Exploring blockchain business models with the customer as a key supplier

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Exploring blockchain business models with the customer as a key supplier

Master thesis report

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EXECUTIVE SUMMARY

Every technology, needs a business model before it can flourish and be profitable (Chesbrough, 2010), and so does blockchain. Companies have started researching if the technology can be valuable for them to use in their daily operations. What is lacking in academic literature is a way of structuring this value. More specifically, structuring value creation, capture and delivery for both customer and company itself. This research aims to find a way of structuring and visualizing this for a large company, that aims to capture value from blockchain in delivering content to their customers.

Focal firm and its problem

The firm in which the research has taken place is one of The Netherlands' leading telecommunications and cable operators. As part of their entertainment services, they provide their customers with television and Video On Demand (VOD). The content they provide is distributed from a small number of centralized data centers. During peak hours, the network is at risk of becoming unevenly loaded because of this. An additional problem is formed by the single points of failure that exist as a result of the centralized way of storing the content.

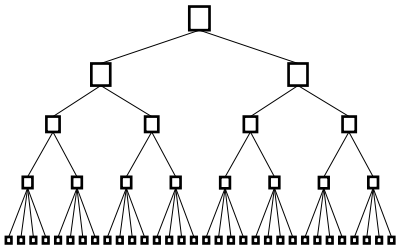

Figure 1 Schematic representation of the network in place

The focal firm aims to solve this problem by implementing a blockchain solution in their entertainment services. This is done by storing the content on customer premises equipment (CPE) that is already present in the customers' homes. These CPEs are currently the media boxes that the customers connect to their televisions in order to watch linear television as well as VOD. It is also possible for the customers to watch content on their mobile devices or computer. The blockchain would then function to facilitate all transactions that happen on the platform and track all files and their locations throughout the network. The content spreads through the network when it is watched by a customer, similar to torrenting. This means that when a certain customer purchases a movie and streams it, it is saved on their CPE. This way, the most popular content spreads throughout the network. The value created for the company here is the network load being more evenly spread, as well as lower dependence on the centralized data centers as single points of failure.

This shows the value that will be created for the focal firm, but the additional value created for the customer still has to be researched. Additionally, the characteristics of blockchain may have consequences for the business model and the framework representing it. Because of this, the following problem statement is central to this research:

In order to apply the aspired blockchain technology to fulfill its entertainment service delivery, the focal firm needs to know how this technology can be translated into a successful business model that will ensure that value will be delivered to their targeted customer segments and will enable them to stay competitive in the rapidly changing market that they operate in. Currently, due to characteristics of the blockchain technology, the business model is not suitable for this.

Methodology

According to Gartner and their Hype Cycle (Panetta, 2017) the blockchain technology is descending from the Peak of Inflated Expectations into the Trough of Disillusionment. Their prognosis is that the time it will take to reach the Plateau of Productivity will take five to ten years. Derived from this fact, the problem statement and preliminary research, it was chosen to find an answer to the following main research question:

RQ 1: What should the focal firm's business model look like in order to successfully be able to deliver their entertainment service through a blockchain solution within five years?

In order to formulate a complete and valid answer to this research question, the design of the research was divided into three parts: Theory, the focal firm, and practice. In the research, all three sources of evidence aimed to answer a supporting research question. These research questions resulted in three sets of design criteria that were used in the proposed redesign of the focal firm's business model.

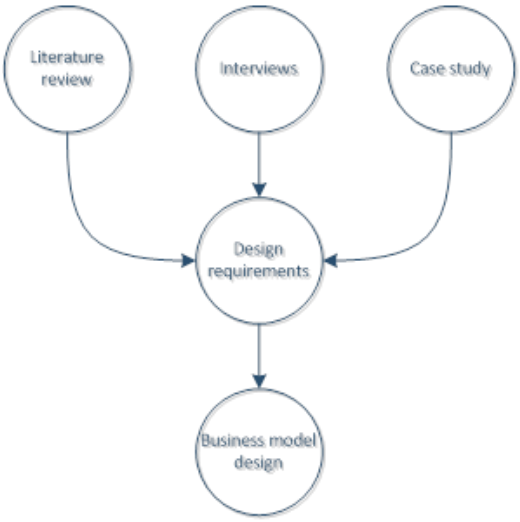

Figure 2 Interplay of inputs for framework design

Academic literature regarding blockchain is scarce. Reports on how to represent a blockchain business model in a framework is non-existent. In order to still gain useful insights from theory, blockchain characteristics were researched, as well as literature regarding fields that (partly) shared characteristics. The fields that were chosen were sharing economy (collaborative consumption), peer-to-peer networks, and grid-computing and cloud-computing. This section answers the following question:

Supporting RQ 1.1: What indications for a blockchain business model does the academic literature on the sharing economy (collaborative consumption), peer-to-peer networks, grid-computing and cloud-computing give as it comes to blockchain characteristics?

Furthermore, the basics regarding business models were thoroughly examined in order to find a starting point for the business model redesign, as well as form a means through which both interview protocol and case study protocol are structured. The framework chosen for this was the Service Business Model Canvas (SBMC) (Zolnowski, Weiß, & Böhmann, 2014), a variation on the Business Model Canvas (BMC) by Osterwalder & Pigneur (2010). This framework was chosen for this role due to its accurate representation of co-creation in services, and its characteristics to facilitate both inter- and intra-firm analyses. Furthermore, the framework provides a static view of a business model, giving it the ability to function as a blueprint (Demil & Lecocq, 2010).

The interviews were held among six members of the core blockchain group of the focal firm. This group researches the opportunities blockchain has for their focal firm, regarded from their own job-related backgrounds. The interviews were semi-structured and were used to find requirements for the envisioned business model. The questions were asked naïvely and along the constructs of the SBMC. The supporting research question to find the inputs from the interviews was the following:

Supporting RQ 1.2: What does the envisioned business process look like and what requirements for the business model does this imply?

The case study formed the source of evidence from practice. During this multiple case study, the case study method by Yin (2009) was used. In this case study, eight whitepapers from startup companies that are relevant to the focal firm were researched. This relevance was based on the services the cases provided. Most importantly, the cases should all deliver services, using a customer's resource as one of the key resources to their business model. Secondly, the industry should either be sharing of files, data (services), media, or a combination of these. Finally, the cases were required to be operational or have had significant investments.

The analysis of these cases along the constructs of the SBMC served to find the third set of design requirements. In doing so, the following supporting research question was used as a guidance:

Supporting RQ 1.3: What lessons can be learnt from current applications of the blockchain in industries relevant to the focal firm, its business model, and the chosen business model framework?

Most important findings

From the three sources, the main findings were the following:

- In literature, interviews, and case study, it was found that an additional role should be added to the business model framework. This was the role of a *Supplying customer*. This customer had generally the same characteristics as the end-user of the service, but also had important additional features of a *Key partner*. This resulted in the need for an extra value proposition, as this customer could now monetize the resource they provided to the firm.
- Resulting from blockchain characteristics, and confirmed during the interviews and case study, was the impact that the blockchain has on financial streams that are described in a business model. This meant that there was an ability to have financial streams flowing between several actors within the business model, instead of between an actor and the focal firm.
- From the interviews and case study, it became apparent that the *Relationship* construct from the SBMC could be redefined to its original form of the BMC. This means that not the contribution to relationships per actor were highlighted, but the relationships that resulted from the choices the focal firm made regarding blockchain characteristics. These choices were summarized in three steps:
    - What role the focal firm plays in the business model, mainly influencing the former relationship construct:
        - *Marketplace*: the focal firm provides a marketplace on which supplying customers can sell their resources to end-users;
        - *Main service provider*: the focal firm directly provides services to the end-user and uses the resources of the supplying customer in their service provision;
        - *Supporting service provider*: the resources provided by the supplying customers are directly consumed by the end-user. The focal firm provides the blockchain that registers all transactions and possibly an app with an overview where the resources are located.
    - Develop a native blockchain or use a token standard on an existing blockchain, influencing the focal firm's activities, resources and determining if *Miners* should be part of the business model.
    - Whether or not the focal firm uses an open source community to (help) develop the blockchain, influencing the key (human) resources of the focal firm.

Based these (and other) findings, the choice was made to distinguish actors based on their interaction with the blockchain, instead of the rather transactional customer - focal firm – partner division present in the SBMC. This way, the role of a customer as the supplier of key resources was visualized in the business model framework. As the relationship between focal firm and partners that do not interact with blockchain stays the same, the original SBMC constructs were respected and adopted in the redesign.

Actors interacting with Blockchain	End-user	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities	Blockchain characteristics
	Content producer	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities	
	Supplying customer	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities	
Focal firm		Cost structure	Key resources	Revenue model	Value proposition	Key activities	Relationship	Channels	
Actors not interacting with blockchain		Cost structure	Key resources	Revenue model	Value proposition	Key activities	Relationship	Channels	
		Cost structure	Key resources	Revenue model	Value proposition	Key activities	Relationship	Channels	

Figure 3 Representation of the proposed redesign to facilitate blockchain business models

ACKNOWLEDGEMENTS

This report marks the end of a Master Thesis Project in which I was able to do the thing that I love: combining things that I have learned with new theories, experiences and technologies. The fact that blockchain transformed from a vague buzzword to one of my everyday recurring themes proves this. This project forms my final step in achieving what I have been working for the last couple of years: a Master of Science Degree in Innovation Management.

During this project, I was supported by a number of people who I would like to thank.
First of all, I want to thank my mentor dr. ing. Wouters, who has given me feedback throughout the project. In one of our first meetings we figured out that our views regarding his role and guidance were similar: meetings were only needed for solving problems and for feedback. This gave me the opportunity to work independently and make this project my own, with intermittent moments of reflection. Additionally, I want to state that the Thesis Circle project that dr. ing. Wouters led helped me during all stages of my project.

I also want to thank Jan van Boesschoten, who helped me understand blockchain and kept testing me on my knowledge. His way of looking at the matter helped me put things in perspective and showed me all the great things (and ugly things) about blockchain and the people working with it. I also want to thank him for the freedom he gave me in tackling the problem at hand. I genuinely hope that the proof of concept is successful, and that someday we all find ourselves watching content from our neighbor's CPE.

Finally, I would like to thank my family, girlfriend, and friends who supported me not only during my thesis project, but throughout my Bachelor's and Master's degree here in Eindhoven. They supported me in all of my choices throughout the curriculum, from going on trips and moving to another house, to choosing courses and moving to Helsinki for half a year. Besides their support, they gave me the opportunity to relax, put things in perspective, and take some time off work.

Benjamin Rensen

1 INTRODUCTION

Recently the interest in the technology called blockchain has reached the public. More specifically, the cryptocurrencies, with Bitcoin as its most known example, have been trending topics in the news and on social media. In December of 2017, the hype around, and value of, Bitcoin seemed to flourish with a price of 17,900 USD per Bitcoin (Kelly, 2017).
The fact that the blockchain seems to be underrepresented in popularity compared to the applications of it, poses an interesting question to be answered. Namely, in which way can the blockchain be of value for existing companies? According to Gartner, and their Hype Cycle for Emerging Technologies, the blockchain has now just passed the peak of Inflated Expectations and is starting its descent into the Trough of Disillusionment, in which the limitations or even possible downsides of the technology may become apparent. They expect that blockchain, categorized as a Digital Platform, will need five to ten years to travel through the Slope of Enlightenment and reach the Plateau of Productivity (Panetta, 2017). On that plateau, the mainstream adoption sets in and the real-world benefits of the technology are generally acknowledged and accepted. (Linden & Fenn, 2003)

The blockchain technology can be used in several applications, of which cryptocurrency is the most known. This is logical as the blockchain technology was first described along this application (Nakamoto, 2008). However, a blockchain application does not necessarily have to be a currency, as a blockchain is merely a ledger that keeps track of all the transactions that happen within a system. This system is immutable and thereby enables and facilitates transactions between peers, without the need for a middleman. (Crosby, Pattanayak, Verma, & Kalyanaraman, 2016)
The second generation of blockchain added smart contracts. These contracts have three distinctive elements: autonomy, self-sufficiency, and decentralization. Autonomy here means that after the contract is launched, it can run without interference of its initiating agent. In other words, the action described in the line of code will be executed, without the initiating party having to confirm every time the action is requested. Self-sufficiency means that, in line with its autonomy, the contract can raise funds by providing the requested services or issuing equity, and spend them on the resources it needs. (Swan, 2015)
Especially this second generation spurred the interest of a large amount of companies. Among these are a vast amount of startups, but also large firms aiming to solve problems in their organisations. Examples of the latter are Wal-Mart and Visa are aiming to decentralize trust in the supply chain, and Oracle that uses the technology for cloud computing applications (Kharif, 2017).

Another company aiming to solve a problem by applying blockchain is the focal firm in this research. Because the focal firm does not only provide connection, but also content, they saw an opportunity to make use of the blockchain by decentralizing their streaming and broadcasting services. As the content is now distributed from centralized servers, single points of failure exist. Moreover, this is also suboptimal from a traffic point of view: if all traffic comes from a small number of servers, the network will be unevenly loaded. When the media boxes - which are already present in the households of customers - are used to store content, a network between these media boxes can be created that functions as the infrastructure that provides other customers with the content they request. Besides facilitating this decentralized storage of content, the blockchain network provides the ledger that registers all transactions and file exchanges happening between these media boxes within the focal firm's entertainment network. This can also facilitate a new system of compensating intellectual property owners, which is now based on licensing.

The problem regarding the single points of failure and the load the data puts on the network should be solved by applying a blockchain solution. In order to stay competitive in the rapidly changing and highly competitive market, it is key for the focal firm to keep evaluating the way their company is delivering services to their targeted customer segments.

Research shows that for a company to use a technology optimally, it is important to first understand what the technology can mean for them, before starting to implement it. Or, according to Chesbrough (2010), the value of a certain technology will remain undiscovered until it can be successfully matched with a suitable business model. This goes for suitability for the company itself, as well as for the customer it aims to serve. This view corresponds loosely with the movement from the Trough of Disillusionment to the Plateau of Productivity in the Gartner Hype Cycle.

Within the firm, the blockchain solution was being developed in parallel to this research. However, characteristics of the blockchain technology imply that a change is needed in the business model that describes the services that are provided by the focal firm. Because of the blockchain characteristics, as well as the necessity for a suitable business model as argued by Chesbrough (2010), business models will serve as the theoretical perspective throughout this research. In the problem statement below, the necessity of a renewed business model within the focal firm is substantiated along the current business model in place and basic blockchain characteristics.

1.1 Report structure

The report is structured as follows. First, the current state of the focal firm will be described, along with the problem statement, objectives and research questions in chapter two. In the third chapter, the design of the research and the methodology that was used to find answers to the research questions are described in further detail.
Chapter four, five and six provide the results of the analyses described in the methodology chapter. These chapters also contain sets of design criteria that help to fulfill the objective of the research and thereby answer the supporting research questions. The subjects of the chapters are: a review of business models and results from literature in adjacent fields in four, results from interviews within the focal firm in five, and results from a multiple case study in six.
After this middle section, the redesign is proposed in chapter seven. Here the framework is proposed and elaborated upon, whereafter it is filled in according to the needs of the focal firm.
The eighth chapter reflects on the research that was done and proposes implications for further research. This chapter also discusses the validity of the redesign and describes the contributions of the research. The report finishes with the bibliography and appendices in chapters nine and ten.

2 PROBLEM STATEMENT

In order to get a thorough understanding of the problem at hand, preliminary desk research was done, along conversations with the project leader of the blockchain proof of concept. As a result, a general overview of the current business model is given in the first half of this chapter to underline the need for a new business model when the blockchain solution is implemented. As the contrast between the current and blockchain business models mostly stem from the underlying technology, a short description of the problem that is to be solved by the blockchain solution itself is given as well.

2.1 Company context

As stated before, the focal firm of this research considers the blockchain as a solution to a problem they encountered in their daily operations. This firm is active in The Netherlands and serves business and residential customers with video services, broadband internet, fixed-line telephony and mobile services. The video services consist of linear (live) television, on-demand television and their own television channels. The total number of customers using video services, broadband internet, fixed-line telephony, or any combination of those services is around four million. The number of mobile telephony customers, measured by active SIM-cards, is around five million. The markets in which they operate are highly competitive, with one main competitor that provides similar triple play packages to their customers. Triple play means that a subscription consists of a bundle of broadband internet, telephony services and video services. Together with the power of operating a large mobile network, enabling them to provide fixed-mobile convergence services, this creates a significant competitive pressure on the focal firm.

2.2 Current business model

In this section, more light will be shed on the problem that is solved by implementing blockchain. This will provide a clearer view on both the network and the business model that are currently in place. Furthermore, it will serve to clarify the difference between the current processes and accompanying business model, and the envisioned blockchain application.

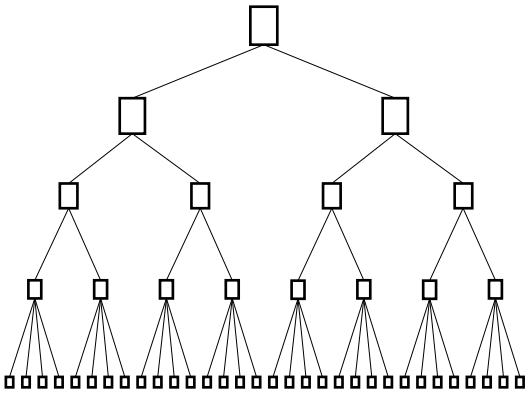

Figure 4 Schematic representation of network in place (simplified)

As stated above, the blockchain solution aims to evenly spread the (peak) load over the network and aims to reduce the dependency on single points of failure. In Figure 4, a schematic view of the network is given. Right now, all content is stored in eight datacenters in the top of the chart. These datacenters together serve 7.2 million customers throughout the country, that are connected to the network via 750,000 remote optical platforms (ROPs): small units placed on the streets that subdivide the incoming cables into multiple outlets, connected to customer's homes. The solution that is described above will use the customer-premises equipment (or CPE) to store content that is, at this moment, stored in only the central datacenters. This way, the "higher" regions of the network will be offloaded. The datacenters will not be discarded from the network in any way. With the content stored on the CPEs, the customer can stream the content they want to watch from their neighbors. If this content is not present within close proximity to the client, the requested content will be fetched from a CPE in a relatively close ROP network. The choice which CPE(s) will be used to fetch the content from will be based on proximity and quality, in order to give the customer good and reliable content, whilst offloading the network.

Below in Figure 5, the current business model is shown in the Service Business Model Canvas framework (Zolnowski et al., 2014). To keep the perspective focused, only the focal firm, customers, and content producer or digital rights owners are included in the business model representation. Logically, other stakeholders are generally involved, but these do not interfere with the service

provision depicted in the business model. This is mainly since the focal firm owns the infrastructure, uses their own data centers and has CPEs in people's homes. This cuts away dependence on partners. Regarding customers, there are several packages that can be acquired, and thereby influence the individual customer's characteristics. In the business model below, the general characteristics that all customers have are depicted. Within content provision, all customers have a linear television subscription of the focal firm. Watching additional content is optional. The payments of the additional content are added to the monthly fee that is paid as variable costs added to the subscription fee. Although all customers have a linear television subscription, a CPE that connects to their television is not required, as watching television through the focal firm's app is an option too. The activities of the customer are kept at a minimum, as the focal firm's services should be performed as smooth as possible. Because of this, onboarding, initiating and consuming the service are the customer's key tasks.

As mentioned earlier, the focal firm provides most of the resources themselves. As they own the infrastructure, the CPEs and the data centers, they are not dependent on key partners as it comes to hardware. The focal firm has to acquire licenses that enable them to provide their customers with content. This results in one key partner type that enables them to do so. The licenses are periodically renewed and enable the focal firm to make the content available to customers. These customers then pay the focal firm for this additional provision. This makes both the relationship with the key partners, as well as the consumer a transactional one. Although the relationship with the licensor involves more personal contact than the one with the customer.

	Customer **The customer is a consumer that can optionally have a CPE at home, or watch linear television and content using a mobile device**						
Customer perspective	**Cost structure** Monthly subscription fee, additional monthly billing of purchased content	**Key resources** Digital device, computer, television	**Key activities** Registration, downloading app (optional), account management	**Value proposition** Watching television or other content at any place and any time	**Relationship** Registration for automated service of self service	**Channels** Digital device with app installed, computer, television	**Revenue model** n/a
Company perspective	**Licensing fees, operations**	**Infrastructure, Human resources, CPEs, Data centers, Software**	**Development, maintenance, operation of hardware and software. Billing**	**Provide additional services to have additional revenues beside the subscriptions**	**Automated services integrated into service provision**	**Website, apps, customer service**	**Monthly subscription fees, additional revenues from content**
Partner perspective	Content creation costs	Content	Creating licensing contracts	Have a large platform to distribute content	Personal assistance	n/a	Licensing fees
	Key Partner **The Key partner here is the producer of the content or the owner/manager of the content's digital rights**						

Figure 5 Overview of the current business model, using the Service Business Model Canvas by Zolnowski et al. (2014)

2.3 Blockchain business model

The nature of the blockchain technology is different in a number of ways as it comes to delivery of services, the decentralized way of storing data, payments, customer relationships, and possibly more. This poses an incongruency between the way of working that the focal firm has in delivering their entertainment services, and a way of working using the blockchain technology. Put differently, the business model that has been in place to create and deliver value for both the customer and the focal firm may need to be changed, as multiple aspects of the value proposition ought to change. This view is in accordance with literature, stating that for a technology to be successful in creating and delivering value, some components in the business model may have to be altered (Hienerth, Keinz, & Lettl, 2011). From blockchain theory, some implications for a business model to be changed can already be distinguished. Primarily, the decentralized nature of blockchain technology in itself implies multiple requirements. The first being that a key resource of a company is spread out among its customers. More specifically, storage and computing power of devices are spread across the network. This diffused characteristic that a key resource has, should be represented properly in a framework.

A second implication resulting from the decentralized characteristics is the distribution of the service. Put differently, the actual way of delivering value changes, as the service that provides the value originates from multiple resources too (e.g. storage, bandwidth). It must be stated that this implication is especially important in the case of the focal firm as they aim to also store the content in a decentralized manner. Because of this, it is important to remember that in the blockchain ledger, only transactions or smart contracts are stored. In the case of the focal firm, the other data (media content) will be stored on systems in the network as well.
A third implication that stems from the decentralized characteristic of blockchain technology is the customer relationship. Traditionally, the relationship between a firm and a customer is (highly) transactional. In blockchain applications, this relationship is reciprocal, as the customer also becomes a supplier of key resources. According to Osterwalder & Pigneur (2010) a key resource is can be owned by the focal firm itself, or can be acquired or leased from a key partner. When using this definition, the customer seems to be able to take the role of a key partner in the business model. Although there is literature on co-creation of services (Payne, Storbacka, & Frow, 2008), or even business model frameworks that aim to visualize co-creation (e.g.: SDBMR (Lüftenegger, 2014) or SBMC (Zolnowski et al., 2014)), the role of a customer as key partner has not been found in a business model (framework) literature yet.
In blockchain technology, not only the decentralized storage results in changes in business models, also the payment system differs. As in blockchain technology tokens are often used as a (crypto)currency, the revenue model and cost structure may change. Moreover, the tokens are also used as incentive for customers as suppliers to provide storage and/or computing power to the firm. These tokens can then often be used for payments within the system. This way of incentivizing also means that there is an additional type of value created for the customer. Besides the main service that is described in the value proposition, the customer can gain value by being this customer as supplier.

2.4 Problem statement and objective

The discrepancies between the current business model and the implications given by blockchain characteristics are summarized in the following problem statement:

In order to apply the aspired blockchain technology to fulfill its entertainment service delivery, the focal firm needs to know how this technology can be translated into a successful business model that will ensure that value will be delivered to their targeted customer segments and will enable them to stay competitive in the rapidly changing market that they operate in. Currently, due to characteristics of the blockchain technology, the business model is not suitable for this.

During this project, a proof of concept was started up in parallel. To have a solid and working concept at the end of the project, there was a need for a business model to accompany the proof of concept that was being developed, in order to not merely prove that the concept works, but also to prove that it creates value in an appropriate way. Finding and designing this business model was the main objective in this research.
Additionally, the research aimed to specify the influences the blockchain has on the visual representation of a business model in a framework. As of writing, no academic literature describes such a framework. Moreover, the business model that was designed during this research may function as a first step in the development of a comprehensive framework to describe these business models with a blockchain based service delivery at its core. The proposed design here then functions as a n=1 sample to prove the necessity and feasibility of such a business model framework. In short, the objective of this report is the following:

Design a business model that helps the focal firm to translate the envisioned blockchain solution into value for both company and customers.

2.5 Research questions

In fulfilling this objective, a set of research questions was formulated to function as a guide throughout the research.
First of all, the main research question that fulfills the purpose of this study is stated. This question was formulated in consultation with the leader of the blockchain proof of concept within the focal firm.

> *RQ 1: What should the focal firm's business model look like in order to successfully be able to deliver their entertainment service through a blockchain solution within five years?*

The blockchain is, as of writing, a rather underrepresented subject in academic literature. Literature describing the business models and their frameworks regarding blockchains even more so. The novelty of the subject at hand makes that the sources of evidence are relatively scarce. This led to the choice for a qualitative approach. In other words, the nature of this research has inductive properties, similar to Grounded Theory. Although there is a difference with this type of research. In Grounded Theory, the sources of evidence are chosen during the research itself. This is not the case here. The similarity between the approach taken here and Grounded Theory lays in three things:

- Multiple sources of data are used to gain insights for building new theory;
- Data within the same type of source are compared to find similarities and differences;
- Findings are grouped to base new theory on. (Corbin & Strauss, 2015)

The three sources of data that were chosen in this research are the following:

- Theory: Literature from adjacent fields. These fields in academic literature overlap with blockchain on one or more characteristics.
- Focal firm: Interviews within the focal firm. The interviews served to crystalize the requirements from the focal firm that come forward from the implementation of the blockchain implementation.
- Practice: A multiple case study researching relevant blockchain whitepapers. The existing and similar applications of blockchain were used to find implications from practice for the design.

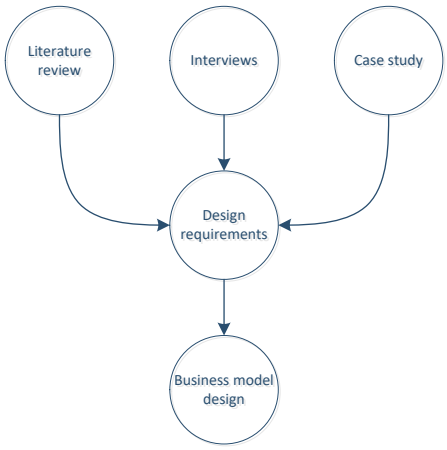

Figure 6 Interplay of inputs for framework design

These three sources gave inputs for the design criteria that were used in the proposed redesign of the business model at hand.
In Figure 6, a schematic overview of the way these sources of evidence lead to the final business model design is shown. The way these three sources of evidence are represented here correspond to the structure that is used throughout the report. The methodology regarding the gathering of evidence from the respective sources is elaborated in the next chapter.

In accordance to the three sources of evidence, three supporting research questions were formulated. These three questions correspond to the sources of evidence stated above.

> *Supporting RQ 1.1: What indications for a blockchain business model does the academic literature on the sharing economy (collaborative consumption), peer-to-peer networks, grid-computing and cloud-computing give as it comes to blockchain characteristics?*

> *Supporting RQ 1.2: What does the envisioned business process look like and what requirements for the business model does this imply?*

Supporting RQ 1.3: What lessons can be learnt from current applications of the blockchain in industries relevant to the focal firm, its business model, and the chosen business model framework?

In the following chapter, the methodology how the research questions were answered is elaborated upon in more detail. Furthermore, this chapter will give a clearer view on the remaining chapters in this report and the reasoning behind it.

3 RESEARCH DESIGN AND METHODOLOGY

In the previous sections, the problem statement, research objective and research questions provided a general overview of the design of this research and the structure of this report. In this chapter, the research design and methodology of the three sources of evidence will be described in further detail.

3.1 Research design

As this research aims to solve a problem that exists in a real-life business context, the project will be regarded as a Field Problem Solving project, or FPS project. As described by Van Aken, Berends and Van der Bij (2007), an FPS project can best be approached by applying the problem solving cycle. The problem solving cycle consists of five successive steps, based on the regulative cycle (van Strien, 1986). These steps are Problem definition; Analysis and diagnosis; Solution design; Intervention; Learning and evaluation. Due to time constraints, and the scope of this research, only the first three steps of this cycle will be taken. These first three steps in the problem-solving cycle form the basis to design a solution for the problem at hand, and therefore fulfill the objective of this research.
The set of three supporting research questions that were described earlier, forms the backbone of this report. Every supporting research question will contribute to answer the main research question by providing a set of design requirements. These requirements originate from the respective source of evidence and will therefore serve as the answer to the supporting research question at hand.
The methodology used to answer these questions is elaborated per source of evidence below.

3.2 Literature review

The first supporting research question aims to find design criteria for a blockchain business model in literature from adjacent fields. In order to get a thorough understanding of business models as a whole, literature on business model frameworks was researched first. During this first part, a starting point for redesign was sought.
The first step in the process was a search of electronic databases to find highly cited reviews and articles in the field of business models. As this type of starting point often finds only about ten percent of the relevant literature (Randolph, 2009), a second step was taken. This second step comprised of using the acquired articles to find other relevant articles, using the snowball method as described by Van Aken, Berends, & van der Bij (2007). Because the electronic database of *Web of Science* enables both forward and backward snowballing, this database was used. To maintain consistency, this database was used throughout the report as the source for academic literature. The relevance of the literature reviews was based on the number of citations (also used as main ordering filter of the results) and by reading abstracts of the research. A review was deemed relevant when the abstract showed a thorough analysis of one or more business model frameworks, or a comparison between them.
As *business model* was a buzzword during the internet bubble, thorough research on its frameworks started after that period (Magretta, 2002). Although the term has been found in earlier papers sporadically, only literature from after this period was used. The cut-off year that was chosen based on this was 2000.

The reviews that were found were also used to find keywords in the field. These keywords were then used to do a more thorough search in the same electronic database. This was done to protect the review from the bias that exists when a researcher only uses snowballing to find sources of information. Put differently, possible bias that a review's author may have is avoided by searching the electronic databases more thoroughly (van Aken et al., 2007). The relevance of the articles was again determined in the aforementioned manner.
Besides this systematic approach to the literature review, the knowledge I already have will not be ignored. Some business model frameworks that I have learned about in previous projects will be included, although they may not be found in the articles that appeared in the search results. Also, serendipity will be considered, meaning that fortunate discoveries during the course of this literature

study may be included. Naturally, the sources of these serendipities and previously obtained knowledge will be included in the reference list.
In Table 1 below, the queries that were used for the literature search to answer the first supporting research question (Supporting RQ 1) are shown, along with the number of results that the result provided. As stated before, first only reviews regarding business models were sought. From these reviews the other five queries were obtained. Moreover, the added queries showed a remarkable number of overlapping results. Logically, the papers that showed in multiple searches were found to be the more relevant papers. For a paper to be deemed relevant for this study, the number of citations were regarded. Logically, as stated before, the abstracts were used to find if the papers contained information on frameworks describing digital service provision.

Table 1 Queries used for answering Supporting RQ 1

Query	Number of results
"Business model"	8035
"Business model" AND design	1951
"Business model" AND representation	109
"Business model" AND ontology	96
"Business model" AND framework	1493
"Business model" AND taxonomy	39

The literature that was used for researching the adjacent fields for implications for blockchain business models, mostly comprises literature reviews that describe the phenomena themselves or the business models that are present in these fields. For these analyses, the snowballing method as mentioned above was used to find more relevant information. This information was used to validate the overlap in characteristics between blockchain and the respective field. Number of citations of the paper was used as a main selection device. In the abstract analysis, basic information on the specific field was sought, in order to serve the goal of comparing the characteristics of the field with blockchain technology.
Hereafter, additional literature was sought to find more information on the field's business models, besides the information already found in reviews. The strings used here simply comprised of a keyword in the field, and "business model". Here, again the number of citations was used to organize the results. However, the abstract analysis received more weight here, as detailed information on different business models was needed. Logically, the cut-off of the year 2000 was preserved, as business models were still the focus of the analysis.
An overview of the strings used is shown below, together with the number of results the queries gave in the *Web of Science*. As stated above, not all papers that were used directly resulted from these queries, as snowballing was applied in all stages of the literature study.

Table 2 Queries used for answering Supporting RQ 1 (cont.)

Query	Number of results
"Sharing economy"	803
"Sharing economy" AND "Business model"	78
"Collaborative consumption"	283
"Collaborative consumption" AND "Business model"	23
"Peer to peer"	17471
"Peer to peer" AND "Business model"	84
"Grid computing"	6806
"Grid computing" AND "Business model"	18
"Cloud computing"	31615
"Cloud computing" AND "Business model"	291

3.3 Interviews

The interviews provided information on the envisioned business model, its constraints and the value it provides. This to-be situation has also been backed by working closely with the proof of concept (PoC) leader. As described by Yin (2009), the interviews were focused and semi-structured. The questions were asked naïvely, in order to get full coverage on a topic from the interviewee. The questions that were used to guide the interview started very open and general, whereafter they became more focused. To elaborate, the first questions covered the blockchain as a whole and the perceived value for the company and other stakeholders. Hereafter, the questions focus on the content delivery, if not mentioned by the interviewee, in order to guide the interview towards finding the value of blockchain in the content delivery operations. Within this focus, the constructs that are used in the Business Model Canvas (Osterwalder & Pigneur, 2010) and Service Business Model Canvas (Zolnowski et al., 2014) were used as a guideline to create a complete set of requirements for the envisioned business model. This was chosen to compensate for the lack of a standardized protocol present in literature (Knafl & Howard, 1984).
The interviews were all conducted among members of the core blockchain group within the focal firm. This blockchain group researches the opportunities blockchain has for their focal firm, regarded from their own job-related backgrounds. It was chosen to only interview employees from this core group, as this guaranteed that the interviewee already knew about the subject of blockchain. If not, the knowledge of the interviewee would be highly dependent on the information given by the researcher. As the project was time constrained, the aimed number of interviews was a total of six. Care has been taken that for all components in the business model, an employee with a relevant background was interviewed. An overview of the questions that were asked can be found in the Interview protocol in Appendix A. In Appendix B, additional information on the interviewees is given. All interview findings were weighed equally. A natural weight occurs from expertise of the interviewees. In other words, the interviewees were naturally able to provide more insights regarding their own expertise.

The interviews were also used to complement and verify the analysis of the current business model and value delivery process. This current state was given in the previous section and was based on preliminary, informal conversations and desk research within the focal firm. In finding the value for customers, the insights were taken from employees instead of directly interviewing customers or doing a survey. This was chosen because the knowledge people have on blockchain is highly dependent on cryptocurrency (“Google Trends - Explore bitcoin, blockchain, cryptocurrency,” n.d.), whilst this project researches other applications of the technology. To make sure the customer's view was not left out of the analysis, an employee from Customer Operations was part of the group that was interviewed.
As the information given about the focal firm is regarded confidential, the interviewees’ names were anonymized. To prevent the influence of a difference in language skills among interviewees, the interviews were held in Dutch, their native language. The full transcripts can be acquired upon request.

3.4 Case study

The case study that is described in this section functioned as a source of information from practice. In this multiple case study, the whitepapers of relevant blockchain implementing service providers were analyzed. To give a more thorough understanding, the reasoning behind this case study will be elaborated before the analysis and results are described.

3.4.1 Function of this case study

The goal of this case study was to describe the role of the customer in a blockchain based environment even more precisely, in addition to the already learnt lessons from literature and the interviews that were conducted.

It may be argued that interviews were the more suitable option for acquiring the information needed in this case study. However, it was chosen not to. This was done because of a number of reasons:

Competition; First of all, (startup) companies may be unwilling in giving information to a researcher that works for a company that aims to provide a similar service as they do themselves.
Time; Secondly, the time that is reserved for this thesis project, together with geographical boundaries, also hinder the possibilities of doing a thorough multiple case study.
Completeness; Thirdly, a company representative may withhold information, for instance due to sensitivity or lack of knowledge on a particular topic, or construct that is necessary to formulate a complete business model.
Comparability; Finally, corresponding to the previous reason, the level of thoroughness may also differ among interviewees. This way, especially when the interviewer is unaware, the analysis will be biased from the start.
It must be stated that a possible disadvantage of studying whitepapers is that they all have a positive bias from the focal company itself, as they provided the whitepapers themselves. However, the whitepapers describe the way the service function in a "should-be" fashion, or blueprint (Demil & Lecocq, 2010). This corresponds to the static characteristic of the Business Model Canvas and its service-oriented variation. Furthermore, whitepapers are used to inform possible investors about the service provision of the company at hand. It is important for these companies to be honest and accurate in their whitepapers, as Initial Coin Offerings (ICOs) are used to raise investments. A characteristic of this type of raising money, is that the value of the investment is dependent on the value of the coin or token that is in place. This results in a need for a clear and thorough description of the company's service provision. Because of these two factors, the one-sided view on the company was not regarded to be a problem.
As Yin (2009) argues, the quality of a case study lies in the preparation, plan and the clarity of the case study design. The case study that was done can be classified as a multiple case study. The way that this study was constructed, was by following the method as described by Yin (2009, p. 57). This structure is also shown in Figure 7 below.

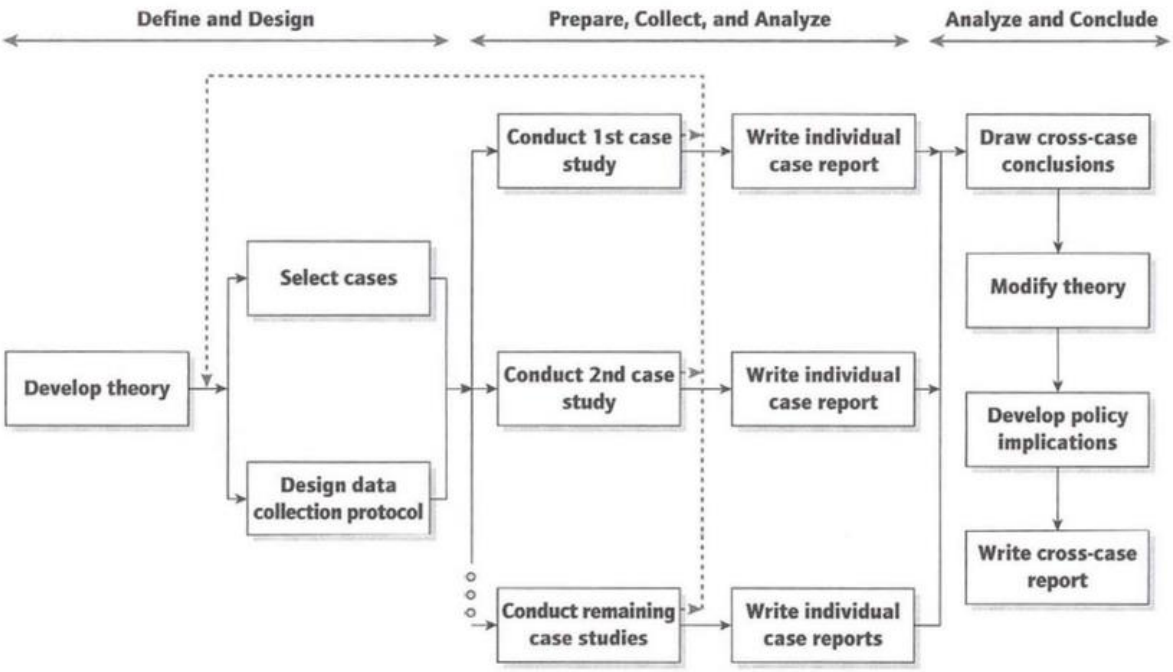

Figure 7 Case Study Method, by COSMOS Corporation. (Yin, 2009, p. 57)

The whitepapers (the cases) were analyzed along the components that exist in the SBMC, as described by Zolnowski, Weiß, & Böhmann (2014). More specifically, the technique that was chosen to analyze the cases along is the *Cross-case synthesis*, as described by Yin (2009). This technique was chosen as it is exceptionally fit for synthesizing robust findings from two or more cases. Put differently, the cases

were analyzed and compared per SBMC component, whereafter special care was given to the relationship that exists between the focal company and the customer, being the supplier of important resources to the company. This latter component is enabled by the separation of the different roles in the SBMC framework. After this analysis, design criteria for the business model framework were concluded. It was chosen to include the cross-case analysis in this report. The individual case reports are available upon request.

3.4.2 Selecting the units of analysis

Key to a case study is setting boundaries for choosing which cases to include and which to omit. This is needed as the internet has the power to provide an extraordinarily large amount of information (Yin, 2009). The choices regarding this that were made in this research are elaborated upon below.

The first selection criterion was *relevance*. As "blockchain" and "Bitcoin" are the buzzwords of the past couple of years, a large (and growing) number of startup companies implementing blockchain have emerged. In order to make a selection between these, only the ones that have a direct implication to the service that the focal firm aims to provide were included. Because of this, the first criterion is that the whitepaper to be used *describes sharing of files, data (services), media, or a combination of these.*

Next, it is important to note that the notion in the literature study, as well as this report, is that the customer provides resources that are unutilized and gets reimbursed for this provision. Of course, the blockchain is always stored in a distributed manner and uses the miners' provided computing power, but the service it enables does not have to be based on digital distribution per se (e.g. making a supply chain transparent or a cryptocurrency).

This posed the next selection criterion: the service described by the whitepaper should have a component that encompasses the *supply of resources by a customer*, besides providing basic storage and computing power for mining services for the blockchain itself.

The third component was that the whitepaper should describe an initiative that has already *received substantial investments*. As these companies are all young, there is no true distinction to be made regarding fails and successes. Still, the capitalizations indicate the interest of investors and users in the company, and therefore indicate a certain level of success up until now.

Along with these three selection criteria (relevance, supply of resources by customers, and investments) the final set of cases was constructed in consultation with the focal firm's PoC leader.

For finding these cases, the website icobench.com was used. This website provides a database with information on a vast amount of (startup) companies. This website provides the possibility to filter the companies by industry, and therefore functioned to filter on the relevance criterion. As was the case with the literature study, serendipity was not ignored. The PoC leader of the focal firm provided inputs too. Logically, these were tested on the three selection criteria as well.

The eight cases that were selected along these criteria are shown in Table 3 below. Additional information on the cases can be found in Appendix C.

Although some whitepapers fulfilled the three criteria, they were not used in the final set for the case study. Reasons for this were an unclear whitepaper that did not provide (sufficient) information regarding the SBMC constructs (e.g. Siacoin, Bubbletone), or general unclarity of the whitepaper. Another whitepaper that seemed suitable to be included caused controversy as the company behind it (TRON) was accused of plagiarizing other whitepapers (e.g. Filecoin, included in the final set).

Although this cut whitepapers from the final set, this was not regarded as a problem, as an appropriate amount of variety was sustained among the cases.

It was chosen not to weigh the findings of the case study analysis, as there was no ground for this. All whitepapers had overlapping characteristics with the focal firm, yet none of them was identical to it. The possibility of scoring the whitepapers based on the degree of overlap seemed arbitrary.

Company name	Category	Resource supplied by customer	Approx. funds raised in ICO (In USD)
Flixxo	Media	Storage	5,000,000.00
Theta	Media	Storage	20,000,000.00
DENT	Data	Telecom assets	4,300,000.00
World WiFi	Data	Internet connectivity	25,000,000.00
Qlink	Data	Telecom assets/Internet connectivity	19,000,000.00
Iungo	Data	Internet connectivity	23,000,000.00
Livepeer	Media	Storage	Kept secret[1]
Filecoin	File sharing	Storage	257,000,000.00

Table 3 Overview of cases selected in case study (funds found on https://icobench.com/, more information in Appendix C)

[1] Although this number was kept secret, the ICO was deemed successful. As the company has already implemented the application, and thus proved their application to be successful, it was included in the case study.

4 THEORETICAL BACKGROUND

This chapter will first describe the field of business models in further detail, together with the Business Model Canvas and the Service Business Model Canvas. In the second part of this chapter, the adjacent fields as described in the methodology will be described and implications for a blockchain business model will be derived from the theories, respectively. The chapter ends with an overview of the design criteria that were formulated using the findings from the theoretical perspective.

4.1 Business models

A newly implemented technology is aimed to solve problems that exist in the current situation. In order to extract value from this technology, it must become deeply embedded within the organization. For this to happen, it is possible that a change in the structure of delivering value to the customer is needed. This is in accordance with literature, stating that for a technology to be successful in creating and delivering value, some components in the business model may have to be altered (Hienerth et al., 2011). Baden-Fuller & Haefliger (2013) add that the true value of a technology will remain latent as long as there is no appropriate business model in place. In other words, the service that is delivered may not drastically change when applying a new technology, but the way that value is delivered may do so. Furthermore, Chesbrough (2010) argues that the value of a certain technology will remain undiscovered until it can be successfully matched with a suitable business model. This goes for suitability for the company itself, as well as for the customer it aims to serve. This view corresponds loosely with the movement from the Trough of Disillusionment to the Plateau of Productivity in the Gartner Hype Cycle (Linden & Fenn, 2003), describing the technology to need time before being of actual, and sustainable, value.

Chesbrough and Rosenbloom (2002) argue that the business model of a company mediates between technology development and economic value creation. Put differently, the business model enables the firm to capture value from technologies they invest in. In addition to this, Al-Debei and Avison (2010) consider the business model a conceptual tool of alignment, essential for a modern (ICT-enabled) business to fill the gap that exists between the business strategy and business processes in place, together with the firm's information systems.

However, as the blockchain technology is relatively new, there is not a large amount of academic literature on the topic yet. As it comes to its blockchain business models and business model frameworks, the amount of academic literature is negligible to non-existent.

In order to create a starting point for this research, a brief description will be given on what business models are and what their function may be, besides translating technologies into (economic) value for the focal firm.

4.1.1 Definition

In articles regarding business models, a trend can be found. This trend is a statement that is, quite surprisingly, not a definition. More specifically, they all emphasize the lack thereof. This is interesting, since the term "business model" has undergone a major increase in popularity among academics in the years 1995-2000 (Ghaziani & Ventresca, 2005), which followed through in the following decade (Zott, Amit, & Massa, 2011). Among other academics, they argue that the reason for this increase of attention lies in the advent of the internet, and its new possibilities for businesses during the internet bubble (e.g.: Amit & Zott, 2001; Chesbrough & Rosenbloom, 2002; Magretta, 2002). An interesting fact that Zott et al. (2011) found about the popularity of the term, is that the increase in popularity in academic literature lags behind the popularity increase in non-academic journals as it comes to the starting point, as well as the volume of this increase. Put differently, business models were already popular in practice before getting serious attention in academic literature. Something the business model seems to share with the terms *blockchain* and *bitcoin* (Panetta, 2017).

The lack of clear definition has brought confusion to the academic world. DaSilva & Trkman (2014) even state that the lack of a definition has led to ambiguous use of the term by using it as a synonym for other terms, such as *revenue model*, *strategy*, or *economic model*. This makes the function of a business model within a company, and therefore within academic literature, unclear. Besides, the way

it should be represented is also unclear. As the word *model* suggests the business model to be a simplified representation of reality (DaSilva & Trkman, 2014), the business model has also been referred to as a design, a pattern, a method, or even a statement (Morris, Schindehutte, & Allen, 2005).
As the bottom line, most articles described the main function of a business model as to describe how the focal firm creates, captures and delivers value (e.g.: Chesbrough & Rosenbloom, 2002; Johnson, Christensen, & Kagermann, 2008; Teece, 2010). From the highly cited review from Zott et al. (2011) an important lesson can be learned. In their review, they choose neither a definition, nor the components that a business model should have. They merely describe and compare definitions in extant literature. They found four emerging themes that enjoy widespread acknowledgement among the literature they used:

- The business model is a new unit of analysis, besides the existent product, firm, industry, or network;
- A business model should provide a holistic approach to explaining how firms work;
- The activities of a focal firm, its partners, and combinations between them play a key role in business model conceptualization;
- Business models aim to explain value creation and value capture. (Zott et al., 2011)

As finding a definition is not the goal of this research, the four emerging themes will fulfill this function. These common themes seem clear enough, although one aspect of a business model seems to be missing: the way of representing or visualizing the business model itself in a framework.

4.1.2 Frameworks

In literature, a vast number of frameworks can be found that all aim to describe a business model best. Although frameworks often come forth from academic research, there is no single one that is perceived to be best. These frameworks were all designed with a goal, function and industry in mind. This is not surprising, since *framework* is semantically described as being *a system of rules, ideas, or beliefs that is used to plan or decide something* ("'Framework' in Cambridge Dictionary," n.d.). As these factors differ among the frameworks, the designs and contents of them differ as well.
In the methodology section above, it was mentioned that the Business Model Canvas and the Service Business Model Canvas will form the backbone of the analyses within this report. These closely related frameworks will be described below. After the individual descriptions of the frameworks, the role within this report will be summarized.

4.1.3 Business Model Canvas (BMC)

The Business Model Canvas is a popular way of graphically representing a business model. The BMC is developed by Osterwalder & Pigneur (2010), using Osterwalder's doctoral thesis as a basis (Osterwalder, 2004). In this canvas, nine interconnected dimensions are depicted. Or as the authors say: "building blocks". These dimensions are the following: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. These building blocks cover the four main areas of business: customers, offer, infrastructure, and financial viability. Osterwalder & Pigneur (2010) chose to build this framework to create clarity for businesses in practice without oversimplifying the business model itself.

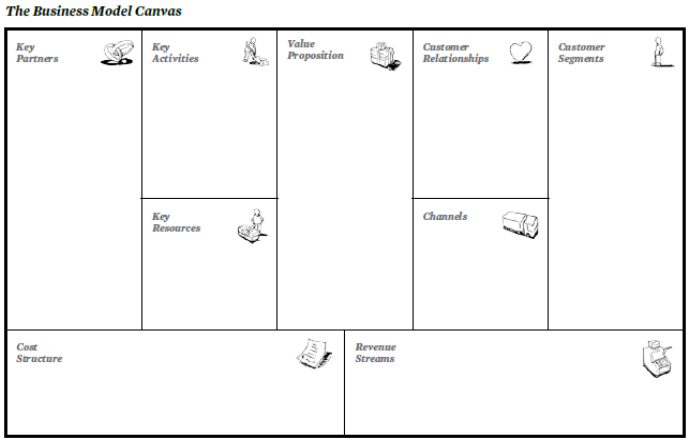

Figure 8 The visual representation of the Business Model Canvas (Osterwalder & Pigneur, 2010, p. 44)

Figure 8 shows the building blocks and the way they are positioned in the framework. The BMC is a static framework, built around describing the value proposition and the way the proposed value is created, captured, and delivered. On first hand, it seems clear that the framework merely aims to analyze the focal firm. However, as the authors claim to have a "one size fits all" framework, the BMC should be capable of functioning as an inter-firm analysis tool as well.

4.1.4 Service Business Model Canvas (SBMC)

A variation on the Business Model Canvas is the Service Business Model Canvas (SBMC). This variation, based on academic research, aims to include a number of core characteristics of services into the Business Model Canvas that, as the authors argue, the original canvas lacks (Zolnowski, Weiß, & Böhmann, 2014). The main service characteristic here is co-creation. The co-creation of value in a service encompasses the process in which value is created when a service is consumed by a customer, and thus has its actual value determined during this consumption (Payne, Storbacka, & Frow, 2008). This process was included in the framework by taking the *Customer* and *Key Partner* components and regarding the other seven existing Business Model Canvas components from a customer, as well as a key partner perspective. As the original Canvas takes the perspective of the focal firm, this was kept in as well. This results in a canvas that provides the reader with at least three distinct descriptions of the seven included components; one for the focal firm, one or more for the key partner(s), and one or more for the customer segment(s) (Zolnowski et al., 2014). Naturally, the general characteristics of the BMC are still in place in this variation on the framework, although the authors have changed descriptions of some of the constructs slightly. For example, the *Relationship* construct is described along the contribution per actor, instead of the relationship type that is chosen by the focal firm. The same can be said about the *Channel* construct. (Zolnowski et al., 2014)
During the analysis of this report, the possibly differing construct descriptions were regarded closely.

Customer perspective	***Customer*** (Customers in the business model)						
	(Costs borne by customers)	*(Resources provided by customers)*	*(Activities carried out by customers)*	*(Value proposition for customers)*	*(Contribution of customers to maintain the relationship)*	*(Channels provided by customers)*	*(Revenues captured by customers)*
Company perspective	**Cost Structure** *(Costs borne by the focal company)*	**Key Resources** *(Resources provided by the focal company)*	**Key Activities** *(Activities carried out by the focal company)*	**Value Proposition** *(Value propositions of the focal company)*	**Relationship** *(Contribution of the focal company to maintain the relationship)*	**Channels** *(Channels provided by the focal company)*	**Revenue Streams** *(Revenues captured by the focal company)*
Partner perspective	*(Costs borne by partners)*	*(Resources provided by partners)*	*(Activities carried out by partners)*	*(Value propositions for partners)*	*(Contribution of partners to maintain the relationship)*	*(Channels provided by partners)*	*(Revenues captured by partners)*
	Key Partner (Partners in the business model)						

Figure 9 Service Business Model Canvas (Zolnowski et al., 2014, p. 720)

4.1.5 Role of (Service) Business Model Canvas

The nine constructs of the (S)BMC will function as the main criteria in the case study analysis, as well as form the initial coding criteria for the interviews. In other words, the same nine constructs form the basis of both the interview and the case study protocols. This was chosen as there is no standardized protocol present in literature for doing so (Knafl & Howard, 1984). These particular frameworks were deemed suitable for this role due to three key characteristics.
The first is the universal applicability of the frameworks. This characteristic makes it possible to fill in the constructs for several (partly) different companies. During the case study, this characteristic is used to compare and analyze the constructs individually. It must be noted that the SBMC is slightly less universally applicable, as it focuses on service-based business models. In this research, this was not a problem, as only digital services were regarded.
The second characteristic is the possibility of the frameworks to be used in both inter-firm and intra-firm analysis. The suitability for inter-firm analysis mostly arises from the universal applicability. However, the possibility to do an intra-firm analysis makes the frameworks suitable to compare the

current situation with the envisioned situation. This makes the frameworks suitable for analyzing the needs from within the firm, as is done in the interviews.
Thirdly, they are static frameworks. A static business model focuses on showing the coherence between the components that are present in the framework (Demil & Lecocq, 2010). This characteristic is directly linked to the goal of this research: to find a business model for a future application of a new technology. In other words, a blueprint that prescribes a "should-be" state of the business model as described by Demil & Lecocq (2010). As stated before, communicating this should-be state is also the goal of the whitepapers themselves.

Besides the SBMC, there are more (slight) variations on the Business Model Canvas. The adjustability of the BMC provides space to base the redesign of the business model framework on to accurately portray a blockchain-powered business model. Throughout the report, the notion is that this fundamental redesign is needed, due to the characteristics of blockchain that were stated before, which cannot be accurately described by the Business Model Canvas, the service-oriented variant, or other frameworks that were found in literature.

4.2 Results from Theory Perspective

In this section, the theory perspective is described. The three chosen adjacent fields are depicted separately. Each section starts with a short description of the field, whereafter the common characteristics with blockchain are described. Hereafter, the implications for the business model redesign are given. This chapter ends with the set of design criteria that was concluded from taking the theory perspective.

4.2.1 Sharing economy (collaborative consumption)

The first field that shares characteristics with the blockchain technology is the sharing economy. There are several similar terms that are used when describing the sharing economy. One of these is collaborative consumption. Other examples are collaborative economy and peer economy (Botsman, 2013). Although these terms are closely related, they are all defined in a slightly different manner, and therefore cannot be used interchangeably. For this review, this will not be problematic, as the terms have one characteristic in common: the ideas all revolve around a network of peers that is based on distributed trust, power and access. (Botsman, 2013) Moreover, the difference in meaning of these terms is not always respected by articles that research the sharing economy (Cheng, 2016). To be able to include several articles, this difference in terms is, with appropriate caution, ignored.
In this research, a definition of collaborative consumption is chosen to describe the phenomenon. This term is defined as: '*The peer-to-peer-based activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services.*' (Hamari, Sjöklint, & Ukkonen, 2016, p. 3) Regarding this definition, the similarities that a blockchain application has with collaborative consumption are the peer-to-peer-based activities, and secondly, sharing access to the resources that the peers in this network own. These characteristics have been described by a number of academics (e.g.: Belk, 2014; Botsman & Rogers, 2010). This particular definition is chosen because the authors emphasize that the sharing of resources is enabled by information technology, which is also key to blockchain technology.

4.2.2 Sharing economy implications

When regarding the sharing of storage or computing power to add to a blockchain and its network, one prerequisite comes to mind: the resource should not be in use by its owner. Regarding this, Stephany (2015) states that value taken from making under-utilized assets accessible to an online community is core to the sharing economy, and results in a reduced need for ownership. The sharing economy initiatives are often online platforms and have two types of customers: the ones offering their resources or services, and the ones consuming these. With two types of consumers, there are also two types of value propositions present. In their article, Hamari et al. (2016) emphasize that there are multiple motivations of users of such platforms, from which the two types of consumers can be derived, e.g. economic benefits (the supplying user) and enjoyment (the consuming user) (Hamari et

al., 2016). Furthermore, the sharing economy is said to be a serious solution for job seekers that are struggling to find a job that fits their needs (Kathan, Matzler, & Veider, 2016). Put differently, a sharing solution helps the supplying consumer to economize their cost of ownership, while, at the same time, the consuming user avoids the risks that regular asset-ownership brings (Schaefers, Lawson, & Kukar-Kinney, 2016).

This double value proposition has a direct implication for a blockchain business model. However, there is a difference when regarding the blockchain. Recurring to the information previously given on blockchain application, the users that are supplying the system with computing power or storage are all part of the same network, providing their underutilized resources. The way this is different from regular sharing economy initiatives, is that this is not necessarily done in the form of a marketplace. However, the supplying consumers are reimbursed for their services (in the form of tokens, based on mining operations or resources provided). Although this difference may be present, it is important to use the insight regarding the double value proposition.

Another important aspect in any marketplace is trust. In an online sharing economy initiative, as defined earlier, the issue of trust is even more seriously present (Houston, 2001). In a marketplace-type sharing platform, the service should build in a centralized trust system through guarantees or rating systems (Kathan et al., 2016). In the blockchain, this trust issue is not a problem, as the blockchain cannot be manipulated in any way. This means that the focal firm in the business model merely enables the different types of customers to interact, instead of acting as a mediator between them.

Finally, the sharing economy implies a change in key resources. The most important resources used in a sharing economy, as well as in blockchain, are provided by the customer. Managing the way these resources are utilized is key to a business model to function optimally (Kathan et al., 2016). Having the correct key processes and activities in place to utilize these resources is the third implication that should be taken away from the sharing economy's business models.

4.2.3 Peer-to-peer networks

In this paragraph, file sharing in peer-to-peer networks is reviewed to find implications for the blockchain business model. Special attention will be going to file sharing platforms that are focused on distributing (media) files among peers, as the blockchain application of the focal firm will be supporting the delivery of an entertainment service.

Peer-to-peer systems are mostly defined by the characteristics that they have. In their article, Rodrigues & Druschel (2010) characterize the concept along seven central elements. Interestingly, all characteristics as described by them can also be found (partly or completely) in the blockchain. These characteristics are: high degree of decentralization, self-organization, multiple administrative domains, low barrier to deployment, organic growth, resilience to faults and attacks, and abundance and diversity of resources. (Rodrigues & Druschel, 2010)

When speaking of peer-to-peer file sharing, more non-legal than legal alternatives come to mind. In a traditional business model, a file can be transferred from the creator or an intermediary to a customer. This way, the files are traceable, as well as their revenue streams (Lechner & Hummel, 2002). In this case, the content creators have a hierarchical power over the customer, who simply purchases the content. However, in earlier work, Hummel & Lechner (2001) notice that the perception of what a virtual, peer-to-peer community is, has changed from a social phenomenon to a business model. This view is congruent with the highly cited article by Hagel (1999), arguing that a virtual community starts as a network of people with a common interest, but ends up as a groups with a significant buying power. The shifts in power (and contribution) to the value chain of the music industry is shown in Figure 10 as an example. Interestingly, the change in value chain shows that the influence (and thus power) that the consumers have in this chain grows proportionally to the growing amount of decentralization in the different initiatives. Although value was created in all chains, the actual buying step was often not present due to piracy and no mechanism in place to track transactions without a third, trusted party (which is possible with the blockchain).

4.2.4 Peer-to-peer networks implications

The challenge these communities have is that in a network, it is hard to manage the transactions or file exchanges (Lechner & Hummel, 2002). They argue from a perspective that a central organ cannot monitor or manage these streams. However, this is where the blockchain can function to monitor this. As the blockchain is a relatively new phenomenon, this monitoring party has lacked in practice. In the past two decades, this lack has been reflected by the emergence of several types of illegal content sharing communities like Napster, Gnutella, and BitTorrent (e.g.: Huang, 2005; Lechner & Hummel, 2002; Rodrigues & Druschel, 2010; Shang, Chen, & Chen, 2008). The implication to be taken away from these (illegal) content-distribution networks lays in the role that the focal firm plays relative to the users in the network. Lechner & Hummel (2002) stress that in these services, the customers are the suppliers of storage. Furthermore, often these same customers also provide the content that is to be distributed. The role of the focal firm is then to merely serve as a facilitator that enables these interactions between the clients in network (Lechner & Hummel, 2002). With a blockchain in place, these transactions can be monitored.

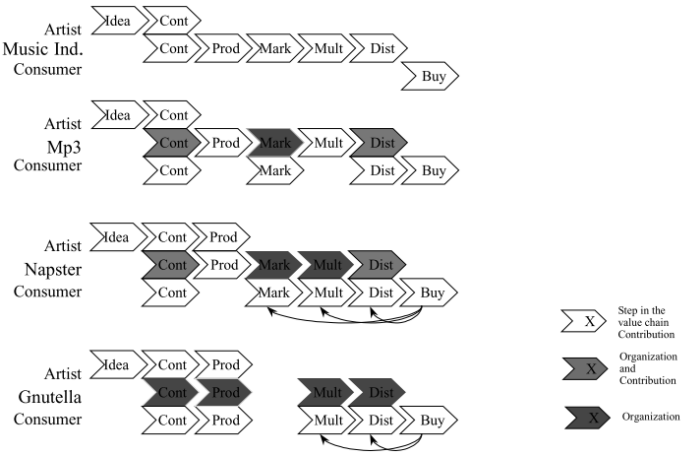

Figure 10 Value chains in the music industry, arranged from most centralized to most decentralized (Hummel & Lechner, 2001, p. 1272)

4.2.5 Grid- and Cloud computing

Definition-wise, there is consensus on what grid computing is characterized by. In 2002, Foster introduced a three-point checklist, that serves to do this:

- Decentralized resource control
- Standardization
- Non-trivial qualities of service (Foster, 2002)

Although these characteristics seem to overlap with simple file sharing in peer-to-peer systems as described earlier, grid applications normally go beyond this basic service (Weinhardt et al., 2009). Cloud computing goes a step further and provides a more user-friendly interface; a characteristic that is not central to grid computing (Weinhardt et al., 2009). Put differently, in cloud computing, the actual process is translated into a comprehensible design for the targeted user.

4.2.6 Grid- and Cloud computing implications

A comprehensible interface is an important factor regarding the relationship a firm aims to have with a customer. In this communication, it should be clear what is possible and how the system works (Abras, Maloney-Krichmar, & Preece, 2004). This should also be clear in applying a blockchain-based application, and thus brings an implication to the distribution, as well as the customer relationship component of a blockchain business model: the value and possibilities of the technology should be clear to the customers (and partners) participating in the system. Then, the value will be delivered properly. This implication is also backed by the fact that there are no to very little sustainable business models when it comes to grid computing, whereas for cloud computing there are (Weinhardt et al., 2009).

Business model-wise, cloud computing has an interesting implication for the revenue model around storage sharing. In their article, DaSilva, Trkman, Desouza, & Lindič (2013) review a number of successful business models around cloud-based services. From the revenue models they review, useful insights for the cost structure in a blockchain application were found. This may seem contradictory, but as the focal firm that uses a blockchain application does not provide, but uses the resources of its

clients, the firm takes the role of consumer of these resources. Interesting here is that the authors imply several ways of paying the providers of the resources. On the one hand, it seems fair to pay the providers a monthly sum for their resources. This fits best if all nodes in the network provide an equal amount of resources (or if tracking transactions is not possible). On the other hand, a pay per use-model may be more appropriate. In this model, the providers of the resource are paid accordingly to the amount they provide to the focal firm (DaSilva et al., 2013). The latter seems to overlap with the consensus mechanisms that are applied to validate transactions in the blockchain (Swan, 2015).

4.3 Design criteria from theory

Below, the design criteria that were concluded from the theory perspective will be given. The criteria will be coded TPx, with x being a number between one and five.

The first important implication that was described previously is that the customer will take on the role of a supplier in the business model. This is because the storage or computing power of a customer will be used to enable transactions that happen within the system. Therefore, the first design criterion is:

TP1: The framework can correctly visualize a key partner role for the customer.

Connected to this first criterion, is the one that describes the distributedness of the resources themselves. As the customer is a key partner in supplying the resources, its role changes. However, it is just as important that the business model framework can correctly visualize and describe the key resources themselves and what is needed from them. Therefore, the second design criterion is:

TP2: The framework can correctly visualize the decentralized key resources, as well as the other resources.

The next criterion will encompass the way of delivering the value in a decentralized manner. Because the blockchain enables transactions directly between peers, a large number of revenue streams will take place within the system. This results in a role for the focal firm as an enabler of this service. Therefore, the third design criterion is:

TP3: The framework can correctly visualize the enabling role a focal firm has in the decentralized value streams.

The primary implication from the sharing economy to the blockchain business model is that there are two types of customers, which in turn results in two different value propositions. These value propositions count for all customers, but depend on the role they have in a transaction (either of supplying resources or consuming). These different types of value created for the customers will correspond to the motivations that the different customer segments (or roles) have (Hamari et al., 2016). This results in the following criterion:

TP4: The framework can correctly visualize the double value proposition that is in place for the different roles a customer can have.

The literature on peer-to-peer networks implied that in the business model for the application that the focal firm aims to have, the focal firm should enable the users of the system to share files and monitor this by having a transaction-tracking system in place: the blockchain. This adds to criterion TP3 in which the focal firm enables the value streams as it comes to transactions. The peer-to-peer theory implies that this role should be extended to also enabling value streams as it comes to the content itself. It was chosen to transcribe this into an extra design criterion. This is because the earlier criterion focuses on revenue streams, whereas this one revolves around distribution channels of the service itself. Therefore, this criterion is:

TP5: The framework can correctly describe the role the focal firm has in distributing the content from the supplying user(s) to the consuming user.

In Appendix D the relationships between the design criteria and the fields from which they originate are visualized in diagrams. This is additional to the analysis and description above and to Table 4 below.

Table 4 The criterions and their corresponding fields, a black circle depicts that this implication was found in that field, a white circle depicts that it was indirectly implied

Criterion	Blockchain	Sharing economy	P2P	Grid/cloud
Key partner role for the customer	●	●	○	○
Decentralized key resources, as well as the other resource	●	○	●	●
Double value proposition	●	●		
Enabling role a focal firm has in the decentralized value streams (general)	●		●	
Enabling role a focal firm has in the decentralized value streams (transactions)	●	○	●	○

5 RESULTS FROM FOCAL FIRM'S PERSPECTIVE

In this section the results from the interviews will be analyzed. This section will be following the structure of the protocol based on the nine constructs of the Service Business Model Canvas. In the second part of this section, the results will be translated into criteria for redesign of the current business model and the business model framework as a whole. To give a clear image of which constructs led to which design criteria, Appendix D provides diagrams to demonstrate the relationships between them. This was chosen as multiple constructs provided insights for multiple criteria.

5.1 Analysis Focal Firm's Perspective

The nine constructs all have the same consistent structure: first the results from the interviews are analyzed, whereafter these are summarized in a table. Throughout the analysis, the interviewee number that provided a finding is stated between brackets. In the tables, the first column describes the main construct, and possible concepts or themes that existed within these constructs. The second column describes the main findings in short statements, corresponding to the codes that were used. This way of representing the findings was chosen as the interviews were semi-structured and not in a direct Q&A format. However, it was made sure that all constructs and questions of the interview protocol were answered (to be found in Appendix A).

Column three to eight represent the interviewees and whether the statement was found in the respective interview. The final column depicts if the respective statement applies to the current state at the focal firm. When an interviewee does not mark a corresponding field, their view on that particular construct did not deviate from the current state at the focal firm. All constructs were treated in all interviews. As stated before, no weight was put on the scores. A natural weight occurs from expertise of the interviewees. In other words, the interviewees were naturally able to provide more insights regarding their own expertise (to be found in Appendix B).

5.1.1 Customer

The customer that exists in the current system remains the same. However, the focal firm offers several packages, of which some do not require the customer to have a media box in their homes. This poses that two types of customers must be distinguished: customers with shared storage in their homes, and the customers without shared storage in their homes. Five of the interviewees noted that this could also result in a third type of customer: the ones with a media box with storage in their homes, who do not want to share this (1, 2, 3, 5, 6). For the customers who would choose to share the storage an incentive would be needed to motivate them to do this. This will be elaborated later.

Interviewee 4 argued that sharing the storage space should be inherent to the basic service and that no choice should be given to customers with a media box. The same interviewee also posed that it is a possibility to only install a storage sharing media box (or other small storage center) in employees' homes. This way the storage is decentralized, yet controlled, and incentivization would be simplified.

Customer	**Main findings**	1	2	3	4	5	6	From current state
	Two customer types: with and without CPE							●
	Third customer type: with CPE, not sharing storage	●	●	●		●	●	
	All CPE owning customers should share				●			
	Only employees should share CPE storage				●			

Table 5 Summary of interview findings: Customer

5.1.2 Key partners

The key partners that exist in the business model when content is distributed stay merely the same. As the focal firm does not create the content themselves (except for their own television channel), the content creators and/or the rightful owners of the digital rights form the key partners in the business

model. During the interviews, these partners were regarded as given and no interviewees proposed to change these. Interviewee 2 adds here that the blockchain can function to precisely track the use of a file and thereby directly pay the rightful party. Interviewee 5 adds that a pay-per-view agreement with these parties will result in a fairer payment system. This may facilitate cooperation between the focal firm and the digital rights holder.
Interviewee 4 notes that when the customers provide the storage to the focal firm, they may be seen as a large group of people functioning as a key partner. However, he also notes that, because the storage they provide originates from the focal firm's native hardware, they should never be treated as a fully functioning key partner. Even though they may be rewarded for this provision. Interviewee 3 adds that the risks of losing data(points) when a customer churns influences the way the focal firm should approach the customers.

Key partner	**Main findings**	1	2	3	4	5	6	From current state
	Content providers / owners of digital rights							●
	Direct payments change key partner position and interaction		●			●		
	All customers together can be regarded as a large key partner			●	●			
	The customers are no full key partners, as the CPE stays the firm's property				●			

Table 6 Summary of interview findings: Key partner

5.1.3 Value proposition

5.1.3.1 Customer value

The values proposed by the interviewees in the content solution for the customer can be divided into roughly three categories: value through service delivery, indirect monetary value, and value from compensation for resources supplied.
The value through service delivery describes a higher quality and reliability of the service experienced by the customer. Interviewee 1 and 5 mentioned that, due to the lowering of the load on the network, the chance on an outage will be reduced. Therefore, the reliability and stability of the network will be higher. This will then, according to the interviewee 5, result in an increased customer experience.
As the content solution aims to decrease the costs for data centers and maintenance costs, these lower costs can result in a lower price charged by the focal firm. This indirect monetary value, created by this new business model, was mentioned by interviewee 1 and 4. 1: "The savings in data center costs can be shared between company and customer." These costs will then result in a lower monthly subscription fee or lower prices of the content that is available on the platform.
The final value would result from the compensation that is provided by the focal firm to customers that supply them with resources. As part of this value, several solutions were mentioned by the different interviewees. The first way of compensating the customer is by offering them cryptotokens as a reward for their resource provision and as an incentive to keep doing so, as described by interviewee 1, 4 and 6. However, interviewee 5 argues that the customers should never be paid in a (crypto)currency. A second method, as described by interviewees 2 and 4, and similar to the previous one, is offering the customers extra services in return for their provision. As interviewee 4 elaborates: "This could be something like a free movie to watch on the platform, or an extra function that is enabled for a fixed amount of time." The final value for customers, which was mentioned and described by most interviewees (2, 3, 4, 5 and 6) described a discount system in which resource providing customers receive a discount on monthly costs or on content they purchase, although interviewee 5 argues that the discount may function as a means to motivate customers to start providing resources, yet should not be eternally available, as the goal is to have a very large amount of customers providing their storage. Although this seems to be similar to the lower costs as indirect monetary value, as mentioned before, this is not the same. The indirect monetary value results from saved costs by the focal firm and should be available to all customers. The discount as an incentive to

provide resources is only available to the customers that actually do so. Three of the six interviewees (2, 5, 6) mentioned this distinction as a requirement of the envisioned business model. Interviewee 5: "Some customers simply do not use video-on-demand. The extra costs of energy will in no way be compensated by discounts that way. They should have the option not to supply their resources." This interviewee also adds that the extra electricity used by the customer should be compensated by the focal firm. Interviewee 1 and 4 also mention this, yet apart from the other incentives.

Value proposition customer	**Main findings**	1	2	3	4	5	6	From current state
Through service delivery	Lower probability on outage, resulting from reduced network load	●				●		
	Better customer experience, resulting from less outages					●		
Indirect monetary value	Lower costs for data centers and maintenance resulting in lower prices	●			●			
Value from compensation for supplied resources	Crypto token rewards	●			●		●	
	Against monetary rewards					●		
	Premium services as rewards		●		●			
	Discounts as rewards		●	●	●	●	●	
	Rewards should only be given temporarily					●		
	The electricity used in sharing storage should be compensated by focal firm	●			●	●		

Table 7 Summary of interview findings: Value proposition of customer

5.1.3.2 Focal firm value

During the interviews, a multitude of values that were created or facilitated by a blockchain business model were envisioned (or requested) by the interviewees. To clarify the analysis, the description of the values mentioned by the interviewees will be categorized into three subjects; monetary value, value from network utilization, value from blockchain characteristics. Although these categories are separately elaborated upon, they are highly interconnected.

The first and foremost value for the focal firm regards the lower costs allocated to data center investments and maintenance (1, 2, 4, 6). Interviewee 1 mentions that this value can be used to the focal firm's advantage in several ways: it can increase profits, due to the higher margin that is created, or it may lead to lower prices for customers, leading to a competitive position in the market. This value, created by lower costs, coheres with one of the key characteristics of the proposed solution: using underutilized storage of the customers to be less dependent on one data center and spread the load throughout the network.

The latter goal creates value in the following manner. The value created here follows from the better utilization of storage capacity in the network and of the network itself (2). This better utilization may not show a direct monetary value, but demonstrates a better utilization of costs invested in the network as a whole. Another way of describing this better utilization was used by interviewee 3, 5 and 6, naming it a reduction in network load, especially at peak hours. The direct, measurable values resulting from this were a lower probability of a large outage (1, 5). Furthermore, when an outage occurs, these same interviewees (1, 5) state that not having a single point of failure will result in outages on smaller scales, in which finding the actual failure is an easier process. Interviewee 1 adds that an outage due to maintenance will be a smaller, and better controlled process as well.

One of the values that directly originates from blockchain characteristics is that, when a token is used to reward the customers for supplying resources, this token can be used as a means to lock-in the customer (2). Interviewee 2 describes that if a customer receives tokens as an incentive to participate in the network, they will lose these when switching to another service provider. This, therefore, results in lower churn rates. Another value that originates from blockchain characteristics occurs when digital rights management (DRM) is handled by smart contracts that automatically pay the entitled party the

right amount of money. The value extracted from this is described by a more (cost) efficient way of handling these payments (2, 5). Interviewee 5 adds that this will facilitate a pay-per-view DRM process.

Value proposition focal firm	**Main findings**	1	2	3	4	5	6	From current state
Monetary value	Lower costs for data centers and maintenance	●	●		●		●	
	Higher margin through lower costs	●						
	Enhanced competitive position attracting more customers through lower price	●						
Value from network utilization	Lower relative costs, as network is utilized more efficiently		●					
	Lower network load			●		●	●	
	Lower probability on outage, resulting from reduced network load	●				●		
	Outages will be smaller scaled	●				●		
	Planned outages from maintenance will be smaller scaled	●						
Value from blockchain characteristics	Token can be used as customer lock-in mechanism, resulting in lower churn		●					
	More efficient DRM payments process		●			●		

Table 8 Summary of interview findings: Value proposition of focal firm

5.1.4 Key resources

Core to the blockchain application at the focal firm are the media boxes (CPEs) that are stationed at people's homes. Using the blockchain and the associated platform, and media boxes were regarded as a given during the interviews. However, interviewees sometimes described alternatives or additional resources to facilitate the distributed storage system as described in the research proposal. One of which is by expanding the customer's modem with a hard disk drive, instead of using the media box's storage space (4, 5, 6). This way, the storage space present in the media boxes themselves will be available for local storage of recordings. Moreover, when a media box without a storage space is introduced, the modem will still be present in the customer's home (5). Although these resources are stationed at the customer's houses, they should be regarded as property, and thus resources of, the focal firm (2, 5). Interviewee 5 states that it may be a scary situation for the focal firm to not have the storage at their own premises and argues that a backup is needed to make sure no data is lost. This could be designed by having a node of the network running at the different offices throughout the country. Although it may be argued if the solution is truly decentralized in that way.

Another alternative to the network of media boxes is by having the customer buying and facilitating the hard drives. In this way, hobbyists can expand the data center they have at home and increase their reward. Interviewee 4 and 5 mentioned that this is theoretically possible, but would be hard to achieve. They mention that having hobbyists interfering with the network makes it hard to monitor the network and, thereby, hard to manage the digital rights of the content.

Although the customer may not directly provide the storage carrying resource, giving up storage space on which they cannot store recorded content can be marked as a form of giving up a resource (2). It must be kept in mind that this would be the case if the media box is used to store content decentralized, not when the modem is expanded. Interviewee 3 adds that when using the customer's storage, the power over the data lies partly in the hands of the customer. In other words, it must be monitored closely who is the owner of the data that is stored on the CPE.

Another resource that is provided by the customer is the electricity for the node (either a media box or an expanded modem) to function (4, 5). Of course, this resource does not directly interact with the business model. Still, it is vital to it. Moreover, some interviewees mentioned that this specific resource should be compensated by the focal firm (1, 4, 5), acknowledging its importance.

As is the case in the current business model, all customers need a device to watch content on to be able to participate in the business model in the role of a user. This can either be a television, tablet, smartphone, or computer.
The resources supplied by key partners to this business model are the same as in the current way of working: content that is available on the platform of the focal firm. Although the storage and distribution will not be done by the content provider, the digital rights remain theirs. This makes them the supplier of the resource. Interestingly, interviewee 6 stated that in the envisioned business model, the customer should possibly also be able to upload their content onto the platform, although right now the video on demand service should be the focus.

Key resource	**Main findings**	1	2	3	4	5	6	From current state
	Digital rights owners provide content; a key resource							●
	Customer should be able to share content						●	
	A key resource to participate is a digital device to watch content on, regardless of customer role							●
	Modem can be extended with HDD, instead of media box				●	●	●	
	CPEs are key resource of the focal firm, as they are property of focal firm		●			●		
	A backup must be present on the focal firm's premises					●		
	Resources should not be altered or expanded by customers				●	●		
	If a media box stays firm property, the customer still provides storage space as a resource they give up		●	●				
	Electricity that a customer uses extra to run a node should be compensated	●			●	●		

Table 9 Summary of interview findings: Key resources

5.1.5 Cost structure

The cost structure as described here will entail different types of effects on the cost structure at both focal firm and other actors in the business model: saved costs and increased costs. These both affect the cost structure in general.
Regarding the costs incurred by the focal firm, the savings as described in the Value Proposition part of the analysis form the main factor, according to the interviewees (1, 2, 4, 6). To recollect, these savings result from savings in data center costs and savings resulting from a lower probability on outages. Three interviewees (2, 5, 6) argue that the network will be utilized in a more optimal manner, which results in a better cost allocation. It can be disputed if this is a direct saving.
The possible incentives for the customers to provide resources to the focal firm result in additional costs for the company (1, 2, 3, 4, 5, 6). Although different incentives were described by the interviewees, these will all result in costs, either direct or indirect. To recollect, the incentives that were mentioned were monetary (1, 6), discounts (2, 3, 4, 5, 6), additional services (2, 6), compensation for electricity (1, 4, 5).
As described in the Key Resources section, the focal firm may provide an external hard disk drive to the customer (4, 5, 6). This may result in additional investments in development and production of these in case this is integrated in the final solution
The customers' cost structures change in similar ways. First of all, as described in the Value Proposition section, the savings that are established by the focal firm implementing the envisioned blockchain solution may result in lower fees for the customer to pay (1, 4). The structure of these depends on how the payments for video on demand will be settled.
A resource for additional costs incurred by the supplying customer is electricity (1, 4, 5). As described earlier, the media boxes or modems at the customers' homes will consume a larger amount of electricity, with operations that are not initiated by that customer, due to characteristics of the blockchain.

The change in costs does not apply to all customer groups, as three interviewees (2, 5, 6) argue that participating as resource providing customer should be optional. For them, as stated before, the additional costs will logically not apply.
As the blockchain facilitates the envisioned business model's transactions, the cost structure for users of the business model may change as well. The smart contracts facilitate direct payments to the owners of the digital rights. This means that a pay per view model would fit here (2, 5).

Cost structure	**Main findings**	1	2	3	4	5	6	From current state
Saved costs focal firm	Lower costs for data centers and maintenance	●	●		●		●	
	Lower relative costs, as network is utilized more efficiently		●			●	●	
Increased costs focal firm	Costs from incentive payments	●	●	●	●	●	●	
	Costs from new or additional hardware				●	●	●	
Saved costs customers	Lower fees, due to savings from focal firm	●			●			
Increased costs customers	Additional electricity costs	●			●	●		
Structural changes	The direct payments through smart contracts change the billing system		●			●		

Table 10 Summary of interview findings: Cost structure

5.1.6 Revenue model

The revenue models are closely related to the cost structure, as value streams often happen within the business model, between the actors.
The most structural difference in the revenue model of the focal firm may result from the way payments are handled: using the blockchain. Besides this, few other implications for the revenue model were provided by the interviewees, apart from the cost savings as described in the Cost Structure section. A factor that may influence the revenues of the focal firm is reduced churn rates due to customer lock-in, as described in the Value Proposition section (2). Besides, the other values proposed to the customer in the blockchain business model may attract new customers, and thereby cause an increase in revenues generated.
The revenue model for the providing customer will consist of the incentives they receive from providing resources to the business model. This means that customers that do not provide a resource will not have a revenue model in place, as is the case in the current business model. There are two ways this revenue may be established, as argued by the interviewees. The first revenue model is indirect, as this describes a discount that is provided to the customer, as described in the Cost Structure section (2, 3, 4, 5, 6).
The other revenue model that was described by interviewees regarded a more direct payment method. Interviewee 1, 4 and 6 described incentives to participate in the business model to be monetary, using a native cryptotoken. Other interviewees described that only the extra electricity that was used as a result of participating in the business model as a resource provider should be compensated monetarily (1, 4, 5), regardless of incentive system.
The revenue model for the key partners, being the digital rights owners of content, changes as these payments will be handled by the blockchain through smart contracts. This was argued by interviewee 2 and 5, describing a pay per view system in which the digital rights owners are paid instantaneously when the content is purchased.

Revenue model	Main findings	1	2	3	4	5	6	From current state
Focal firm	Reduced churn rates, resulting in higher revenues		●					
Customer	Indirect revenues through savings, in the form of discounts		●	●	●	●	●	
	Monetary incentives (crypto token)	●			●		●	
	Monetary compensation for electricity usage	●			●	●		
Digital rights owners	Pay per view system		●			●		

Table 11 Summary of interview findings: Revenue model

5.1.7 Channels

The channels that are facilitated by the focal firm will stay generally the same: the mobile app, the TV app, their customer service channels and the payment system. In the new business model, the blockchain would form the core of this payment system.

In communicating about blockchain, the interviewees posed different arguments on whether and how the communication around blockchain should be done. All interviewees posed reasons to choose to communicate about the underlying blockchain. However, two types of reasons were distinguished. The first reason is to educate the customer on how the service provision changes, and why this is the case (1, 2, 5, 6). The other reason to communicate is to influence the market position of the focal firm (3, 4, 6). The interviewees argue that communicating that the focal firm works with blockchain will signal that it is an innovative company. Which communication channels should be used for these activities was not described by the interviewees.

On the other hand, interviewee 1 and 4 argued that the use of blockchain should not be communicated to the customers, due to a possible negative image that has been created around blockchain in popular media. They also state that the consumer is not necessarily interested in how the service works as long as it works fine. Interviewee 2 and 5 argued that this negative attitude may not be present when regarding technology enthusiasts. They argue that communication about the technical characteristics of the service may be communicated to them via a forum that is already in place.

The channels that a customer adds to the business model does not change compared to the current business model: the customer needs a device to watch the content on, such as a TV with the dedicated app or a mobile device.

Channels	Main findings	1	2	3	4	5	6	From current state
Communication: no	Negative image of blockchain in popular media	●			●			
Communication: yes	Educate customer about the positive effect of blockchain	●	●			●	●	
	Influence market position by showing innovative image			●	●		●	
	Only communicate to enthusiasts (early adopters etc.)		●			●		

Table 12 Summary of interview findings: Channels

5.1.8 Relationship

Only one of the interviewees clearly describes an acquisition program that could be applied in the new business model in order to incentivize customers to start providing resources. To clarify, this can either be completely new customers or existing customers transforming into the new role. The program described by interviewee 5 consists of incentivizing customers with tokens to build a large group of providing customers to begin with, after which the number of tokens per customer decreases to zero (opposed to the perpetual tokens described by 1, 4, 6).

Although the incentives for supplying resources were regarded in the value proposition, these were not seen as dedicated acquisition, retention or upselling activities. However, it goes without saying

that these added values may result in higher customer acquisition and lower churn. The complete overview of these values is shown in Table 7. In Table 13, only the findings that were marked by the interviewees as acquisition, retention, or upselling programs are shown.
As stated before, interviewee 2 noticed that incentivizing customers with tokens that are only usable within the focal firm's ecosystem provides a possibility for customer lock-in. Put differently, the tokens serve as a retention mechanism. Apart from the lock-in, the incentives as a whole, described by all interviewees in one way or another, can be regarded to be a retention mechanism. This results from the ongoing nature of the incentivizing programs.
It can be argued that incentivizing by providing extra services to customers is a form of upselling as well (2, 4). Another upselling method, proposed by interviewee 3, is by increasing the price of the basic product, and thereby making the provision of resources more interesting to the customer.
Regarding the six types of relationships, no concrete information was given by the interviewees, although the relationship between the users of the business model was discussed by several interviewees.

Relationship	**Main findings**	1	2	3	4	5	6	From current state
Acquisition	Incentivize new customers with tokens for a fixed period of time					●		
Retention	Lock-in that results from tokens		●					
Upselling	Providing premium (or extra) services as a reward		●		●			
	Increase price of basic product, making the provision of resources relatively more interesting			●				

Table 13 Summary of interview findings: Relationship

5.2 Design criteria from Focal Firm's Perspective

In the following section, the results from the interviews within the focal firm will be translated into inputs for the business model to fit the envisioned blockchain application. Implications that are taken here will also be of value to the basic design of the business model framework as a whole, as they form a ninth case from practice. The criteria will be coded FFPx, with x being a number between one and five.
In the current situation, there are customers that have a media box (CPE) at home and customers that have not. In the interviews, it became apparent that this difference is meant to stay when the blockchain would be applied. Moreover, some interviewees indicated that people with a media box in their homes should be given the option to not participate in the storage sharing activities. This poses the following criterion:

FFP1: The business model should include two types of customers: one sharing their storage, and one not doing so, regardless of a media box being present in their homes.

From the optional participation in the sharing program, follows that the rewards and compensation provided by the focal firm will not be present for all customers. From the interviews it became apparent that a discounting system would be the most logical compensation for a supplying customer. Additionally, it was generally mentioned that the customer should also be compensated for the additional electricity the media box consumed due to sharing operations. This poses the following:

FFP2: The business model should comprise a discounting system for rewarding supplying customers, as well as a way of compensating their additional electricity expenses.

Logically, the electricity compensation should not form an extra incentive for the customers to participate in the storage sharing program, as they should not be able to make a profit from this. However, the discount provided to supplying customers should provide an additional value to this customer group. As this value is only proposed to them, a dual value proposition should be in place.

Still, the value for non-sharing customers should not be lower than it is in the current way of working. In short:

FFP3: The business model should provide additional value to the supplying customer, corresponding with the extra services they deliver for the focal firm.

Throughout the report, the notion is that a key resource for the focal firm is delivered by (a group of) customers. In case of this focal firm, this key resource is storage. Although the interviewees provided several options to what device should carry this storage (modem or media box), it was clear that the device should be supplied by the focal firm. Still, the customer is the actor that gives up, and therefore provides, storage and uses electricity to make the business model function. This poses the following implication:

FFP4: The business model should display that the media box stays property of the focal firm, yet the supplying customer gives up and delivers key resources they have initially paid for.

As the payments via smart contracts can be handled directly and precisely, the content owners can be paid directly in a pay-per-view way of working. In the current business model, the payments of video on demand content occur at once, together with the monthly subscription payment. Besides the implication this has for the content owners, this also has a large influence on the cost structure and revenue model for all actors in the business model. From this follows:

FFP5: The business model should display the value streams that follow from a pay-per-view model, based on the smart contracts in place.

6 RESULTS FROM PRACTICE PERSPECTIVE

In this section, the whitepapers will be discussed along the nine constructs of the Service Business Model Canvas in the first part. In the second part of this section, the results will be translated into criteria for redesign of the current business model and the business model framework as a whole. To give a clear image of which constructs lead to which design criteria, Appendix D provides diagrams to demonstrate the relationships between them. This was chosen as multiple constructs provided insights for multiple criteria. This is similar to the previous sections.

6.1 Analysis of Practice Perspective

After each paragraph, a table is given that summarizes and structures the findings that were elaborated. Based on this analysis, the design criteria from the case study will be drawn.

6.1.1 Customer

In all whitepapers it was stressed that the different roles that existed within their business model could be fulfilled by any customer at any time. This means that the customer that is the end-user of the service, may also be the provider of resources of this same service for another consumer, possibly at the same time. However, this latter remark may be illogical for the cases in which Wi-Fi and mobile data was shared (i.e. DENT, Iungo, World WiFi, QLink).

The whitepapers used for the analysis were partially selected on the criterion regarding the supplying role of the customer. This criterion stated that this role should go beyond merely providing resources to do blockchain related operations, like validating transactions or executing smart contracts. Logically all whitepapers contained the resource providing customer role. Interestingly, not all whitepapers made use of the customer resources to perform blockchain related operations, but only in the service provision itself. This was done by using a token standard that makes sure that the transfer of value will be executed on an existing blockchain. The Ethereum blockchain fulfilled that role for Flixxo, DENT, LivePeer and Iungo (all ERC20), and World WiFi (ERC223). As the parties that execute these operations on the Ethereum blockchain are not related to the business model of the focal firm, they are left out. The other three cases (Filecoin, Theta, QLink) described their own blockchain, including a customer role providing resources to participate in validating/mining operations. It must be remarked that QLink used another existing blockchain (NEO, a similar platform to Ethereum) as well, as a database from which information could be gathered. This information is used in their native blockchain.

Another customer group that is found in multiple cases is the content provider. This customer uses the service, enabled by blockchain and resources provided by other customers, to distribute their own product to their viewers. In Flixxo, LivePeer and Theta, this content producer uses the network to distribute their video content to viewers. In these three initiatives, the producer has the possibility to charge the viewers for watching the content. In other instances where content is distributed in the network, this is done alongside the main goal of the business model. This will be elaborated upon in the Key Partners analysis, as this latter group mainly consists of advertisers.

Customer		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
	Customer supplying a key resource	●	●	●	●	●	●	●	●
	Different customer roles can be fulfilled by all customers	●	●	●	●	●	●	●	●
	Using and supplying in parallel is illogical			●	●	●	●		
	Customer resources used for mining		●			●			●
	Open source development community present							●	●
	Customers use platform to distribute content	●	●					●	

Table 14 Summary of case study findings: Customer

6.1.2 Key partners

The key partners and the customers in the blockchain business models do not differ a lot. It may even be argued that they overlap to a large extent.

First of all, some of the cases focused on the distribution of (paid) content (Flixxo, LivePeer, Theta). Other cases distributed advertisements throughout the system to generate revenues for the focal firm, the resource providing customer, the content producer, or a combination of these. At Flixxo, the advertisements generate revenues for both focal firm and content producer. In the Theta business model, the content producer and the viewer are rewarded with tokens. At World WiFi and QLink, the advertisements were merely used to provide the end-user with a free service.

In the analysis, the supplying customers, as well as the possible miners, were argued to be customers, not key partners. In their description of the Business Model Canvas, Osterwalder & Pigneur (2010) argue that key resources are provided by the focal firm, or are leased or acquired by key partners. However, in all business models that were derived from the whitepapers, a customer group acted as a supplier of key resources, and thus as a key partner. Still, in all whitepapers, it was noted that the supplying customer was not tied to one customer role, and could also be the consumer of the service they helped deliver themselves.

The only recurring key partners in the business models were the advertisers, and the customers that functioned as key partners. DENT included two other B2B partners in their whitepaper: the mobile operators. These key partners provided an enabling role for the customers to trade their resources (mobile data) through the DENT exchange. This mobile data made use of the infrastructure provided by the mobile operators, being the key resource they bring to the equation.

Key partner		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
	Existing blockchain platform used	●		●	●	●	●	●	
	Advertisers were involved in the business model	●	●		●	●			
	Other B2B key partners involved			●					
	Customers function as a key partner, using the description of Osterwalder and Pigneur (2010)	●	●	●	●	●	●	●	●

Table 15 Summary of case study findings: Key partner

6.1.3 Value proposition

As the selection criterion describes, the whitepapers that were used in the case study all depicted a service in which the customer provides the focal firm with a (latent) resource, besides resources to mine the blockchain. This selection criterion resulted in a value proposition for the *"supplying customer"* that generally stated that the value created for them lies in the ability to monetize an otherwise underutilized resource. Three whitepapers also described the ability for this supplying customer to invest in the resource and expand the amount of resources they provide (i.e. Qlink and World WiFi with additional native hardware, Filecoin with a hard drive). Naturally, for the other initiatives it may be possible to invest in resources dedicated to serve the focal firm's business model as well, but this would result in a loss generating operation (e.g. a separate mobile data subscription in order to resell everything on the DENT marketplace).

For the advertisers, the value proposition always stated the ability to better target customer groups and perform direct payments. Both these characteristics directly follow from the blockchain that is in place. As the blockchain registers the transactions and views, a clear profile of the customers can be created. These profiles can then be used in targeting the customers. The payments of these advertisements will not have a middleman to fulfill a payment order, as a smart contract handles this.

For the focal firms, the value propositions differed per case. However, some parallels were found in their motivations. The first parallel regards a value proposition that solves a problem for the firm itself, or for a predecessor or close partner of the firm. Flixxo aims to create a less costly infrastructure,

although they do not own any infrastructure. Although this means that their own costs are not directly reduced, they become an interesting partner for the infrastructure owners. Theta works closely with Sliver.tv, and creates value for this firm by offloading a large part of the costs allocated to content delivery networks. World WiFi creates value by combining two markets in which the founders of the company were already active. By doing this, they aim to create growth.
A second parallel in value propositions is the monetary description of value. This goes for Flixxo, Iungo, Theta, World WiFi, and DENT. This value is mostly created by charging a transaction fee or advertisement revenues. The structure of this will be further described in the Revenue Model section.
A third group of cases did not provide or suggest a value proposition (Filecoin, LivePeer and QLink). In these whitepapers, it also did not become clear in which way money was made through the business model.

Value proposition		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
Supplying customer	Ability to monetize underutilized resource	●	●	●	●	●	●	●	●
	Invest to expand resources supplied				●	●			●
	Expansion with resources sold by focal firm				●	●			
Advertisers	Accurate customer targeting, no middlemen	●			●	●			
Focal firm	Value from blockchain application solves existing problem within the firm, or a predecessor	●	●		●				
	Value described in terms of monetary value	●	●	●	●		●		
	No clear value created for the firm described in whitepaper					●		●	●

Table 16 Summary of case study findings: Value proposition

6.1.4 Key resources

The key resources that exist in a business model are described by Osterwalder & Pigneur (2010) as "the most important assets required to make the business model work". These resources can help the focal firm in creating and delivering value in any way, such as reaching a market, maintaining relationships, or simply earning revenues. The definition by Zolnowski, Weiß, & Böhmann (2014) was similar, describing it as the resources required in the provision of the service.

6.1.4.1 Provided by focal firm

The first resource that is key to a blockchain-powered business model is the blockchain itself. This blockchain can be used for different applications (e.g. cryptocurrency, smart contracts). The cases that were present all used the blockchain in a similar manner: as the backbone of the value transferring system, and thereby exchanging all monetary value within the system automatically. This is done using smart contracts.
Besides this allocation of monetary value, other applications were found. Filecoin, Flixxo, LivePeer and Theta also used the blockchain to track the allocation of the distributed files within the system. In the streaming services of Flixxo, LivePeer and Theta, this was mainly done to facilitate the distributed streaming services to reduce the load on the content delivery network (CDN). QLink used a blockchain for an additional goal: registering users' digital assets that were traded within their system on the NEO blockchain.
The first instance of the blockchain (the genesis block) is created by the focal firm. Hereafter, the miners will start adding new blocks to the blockchain. This means that the blockchain as a resource is, primarily, supplied by the focal firm, but altered and expanded by the miners. Naturally, when an update in the blockchain protocol is needed, this will be the responsibility of the focal firm (even if an open source community helps improve the protocol). The tools and the staff to maintain the blockchain (and other website, app or platform) are key resources in the business models too.

Two whitepapers described an optional resource to sell to the customer to improve their use and delivery of service to other users within the system. One of these is the World WiFi antenna, functioning as a means through which the resources provided by the supplying customer are better utilized and improved. The Base Station by QLink also aims to enhance the existing Wi-Fi network that is shared by the supplying customer. However, it also fulfills the mining operations that are needed in QLink's native blockchain. This device, too, is not necessary for the supplying customer to partake in the business model, although it improves the services that this customer provides to the system. This can increase the monetary returns for the supplying customer in two ways. First, as their resource is improved, their returns by providing these will be higher. Second, they will be rewarded for the mining operations that are done by their Base Station. It is important to keep in mind that if the customer buys the additional resource from the focal firm before using it, it technically changes to the customer's resource in the service business model.

6.1.4.2 Provided by supplying customers

In the analysis, some whitepapers were comparable regarding services, yet very different in process. To decrease the load on content delivery networks, the streaming services that were analyzed showed several different procedures to do this. The two procedures were either caching content or storing content. Theta and LivePeer applied the former technology, which means that the resources from customers (internet connection, processing power) were used to redistribute content to nearby viewers. At Flixxo content is stored on the customers' hard drive for a longer period. Here, the supplying customers provide storage on which Flixxo stores all content that is available on their platform. This is similar to the way files are stored in the peer-to-peer network of the BitTorrent protocol (Rodrigues & Druschel, 2010). This means that no central database is in place to provide content, as is the case with the other two streaming services that were analyzed. It must be stressed that, although the content is stored in a distributed manner, the content is not stored inside the blockchain itself, as this is technically not possible yet. The blockchain merely functions to allocate the data in the network.

In Flixxo, the storage that the users share is merely used for content, against a fixed reward. In Filecoin, customers also provide storage, but with a different goal. In the Filecoin ecosystem, the supplying customer (storage miner) provides users with storage, for which they receive rewards, based on deals they make with these users. These deals will be elaborated upon later, when regarding the revenue and cost models. Filecoin has a second customer supplier. The retrieval miner exchanges files between storage miner and user. The resource needed for this is mostly their computing power.

In the remaining four cases, the key resources provided by the supplying customers were mobile assets: WiFi connectivity and/or mobile data packages (DENT, World WiFi, Iungo and QLink). Regarding the resources provided by the supplying customer, the resources shared using DENT differ from the ones in the latter three. DENT provides their customers with a marketplace on which mobile data packages can be traded freely. For doing this, the customer using the service and the supplying customer do not have to be in close proximity to one another. In QLink, Iungo and World WiFi, the resources provided by the customers are also the means through which the service is directly delivered. This means that the user of the resource has to be in close proximity to the device that distributes it. Here, this device is the router, and possibly a device that strengthens the signal. In World WiFi, this is their own antenna, for QLink this will be the Base Station, previously described. On the QLink platform mobile data packages can be traded as well to users in close proximity.

In a number of cases, the key resources provided by the customers could be expanded, resulting in a higher reward for them. Put differently, the notion of providing and monetizing an existent, underutilized resource can in some cases be extended to be an investment. In Filecoin for example, the whitepaper states that customers can monetize their underutilized hard drives, with the possibility to invest and create a small, in-home data center. This may then result in higher revenues for these supplying customers. This same principle is shown in the WiFi sharing services (Iungo, World WiFi, QLink) as a larger network brings the possibility to reach more users.

Miners do not actively take part in the focal firm's business model when existing blockchains are used. Because of this, these miners, as well as their resources, are left out of the business models as well. However, Theta, QLink and Filecoin provide their own blockchain, and therefore need miners to validate the transactions on their blockchain too. The key resources provided by these miners are always the same. These are: a device (most often a computer) of which the computing power is needed in the validation of transactions, an internet connection, and some storage to save a copy of the blockchain ledger. In QLink's case, their BaseStation fulfills this function.

6.1.4.3 Provided by user (end-customer)

All analyzed whitepapers describe digital services. Because of this, users needed digital devices with the possibility to connect to the internet to participate. The whitepapers that did not describe an internet connection as a prerequisite, were the services that had the provision of a (mobile) internet connection as their core service (i.e. World WiFi, DENT, Iungo, QLink). Flixxo, LivePeer and Theta required the user to have a device to watch content on. Filecoin required a computer from which the files to be stored could be sent to the storage miner.
Another key resource for the user that came forward in multiple whitepapers was a wallet with tokens, in order to pay for the service provided. In services that were free or not necessarily paid (freemium), having a wallet was not a prerequisite.

6.1.4.4 Provided by key partner

Several key partners were found in the cases, as shortly mentioned before. The companies that did not describe key partners were LivePeer, Iungo and Filecoin.
Advertisers are present in the Flixxo, Theta, QLink and World WiFi whitepapers. The key resources they provide are similar in all cases: their own advertisement campaigns. Besides this campaign, the advertisements must be paid for. This is done in different ways (described in further detail later), yet always enabled by smart contracts. As all payments are registered on the blockchain, the advertisers are required to have a wallet with corresponding funds.
Only DENT describes an additional key partner: the mobile carriers. These partners provide the infrastructure through which the data is delivered to the end-user.
Although not described as a key partner in the whitepapers, some cases used an existing blockchain platform for their application. This means that this blockchain is developed by a third party. These are NEO (QLink) and Ethereum (Flixxo, DENT, Iungo, LivePeer, World WiFi). In this analysis they will not be regarded as a key partner, as this blockchain software is free to use.

Key resource		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
	Blockchain used to track files within the network	●	●					●	●
	Nodes throughout network used to offload CDN in streaming	●	●					●	
	Blockchain used for asset registration					●			
	Smart contracts facilitated monetary value streams in the network	●	●	●	●	●	●	●	●
Provided by focal firm	Native blockchain implemented by focal firm		●			●			●
	Tools to maintain blockchain and update blockchain responsibility of focal firm	●	●	●	●	●	●	●	●
	Additional resources to participate are supplied by focal firm				●	●			
Provided by customer	Streaming service using customer resources for caching		●					●	
	Streaming service using customer resources for storing content	●							
	Computing power as key resource	●	●					●	

	Storage as key resource	●							●
	Mobile assets (bandwidth/mobile data) as key resource	●	●	●	●	●	●	●	●
	Supplied resources traded on marketplace			●					●
	Resource directly used by end-user in close proximity				●	●	●		
	(Additional) physical resources of customer can be purchased from focal firm				●	●			
Provided by miner	Computing power as key resource		●			●			●
	Storage as key resource		●			●			●
	Bandwidth/mobile data as key resource		●			●			●
Provided by end-user	Device needed to use services is either mobile device or computer	●	●	●	●	●	●	●	
	Computer required to use services								●
	Wallet with cryptotokens required			●		●			●
	Wallet with cryptotokens optional	●	●				●	●	
	Wallet or tokens not present for end-user				●				
Provided by remaining key partners	Existing blockchain platform used	●		●	●	●	●	●	
	Ethereum ERC20 used as token standard	●		●			●	●	
	Ethereum ERC223 used as token standard				●				
	NEO blockchain used					●			
	Focal firm dependent on infrastructure of key partner			●					
	Advertisement a key resource enabling a free-to-use service	●	●		●	●			

Table 17 Summary of case study findings: Key resources

6.1.5 Key activities

The key activities executed by the actors in the business models are closely related to the accompanying key resources. This is mostly shown by the key activities that were identified for the supplying customers. Maintaining the resource they supply can be found in all whitepapers, although in different forms. The main difference stems from the nature of the service (or value) that is core to the whitepaper. In DENT, Iungo, QLink and World WiFi, the platform enables the supplying customers to sell access to their resources directly to the end-users. For DENT, this is done on the Exchange they have in place. For the other three services, the resource is delivered to a user in close proximity, that is directly connected to that router. Not maintaining the resource results in a direct loss of revenues for the supplying customer.

For Filecoin, LivePeer, Flixxo and Theta, this is different. In these cases, the supplying customers facilitate the resources that enable the focal firm to fulfill their services. More specifically, in the Filecoin and Flixxo business models, the storage that is supplied should be dedicated and available at all times, for the focal firm to deliver a reliable service to its users. At Theta and LivePeer this is also the case, but then the resources are used for caching. Therefore, availability is needed, but the resources themselves are more commutable.

For miners the set of key activities is larger. However, as mining is an automatic process, the key activity still is mainly maintaining and updating the resources they provide.

For the end-users, it is important to be able to use the service they desire. In the cases, this differs from connecting your device to a free Wi-Fi hotspot, to acquiring cryptotokens in a wallet or downloading an app. As these activities have minor influence on the business model and dependent on the cases themselves, they will not be thoroughly analyzed here.

A key activity that exists in multiple cases is generating the smart contracts. This activity is done by the advertisers in Flixxo and Theta, and by content producers in Flixxo, Theta and LivePeer. As these smart contracts determine monetary streams between parties that act on the platform, they are key

to the business model. In the business model of World WiFi and QLink advertisers buy ad impressions beforehand, instead of paying as the advertisements are viewed. This means that no smart contracts are needed for this particular process.
Another key activity for advertisers and broadcasters is to produce the content they aim to distribute throughout the network. Although producing this content is key for them to participate, it does not happen inside the business model. Therefore it will be left out.
Finally, in all whitepapers similar sets of key activities were found for the companies. The key activities described maintaining the platform (and app) and the underlying blockchain. Additionally, LivePeer and Filecoin have the role to coordinate the protocol development community that supports the core team. DENT monitors relationships with the carriers whose infrastructure is needed for their value delivery.

Key activities		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
	Customers should list their resource on an exchange			●					●
	Maintain internet connectivity	●	●		●	●	●	●	●
	Miners should update mining software		●			●			●
	End-user has a required activity before using the service (download app, buy tokens)	●		●		●	●		●
	Smart contracts generated by advertisers (among others)	●	●						
	Smart contracts generated by content producers (among others)	●	●					●	
	Focal firm coordinates open source development community							●	●

Table 18 Summary of case study findings: Key activities

6.1.6 Cost structure

In the whitepapers, different cost structures were found per actor, related to the service design. The cost structures described by the whitepapers will be described per actor. To clarify, in all business models, the end-users can also take the role of a supplying customer. As this is not a necessity, the actors will be analyzed separately.

6.1.6.1 End user

The end-user in the business models can be divided into roughly two subgroups: the ones using paid and the ones using free services. Regarding the paid services, Filecoin and DENT provide the users with a marketplace on which the resources can be traded. This means that the cost structure of the end-user is based on bidding and asking prices. Another paid service is described in the QLink whitepaper. The way the assets registered on their blockchain are priced is unclear.
The only whitepaper that does not indicate direct costs for the end user is World WiFi. In their services, the user watches an advertisement, instead of directly paying for the connection. The four other whitepapers describe a freemium model. Flixxo, Theta and LivePeer offer free content, as well as sponsored and premium content. The premium content causes costs incurred by the end-user, which are dependent on the prices set by the content producers. The other freemium model is applied by Iungo, who aimed to eliminate advertisers from their business model. The costs for the user originate from premium services provided by the firm.

6.1.6.2 Supplying customer

In all whitepapers but one, the customer that supplied the focal firm with key resources did not pay any direct costs to other actors in the business model, with Iungo as the one exception. Like their freemium model for end-users, the company offers the supplying customer additional services at a premium.

The other costs for the supplying customers are necessary to participate in the business model, yet are not paid to actors that act within the business model. These costs originate from their internet subscriptions, maintenance costs of equipment, and the resources they may resell on the platforms. The BaseStation (QLink) and the Wi-Fi antenna (World WiFi) form a source of optional costs.

6.1.6.3 Focal firm

In the whitepapers, the thoroughness of the description of cost allocation differs a lot. This varies from explanations along percentages (Iungo, QLink, Flixxo, World WiFi) to general statements and roadmaps. Filecoin and LivePeer lacked these descriptions. Although this difference in detail may exist, the costs that were described were for all whitepapers generally the same. The cost structures all had staff, legal, marketing, research and development, and general maintenance costs. All these costs are necessary for the business model to function, yet do not flow from the focal firm to any other actor in the business model itself. As the blockchain handles all transactions automatically, the focal firm does not play a role in rewarding the supplying customers or, in case of the media-based whitepapers, the producers of content.

6.1.6.4 Remaining actors

Several whitepapers describe advertisers. Naturally, the advertiser incurs costs from creating the campaigns, outside of the business model. Within the business model, the whitepapers described several cost structures for advertisers. The payments that flow from advertisers to other actors were processed by smart contracts on the blockchain. At Iungo, DENT, Filecoin, and LivePeer no advertiser role was described.

One of the cost structures in the whitepapers is pay-per-view (Theta and Flixxo, both media category). With this structure, a fee is directly paid to the receiving actor as the advertisement is played. This fits blockchain, as a standardized smart contract fulfills this repetitive process of small, direct transactions. The others described a prepaid structure. In QLink, the advertiser buys bytes from asset owners, which they can use to distribute their advertisements with. World WiFi implements a similar process. The advertiser buys ad impressions from router owners, who then forward the advertisements to their users. The cases were both in the data category.

As it comes to broadcasters or content creators that are described in the content distribution cases, costs mostly exist outside the scope of the business model, as the content has to be produced. Only in the LivePeer whitepaper, a cost structure to pay another actor in the business model is described. This is the incentive that the broadcaster pays the owners of the transcoding and relay nodes.

Finally, the DENT whitepaper describes the carriers that act within the business model. These actors have no costs incurred within the business model itself.

Cost structure		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
End-user	Costs dependent on prices on exchange			●					●
	Unclear how prices are determined					●			
	Service free to use				●				
	Freemium model	●	●				●	●	
	Freemium model based on premium content from content producer	●	●					●	
	Freemium model based on premium subscription from focal firm						●		
Supplying customer	Freemium model based on premium subscription from focal firm						●		
	Costs for additional resources supplied by focal firm				●	●			
Focal firm	Description of cost allocation present in whitepaper	●	●	●	●	●	●		

	Description of cost allocation not present in whitepaper							●	●
Remaining actors	Advertisers pay fee per view of their advertisement	●	●						
	Advertisers pay for advertisement time/data beforehand				●	●			
	Broadcaster directly pays supplying customers for their services							●	

Table 19 Summary of case study findings: Cost structure

6.1.7 Revenue model

Logically, several of the costs incurred in the business model flow from one actor to one or more others. This is why the revenues in this section will largely overlap with the costs described above.

Although the end-user has been described as a passive actor regarding the business model constructs, some whitepapers describe (incidental) revenues made by this actor. This occurs at Flixxo, Theta and QLink. In all three whitepapers, the revenues originate from the end-user watching advertisements or sponsored content. Flixxo also describes incidental peer-to-peer donations. A reduction in costs may be regarded as an indirect revenue stream. This type of revenue stream will not be added to this analysis, as this is already a part of a value proposition.

Monetary rewards for supplying customers form a core characteristic of the whitepapers that were analyzed. The structures that can be distinguished are a fixed reward per resource unit and a reward based on market mechanism. In the whitepapers of Flixxo, LivePeer, Theta, QLink, Iungo, and World WiFi, the miners or supplying customers receive an incentive per unit of the supplied resource they provided. Filecoin and DENT provide a marketplace on which the resources can be traded. This results in various prices for the resources, and thus for varying revenues. Other revenues can be made by the supplying customer through bonuses (e.g. World WiFi's referral program), donations, or by taking multiple roles in the business model (e.g. also produce content in Flixxo).

As it comes to the focal firms, not all firms describe their own revenue streams in their whitepaper. Filecoin and LivePeer lacked these. QLink did not explicitly describe anything regarding their revenues, but it may be reasoned that their future sales of their hardware (the Base Station) will generate revenue. In the other whitepapers, patterns regarding the structures of revenue streams can be distinguished. First of all, Iungo, World WiFi and Flixxo take a percentage (3%, 5%, and 10%, respectively) of transactions that happen between the actors within their business model. Another way to generate revenues is by offering an additional service to actors in the business model. This is done by DENT (profits from acting as a virtual provider), Theta (premium goods and services), and Iungo (premium subscriptions for end-users and supplying customers). The Wi-Fi antenna that is sold by World WiFi may account for additional revenues as well.

Remaining partners that generate a revenue are broadcasters and content producers (Flixxo, LivePeer, Theta). These payments originate from the viewers (LivePeer, Flixxo, Theta) or advertisers (Flixxo, Theta).

In the DENT whitepaper, the carriers of both the buying and the supplying customers have a revenue stream that flows directly and, respectively, indirectly from the business model. The carriers of the buyers receive a transaction fee from the deal between buyer and supplying customer. The carrier of this latter customer experiences indirect revenues through a better utilization of costs.

Advertisers do not generate revenues within the business model.

The blockchain has a key role in handling the transactions and, thus, in the revenue streams from one actor to another. The smart contracts that are in place influence the greatness of the revenues that are made, based on agreements between the relevant actors.

A type of revenue that all cases showed was the investment they received, either through ICOs or other methods. As this type of non-operational revenue does not happen at regular intervals, they will not be included in the analysis and the criteria that follow from it.

Revenue model		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
End-user	End-user can generate revenue (tokens) by watching ads	●	●			●			
	Donations between end-users are possible	●							
Supplying customer	Revenue is a reward per unit of resource supplied	●	●		●	●	●	●	
	Revenue is based on market mechanism on an exchange/marketplace			●					●
Focal firm	No revenue streams from business model specified					●		●	●
	Possible additional revenues from selling additional resources				●	●			
	Firm takes a percentage from transactions as a fee	●			●		●		
	Revenues generated by offering additional services		●	●			●		
	Revenues generated from subscription model						●		
Remaining actors	Content producers generating revenues from viewers	●	●					●	
	Content producers generating revenues from advertisers	●	●						
	B2B partner receiving transaction fee			●					

Table 20 Summary of case study findings: Revenue model

6.1.8 Channels

To recollect from the Business Model Canvas' definition of channels, there are three roles a channel can fulfill: communication, distribution, and sales. Within these roles, a distinction can be made between direct and indirect channels, and partner and owned channels (Osterwalder & Pigneur, 2010). In the whitepapers, most communication channels that were present to reach the actors were the firm's website, a GitHub page, and social media. The whitepapers themselves are a means through which the firm communicates to partners and customers as well, although the information is not updated as often as other channels permit.

As it comes to distribution of the value proposed and created in the business model, several actors may provide channels, as described by Zolnowski et al. (2014). To clarify, a channel forms a touchpoint between the focal firm and another actor in the business model (Osterwalder & Pigneur, 2010).

The channels presented in the cases largely overlapped. Besides a website and GitHub page, most firms used a (web)app for their digital service. Only World WiFi does not require the end-user to install an application on their device or log onto a web-app or in-browser exchange. In all whitepapers, the channel that is provided by the end-user is a digital device. This can be either a computer, tablet, smartphone, or a combination of them. These were used in the consumption of the service.

Interestingly, the other actors do not provide other channels than devices to connect to the network and on which they install possibly required software. Besides this, the users of the network (including broadcasters and advertisers) use the channels provided by the focal firm to reach the other actors present in the ecosystem. So from the focal firm's point of view, the channels are direct and owned, although the underlying infrastructure may be from partners. From the point of view of other actors, the channels are indirect, as they use the apps provided by the focal firm as their touch point with their customers. In some of the whitepapers, this is obvious, as an exchange is used (DENT, Filecoin). In others, it is less obvious, for example the video platforms through which the broadcasters and content producers distribute their videos (Flixxo, LivePeer, Theta).

The blockchain itself cannot be regarded a channel. Although it facilitates value delivery in all whitepapers, it does not form a direct touchpoint with another actor in the business model. This same argument can be opted regarding the infrastructure created by the interconnected routers in the networks of Iungo, QLink and World WiFi, and the infrastructures the carriers in DENT's network deliver; the infrastructures provide a means through which value is delivered, but does not form a

touchpoint between actor and focal firm. This is partly because the actors often deliver value to one another.
Regarding sales and promotion channels, the whitepapers do not describe detailed plans. Although all whitepapers have sold coins as part of their investment rounds, it is unclear how they aim to expand the customer base.

Channels		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
	GitHub is used as a communication channel		●			●	●	●	●
	Social media used as a communication channel	●	●	●	●	●	●	●	●
	Website used as a communication channel	●	●	●	●	●	●	●	●
	(Web-)application used as value delivery channel	●	●	●		●	●	●	●

Table 21 Summary of case study findings: Channels

6.1.9 Relationship

Similarly to the channels, the Service Business Model Canvas shows the contribution to the relationship by different actors with the focal firm and the other way around (Zolnowski et al., 2014). Again, this does not cover the actors' contribution to relationships with the other actors. There are three motivations for maintaining relationships from the focal firm's perspective, as described by Osterwalder & Pigneur (2010): customer acquisition, customer retention, and upselling. They distinguish six types of relationships between focal firm and customer: personal assistance, dedicated personal assistance, self-service, automated services, communities, and co-creation.
No upselling activities were found in the whitepapers. Interestingly, all whitepapers described customer retention. This motivation results partly from the way the blockchain is used in the cases. The miners are rewarded for performing the mining operations. This reward can be seen as a means through which retention is established. Firms using a non-native blockchain will not directly reward miners. Furthermore, in the rewards that stem from smart contracts between actors within the business models, the focal firm has no part.
For customer acquisition, several solutions were found in the whitepapers. Five of the eight whitepapers described an incentive program for either incentivizing referral (to expand the network) or incentives directly paid to new users. Of the former kind, World WiFi and Iungo give referrers a percental bonus for adding new customers to the network. The latter method is used by Flixxo and DENT. Flixxo awards fifteen percent of their investments to the early adopting content producers on their platform, decreasing to zero over time. DENT awards new users with tokens for downloading their application and will work together with carriers to be able to promise free data packages to new customers. Although QLink does not elaborate on how they will acquire new customers, fifteen percent of their investments is dedicated to doing this.
In the whitepapers, three relationship categorizations were found: Automated services, communities, and co-creation. The one occurring most frequently is the automated service, provided by the focal firm. In all whitepapers, this type of relationship existed between the focal firm and the end-user of the service. The only contribution this user had in this relationship was initiating it (e.g. by downloading an app).
In the QLink, World WiFi, DENT, and Filecoin whitepapers, only automated services can be distinguished as relationships between the focal firm and actors in the business model. LivePeer and Filecoin maintain a co-creation relationship with their open source community, which is not active within the business model itself. QLink has a variation of this co-creation community, with users that can become a *Trooper*. These troopers perform tasks for a fixed reward, paid in QLink's native token.
In the QLink business model even the advertisers have an automated service relationship with the focal firm. Advertisers buy data directly from asset owners to distribute their advertisements to end-

users. In this process, the firm only facilitates the blockchain that processes these transactions, but does not interfere in any way.
In the content distributing business models (Flixxo, Theta, LivePeer), the broadcasters or content creators have a co-creation relationship with the firm. This follows from the fact that these customers create content (and therefore value) for public consumption (Osterwalder & Pigneur, 2010). Besides the automated services that exist for the end-users in the Flixxo and Theta whitepaper, the advertisers use automated services as well. This reasoning is similar to the one mentioned earlier in QLink, as the advertisers reach agreements and create smart contracts directly with the content creators.
Iungo is the final whitepaper that has another relationship in place, although the particular actor is not explicitly present in the business model. This relationship is unique for the evangelists; a subgroup of users that help expand the network and provide tech support to peers. This support function creates a community relationship, as described by Osterwalder & Pigneur (2010). The other actors have an automated services type of relationship with the Iungo.

In the relationship analysis above, the relationships between focal firm and respective actor were described. In their article, Zolnowski et al. (2014) propose that the relationship blocks should contain information on how the actor contributes to the relationship that exists between that actor and the focal firm. In the examples they use, it stands out that these contributions are mostly either initiating the relationship, or maintaining it through the daily service operations. Because of this, these contributions largely overlap with the key activities that are described in the services. In this analysis, such an action is downloading software and keeping this software updated. This is core to both relationship and participating in the service provision in general.
An important aspect in the cases, which does not get any room in the SBMC nor the BMC, is the relationship between actors and the role the firm plays in this relationship. Key to this relationship is the function of the supplying customer's key resources. Three groups were distinguished.
The first is the group in which the focal firm provides a marketplace on which the supplying customers can sell their resources to end-users, as described in Filecoin and DENT's whitepapers. The firm mainly provides the means through which trade is possible between the respective customer types.
The second group consists of cases in which the resource provided by a supplying customer is highly supporting or enabling the service delivery of the firm. This way, the supplying customer does not sell their resources to another party, but gets a reward for providing them to the focal firm. This is described in the whitepapers of Flixxo, LivePeer and Theta. The key resources here are essential to the service provided by the focal firm, yet are not the object that are transferred or traded.
In the third group, the resources provided by the supplying customers are directly consumed by the end-user. The focal firm provides the blockchain that registers all transactions and possibly an app with an overview where the resources are located. These resources are all mobile asset sharing services: Iungo, World WiFi, and QLink. Although this group seems similar to group 1, there are key differences. Primarily, the users of the resource directly connect to the provider of the resource that is in closest proximity, instead of choosing a resource that matches their needs best on a marketplace, as is the case in group 1. Furthermore, in the third group, the price of the resource (if any) is based on how much of the resource is used, instead of packaged and at a fixed price. From this follows a difference in the role the focal firm has. In group 1, the focal firm enables the customers to match, based on their needs. In group 3, the focal firm merely automates the transactions that happen in the background. Finally, in the first group a packaged (and fixed) amount of the resource is sold, and is not required to be consumed immediately. In the third group, a service is provided in the sense that the good is consumed in parallel to the delivery of it (Payne, Storbacka, & Frow, 2008).

Relationship		Flixxo	Theta	DENT	World WiFi	Qlink	Iungo	LivePeer	Filecoin
Motivation: acquisition	Rewards for referrals				●		●		
	Rewards for joining the network	●		●					
	Incentive program for customer acquisition, method unclear					●			
Motivation: retention	Supplying customers and miners are paid in crypto token, functioning as retention mechanism	●	●	●	●	●	●	●	●
Type: automated service	Relationship type present between focal firm and end-user	●	●	●	●	●	●	●	●
	Relationship type present between focal firm and supplying customer	●	●	●	●	●	●	●	●
	Relationship type present between focal firm and advertiser	●	●		●	●			
	Relationship with remaining actors			●					
Type: co-creation	Relationship type present between focal firm and content producer	●	●					●	
	Community present to improve network					●		●	●
Type: community	Community present to solve other users' problems						●		

Table 22 Summary of case study findings: Relationship

6.2 Design criteria from Practice Perspective

In the following section the criteria that follow from the cross-case analysis will be elaborated upon. These criteria will, together with the ones from both literature and interviews within the focal firm, function as inputs for the redesign of the business model for the focal firm, as well as a redesigned framework that visualizes a blockchain-powered business model in the way that seems best fit. The criteria will be coded PPx, with x being a number between one and nine.

Regarding the customers that were present in the analyzed whitepapers, it stood out that different customer roles are present in all business models when a focal firm aims to use customers' resources in providing their services. In the Service Business Model Canvas, different customer types are present as well (Zolnowski et al., 2014), although a difference with the whitepapers was found during the analysis. This difference lies in the fluidity of the customer types. This means that in the whitepapers that were analyzed, a customer could take on different customer roles, whereas in the Service Business Model Canvas, the customer types are more fixed. The roles in the analyzed whitepapers were generally the ones of end-user, supplying customer, and, in case a native blockchain was used, miners. This poses the first design criterion:

PP1: The framework should have room for multiple customer roles and should demonstrate the fluidity of the customer regarding the role it fulfills within the business model at any given point in time.

What became apparent in analyzing the whitepapers was that if a customer provides the focal firm with a key resource, the customer becomes a key partner, according to the description of the origin of a key resource by Osterwalder & Pigneur (2010): key resources are provided by the focal firm, or are leased or acquired by key partners. The fact that customers provide a key resource in a blockchain business model shows that the difference between a key partner and a customer is blurred, as the relationship becomes more networked than transactional. What this implies for a business model is that the (supplying) customer should receive a more active role in the business model itself, not just receiving value, but also enabling the firm to create value. It must be noted that this is different from co-creating value, as is core to service delivery, defined as value that is created when a service is consumed by a customer, and thus has its actual value determined during this consumption (Payne et al., 2008). Although the supplying customer enables the firm to deliver value to (other) customers, the

relationship may still be less personal than with other key partners, as the number of supplying customers is high in all analyzed whitepapers. This new role poses the following criterion:

PP2: The framework should accurately describe the key role a customer may take on, when supplying a key resource that enables the firm to deliver value to the customer base as a whole.

Related to the previous criterion, the way the value propositions are described may have to change accordingly. Right now, the Service Business Model Canvas describes three types of value propositions: a value proposition for the key partner, a value proposition for the customer, and the value proposition of the firm (Zolnowski et al., 2014). Although this seems to form a complete set of all value created within the business model, it still provides a firm-centered set of propositions. In other words, there is no clear description of what value supplying customers create for themselves or for the focal firm. As there are several actors in the business model both creating and receiving value in a networked manner, it may be desirable to be able to differentiate the value propositions according to their origins and the value streams that exist within the business model. Furthermore, in the cross-case analysis it became apparent that sometimes customers directly exchange value with other customers or even key partners that act within the focal firm's ecosystem. This finding is in accordance to the statement made by the authors describing the SBMC, arguing that their framework, although portraying co-creation, does not leave room for networked relationships between actors within the business model. This poses the following two connected criteria:

PP3: The framework should include the value proposition per actor within the business model, according to the value streams that exist therein, meaning that the origin of said value is accurately depicted.

PP4: The framework should show the possibility of direct value exchange between customers or between customer and key partner within the business model, without needing interference of the focal firm.

In the cross-case analysis it became apparent that, when several actors within a business model provide value or services to each other, the revenue streams and cost structures that are present in a business model framework are often described twice. Furthermore, when the total value of a smart contract, as well as the distribution of this value, is determined by smart contracts, the structures of both costs and subsequent revenues change. In the SBMC, this was not the case as the authors state that networked business models were not focused on (Zolnowski et al., 2014). However, as the (monetary) value streams that are enabled by the blockchain and its smart contracts are core to the cases, as well as to this research as a whole, the following criterion will be used in the redesign:

PP5: The framework should accurately describe the (monetary) value streams that occur between actors within the business model, corresponding to the blockchain (and its smart contracts) in place.

The smart contracts also provide another criterion for the design of a business model and its framework. It should be clear what parties can influence the contents of a smart contract and what constraints exist in this process. In the cross-case analysis, several whitepapers were compared in which the actors in the business model determined the contents of it, yet still a percental or fixed transaction fee should be paid to the focal firm. This poses the following for the key activities in a business model framework:

PP6: The framework should accurately describe which actor(s) can determine the contents of a smart contract and what constraints are in place.

In six of the eight cases that were researched, an existing platform was used to facilitate the blockchain and its operations. Three developed their own native blockchain (of which one used both a native and an existing blockchain). When an existing blockchain is used, this can be regarded as outsourcing. This means that it is a resource that is provided by a key partner (in the analysis Ethereum and NEO). The

miners of these blockchains are therefore no part of the focal firm's business model. When a native blockchain is in place, this should be different, as this means that miners are directly supplying their resources to the focal firm and are thereby performing key activities to the business model. The choice whether to develop a native blockchain therefore has a large impact on the business model:

PP7: The framework should explicitly represent the choices that were made regarding blockchain development and the effects it has on the business model.

During the analysis it became clear that the actors in the business model often have a relationship with one another. These relationships are not present yet in the current SBMC and BMC framework. Moreover, the frameworks focus on the relationship that the focal firm has with the actors in the business model and what every actor contributes to this relationship. As in the analysis several types of relationships between actors were found, the following criterion was concluded:

PP8: The framework should describe the relationships between the actors in the business model with details on its characteristics and the concerned actors.

Additional to this criterion, another interesting finding regarding relationships emerged in the analysis. As can be read, three different roles for the focal firm were distinguished in the whitepapers. These roles corresponded to the way the blockchain was applied. In short, the three roles were: the supplying customer facilitating the focal firm's service provision; the focal firm facilitating a customer's service provision; a marketplace facilitated by the focal firm on which supplying customers can sell resources to end-users. As this role determines the way the blockchain is applied in the business model, the following criterion has been formulated:

PP9: The framework should accurately depict the role the focal firm has in the business model and what role the blockchain has to support this.

7 REDESIGN

In the following chapter, the design criteria taken from theory, practice and the focal firm will be translated into a business model framework and a business model for the focal firm. The first section of this chapter will be dedicated to translating design criteria into a redesigned framework. In the second section, this newly proposed framework will be filled in according to the requirements of the focal firm of this research. Although the focal firm's perspective will mostly be used in this second section, some design criteria that resulted from the interviews are also used in the general framework (first section). This means that the focal firm partly functions as a ninth case, additionally to the eight cases of the practice perspective.

The codes of the criteria used in the design decisions will be stated between brackets throughout this chapter. This is done to depict the step from the criteria into the redesign itself. A list of all design criteria and corresponding codes can be found in Appendix E.

The Service Business Model Canvas by Zolnowski et al. (2014) that has been core to the analyses in this research will be taken as a starting point, as described in the methodology. To recollect, the reason why this is done lies in the goal of this research: finding a should-be state of the business model. This blueprint function must be apparent in the redesign as well. Moreover, as it is desirable to generalize the redesign, the ability to perform both inter- and intra-firm analysis must be kept in as well.

7.1 General framework

As the SBMC was used as a starting point, the swim-lane representation of the different actors in the business model was kept in the redesign. Moreover, the reason why the original authors used this representation, was that it made differentiation between value propositions possible (PP3). A difference, however, is that in the original SBMC only three different types of actors existed: customers, the focal firm, and key partners. As stated in the analysis, the fact that customers can supply key resources, makes the difference between key partners and customers blurry (TP1). Still, not all key partners interacted with the blockchain. In other words, the traditional key partners that only interact with the focal firm are still in place, as well as customers having some key partner characteristics. This distinction is now based on the blockchain (PP4). Figure 11 provides an overview of the way the different roles are structured within the redesign.

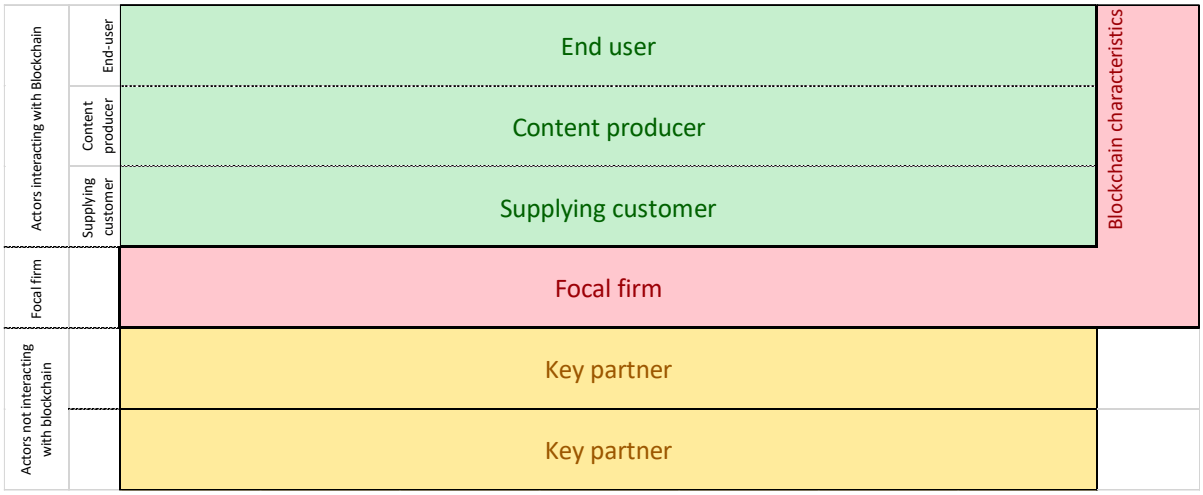

Figure 11 Overview of sections in proposed redesign. Note: the three labels in the top three rows are examples of actors.

Instead of having the focal firm in the middle, dividing the key partners and customers from each other, this distinction is made based on whether the actor is actively interacting with the blockchain (platform). This interaction with the blockchain also means that there are direct relationships possible between the actors that do so (PP4), but not with the partners that do not. An example of the former is an advertiser that forms smart contracts with content producers. An example of the latter is a manufacturer of mining equipment that is resold by the focal firm.

The analysis showed that the fluidity between the roles a customer can have is important to the blockchain business model. This fluidity is implemented by separating the different customer types by dashed lines. When a line is solid, this depicts that there is no fluidity between the roles described there (PP1).
As can be seen in Figure 11, the focal firm's row has an extension on the right side. This extension visualizes and emphasizes the actors that interact with the blockchain (PP4). An additional function that this extension has, is describing characteristics that are key to the implemented blockchain solution (PP7). The characteristics that are described in this extension will be elaborated upon later.
On the left side of each actor row, the actor will be described with a key word. On the left-most side, a column depicts the distinction between the focal firm, the actors who interact with the blockchain platform, and the actors that do not. The contents of the different types of roles are described in the next paragraphs.

7.1.1 Actors interacting with blockchain

The largest changes implied by the analyses take place among the actors that directly interact with the blockchain and the platform that is built around it. As stated above, the dashed line represents the fluidity of the role that a customer can take in the business model, along with the corresponding characteristics of these roles (TP1, TP4, PP1). It must be stressed that, opposed to the SBMC, the actors depicted above the focal firm are not all customers. This means that a role that would have been a *Key Partner* in the SBMC, may now be a role that the customer can take (TP1). This gives the opportunity to describe key elements of the blockchain and their effects on the business model (PP7).
The constructs can be divided into roughly three categories. In the middle, the value taken by the actor is described. On the right of this, the activities are shown. On the left, the tangible inputs and outputs of the activities are shown (Figure 12).
The analyses showed that the several sources of value are a key element of blockchain. In the SBMC, only the value proposed by the focal firm was described per actor. In the redesign, the actors that interact with the blockchain can also create value for other actors. Because of this, the value proposition is replaced by a more general construct: *Value taken* (PP3, PP4). This building block describes all value proposed to that particular actor, which makes it easier to distinguish the value streams between the actors. This way, the design criterion regarding the value proposition per actor is fulfilled (PP3). However, it does not give a dynamic picture of all value streams that happen within the business model. For a static business model that is ought to function as a blueprint, this was deemed inferior to the blueprint characteristic that was asked for.
The *Activities* construct that was present in the original SBMC is taken out of the framework and replaced by two constructs. These are the *Value creating activities* and *Blockchain activities*. The former of these describes all activities performed by the actor that directly add to the value creation for other actors in the business model (PP3). The latter describes all blockchain related activities, such as mining and constructing the inputs for the smart contracts in place. The smart contract generation has important implications for the revenue model of the actor (and thereby cost structure of others), and therefore is key to the blockchain business model (PP6).
In the analysis it became apparent that the *Activities* and *Relationship* constructs often had the same onboarding activities (e.g. downloading an app or logging into an account). These activities were often basic activities that were required to partake in the service delivery. These activities will now be shown in the *Onboarding and maintenance activities* block. Here, these minimum requirements to start or continue using the service and partaking in the business model will be depicted.
Three constructs that were present in the SBMC were directly used in the redesign. These were the *Cost structure*, *Revenue model*, and *Key resource*. The first two form the financial information that is depicted regarding the actors that interact with the blockchain. As stated before, the structure of these is dependent on the way the smart contracts are built up (PP5, PP6). Furthermore, when resources are traded through marketplaces, these structures differ even more. The *Key resource* here describes any key resource that is directly needed for this actor to fulfill any of the activities described in the three activity-themed building blocks. As the resources needed for onboarding and

maintenance activities, the channels provided by the actor are shown in this block as well (TP2, PP2). This comes forth from the channels provided by customers largely overlapping with the key resources in the original SBMC.

Actors interacting with Blockchain								
	End-user	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities
	Content producer	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities
	Supplying customer	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities

Figure 12 In-depth view of section *Actors interacting with blockchain*

Between the original BMC and the SBMC there was a discrepancy regarding the contents of the *Relationship* building block. In the BMC this construct stated the type of relationship between actor and focal firm, in the SBMC it described the contributions of the actor to maintain the relationship with the focal firm. As stated above, this latter description is taken care of by the *Onboarding and maintenance activities*. The BMC description of relationships will be mostly described in the blockchain characteristics, as it was found to be highly dependent on the role the focal firm plays in the business model caused by their choice of blockchain function. This will be elaborated below.

7.1.2 Focal firm

The constructs for the focal firm are mostly kept the same relatively to the original SBMC. Still, the contents will be elaborated below for clarity. Furthermore, the choices made by the focal firm regarding blockchain implementation are added to the right of the swim lane. To emphasize the role of the blockchain, this block is turned into a column in such a way the actors interacting with the blockchain are clear at first glance.

The first thing that stands out is the change in order of the constructs, compared to the original SBMC. This was chosen to remain the consistent with the order that was chosen for the actors interacting with blockchain. As only part of the constructs overlaps, these were all put in the same columns, to have a quick overview of these constructs per actor. For the other constructs, the SBMC's order was respected. Furthermore, the *Cost structure*, *Key resources*, *Revenue model*, *Value Proposition* and *Key activities* comprise the same information as in the SBMC. For the other constructs, the contents are (slightly) changed. Although the blockchain characteristics are shown in the right of the framework, the infrastructure on which it is built remains part of the *Key resource* construct. This can be either the firm's own, or from a key partner (TP5). In the latter case, this resource will be found in the swim lane (or row) of that partner.

In the SBMC, the relationship construct comprises information of that actor's contribution to a relationship. This is different from the construct in the original BMC, in which customer acquisition, retention and upselling activities are described. In the proposed redesign, these factors are reintroduced in this construct. It may be argued that these aspects of a relationship aspects may differ per customer. However, because there is a large amount of fluidity in the role a customer fulfills within the business model, this distinction was left out. That way, it was deemed sufficient to have these relationship-related activities described in a central construct for the focal firm. Furthermore, the relationship type (e.g. automated service, co-creation) was left out, as the blockchain characteristics will influence these highly.

To recollect, a channel in the original BMC was described as any touch point that plays an important role in customer experience (Osterwalder & Pigneur, 2010). In the case study analysis, it became apparent that the channels that were provided by actors interacting with blockchain were often the same devices as their key resources, or apps and platforms provided by the focal firm (as stated in the description of the actors interacting with blockchain). This is why the *Channel* construct in the proposed redesign describes all apps and platforms used by the focal firm in value delivery.

Additionally, the construct describes all marketing and communication channels that are used by the focal firm to reach their customers. These are categorized in delivery channel, and marketing and communication channel.

Actors interacting with Blockchain	End-user	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities	Blockchain characteristics
	Content producer	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities	
	Supplying customer	Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities	
Focal firm		Cost structure	Key resources	Revenue model	Value proposition	Key activities	Relationship	Channels	

Figure 13 In-depth view of section *Focal firm*

In the *Blockchain characteristics* construct, a number of choices that were made regarding blockchain are described. These choices originate from the analyses described earlier in the report. This is primarily done to state what role the focal firm, and therefore the blockchain, has in the business model.

The first choice that is made regards the role the focal firm has in value delivery. In the design criteria, three types were described (TP3, PP5, PP8, PP9):

- *Marketplace*: the focal firm provides a marketplace on which supplying customers can sell their resources to end-users;
- *Main service provider*: the focal firm directly provides services to the end-user and uses the resources of the supplying customer in their service provision (PP2);
- *Supporting service provider*: the resources provided by the supplying customers are directly consumed by the end-user. The focal firm provides the blockchain that registers all transactions and possibly an app with an overview where the resources are located.

A choice between the three has consequences for several constructs in the business model, for multiple actors. For instance, a *Marketplace* type application uses blockchain to register the transactions directly between supplying customer and end-user. This already shows that a dashed line should be present between the actors, the revenue model and cost structure are based on bid/ask prices, and the smart contracts are configured along supplying customer's inputs. A concrete example for this is DENT, that was used in the case study analysis. As the changes in several building blocks brought forward by the choice of types may be subtle, it was chosen to include it in the blockchain characteristics construct.

Another important choice to be made is whether to develop a native blockchain or to use an existing platform (e.g. Ethereum) (PP7). Logically, when developing a native blockchain, the miner should be added as an actor, besides the supplying customer. If an existing platform is used, this miner will not be included. As stated in the analysis, the use of a token standard is free. Because of this, the developer of the token standard will not be regarded a key partner.

Finally, it is important to highlight whether the blockchain is developed and updated by an open source community (PP7). These developers are not regarded to be part of the business model as an actor, as they do not directly provide value to the service provision itself. Their role would be more comparable to that of employees of the focal firm (i.e. human resource).

7.1.3 Remaining key partners

The bottom rows (swim lanes) of the proposed redesign are reserved for the key partners in the business model that only interact with the focal firm, but not with the blockchain (TP2). In other words, these are the key partners that are also present in the original SBMC. Because of this reason, the seven constructs present in the SBMC are directly used in the proposed redesign. The only difference that

was made is the order of the constructs. This was done to keep a consistency with the focal firm and with part of the actors interacting with blockchain.
There is no possibility to have a dashed line between the actors on this side of the framework. This comes forth from the actors delivering to the focal firm, and not to each other.

Actors not interacting with blockchain								
	Cost structure	Key resources	Revenue model	Value proposition	Key activities	Relationship	Channels
	Cost structure	Key resources	Revenue model	Value proposition	Key activities	Relationship	Channels

Figure 14 In-depth view of section *Actors not interacting with blockchain*

7.2 Applying the framework to the focal firm

In the previous sections, the framework was described as a result of the inputs from design criteria. In this framework redesign, not all criteria were applied yet. This is because a number of these criteria described the requirements regarding the contents of the constructs for the focal firm of this research. Filling in these constructs is done in this section. Thereby, the main research question of this research will be answered:

What should the focal firm's business model look like in order to successfully be able to deliver their entertainment service through a blockchain solution within five years?

7.2.1 Actors interacting with blockchain

First, the actors that interact with blockchain will be determined along the requirements from the focal firm. The interviews showed that the bottom line of the service provided to the customer should not change. Because of this, the customers that are present in the redesign will be the same as in the current business model. This means that several packages exist for customers, with an optional addition of a CPE (FFP1). This means that the resources that a customer uses to participate in the business model may differ per customer, as it is possible to only use Video On Demand services with a tablet device. This type of customer will be the *End-user* in the redesign. As the interviewees noted that it is important that providing storage is optional, the customers that have a CPE, but do not share resources, are grouped under this actor as well.
An additional customer role is the supplying customer. This customer provides storage on their CPE to the focal firm. The focal firm uses this storage to store content throughout the network, as described in the problem statement. As the usage of the CPEs for delivering the focal firm's services consumes electricity, part of the supplying customer's revenue model is a compensation for these extra costs (FFP2).
In the business model of the focal firm, the characteristics described for *End-users* also describe the characteristics of the supplying customer, but not the other way around. In other words, the supplying customer has additional characteristics, but is always an end-user as well (FFP3).
A third actor that directly interacts with the blockchain is the content producer (or owner/manager of digital rights of the content). In the current state, this producer is a key partner in the business model of the focal firm. As the blockchain facilitates direct payments for goods and services consumed, the opportunity arises to include this actor in the blockchain operations. This inclusion has consequences for the cost structures and revenue models in the business model. In the current state, the payments for movies are done at the end of every month, along with the subscription fees for the customer. These are all paid to the focal firm. As this content creator directly receives money for their content, they also determine the distribution of the funds paid per unit of consumed content (FFP5). This makes determining parameters for smart contracts one of their key activities. Still, some of this money should be reserved to compensate the supplying customer and for a fee to the focal firm.

In Figure 15 below, the constructs are filled in using the information gained from the inputs from focal firm and other analyses. Again, all blocks that are described for the end-user also describe the supplying customer's characteristics, as all supplying customers are also end-users in the business model at hand.

		Cost structure	Key resources	Revenue model	Value taken	Value creating activities	Blockchain activities	Onboarding and maintenance activities
Actors interacting with Blockchain	End-user	Subscription fee, additional costs per movie	Digital device or computer	n/a	Fast, high quality, reliable content on demand	Watching additional (premium) content	Paying for content	Registration, downloading app, general set-up
	Supplying customer	Electricity costs	Storage, electricity	Compensation for electricity, reward in the form of discount	Monetizing an underutilized resource	Enabling the focal firm to reduce network load	n/a	Setting up storage sharing, mainainting constant uptime for CPE
	Content producer	Costs for creating content	Content	Direct pay per view	Direct payments, accurate statistics on popularity of content	Content creation	Smart contract generation	Upload original content into network for priliminary distribution

Figure 15 Proposed redesign for the focal firm, section *Actors interacting with blockchain*

7.2.2 Focal firm

The blockchain implementation brings mostly financial changes to the focal firm's business model characteristics. As content provision is mostly based on licensing fees that enable a firm to sell video streams to customers, a pay-per-view model that directly pays the content producer changes this significantly (FFP5). The most important change can therefore be seen in the cost structure, where the licensing fees will disappear, or decrease. This cannot be concluded definitively, as this is dependent on deals that are to be made with the content producers. Furthermore, datacenter costs will decrease, as the CPEs will be used to store the data.

As it comes to revenue, the subscription based linear TV service stays the same as the current model. Added to this are the fees paid by customers that watch additional content. As the current process of licensing and streaming is changed into direct payments to the owner of the rights, the income the focal firm has from this source will be lower. Again, the lower costs will compensate for this.

The key resources here are the same as in the current state, although the application of the blockchain may need some changes in the structure of these. For instance, the data centers will be used differently, as the CPEs will function as the main carriers of data. Note that the CPEs are shown as key resource provided by the focal firm, as these remain their property (FFP4). As the customers use these, the resources they may subsequently supply are storage and electricity (Figure 15).

Additional to the value proposition of the current state, a relative value is created by implementing the blockchain solution. This value proposition is coherent with the problem the blockchain solution aims to solve: distributing the load more evenly throughout the network and being less dependent on a single point of failure. Additionally, redistributing the load throughout the network will result in a better utilization.

The key activities of the focal firm to make the business model work are mostly developing the hardware and software that are used in the network. Additionally, the infrastructure should be monitored and developed constantly, as is the case in the current situation. It was suggested during the interviews that having the content stored in customers' homes results in outages on smaller scales that are easier to localize. This suggests that the processes to monitor may have to be changed. However, this is not within the scope of this research.

Regarding the *Relationship* construct, the blockchain solution itself has interesting implications. First of all, the rewards (discounts) for supplying storage can be regarded as a customer retention mechanism, as well as an upselling mechanism for customers who do not provide yet (FFP2).

Additionally, the interviews showed that premium services could be used as rewards, which may motivate people to buy premium services in the long run. Regarding acquisition, the new business model has no direct implications. Only one interviewee proposed an incentivizing program that contained free tokens to be granted to new customers. Because it was only described by one interviewee, this tactic will be left out of the business model. Moreover, the upselling activities currently present at the focal firm will not be depicted in the business model, although they will be present. This activity comprises combining products from different markets the focal firm operates in and offering discounts and premium services to customers who combine their mobile subscription with a television and internet subscription from the focal firm.
The delivery channels of the proposed business model are the same as in the current state. Customers can watch content with a dedicated application, on the internet, and on a television that is connected to their CPE (media box). As it comes to marketing and communication, the channels stay the same as well. In the interviews, it was suggested that communication about blockchain should be done cautiously, selectively, or not at all. The interviewees that were in favor of communicating about the underlying technology, they suggested that a forum for enthusiasts was sufficient.
Regarding the blockchain characteristics, the role that the focal firm takes is the one of the main service provider. The blockchain solution describes that the focal firm uses the CPEs at customers' homes to deliver their services to end-users. The resource that is provided by these supplying customers (i.e. storage) supports the focal firm in delivering the content to the end-user (PP8, PP9).
It was not deemed necessary to develop a native blockchain. This is because of two reasons. The first is that having an extra actor that performs mining activities then has to be added to the business model. If this is a customer group, either the CPEs should be altered, another device must be developed, or unauthorized devices must be allowed for this, which may form a risk for DRM. If the mining activities are performed by the focal firm, the decentralization aspect of the solution is lost.
The second reason is that similar applications already proved to work on existing blockchains (Flixxo). The proposed blockchain operations are already in practice in other applications.
In the proposed business model, it was chosen to develop the application internally or by a trusted third party, instead of open source. This was chosen due to the high competition that exists in the market.

Actors interacting with Blockchain	End-user	Subscription fee, additional costs per movie	Digital device or computer	n/a	Fast, high quality, reliable content on demand	Watching additional (premium) content	Paying for content	Registration, downloading app, general set-up	Blockchain characteristics - Focal firm stays main service provider - An existing blockchain is used - Development is done internally or by a trusted party
	Supplying customer	Electricity costs	Storage, electricity	Compensation for electricity, reward in the form of discount	Monetizing an underutilized resource	Enabling the focal firm to reduce network load	n/a	Setting up storage sharing, mainainting constant uptime for CPE	
	Content producer	Costs for creating content	Content	Direct pay per view	Direct payments, accurate statistics on popularity of content	Content creation	Smart contract generation	Upload original content into network for priliminary distribution	
Focal firm		Cost structure Lower or no licensing fees, incentive for supplying customers, operational costs	Key resources Infrastructure, Human resources, CPEs, Data centers, Software	Revenue model Subscription based income, additional fees from content	Value proposition Distribute network load more evenly, be less dependent on a single point of failure.	Key activities Hard-/software and infrastructure development, contract negotiations	Relationship Retention through token lock-in, upselling through premium goods rewards.	Channels Delivery: App, web-app, CPE App; Marketing & communication: website, social media, television	

Figure 16 Proposed redesign for the focal firm, section *Focal firm*

7.2.3 Remaining key partners

As the main key partners of the current state start interacting with the blockchain directly, there are no key partners shown in the proposed redesign. Furthermore, the interviewees did not propose other necessary partners apart from the ones already depicted above. Of course, there are still key partners

that remain essential for the business model to function. Examples of these are the partners developing the CPEs, the partners that help build the infrastructure, and the partners that develop the blockchain application, if done by a third party. This latter one seems to interact with the blockchain, but this is not the case. This comes forth from them developing it, but not participating in the daily operations. As described in the current business model, the focal firm owns the infrastructure. This also keeps the number of key partners low.
These partners were not taken up in the business model redesign as they are either present in the current way of working, or as they were out of the scope set for this research. Moreover, the problem statement emphasized the business model not being suitable for displaying characteristics of the blockchain. The partners here are in no way influenced by these characteristics.

8 REFLECTION

In this final chapter, the choices that were made during this research are reflected. This will be done by reviewing the validity of the proposed redesign and describing the limitations and some implications for future research.

8.1 Validity

As this research only encompasses the first three steps in the problem-solving cycle, the implementation of the solution and corresponding evaluation will not be part of this report. However, it is possible to reflect on the validity of the proposed redesign. As there is little consensus on an appropriate set of evaluation criteria for qualitative research (Corbin & Strauss, 2015), choices must be made regarding the method of validation. As the field this research is placed in is rather new, the sources for comparing and testing validity by comparing to similar studies were scarce.

Internal validity answers the question if the method has covered all relevant items that were needed to answer the research question (van Aken et al., 2007). The question that was central to this research was the following:

What should the focal firm's business model look like in order to successfully be able to deliver their entertainment service through a blockchain solution within five years?

The objective of this report was designing the business model for the focal firm that would provide an answer to this question. The inputs gathered came from three resources: theory, practice, and the focal firm itself. These three perspectives were chosen to compile a broad set of inputs to base design criteria on. This triangulation increases the validity of the research at hand, as it reviews the problem from different angles (van Aken et al., 2007).

The theory perspective comprised three fields that all partly overlapped in characteristics with the blockchain. As no theory of blockchain business models existed, these were used. It may be argued that if more fields for these inputs were used to base criteria on, the findings would be stronger or different. On the other hand, this may also have given a skewed view of the needs for blockchain, as these criteria are based on adjacent fields, as opposed to on blockchain theory itself.

During the interviews, only employees that were part of the blockchain core group were interviewed. These employees worked in different departments of the focal firm. This was chosen as otherwise the answers of the interviewees may have been dependent on the information regarding blockchain given by the researcher. On the other hand, without this restriction, the employees to be interviewed could have been chosen more freely. In other words, the researcher would not have been restricted to the availability of roles in present within the blockchain core group. If this restriction would not have been present, multiple interviewees could have been chosen per construct. Nevertheless, it was possible to find answers for all constructs within the blockchain core group, as the members' roles within the company differed. Moreover, a business model functions to provide an overview of the way a company creates, captures and delivers value (Zott et al., 2011). The selected interviewees provided these insights sufficiently.

The third and final source of inputs came from practice. This was in the form of eight whitepapers that described relevant companies. It is very important to keep in mind that field of blockchain evolves rapidly. The final set of whitepapers to be included in the case study was selected in June 2018. In the months after, other possibly suitable initiatives appeared, that would have given valuable inputs. During the research, none of the analyzed cases discontinued their operations. In other words, in the final stages of the project, all cases still fulfilled the selection criteria that were set beforehand.

Besides the three perspectives that were taken, it would have been valuable to include blockchain experts as a fourth perspective. It was chosen not to do this, as the focal firm aimed to keep the project confidential. This is another reason why only employees with expertise on blockchain were interviewed at the focal firm. For this same reason, no (potential) customers were interviewed or surveyed for the project. Moreover, it was deemed too early for customer involvement by the leader of the PoC, as the blockchain solution is aimed to be implemented in five years.

In order to have additional expertise on the internal validity from the focal firm, the PoC leader was consulted in both the beginning, as well as the end of the research. This was ensured for the interviews by only selecting from a group of employees that were confirmed by himself to have sufficient capabilities and knowledge to provide useful inputs regarding blockchain. For the case study, the final set of whitepapers was proposed to this same PoC leader before starting with the analysis. This was done to ensure the relevance of the cases for the research objective. During the analyses, development of design criteria and the redesign, the influence of this PoC leader were kept at a minimum to avoid bias.
In order to validate if the research question was answered and if the objective was achieved, the redesign was evaluated by the PoC leader in the final stages of the project. In his feedback, he stated that the research had provided good, well-founded conclusions and provided useful statements. He remarked that the thorough analysis provided valuable information to the focal firm and to the blockchain project.
Although this feedback provides information from the focal firm on the validity of the solution, the true use will become apparent when the business model is applied in its envisioned function. Together with the outcome of the PoC, the business model will be used to gain support for the blockchain solution within the company. This true test of the business model falls beyond the scope of this research.
Additionally, the business model framework can be tested by implementing other relevant whitepapers into the redesigned framework. Although testing this external validity is less common in a problem solving project (van Aken et al., 2007), it helps in proving the generalizability of the redesign. Due to the focus on the focal firm, as well as time constrains, this was not done.

8.2 Limitations

In the early stages of the research, it was chosen after a thorough literature study to use the Service Business Model Canvas to run as a common thread through the project. This was mainly done to have a starting point for the redesign, and to compensate for the lack of a standardized protocol, as described by Knafl & Howard (1984). If another framework was chosen to form the foundation of both redesign and protocol, the results may have differed significantly.
Second, time was a constraint that could not be compensated for. The proposed redesign was only filled in for the focal firm in this research. The findings would gain robustness if there is a possibility to test the redesign on more cases.
Third, in the case study, only inputs were used from whitepapers that described companies that provided services that directly overlapped with the ones provided by the focal firm. In order to have gained a broader applicability, whitepapers from other fields could have been used. It was chosen not to do this. Moreover, some whitepapers that seemed promising were dropped during the process. One of them was part of a preliminary selection, but was dropped after the whitepaper proved to lack too much information regarding the SBMC constructs. Another was dropped later in the process due to allegations of plagiarism in the whitepaper itself. As this controversy was not proven, nor countered, this whitepaper was dropped as well. Although this decreased the number of whitepapers from the envisioned ten to eight, this was not deemed problematic, as all categories were covered by the whitepapers. Furthermore, in the analysis a large overlap in inputs from the whitepapers was found.
Finally, the possibility exists that the proof of concept that has been started up within the focal firm is unsuccessful. In case this results in a change in the envisioned application, the proposed redesign of the business model may not be fitting anymore. Although it is not ruled out that the proposed redesign may still be of value for another application within the firm, appropriate caution must be taken.

8.3 Implications

As described earlier, this research has been a field problem solving project, as described by van Aken et al. (2007). In their book, they describe four types of theoretical implications that can be concluded from an FPS project: innovation, elaboration, verification, and falsification. This research has had an

exploratory nature, both regarding the focal firm and the scientific field it is placed in. This exploratory nature makes that no verification or falsification has taken place.
In the methodology chapter, the exploratory nature of this project was linked to the Grounded Theory approach by Corbin & Strauss (2015). To recapitulate, this approach aims to explore (and create) new or adjusted theories, based on multiple resources (triangulation). From this nature follows that the current research contributed by either innovation, elaboration, or both. As early in the process the assumption was made to change the current Service Business Model Canvas to fit the envisioned blockchain application, the elaboration implication on current theory is lost. The innovation implications for theory will be elaborated below.

The research has proposed a change in both the business model as well as the business model framework for the focal firm. This suggestion poses the implication for the scientific community that this framework may be generalized. Although triangulation created a solid ground to base the findings on, additional research is needed to test for generalizability. This triangulation was done using three qualitative methods of research (case study, semi-structured interviews, and a literature study). In generalizing the findings, quantitative research and expertise from outside the focal firm may be desirable.
Furthermore, the current research was focused on an application of blockchain that uses consumer resources, besides possible resources used in mining operations. In other words, a new business model framework for blockchain is proposed, but additional research is needed to test for generalizability. This latter fact is typical for an FPS project, in which a real-world problem is solved within its own, specific context (van Aken et al., 2007).

To be more specific on how the results of this study form implications, a short elaboration will be given below. This research has made an effort to combine the fields of blockchain and business models and thereby form a starting point for researching the business model frameworks for blockchain solutions. This framework is ready to use for companies that (aim to) use blockchain in their business model for monetary transactions or for exchanging (access to) resources.
In designing this framework, several decision criteria were found, that are important to designing a blockchain business model. For example, three roles a company can have within their blockchain business model were identified (providing a marketplace, use customer resources in service provision, facilitate peer-to-peer service provision). During the literature study, no business model frameworks were found that accurately describe all three of these roles for a focal firm.
Besides the roles that were found that a company can identify itself with, a set of choices to be made regarding blockchain characteristics was given. These characteristics were found in the case study and provide important decision criteria during the design of a blockchain solution. These criteria were whether to outsource the development of the blockchain, whether to develop a native blockchain from scratch or to use an existing platform for this (e.g. Ethereum), and whether an open source community is used to propose updates to the blockchain code.

8.4 Future research

The nature of this research was highly explorative, due to the lack of academic research on blockchain and the business model frameworks that can accurately embed this technology. This report may serve as a first step in this domain, yet it must be acknowledged that further research is needed to prove, disprove, or add to this research.
A way of adding to this field is by researching blockchain business models that go further than describing the niche that was chosen here, as this research mainly focused on content delivery.
Second, the blockchain is a rapidly evolving technology. During the course of the project, new initiatives were launched and problems that prevented some startups to scale up were solved. This made that the “blockchain world” at the end of this project looked nothing like itself a year prior.

Regarding the focal firm itself, further research is needed as well. As stated above, the implementation and evaluation of the redesign within the focal firm will further validate it.
During the research described in this report, a proof of concept was started to investigate the practical possibilities of the envisioned blockchain application. When this proof of concept is (successfully) finished, further action must be taken to scale up the project and research the blockchain solution even further. Examples of this are researching data loads (and its bottlenecks), marketing, rollout, et cetera. Some of these examples were given by the interviewees.
In the proposed business model, the services are still delivered based on a subscription on linear TV (fixed costs) with the possibility to watch additional content (variable costs). During the research, several employees noted that consumers watch less linear television. Although the expectations on if it will disappear definitively are divided, this poses an interesting implication for the future. It may be profitable for the focal firm to start offering their customers packages that do not include linear television. In this package, the customer downloads an app and can watch the content they please at any moment they want. Still, live sports events remain popular. For these, streaming keys can be offered.
As the blockchain facilitates direct payments to owners of digital rights and content producers, the possibility arises to offer a platform for new producers. In the proposed business model, the producers will be the same as in the current business model. In the future, the focal firm is advised to research the possibility to provide a platform for small content producers, or even consumers that want to share and monetize quality content. This way, a larger and more varied catalogue of content can be provided to the customer base. In the current business model, an arrangement like this is hard, as the market is dependent on the periodic licensing system.
Finally, a remark must be made on the academic literature on business models in general. When researching the basics of business models, it became apparent that numerous different definitions exist for the term “business model”. A highly cited journal in the field, *Long Range Planning*, even had a special issue dedicated to the business model, which had multiple articles that proposed various definitions for the term (e.g. of Casadesus-Masanell & Ricart (2010); Chesbrough (2010); Demil & Lecocq (2010); Teece (2010); Zott & Amit (2010)). I believe that to work towards a mutual understanding of what business models can do for new technologies like blockchain, it is important to have one definitive definition for the term.

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10 APPENDICES

10.1 Appendix A: Interview protocol

As described by Yin (2009) the interviews will be focused and semi-structured. The questions will be asked naïvely, in order to get full coverage on a topic from the interviewee. The questions that were used to guide the interview start very open and general, whereafter they become more focused. To elaborate, the first questions will cover the blockchain as a whole and the perceived value for the company and other stakeholders. Hereafter, the questions focus on the content delivery, if not mentioned by the interviewee, in order to guide the interview towards finding the value of blockchain in the content delivery operations. Within this focus, the constructs that are used in the Business Model Canvas (Osterwalder & Pigneur, 2010) and Service Business Model Canvas (Zolnowski et al., 2014) will be used as a guideline to create a complete set of requirements for the envisioned business model.

The questions that were used are shown below. To clarify, the questionnaire was not used in a question-and-answer type of way, as the interview was semi-structured. In the course of the interviews, a noticeable, and natural emphasis was laid on the expertise of the interviewee. However, in all interviews, all subjects and questions have been discussed.

	General blockchain
Introductory	What is your job title and function within the focal firm?
Introductory	How is blockchain part of your current job?
Blockchain	How can the blockchain help the focal firm in their current services?
Blockchain	What problems within the focal firm can be solved using blockchain?
Blockchain	What problems for the customer can be solved using blockchain?
Blockchain	What value may be added to the focal firm by blockchain?
Blockchain	What value may be added to the customer by blockchain?
Blockchain	Can these values be added by technologies that are currently used?
	Focused on content
Value	What problems do you think can be addressed using this solution?
Value	Will these problems be solved using this solution?
Value	What characteristic is essential for this solution to have?
Infrastructure	Is the infrastructure ready for this solution? What should change?
Key Partners	Who are the key partners in the current business model?
Key Partners/relationship	Will the key partners change? How?
Finance	Should the customer be reimbursed for providing resources?
Finance	How would the focal firm's revenues change in this situation?
Customer/relationship	Do you think the relationship with the customer will change? How?
Customer/relationship	What are the main differences with the current situation, regarding the customer's position?
Customer/relationship	Should the implementation of blockchain be noticeable for the customer? Should it be communicated?

10.2 Appendix B: Additional information interviewees

Interviewee 1

This interviewee was at the time of the interview a member of the Deploy team that builds the network throughout the country. A month after the interview, he would start as a Manager of the Service Management team in operations. From both viewpoints of his current and his future job, the interviewee has been researching the possibilities of blockchain to be integrated in the organization. He started reviewing blockchain after he encountered a problem in his job and blockchain seemed to provide a possible solution to this.

Interviewee 2

This interviewee was at the time of the interview a Senior Commodity Lead in the Procurement department of Mobile IT. Within the procurement team, he also fulfills the role of innovation specialist. This means that he explores technologies like chatbots, artificial intelligence and blockchain to optimize processes within his team and the organization as a whole. He emphasizes that the blockchain should only be applied if it adds more value than other, currently applied solutions. He believes that several companies only obtain value from blockchain through using the buzzword in advertising, instead of actually needing or using it.

Interviewee 3

This interviewee was at the time of the interview a Deploy Manager in the Deploy and Integration department. His team focuses on building innovations in the network on a small scale and test these. Hereafter, the (successfully) tested innovation will be scaled up by another team. From his role within the company, he sees opportunities with blockchain in enhancing the traceability of data and the decentralization of trust. He argues that this can help in logistical processes, tenders, financial operations, and service delivery. In his current job, he sees a promising opportunity to decrease the monopoly position of some vendors by applying smart contracts to the tendering process.

Interviewee 4

This interviewee was at the time of the interview a Technology Strategy Manager. It must be noted that when accepting the invitation for this interview, his fulfilled a role as Manager Network Monitoring Systems and Tooling. In his current role, he focuses on innovation and strategy at the focal firm. Within his team, he specializes in innovation in the IT domain. He regards blockchain as promising and tries to find use cases for applying it within the company. Although he is aware of what is happening in the field, no use case was selected at the time of the interview.

Interviewee 5

This interviewee was at the time of the interview an Innovation Specialist in the Customer Operations department. Within this department, he is part of the Business Planning and Innovation team. In his current role, he is concerned with the strategy and vision of the Customer Operations department. Long range planning and innovation are part of these occupations. Although there are no current blockchain projects within the Customer Operations department, the blockchain core group within the company was initiated by this department, when the employees noticed that their colleagues from Technology were exploring blockchain as well. This group started with creating awareness by organizing workshops, and in September 2018 a use case was selected to be worked out into a proof of concept. This use case was the content delivery solution that functioned as the starting point of this current research as well.

Interviewee 6

This interviewee was at the time of the interview a Technology Strategy Manager. In his team, he focuses on technological strategy, guidance within the technology domain, demand management and quality management. Similarly to interviewee 4, he proactively seeks for opportunities to integrate

technological innovations in the focal firm. He is the initiator and organizer of the workshops and the blockchain core group.

10.3 Appendix C: Individual case descriptions

Flixxo

Flixxo is a company that uses blockchain to enable a social video distribution platform in which users can participate by lending their storage and bandwidth to improve the network. In exchange for this, these users can earn tokens, called Flixx. The founders claim that their service combines peer-to-peer payments, enabled by blockchain, with a BitTorrent-like peer-to-peer file distribution system. Flixxo uses the ERC-20 token standard. ("Flixxo Whitepaper," 2017)

Theta token

Theta token is currently only used on streaming website Sliver.tv. The Theta token uses the consumers' bandwidth to create caching nodes within their streaming network, for which they earn tokens. The content that is streamed will still be stored in a centralized database, but is cached in a distributed manner in order to decrease the load in *last-mile delivery* in the content delivery network (CDN). This aims to improve the streaming speed and quality of the content. ("Theta Network Whitepaper," 2018)

DENT

This company focuses on using smart contracts on the Ethereum blockchain (ERC-20) to provide a marketplace in which users can freely buy, sell and donate data packages. With doing this, they aim to create a *Data sharing economy* in which the DENT token is used to do transactions between peers. Thereby it will be a worldwide community in which users can buy each other's unused data abroad. ("DENT Whitepaper," 2017)

World WiFi

The whitepaper behind this startup describes their operations as a sharing economy-like application (they name Uber and Airbnb in comparison) that allows people to offer peer-to-peer Wi-Fi services in return for a monetary incentive. This service uses blockchain technology, and has the WeToken at its core. The Wi-Fi that is provided will be free to the consumer, as the revenues come from advertisers. The WeToken is an ERC-223 standard token of the Ethereum platform. ("World Wifi Whitepaper," 2017)

QLink

The service that is described in the whitepaper of QLink underscribes their goal to create the world's first decentralized mobile network. Doing this should extend network coverage, reduce the cost of telecom infrastructures and reward the users of the network for sharing their unused assets. These assets to be shared can be Wi-Fi connectivity, mobile data access, and enterprise-to-peer SMS. The sharing of assets will be done by registering assets on the Public NEO blockchain by their unique digital identities. The usage of the assets by a third party will be recorded on the QLC chain blockchain by recording the usage footprint. The execution of the smart contracts underlying the transactions will also be on this QLC chain. So the two blockchains in use both have separate functions: the NEO Public chain supports the registration of telecommunication infrastructures as digital assets; the QLC chain provides billing and operational support, by executing the smart contracts.

The inclusion of QLink in this analysis was based on the Wi-Fi and mobile data sharing services between users, as these services encompass the sharing of a user's underutilized assets in an incentivized manner. Therefore, the enterprise-to-peer SMS services that are described in the whitepaper will be carefully omitted in the analysis of the whitepaper.

In the whitepaper the authors stress that, although the main use of the QLink platform is sharing telecom assets between peers, the platform can be used for other use cases as well. The examples of possible uses of the platform, besides its core functionality, will be left out of the analysis as well. This is done to be able to keep focus on the usability of the analysis within the scope of this research: finding relevant implications for the business model of the focal firm. (Zhou & Li, 2017)

Iungo

Iungo is a Wi-Fi sharing service that applies a freemium business model, in order to be independent of advertisers. Their IUNGO token (abbreviated as ING) is an ERC-20 standard token, and thus uses the Ethereum blockchain. The goal of Iungo is to create a global network of reliable Wi-Fi hotspots. ("Iungo.network Whitepaper," 2018)

LivePeer

LivePeer is a project that provides broadcasters with a live video streaming network protocol. This protocol is unique in its decentralized, highly scalable and crypto token incentivized way of working. The decentralized way of streaming will ensure there is no single point of failure. In order to achieve this way of delivering the service, underutilized resources of customers are used: their bandwidth and computational power. The users that run the nodes that provide these resources earn Ether (Ethereum's token) as an incentive. The LivePeer Token merely serves as a protocol token that, for example, facilitates the proof of stake to delegate the work (an ERC-20 standard token). Put differently, as the user provides its resources in a reliable manner, their stake in the system grows and therefore the security that the overall work in the system will be performed honestly and correctly. No monetary value is transferred through the LivePeer token. (Petkanics & Tang, 2018)

Filecoin

The business structure of Filecoin is a bit different from the other focal firms. Because it still describes the sharing of underutilized resources to provide a peer with a service, it is still included in this case study. In their whitepaper, it becomes clear that Filecoin does not aim to make a profit themselves. The organization behind Filecoin, Protocol Labs, also developed protocols like IPFS and libp2p. The organization consists of a core team and a large number of open source contributors. The organization is funded by renowned parties like Stanford University and Winklevoss Capital.
Like the other open source projects of Protocol Labs, Filecoin revolves around decentralizing the internet. Filecoin itself is a cryptocurrency powered storage network, in which miners earn monetary incentives (Filecoin) by providing hard-drive space to the network. The users spend their Filecoin to use the service; storing their files encrypted in the decentralized network. ("Filecoin Whitepaper," 2018)

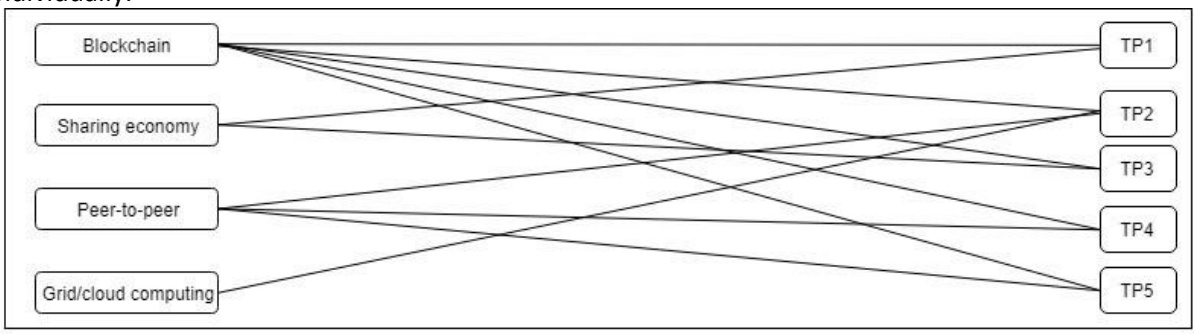
The information on the funds raised during the initial coin offerings were found on ICO Bench. These can be found in the bibliography.
("Dent (DENT) - ICO rating and details | ICObench," n.d.; "Filecoin (FIL) - ICO rating and details | ICObench," n.d.; "Flixxo (Flixx) - ICO rating and details | ICObench," n.d.; "IUNGO (ING) - ICO rating and details | ICObench," n.d.; "Livepeer (LPT) - ICO rating and details | ICObench," n.d.; "QLC Chain (QLC) - ICO rating and details | ICObench," n.d.; "Theta Network (THETA) - ICO rating and details | ICObench," n.d.; "WorldWiFi (WT) - ICO rating and details | ICObench," n.d.)

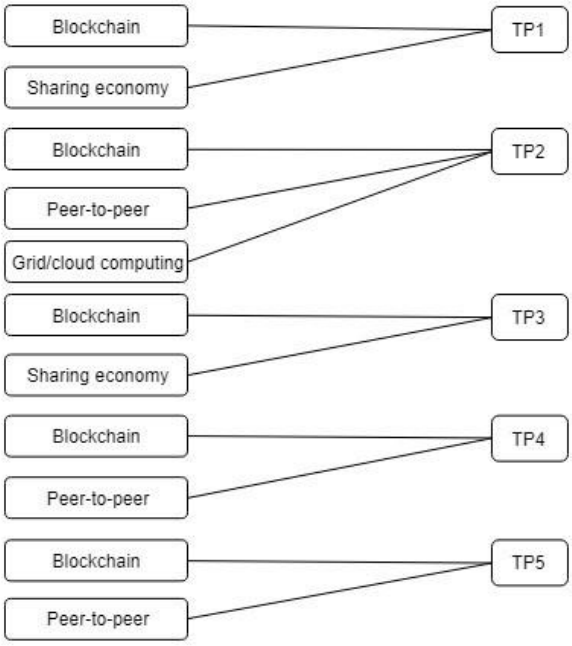
10.4 Appendix D: Relationships between inputs and design criteria

In all diagrams in this appendix, the inputs are shown on the left side and the design criteria are on the right. For clarity, the codes of the criteria were used. In Appendix E a full list of the design criteria is shown, along with the corresponding codes that were used throughout the report.

10.4.1 Theory perspective design criteria

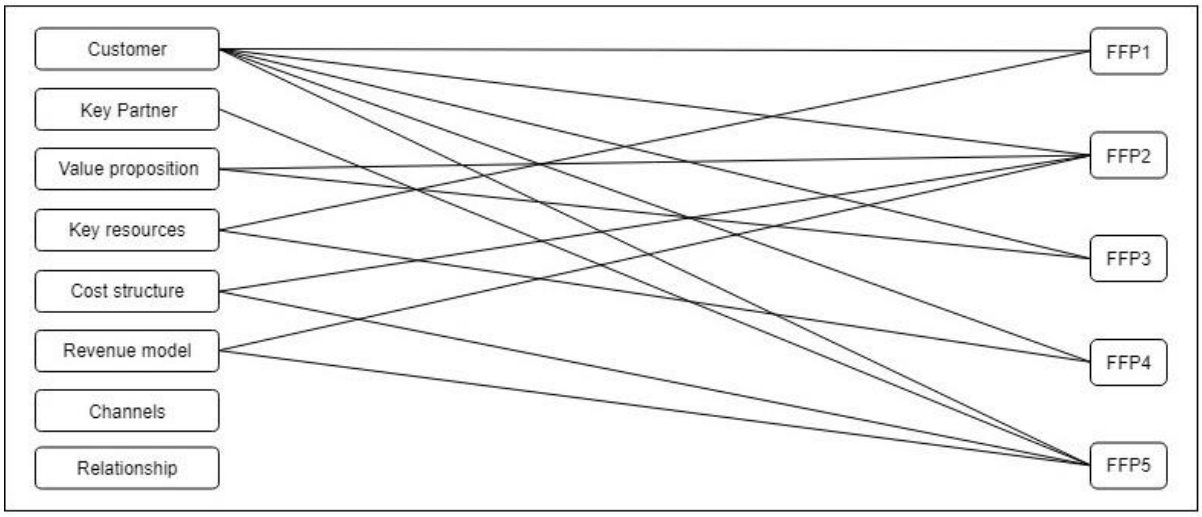
Below, the relationships between the researched fields and the corresponding design criteria are given in a diagram. First, an overview is given of all relationships, whereafter the criteria are depicted individually.

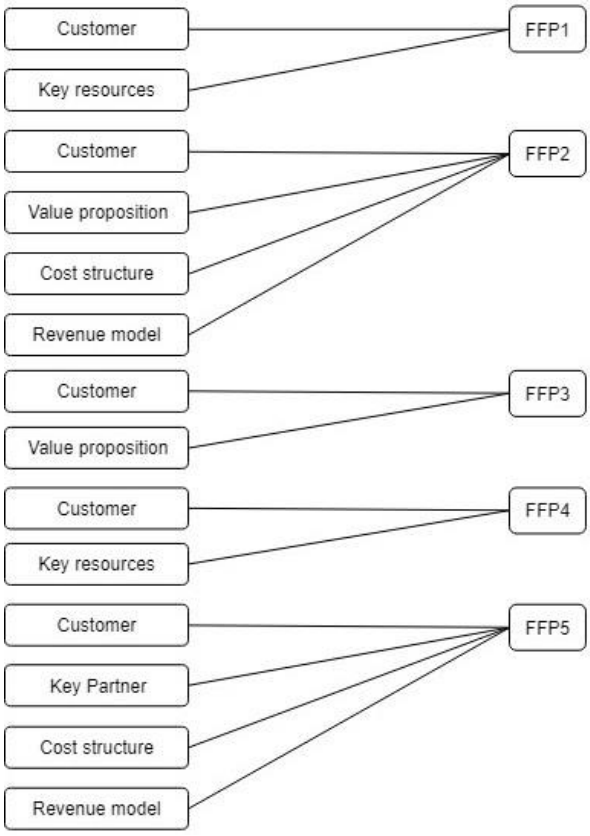




10.4.2 Focal firm perspective design criteria

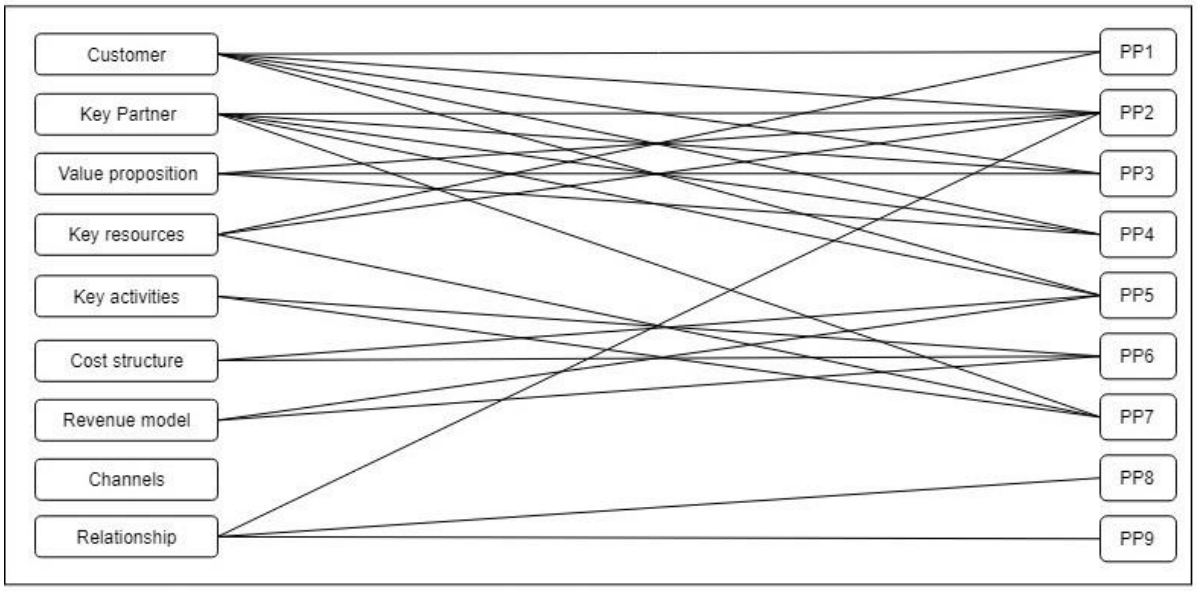
Below, the relationships between the nine constructs of the (S)BMC and the corresponding design criteria are given in a diagram regarding the focal firm perspective. First, an overview is given of all relationships, whereafter the criteria are depicted individually.

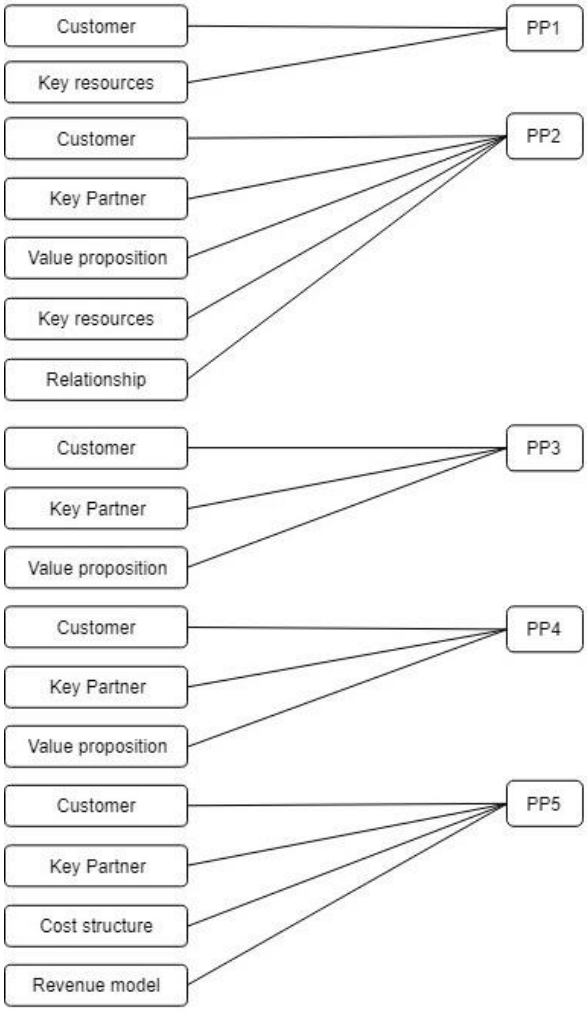


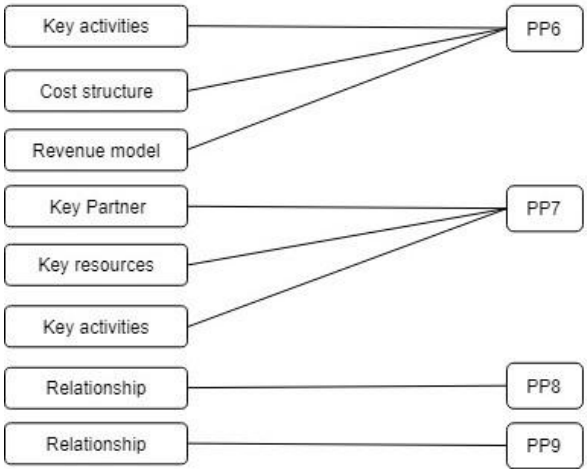


10.4.3 Practice perspective design criteria

Below, the relationships between the nine constructs of the (S)BMC and the corresponding design criteria are given in a diagram regarding the practice perspective. First, an overview is given of all relationships, whereafter the criteria are depicted individually.






Key activities
Cost structure
Revenue model
Key Partner
Key resources
Key activities
Relationship
Relationship
PP6
PP7
PP8
PP9

10.5 Appendix E: List of design criteria and corresponding codes

Below, a list is shown of all design criteria that were found and used in this research. The first column divides the table into three parts, corresponding to the three perspectives taken in this research. The second column depicts the criteria. This third column depicts the corresponding codes.

	Design criterion	**Code**
Theory	The framework can correctly visualize a key partner role for the customer.	TP1
	The framework can correctly visualize the decentralized key resources, as well as the other resources.	TP2
	The framework can correctly visualize the enabling role a focal firm has in the decentralized value streams.	TP3
	The framework can correctly visualize the double value proposition that is in place for the different roles a customer can have	TP4
	The framework can correctly describe the role the focal firm has in distributing the content from the supplying user(s) to the consuming user.	TP5
Focal firm	The business model should include two types of customers: one sharing their storage, and one not doing so, regardless of a media box being present in their homes.	FFP1
	The business model should comprise a discounting system for rewarding supplying customers, as well as a way of compensating their additional electricity expenses.	FFP2
	The business model should provide additional value to the supplying customer, congruent to the extra services they deliver for the focal firm.	FFP3
	The business model should display that the media box stays property of the focal firm, yet the supplying customer gives up and delivers key resources they have initially paid for.	FFP4
	The business model should display the value streams that follow from a pay-per-view model, based on the smart contracts in place.	FFP5
Practice	The framework should have room for multiple customer roles and should demonstrate the fluidity of the customer regarding the role it fulfils within the business model at any given point in time.	PP1
	The framework should accurately describe the key role a customer may take on, when supplying a key resource that enables the firm to deliver value to the customer base as a whole.	PP2
	The framework should include the value proposition per actor within the business model, according to the value streams that exist therein, meaning that the origin of said value is accurately depicted.	PP3
	The framework should show the possibility of direct value exchange between customers or between customer and key partner within the business model, without needing interference of the focal firm.	PP4
	The framework should accurately describe the (monetary) value streams that occur between actors within the business model, according to the blockchain (and its smart contracts) in place.	PP5
	The framework should accurately describe which actor(s) can determine the contents of a smart contract and what constraints are in place.	PP6
	The framework should explicitly represent the choices that were made regarding blockchain development and the effects it has on the business model.	PP7
	The framework should describe the relationships between the actors in the business model with details on its characteristics and the concerned actors.	PP8
	The framework should accurately depict the role the focal firm has in the business model and what role the blockchain has to support this	PP9