributed democratic process disqualifying it from a feasible option in the context of KI's cooperative. Finally, the flexibility of a public type is too inert in order to allow the cooperative to facilitate sufficient change and be able to adapt to their owners' intentions.

Private

Xu et al. (2017) argue that private blockchains, unlike public, require a high level of pre-established trust to found a sound governance mechanism within the technology. The higher level of trust between parties, the lesser need to eliminate distrust of actions by mechanisms of consensus, thereby *with high-level of trust comes great privacy*. The COO/VP describes the organizational structure of KI to be a bit special due to the cooperative structure, i.e. owned by its customers. In principle, there should be no conflicting relationships with stakeholders and allows the enterprise to serve the interest of the public, thereby a mutual trust is created between the parties. Consequently, she argues that KI as a financial institution has a better position to build trust in comparison to a regular bank, as banks have to produce a return to shareholders potentially return to various bonus programs, where KI has to produce value to their members. Morabito (2017) argues that there is an immense opportunity to cut costs of trust agencies through blockchain, similarly, KI could potentially use blockchain as a tool to substitute parts of their own trust generation function, thereby liberate resource which could but utilized to further improve loan term for its members. The head of Business development and the senior portfolio manager confirms that KI´s level of trust is high both within the cooperative and externally due to well-managed funds. The representatives from the municipalities confirm that the level of trust to KI is high, due to transparency, valuable cooperation and practices with KI. We argue that these views presents a clear picture that KI has a remarkably high level of trust, and based on Xu et al.´s (2017) argument, this means that the cooperative structure fits well in private blockchain.

The notion of the financial manager of the medium-sized municipality indicates that the trust might not be perfect, as she would need further intel of the intentions of KI´s consultancy practices. Moreover, the CIO argues that they intend to diminish the control mechanisms regulating the

borrowing process to the municipalities, consequently entitling municipalities more trust than previously. These examples demonstrate the need for further trust generation within the cooperative. Boudreau (2010) argues that it is vital for a platform owner to adequately balance control mechanisms in order to accommodate motivation and maximize value proposition, this is also echoed by Parker & Alstyne (2014) that argues that the level of openness can significantly alter the participation and motivation of investment from platform partners. KI´s ambition to minimize control could lead to a greater motivation from its member to invest more time in their platform, yet, possibly decrease the targeted value of correct borrowing application. The COO/VP and CIO both argues that the main role of KI is to produce the best loan terms for the members. An argument from the Head of business development and the Senior portfolio manager is that higher level of trust generates better creditworthiness for municipalities, thereby better loan terms. Thereby we argue that even if the trust is high within the cooperative and externally, it is in KI´s interest to increase it further, in fact, it is their mission to do so. Based on Xu et al.´s (2017) definitions, this implies that KI should not constrain themselves within the limits of trust generation in a private blockchain, and rather, should aim for the opposite direction as much as possible.

The treasury manager and CFO of the large municipalities argue that one component of KI´s trustworthiness is their high level of transparency, and would be happy to see their data on KI finans (KI´s platform) to be completely open to the public. This is further confirmed by the senior portfolio manager, that sees transparency as a tool to increase trust, the more transparency, the more trust will be given to KI and the cooperative. However, the chief analyst in KI provides a different perspective, where KI chose to limit the access of financial data in their platform. Only the municipality in question and their dedicated account manager along with the research department got access, this was seen as a measure to increase trust, yet this is somewhat contradicting to previous viewpoints and arguments. Further, she speculates that the remaining financial industry i.e. banks, might not want to keep this data fully open, as it could increase the potential of undercutting prices, which KI also needs to take into consideration. Morabito (2017) argues that private blockchains seem to fit well with corporations in need of control and need of preserving sensitive data as it could be exploited by competitors. We argue that this is not the case of KI, as the COO/VP of KI argues that there is no reason for KI´s individual existence if there is a better solution for their members than what KI offers, then that should lead the way. This is further echoed by the CIO that says if there is anything that could give better financing to the members, then that should also become KI´s mission, even if it means disintermediating themselves. Based on these perspectives and previous arguments, we argue that it would be beneficial to make the data on KI finans fully readable to the public as it would increase the trust within the cooperative and to external interestees. Even if the scenario arises of competitors undercutting KI´s prices, that just means better loan terms for KI´s members, in fact, this change should be welcomed by KI. Further, this can be connected to Iansiti & Levien´s (2004) concept of a 'keystone strategy', where a firm strategically dedicate resources in order to improve the ecosystem and its actors (businesses) within it, consequently, leveraging itself as a more central node within the ecosystem, strengthening its position. Strategically, KI could see this change as an opportunity to foster a new praxis designed by their ecosystem, strengthen their position, and provide better loan term for their members. Thereby, KI should aim for a greater level of transparency, and in regards to Morabito´s (2017) arguments of sensitive data and Xu et al.´s (2017) definition of private blockchain, the cooperative does not align well with private blockchain.

The COO/VP of KI argues that the primary value of KI:s business model is built on the economy of scale, where they are representing a large number of municipalities meaning larger amounts of money, providing greater loan terms. The CIO of KI further argues that their ongoing process of automation takes aim at minimizing cost and simplifying the loan process for municipalities. As KI´s mission is to provide the best possible loan terms for their members, diminishing operational costs are central to further enhance this vision. Xu et al. (2017) and Buterin (2015) argues that a private blockchain is less financially heavy to create, govern, maintain and develop, as well as better performance due to less rigorous authentication requirements due to the already established trust within the chain. Based on this dimension, a private blockchain would support KI´s ambitions of cost efficiency. Furthermore, the CIO and Chief analyst of KI argues that it is not clear whether the municipalities should be granted governance rights and maintenance obligations of a blockchain solution, rather it could be vital to discuss if the technology should be run centrally (within KI) by technocrats, which would align well with a private blockchain, however, both emphasize the importance of including the municipalities perspectives. If KI seeks to control the technology centrally, based on Parker & Alstyne (2014), it might affect the interest of participation from the value creator of the platform. They further argue that orchestrating the buyers' requirements in a platform is paramount in order to drive adoption. Therefore, it might be wise for KI to consider providing governance rights to the municipalities in a blockchain platform, as it could enrich value brought and increase participation. This proposes that KI should not design a blockchain platform based on KI´s single participation, further disqualifying a private blockchain defined by Xu et al. (2017).

To summarize the applicability of the private scope we have addressed the elemental properties inspired from Xu el al. (2017); trust, transparency, integrity, equal rights, cost efficiency, and flexibility. First, trust, even if KI has a remarkably high level of trust, there have been doubts of bias profit agenda, further KI´s ambition is to increase the level of trust further, thereby suggesting that a private blockchain would not align well with their ambitions. Regarding transparency, it is seen as a central element for building trust, thereby a private blockchain could limit the trust-building mechanism. Further, the verity of the data is vastly limited with a private blockchain and could restrict the potential of green loans and external auditability. Regarding equal rights, the private blockchain would not fit well with KI´s current structure as a cooperative owned by municipalities where mutual decision making is essential. As KI would like to optimize costs in order to provide great loan terms, this aligns well with the characteristics of a private blockchain as computations would only need to run at one actor. Finally, in order achieve long-term stability for its members, it is important for KI to facilitate a sufficient amount of bureaucracy in order to counteract potential price dissemination and volatility, thereby a highly flexible blockchain type such as private diminishes in necessity.

Consortium

Just as Normark (1996) argues that the cooperative organization as a way to coordinate economic activity constitutes an equilibrium between monopsony and monopoly, the blockchain consortium type is an equivalent counterpart in between fully private networks and publicly distributed ones. Buterin (2015) means that the consortium type is applicable in a context facilitating several organizations, distributing authority to several nodes. The COO/VP emphasizes that the owner conditions of KI as a cooperative enterprise owned by municipalities means that there are in principle no conflicting stakeholder relationships which allow the enterprise to substantially serve the interests of the public. Buterin (2015) argues that if the nodes or validators are previously entrusted the risk of

adversarial or disproportionate influence on the network can be eliminated, disqualifying the need of a public type. Further, in a consortium, only the member nodes need to validate transactions which are far cheaper compared to a public blockchain where the number of nodes can be huge which also decelerates transaction speed (Buterin, 2015; Xu et al., 2017).

The end-user of KIs borrowing operation are the municipal officials in their respective financial departments. This means that if the peer-to-peer feature of blockchain is to be achieved in a cooperative context, it would make sense if nodes were distributed to the municipalities where the interaction to the lending platform would take place. Further, the COO argued that there is a strength in risk spreading, referring to the owner directives governing the organization. If such voting process would be distributed and fully traceable on a blockchain this would empower this intention. Drawing upon platform governance literature, Parker & Alstyne (2014) argues that third party complementors have greater negotiating influence and leverage to protect their value from exploitation if they are entitled stronger intellectual property rights by the platform owner. Conversely, if they feel that the platform owner intends to exploit their position they might be deterred from participation. This can be translated to the situation where one of the financial managers expressed that they are not fully convinced that KI is completely individual and devoid of a profit agenda of their own. Consequently, if that manager knew that their department operated a node of their own in the network, we argue that this would confer them increased influence which would support the cooperatives notion of shared power. Further, Kenney & Zysman (2016) argues that the nature of platforms, cutting out the middleman, often mean that they outcompete rivaling companies allowing them to appropriate large shares of the value created by the members of the platform. This means that power becomes centralized to the platform owner, arguably weakening the economic incentives Cusumano (2010) means are paramount to economically incentivize participation.

Applying the consortium type, distributing nodes to the member organizations, is further aligned with the CIO who argued that KIs level of control is meant to decrease whereupon the municipalities are scheduled to be more autonomous in the future as a part of the organizations' intention to be more automated. However, as made apparent by the COO/VP and chief analyst, there are reasons to why KI should possess greater influence than each of the member nodes. Firstly, because the COO/VP argued that the operative board of directors has to be able to make business decisions on their own initiative. Secondly, because the chief analyst pointed out that in the case of an emerging unhealthy dept growth in a municipality, KI has to be able to intervene and limit their borrowing. Thirdly because the chief analyst argued that they have to be able to counteract a high price dissemination in the borrowing terms between small and large municipalities. Fourthly, because KI has to be able to standardize the design of the possible trading options on the platform, based on the standpoint from the head of business development and the senior portfolio manager who argued that unregulated peer-to-peer activity would increase price volatility leading to unfavorable borrowing terms. However, the chief analyst pointed out that the current processes for the account managers, handling borrowing requests, are highly ambiguous and independently established inhibiting a shared benchmark. This highly manual process needs to be adjusted prior to the launch of such lending platform based on Zhu & Furr (2016) who argues that a platform presupposes a sufficiently designed original product. The head of business development argued that a peer-to-peer platform would eat into the profitability of the market makers to such an extent that he questioned whether they would continue to operate, leading to the question whether KI could facilitate investors themselves.

Implying a need for conformability, considering whether a new type of member should be acquired requires the blockchain to be flexible. Xu et al. (2017) argue that consortium blockchains facilitate flexibility through their permission management component, which infers the process where novel members are authorized by the existing ones, enabling safeguarding and scalability. This feature also allows the consortium to allocate readability rights to their blockchain to actors outside the cooperative which has been advocated by the COO/VP in order to increase the transparency level of the organization and further by the CFO of a large municipality pointing out how it could simplify auditing.

To summarize the applicability of the consortium scope we have addressed the elemental properties inspired from Xu el al. (2017); trust, transparency, integrity, equal rights, cost efficiency, and flexibility. First, trust where it has been made apparent that the level of trust in the cooperative is high but there have been doubts of a biased profit agenda which makes the consortium, facilitating several actors to participate an optimal blockchain type. Since KI strive to maintain high levels of transparency to generate trust from financial institutions as well as the public, the consortium is deemed too restricted to support this aim. Regarding the verity of data on the blockchain the consortium is not as solid as the public type which disqualifies the consortium to best support data integrity. For the cooperative, equal rights are deemed important to facilitate the mutual participation in the cooperative making the consortium an optimal choice. The property of cost efficiency is less accommodated in the consortium than in the unicellular private type which disqualifies the consortium as the most cost-efficient. Finally, an optimal level of flexibility is accommodated in the consortium type since it is both sufficiently malleable to incrementally implement changes on the platform whilst at the same time stable enough to support long-term stability for its members.

Breakdown of the discussion

Based on previous discussion points within each type, we would like to establish how well KI´s cooperative lending platform would align with Xu et al.´s (2017) blockchain types based on six characteristics. First, the level of trust is remarkably high in their cooperative, which presents a picture that aligns well with a private blockchain, however, the trust is not perfect. Additionally, it is in KI´s interest to increase the trust further, thereby distributing the control and visibility of the data further could be a way to approach this. Consequently, based on this dimension, we argue that KI should utilize a consortium structure. Secondly, almost all respondents were positive for a fully public readability of the data of KI finans, we argue that this aligns well with a public blockchain. Third, Integrity, the verity of the data, is also considered a priority for the cooperative as they would like to verify the *greenness* of funds, the traceability of funds, and establishing the possibility of higher credibility from rating institutes, this would place the cooperative under public as well. Fourth, equal rights, as the cooperative structure discriminates external interestees by only providing fund to its members, as well as the ownership rights of KI, this argues for possible synergies of utilizing a blockchain that does not only serve one organization, nor allows all participation, yet welcomes all members of the cooperative for participation, thus a consortium blockchain would be beneficial for this aspect. Fifth, as KI´s mission is to provide better loan terms to its members, heavily reflected by the way of managing business by economy of scale, as well as automation is central to reduce costs, we argue this present the perspective of utilizing a cost-efficient and a high-performance blockchain would deem beneficial for KI, i.e a private blockchain. Sixth, If KI would like to enlarge their scale of their blockchain to include more features or participants, this is important to consider before

considering type structure, where KI would need enough flexibility to facilitate the change, yet enough bureaucracy to limit volatility and establish stability and amongst the member municipalities, we argue that a consortium blockchain would be optimal to facilitate this. This figure below illustrates the aforementioned six characteristics and the alignment of a cooperative lending platform.

Properties	Type		
	Private	Consortium	Public
Trust		✓	
Transparency			✓
Integrity			✓
Equal rights		✓	
Cost efficiency	✓		
Flexibility		✓	

Figure 4. Conceptualization of how the blockchain types fit the case study.

Based on the previously discussed characteristics; trust, transparency, integrity, equal rights, cost efficiency and flexibility, we can clearly see benefits of utilizing a more centralized private blockchain. However, the benefits of possible gains with public blockchain in forms of transparency and verity of data, outweighs these cost benefits. Yet, as it is a cooperative, KI is ruled by and is serving their members; the municipalities, and needs to facilitate enough stability and flexibility, distribute sufficient control to accommodate its members, and continue building trust with current blockchain solutions. Ultimately, we argue that a consortium blockchain leaning towards an incremental pursuit for a public blockchain, which incorporate fully public reading accessibility of the data, would be the optimal way to support a cooperative lending platform for KI and their member municipalities.

Conclusion

The aim of this study was to answer what blockchain type supports a cooperative lending platform. To examine this, a case study with an abductive approach was conducted to analyse a financial institute and its symbiotic relationships within their cooperative. Six elemental properties of blockchain technology were evaluated where three points towards that the blockchain type that supports a cooperative lending platform is the consortium blockchain. One property support the private blockchain, *cost efficiency*, whilst two support the public blockchain in form of *transparency* and verity of data (*integrity*). Yet, as a cooperative, ruled by and serving the members, it needs to balance *flexibility* and facilitate enough stability, distribute sufficient control to accommodate its members, maintaining *equal rights,* and continue building *trust*. Concludingly, a consortium blockchain leaning towards an incremental pursuit for the characteristics of a public blockchain, which incorporate entirely public reading accessibility of the data, whilst write-permission is kept within the cooperative, would be the optimal blockchain type to support a cooperative lending platform.

Further studies

The limitation of this was to not include consensus mechanisms and deeper nature of cryptography. As we have answered what type of blockchain that supports cooperative lending platforms, consequently, the question of what type of consensus mechanisms that supports a cooperative lending platform is evoked. Moreover, we would also like to endorse exploring further practical applications aligned with possible design choices of a consortium blockchain, some suggested in our study, and examine the feasibility of said practical applications.

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Appendix

Appendix I: Interview-kommuninvest

What blockchain type supports a cooperative lending platform?
****
- Jonas och Carl-Marcus, masterstudenter från GU som studerar blockchain.
- För att undersöka om blockchain är relevant för KI kommer vi att fråga om: relation till kommuner, integritet och plattform.
- Intervjumallen är likadan oberoende av roll på KI, svara utifrån er förmåga.
****
Berätta lite om din roll på KI (Hur ser en arbetsdag ut för dig?)

Relation till Kommuner

Hur skulle du beskriva er relation med kommunerna?

Hur skulle du beskriva er tillit kommunerna?
> Hur skiljer sig kommuninvests tillit mellan olika kommuner?

Hur skiljer sig lånevillkoren mellan olika kommuner?

Vilka exempel på erfarenheter med <kommun/investerare> anser ni varit:
- bra
- mindre bra

Om en blockchain-plattform som ersättning för den låneprocess ni idag erbjuder skulle utvecklas, i vilken grad bedömer du att kommunerna bör vara involverade i:
> utvecklingen av en sådan?
> styrningen av en sådan?

Hur ser ni på möjligheten att kommuner kan bedriva utlåning till andra kommuner? (Om en plattform gör det möjligt att matcha kommuner och investerare utan er intermediering)
> - Hur stor tillit har ni till att kommunerna fortsätter att sköta sina lån genom er plattform och inte går till investerarna direkt?
>   - Vad innebär det för en sådan plattform att investerare är både partners och konkurrent till plattformen?

Integritet
Hur känsliga är de uppgifter som ni delar med respektive kommun för andra parter? Exempel på detta? (*lånevillkor?)*
- *Vad skulle vara öppen/stängd data i så fall?*
  - Hur skulle ni ställa er till att KI finans (plattformen) data skulle vara helt öppen?
- Att historiken är bestående? (Vad som en gång exponerats är alltid tillgängligt) *Immutability*

35

Plattform

Vilka är de viktigaste utvecklingsprojekten för plattformen?

- Vilken av dem skulle ni säga är huvudprioritering?
- (Hur arbetar ni med innovation?)

Vilka exempel på erfarenheter med KI finans (plattformen) anser ni varit:

- mindre bra
- Hur styr ni användarbetenden?
  - Hur har det förändrats?
  - Hur regleras 'dåligt betende'?

Avslutningsvis:

- Är där något ytterligare du tycker vi ska belysa?
- Är där någon mer som vi borde prata med enligt dig?

Appendix II: Interview-kommun

Skall besvara -> **What blockchain type supports a cooperative lending platform?**
****
- Jonas och Carl-Marcus, masterstudenter från GU som studerar blockchain.
- För att undersöka om blockchain är relevant för KI kommer vi att fråga om: relation till KI,
integritet och plattform.
- Intervjumallen är likadan oberoende av kommun, svara utifrån er förmåga.
****

Relation till KI

Hur skulle du beskriva er relation med kommuninvest?

Hur skulle du beskriva er tillit till kommuninvest?
>   Vilka är dem olika rollerna hos er som arbetar mot KI?
>   > Hur är dynamiken mellan dem olika roller?

Har ni några exempel på erfarenheter med kommuninvest ni anser varit:
- bra
- mindre bra

Hur skulle du ställa dig till om kommuninvest utvecklade en plattform som gör det möjligt att matcha er direkt till investerarna utan kommuninvests intermediering?

Om en blockchain-plattform som ersättning för den låneprocess ni idag skulle utvecklas, i vilken grad bedömer du att kommunerna bör vara involverade i:
>   utvecklingen av en sådan?
>   styrningen av en sådan?

Hur ser ni på möjligheten att kommuner kan bedriva utlåning till andra kommuner? (Om en plattform gör det möjligt att matcha kommuner och investerare utan er intermediering)
>   - Hur stort intresse skulle ni ha för att fortsätta driva belåning genom plattformen och inte gå till investerarna direkt?

Relation till investerare
Vilken relation har ni till KI:s investerare?
-Finns där ett intresse att ha det?

Integritet
Hur känsliga är de uppgifter som ni delar med KI för andra parter? Exempel på detta? (*lånevillkor?*)
- *Vad skulle vara öppen/stängd data i så fall?*
  - Hur skulle ni ställa er till att KI finans (plattformen) data skulle vara helt öppen?
- Att historiken är bestående? (Vad som en gång exponerats är alltid tillgängligt) *Immutability*

Plattform

Vilka exempel på erfarenheter med KI finans (plattformen) anser ni varit:

- mindre bra

Känner du att vi adresserat alla frågor relevanta för intervjun eller skulle du vilja lägga till något?