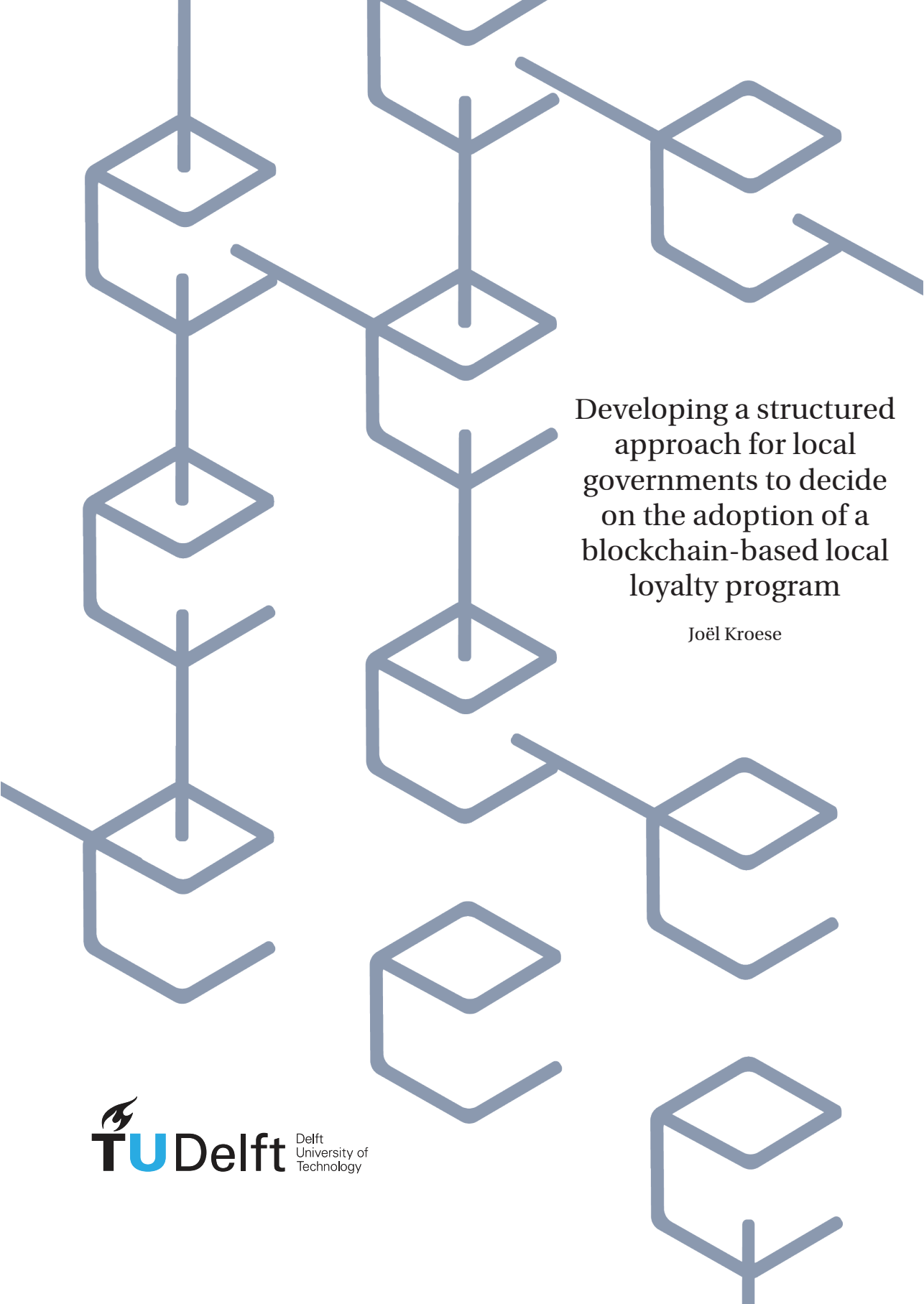

Developing a structured approach for local governments to decide on the adoption of a blockchain-based local loyalty program

Joël Kroese

TU Delft Delft University of Technology

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DEVELOPING A STRUCTURED APPROACH FOR LOCAL GOVERNMENTS TO DECIDE ON THE ADOPTION OF A BLOCKCHAIN-BASED LOCAL LOYALTY PROGRAM

Thesis

to obtain the degree of Master of Science in Management of Technology at the Delft University of Technology,
to be defended publicly on **December 3**rd, 2018 at **10:30 AM**.

by

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An electronic version of this thesis is available at http://repository.tudelft.nl/.

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Technology is neither good
nor bad nor is it neutral

1st law of technology - Melvin Kranzberg

PREFACE

Before you lies my thesis on which I worked for the last couple of months, which explores the application of blockchain technology to obtain a sense of loyalty towards a city centre. It has been written as my final step towards my Masters degree at Delft University of Technology.

After conducting a literature review and desk research I performed multiple interviews to see how the implementation process of a local loyalty initiative looks like. During these interviews I noticed the added value and relevance of the research I had been performing in the period leading up to those interviews. The combination of scientific and societal relevance is something that I have started to appreciate even more while conducting this research.

It has been a rough road to complete this thesis due to multiple setbacks in the co-operation with multiple parties. Combined with health problems, my stubborn personality, and my goal to hand in my thesis before the end of August, I placed a heavy burden on myself. Luckily that was also around the time I joined forces with Jolien, who helped me to relieve the pressure and balance the focus on my personal well-being and on the course of my research. Despite of our disagreements and different viewpoints during certain periods of the collaboration, those weekly sessions helped me to stay on track and the collaboration and efficiency of our meetings improved significantly.

Next to the support of Jolien I also want to thank Marijn and Jan Anne for their critical feedback during the sessions with the commission which improved the quality of the final product as you can read it.

During the course of performing the research I spent most hours studying in the library or other places around the campus. Accompanied by multiple dear friends, mostly from Navigators Delft, those hours became bearable and made me even enjoy it on some days. In the hours outside of the library I could always count on the loving support of my girlfriend and my parents. They never ceased to believe in me and always made time to help me vent my struggles.

I hope you enjoy your reading.

Joël Kroese

Delft, 17 November, 2018

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SUMMARY

Over the last years the online retail is increased in its size and the physical retailers do suffer the consequences. These consequences are reflected by the increasing number of vacant stores in the city centres in the Netherlands. These vacancies might inflict a downward spiral which consists of both commercial and societal problems: a reduction in the liveability of the city, a decrease in the amount of visitors, decreased revenues for the retailers, and even more retail vacancies.

Different studies point to the promotion of the city centre by the local government as a way to attract new customers and counteract the increasing vacancies. The local government is approached by different companies and start-ups who propose a blockchain-based solution to promote their city centre. These blockchain-based solutions offer a loyalty program which can be joined by the retailers within the city centre.

The individual retailers are already familiar with ways of promoting their own store, one of these ways are loyalty programs. A loyalty program is a program which encourages the loyalty of the customer by rewarding loyal behaviour. The increase in the number of such loyalty programs leads to an increase of the inactivity of the available programs. Proposed countermeasures for this inactivity are to meet the demanding customers and to offer more personalized programs. However, in order to offer these programs, data has to be provided by the customer, an activity of which the customer becomes more reluctant. As a way to overcome the inactivity and the reserved attitude of the customers with respect to the sharing of their data, different companies propose blockchain-based solutions.

The blockchain-based solutions proposed by different companies offer low entrance barriers by which different retailers can easily join the same loyalty program. Such an extensive loyalty program could also be translated towards a loyalty program which promotes the local retailers: a blockchain-based local loyalty program.

The local government is not able to determine whether or not a loyalty program should be implemented in their city centre and is not able to determine if the blockchain technology provides added value for the program. The academic literature on both the local loyalty programs and the blockchain-based loyalty programs is also absent, creating both a societal and scientific relevance for the exploration of the field of blockchain-based local loyalty programs.

Therefore, the research objective determined is *to enable the local government to decide whether a local loyalty program will contribute to the promotion of the city centre and to decide whether this loyalty program has to be blockchain-based.* The corresponding research question to be answered is *'Which decision tree can support local governments to decide on the implementation of a blockchain-based local loyalty program?'*

For the answering of this research question a Design Science Research (DSR) approach was chosen and six subquestions corresponding with the activities of the approach were constructed to guide the research. The activities of DSR which led to an evaluated artefact are: explicate problem, define requirements, design and develop artefact, demonstrate artefact, and evaluate artefact. Given the absence of literature on the subject of the blockchain-based loyalty programs, the first three subquestions were focused on blockchain-based loyalty programs, after which the fourth subquestion guided the translation towards the local loyalty programs.

EXPLICATE PROBLEM

Blockchain technology is a technology which is used to store transactional information. The information on the transactions is not secured by a single firm, but is controlled by all the contributors in a network and is therefore often referred to as a distributed ledger. By creating a value corresponding with the transactions, a new currency, or a point value for a loyalty program, can be introduced. Next to the introduction of a new currency, blockchain technology can also be used to execute smart contracts. These contracts can be added to the distributed ledger and are executed automatically instead of requiring the verification by a middle man.

The novelty of the blockchain technology results in a need for use cases since the actual added value of the technology is not proven yet. Next to the need for use cases, the infant state of the technology also results in issues regarding the privacy of the participants in the blockchain network. By the use of blockchain technology, it is still not possible to guarantee a 100% privacy, however, new methods are being proposed and there can already be designed to implement those methods in the future.

By creating a distinction between the loyalty towards the loyalty program and the loyalty towards a brand, the drivers for the loyalty towards the brand can be identified. Amongst which are the attractiveness of the rewards and the effort that is required by the customer in order to use the program.

The different companies proposing blockchain-based solutions offer opportunities which enhance the data-analysis with which more attractive rewards can be selected for the customers. The required effort for the customers is also reduced since bigger partnership programs can be founded and customers only have to enrol once. Partnership programs are programs with multiple points for the customer to earn (earn partners) and to redeem those points (burn partners). These partnerships are made more attractive for the retailers by adding asynchronous partnerships, in which the value of the points earned could differ amongst the different retailers.

DEFINE REQUIREMENTS

For the design of a loyalty program six different design components were identified: membership requirements, program structure, point structure, reward structure, program communication, partnership. By using these design components, the different blockchain-based solutions proposed were structured, resulting in the blockchain-based loyalty program design decisions, which can be found in Table 1. The most distinctive design decision is on the structure of the program, which could be a Frequency Reward Program (FRP) or a Customer Tier Program (CTP), or a combination of both. An FRP is a program in which the customer can earn rewards by collecting points based on the frequency and amount of purchases spent within the program. A CTP is a program in which a customer qualifies for a certain tier based on his loyalty towards the program, this qualification grants him products and services in accordance with the tier he qualified for.

The addition of blockchain technology unto the loyalty programs added multiple design decisions unto the design components identified for the loyalty programs. It also removed a design decision which did apply for the regular loyalty programs: whether the program was part of a partnership, since the blockchain would have had no added value otherwise. Next to that, the addition also resulted in a new design component: blockchain. Which concerns the information exchange with different programs and other blockchain applications.

DESIGN AND DEVELOP ARTEFACT

With the design decisions as a starting point, different architectures were created for partnership programs. The program structures FRP and CTP were used to categorize these program architectures. By modelling the business processes of these architectures using Business Process Modelling Notation the differences between these architectures and the influences of the addition of blockchain technology unto the loyalty programs were explored. It was found that next to the FRP and CTP structures, the addition of smart contracts could result in additional program architectures, which could be used to elaborate the FRP and CTP structures either temporarily or continuously. The additions found were *channel loyalty*, in which a producer of a product rewards the customer who buys their products at a retailer, *lifestyle loyalty*, in which an organization or institution rewards additional points when products associated with a certain lifestyle are bought, and *group loyalty*, which enables the retailer to reward groups of customers who have a shared characteristic, such as a family or sports team.

By an assessment on the different program architectures from the perspective of two end-users, the customers and the retailers, the added value for the architectures was derived. The FRP structure was found to enable added value for the application of the smart contracts, since this program assigns value to the points earned. Next to that, the FRP could easily be expanded with a CTP structure. Therefore, the selected architecture for the blockchain-based loyalty program to explore was an FRP structure with optional expansions.

This selected loyalty program architecture was translated into local loyalty programs using Delft as an example for implementation. It appeared that the lowered entrance barriers identified for the blockchain-based loyalty

Table 1: Design decisions for a blockchain-based loyalty program

Membership Requirements	Who should be able to join the program? How can the customers join the program? What are the costs for joining the program?
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?
Point Structure	When does someone qualify for a tier? Which amount of points results in a reward? When do the points expire? Do people earn extra points when part of a group? * What dimensions are considered for the point redemption value? * What type of token is used? *
Reward Structure	Utilitarian or hedonistic? Self-beneficiary or altruistic?
Program Communication	When to send the customer updates and messages? How personalized is the communication with the customer? Who is in charge of the communication? *
Partnership	Who should be included in the partnership? What form of partnership should be chosen? How much are my points worth at each partner? *
Blockchain	Does the program exchange information with other systems? *

* Design decisions added due to addition of blockchain technology

program could also be used to enable non-retail participants unto the program, such as sport clubs and cultural sights. Which resulted in an extra expansion of the program: *non-retail redemption*. The selected local loyalty program and its expansion can be found in Figure 1.

DEMONSTRATE ARTEFACT

Based on the derived program the demonstration of a blockchain-based local loyalty program could be performed by showing how such a program would look. In order to show this, the different actors and their goals were identified for the different variations of the loyalty program. Based on the focus on the local loyalty and guided by the design decisions, rules were determined to structure a blockchain-based loyalty program. These rules showed the necessity for the different retailers to participate in the program and offer attractive rewards, with the active participation of the retailers the program would optimally function for the customers. Once the program has gained more users, the data-analysis could be optimized and the customers could be targeted even better, creating a more personalized program.

EVALUATE ARTEFACT

By performing interviews on the implementation process of a local loyalty program the conditions and the necessary steps to be taken in order to decide on the implementation of a local loyalty program are evaluated. It appeared from the interviews that the collaboration of three actors on a local level was a requirement: the local government, the real estate parties, and the retailers. The process for the implementation was found to be existent of five steps: performing expert judgement, preparing, conversing, creating the program of requirements, and adapting and expanding.

Guided by these five steps for implementation and the evaluation of the blockchain technology with respect to loyalty programs, a decision tree was constructed for the decision on the implementation of a local loyalty initiative (Figure 2). It appeared that a solution for the local government to promote the city centre and counteract the downward spiral of the vacancies might be a local loyalty program, but is not necessarily the case. Once it appears that a local loyalty program is indeed feasible, the program of requirements should determine whether or not the technology used for the program is blockchain technology.

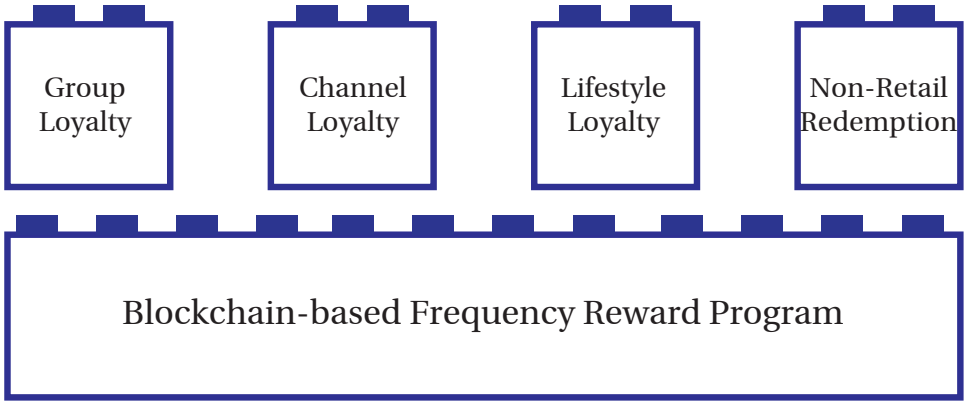

Figure 1: Program selected for further exploration by means of the fifth subquestion

Given the infant state of the blockchain technology the actual added value of the technology is not yet proven. This research found that the blockchain technology might provide for added value for a local loyalty program, it should however be considered if this added value is actually worth the gamble on an unproven technology.

By providing the decision tree on the implementation of a blockchain-based local loyalty program this research contributes to the decision-making process for the promotion of the city centre by the local government. Due to the absence of literature on local loyalty programs, the interviews exploring the implementation process of these programs adds a new field of research unto the promotion of the city centre.

The activities used to derive the decision tree resulted in the design components for a loyalty program. By using these components to structure the opportunities of the blockchain-based loyalty programs, a structured approach is offered for a designer of a blockchain-based loyalty program. The design components, moreover, the design decisions, of a blockchain-based loyalty program also enhance the design of a loyalty program by covering all decisions necessary to design such a loyalty program.

Future research could empirically test the different program architectures derived to validate them. Since the implementation of a local loyalty program is a complex decision-making problem involving multiple local parties, a case study could be derived guided by a TIP-approach of which covers the technological-, institutional, and process design. By using a case study and gathering empirical data, more insight would be gathered on the local loyalty programs and the added value of blockchain technology could be explored further.

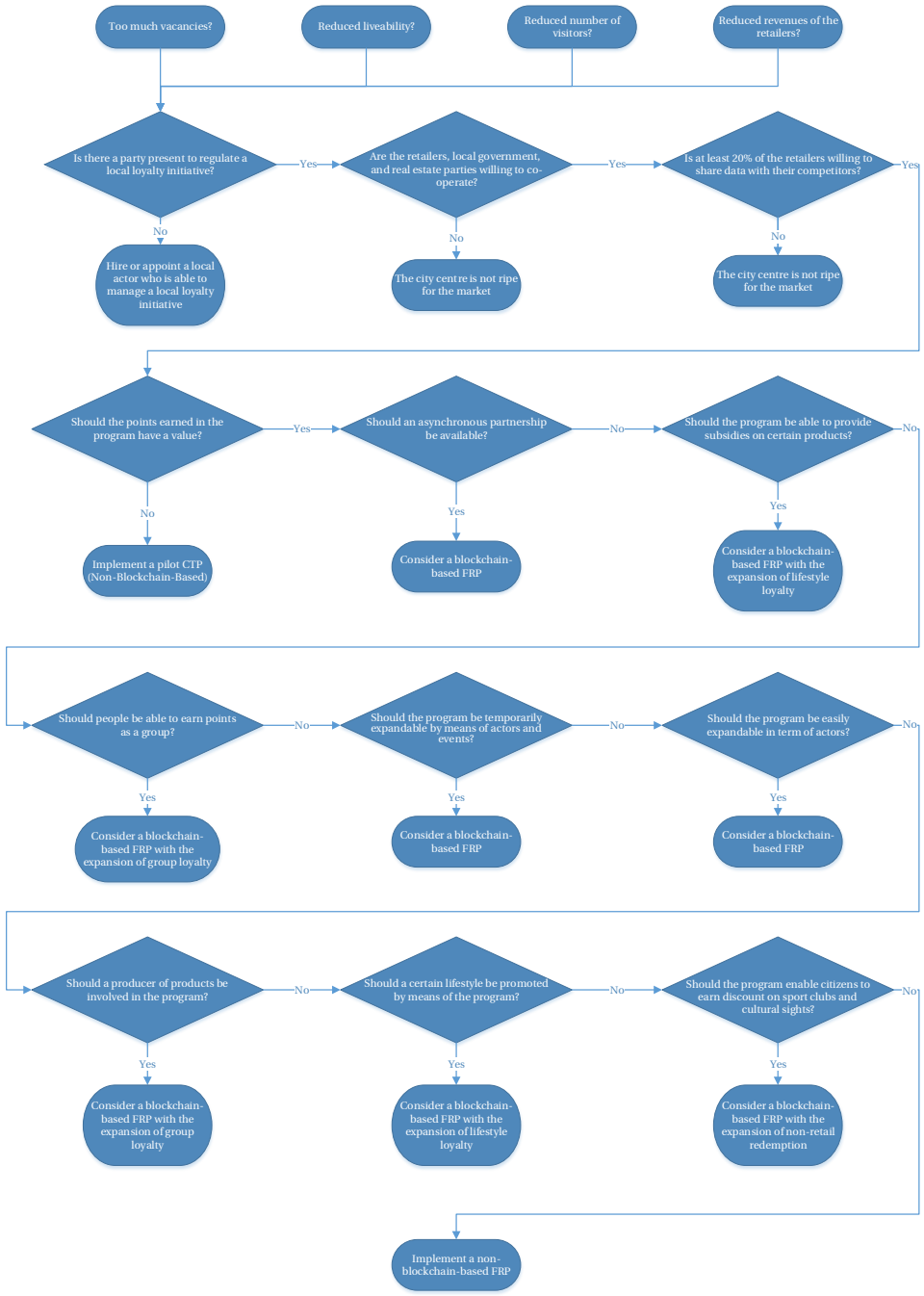

Figure 2: Resulting structured approach for the implementation of a local loyalty initiative

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INTRODUCTION

1.1. BLOCKCHAIN-BASED LOYALTY PROGRAMS

Over the last years more and more stores in the city centres became vacant. The start of this increase in vacancy started around the economic crisis of 2008 (Ossokina et al., 2016). The results of a high vacancy rate could be disastrous, since it is associated with a decline in the confidence of the local retail and an increase of the crime rates within a city (Berwyn, 2012; Teale, 2012), which in the end might be leading towards even worse vacancy rates (Neer, 2017). The downward spiral for the vacancy rates derived by Neer (2017) representing the result of retail vacancy is shown in Figure 1.1. The liveability within this spiral contains the aspects: "safety, the quality and appearance of the properties and the quality of the public space" (Neer, 2017, page 12).

Figure 1.1: Downward spiral of retail vacancies adapted from Neer (2017, page 13)

Next to the downward spiral, by which the vacancy might inflict even more vacancy, another negative influence on the vacancies within the city centres in the Netherlands is induced by the rising popularity of the e-commerce. This rising popularity is shown by the revenues of the e-commerce of 2017 in which the 17 million Dutch citizens spend 22.5 billion of their hard earned euros online, a rise of 13% with respect to 2016 (Thuiswinkel.org, 2018). These numbers are even more troubling for the retailers within the city centres, who are the most likeable retailers to be substituted for the e-commerce (Weltevreden and van Rietbergen, 2009).

Even though the vacancy and e-commerce are threatening the physical retail it is still valued by the customers, especially the convenience, specialism, and inspiration the physical retail has to offer (INretail, 2018), however, the retailer should be aware that he should serve the demands of his customers and create the value for the customers (Raatgever, 2014).

To bring this added value of the individual retailers towards the visitors of the city and to fight the increasing vacancy numbers, Neer (2017) offers several instruments for the local government, amongst which is the pro-

motion of the city centre (Neer, 2017, page 62). The promotion of the city centre might attract new customers, which in turn results into a decrease in vacancy (Pasidis et al., 2017).

1.1.1. LOYALTY PROGRAMS

Ways to attract customers by individual retailers are common and were already introduced in 1981, when American Airline introduced their Frequent Flyer program in order to use the full capacity of their planes and also promote customer loyalty. Being the first mover in this field, they were soon to be copied by other airlines and other companies in other sectors across the globe (O'Malley and Lisa, 1998). Over the last decades, such programs were adopted more and more in all sorts of sectors to enhance the relationship between the user and a brand, retailer, company or service. Up until this day, the loyalty program market is in the rise and it is impossible to imagine a world without such programs. With a rise of 15% with respect to 2016, the market consisted of 3.8 billion memberships in the US in 2017 (Fruend, 2017). According to Bond Brand Loyalty (2017) every North American is member of 14.3 loyalty programs on average, but is only active in 47% of them. Troubling numbers when compared to 2014, when the average North American had 10.9 memberships, but was active in 72% of them. Next to the decrease in activity, 28% of the people abandon a loyalty program before even having redeemed a single point (Bond Brand Loyalty, 2017). The solution according to Fruend (2017) is to provide for the high expectations of the customers, who demand that the program offers them personalized offers and communications.

Programs provide access to the information on consumers to personalize the offers, as was already noticed by Dowling and Uncles (1997) and later on underlined (Berman, 2006; Meyer-Waarden and Benavent, 2009). The implementation of such personalization was early adopted by the British retail giant Tesco, which resulted in an interesting use case which is studied intensively and created more insights in the necessity for personalization of the program (Humby et al., 2003; Rowley, 2005; Turner and Wilson, 2006). From the perspective of the firm it was also found that the profitability of the loyalty program depends on the selection and categorization of the consumer segments (Bijmolt et al., 2010). However, due to this emphasis on the data of the customers, the focus of the companies could also shift from rewarding loyal consumers to just gathering data on the customers (Schneider, 2015). With as possible outcome that the loyalty program becomes a “sham” instead of a “true loyalty program” (Shugan, 2005). A "sham" is being defined by Shugan (2005) as a program that is wrongly used by the companies and demands trust of the customers instead of providing it.

Next to the targeting, the collected data could also be used for applications besides profits and marketing purposes. Kroger, an American retailing company, for example used the data to identify people who bought a certain type of beef which had to be recalled and could personally reach out to them (Turcsik, 2004).

Even though the personalization is wanted by the consumers, and also benefits the companies, the consumers are hesitant to enrol for loyalty programs due to privacy concerns (Ashley et al., 2011; Demoulin and Zidda, 2009; Doorn et al., 2007; Noble and Phillips, 2004). A trend which is also noticed outside the field of the loyalty programs, the ‘Big Data Backlash’, referring to the selective sharing of the customers as a result of the usage of their personal information by companies (Ernst & Young LLP, 2013).

It becomes apparent that this market might be in need for a disruptive program which is more customer-oriented and could again be addressed as a “true loyalty program”. Improving the experience of the loyalty programs both for the customer and the physical retailer.

1.1.2. PROPOSED SOLUTIONS

Noticing these trends within the loyalty programs, different companies are already coming up with their own solutions. One of which is the trend seen in the number of partnership programs: programs which span across multiple organizations (Fruend, 2017), enabling the customer to redeem their points in different ways. These partnership programs are also used to create local partnerships by which the physical retailers could attract customers towards their city centre and promote their stores by co-operating (WeLocals). Another actor who might benefit from such a program is the local government, who is responsible for the liveability of the city centre and is also responsible to prevent and address the vacancies (Neer, 2017). A local partnership could be used by a local government to promote the city centre, one of the instruments offered by Neer (2017) to counteract the vacancies.

To support such local partnership programs, several companies are hopping on the ‘blockchain train’ (Retail-

Coin, 2018). A technology which disrupted the financial sector, but seems to have applications far beyond the financial sector (Tapscott and Tapscott, 2016). The apparent paradox of the personalization demanded by the customers, but the tendency to not provide information on the other hand is something that might possibly be addressed by means of the blockchain technology. Since this technology enables people to be in control over their own personal data instead of having to provide it to everyone (Zyskind et al., 2015). The question however remains whether a blockchain-based loyalty program provides added value or is only used because of its novelty and the hype? How should a local government decide on what their loyalty program would look like and which technology should be used?

1.2. KNOWLEDGE GAP

To find the knowledge gap with respect to the decision for the local government whether or not to adopt a local loyalty program to promote the city centre, and if that loyalty program should be blockchain-based, the academic literature was addressed.

1.2.1. LOCAL LOYALTY

First the academic literature on local loyalty programs was consulted for which both Scopus and Web of Science were used to search for relevant literature on the topic, the search terms *local AND "loyalty programs"* and *city centre AND "loyalty programs"* received only a couple of hits (Table 1.1).

Table 1.1: Literature count on the local loyalty initiatives

Query	Scopus	Web of Science
local AND "loyalty program*"	10	8
city center AND "loyalty program*"	1	0
city centre AND "loyalty program*"	1	0

The abstracts of the literature found using these queries were read and none of the research found addressed the topic of local loyalty programs.

1.2.2. BLOCKCHAIN LOYALTY PROGRAMS

Second, the current state of research on blockchain-based loyalty programs is explored by use of a publication count. The counted publications are up until 2017 and based on the search engine Scopus. The results of which are presented in the graph in Figure 1.2. It is found that blockchain is a topic which is being studied more intensively over the last years. When comparing the research on loyalty programs and blockchain, it is seen that loyalty program research receives a constant growing attention over the last years and the research into blockchain grows exponentially over the last years.

Only recently the applications of blockchain are being studied. However, the application of blockchain on loyalty programs has not been studied at all, according to the research found on Scopus. Three hits come up for the search term *"blockchain" AND "loyalty programs"*. When these hits are given a closer look, it appears that one of them is a book on the application of blockchain and it only mentions the fact that blockchain-based loyalty programs are on the rise (Morabito, 2017a). Another hit is an overview of the work of a researcher, who mentions that he is working on three separate papers, one of which is on loyalty programs and another one is on Bitcoin, but they are not combined (Geng, 2016). The last one explicitly states that loyalty programs are outside of his scope of research (Nieman, 2016).

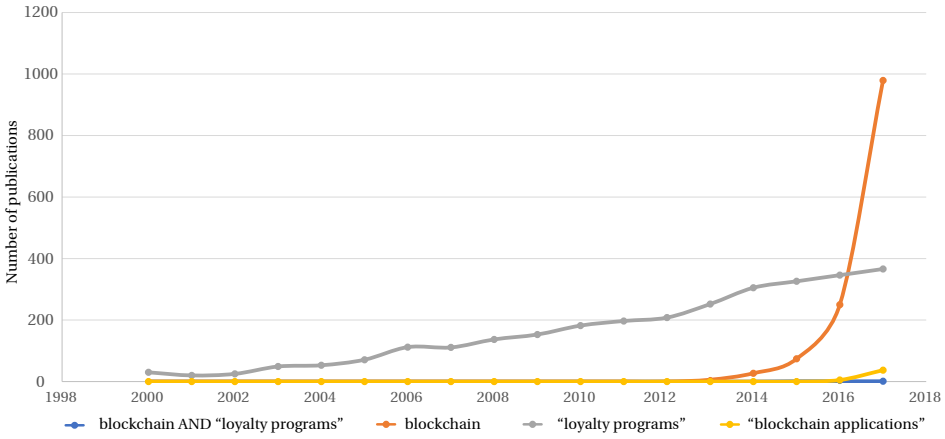

Figure 1.2: Number of publications on different search terms

1.3. RESEARCH OBJECTIVE

Since no literature was found on both the local loyalty programs and the blockchain-based loyalty programs, the local government has no academic basis on which they can make the decision for the adoption of local blockchain-based loyalty program. Therefore, the research objective formulated is:

to enable the local government to decide whether a local loyalty program will contribute to the promotion of the city centre and to decide whether this loyalty program has to be blockchain-based

Given this research objective, the main research question to be answered is:

Which decision tree can support local governments to decide on the implementation of a blockchain-based local loyalty program?

A decision tree is selected to provide a structured overview of the decisions leading up to the implementation of a blockchain-based local loyalty program. With this decision tree a local government is enabled to decide if such a loyalty program will contribute to the promotion of the city centre.

1.4. SOCIETAL AND SCIENTIFIC RELEVANCE

The physical retailers and specifically the physical retailers within a city centre (Weltevreden and van Rietbergen, 2009), lose ground with respect to the e-commmerce. Hence more vacant buildings appear in the city and these vacancies could even lead to a downward spiral of the vacancy rates, also endangering the liveability of the city (Neer, 2017). One of the instruments offered by Neer (2017) to counteract this vacancy is the promotion of the city centre by the local government.

The field of the loyalty programs is constantly changing, impeding the local government to decide on whether to adopt a loyalty program and how to design such a program. Next to that, the customer wishes for a more personalized program on the one hand, while being reserved to provide the firms with their personal data on the other hand. Focusing too much on these issues could lead to a lack of focus on the actual objective of a local loyalty program: true loyalty towards the city (Bijmolt et al., 2010).

Since blockchain technology is still in its infancy, it is not known yet what all the possible applications are and little to no research is to be found whether the usage of blockchain technology actually is of added value (Glaser, 2017). As was seen in the research count, no academic work on this use case of blockchain technology applications is found, whereas blockchain technologies potentially offer a solution to combine more control over personal data for citizens and true loyalty to the retailers. This gap will be filled by providing a structured approach for the implementation of a blockchain-based local loyalty program.

The decision to use a blockchain-based loyalty program instead of a database-based loyalty program is not scientifically supported. Since there is no scientific research on the adoption and implementation process of the local loyalty programs as well, these processes are explored. By which this research adds also to the research domain of loyalty programs.

1.5. RESEARCH APPROACH

This section is divided into different sections and the goal is to design a research to support the answering of the main research question. To structure this research a research framework is selected. The Design Science Research is introduced as research framework and the different activities associated with this approach are selected. By using this framework the subquestions are composed in order to support the research objective and the main research question. Next, the research data requirements are discussed and methods are selected to gather this data. Finally, this section is concluded with an overview of the research by means of a flow diagram.

1.5.1. DESIGN SCIENCE RESEARCH

Two kinds of scientific research could be distinguished in Information Technology, and is either knowledge-producing (descriptive research), or knowledge-using (prescriptive) (March and Smith, 1995). To find an answer to the main research question, a prescriptive research has to be conducted, to guide the local government in the decision for a blockchain-based local loyalty program. A research framework which uses existing knowledge to address business or organizational needs in a problem domain is Design Science Research (Hevner et al., 2004).

By conducting five main activities, the output of the Design Science Research (DSR) is an evaluated artefact, by which the artefact *"[...] may provide totally new opportunities to improve practice long before practitioners recognize any problem"* (Iivari, 2007, page 52). Due to the issues described in the introduction, this statement is applicable to local governments who are confronted with retail vacancy problems within their city centres, which may even inflict more retail vacancies. The application of a blockchain-based local loyalty program could be a source of new opportunities and could improve practice.

Hence DSR provides a knowledge-using framework which addresses organizational needs and may provide new opportunities. Therefore, DSR is suited as a framework to investigate the artefact of this research, a blockchain-based local loyalty program. Based on the guidelines of Hevner et al. (2004) and the framework of Peffers et al. (2007) a new framework is provided by Johannesson and Perjons (2014), this framework can be found in Figure 1.3 and is used to guide this research.

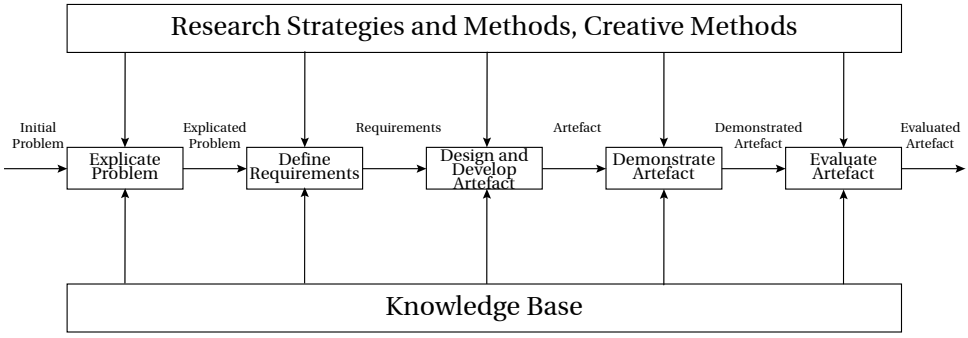

Figure 1.3: Design Science Research representation adapted from Johannesson and Perjons (2014, page 82)

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1.6. RESEARCH QUESTIONS

The selected research framework, and its corresponding activities are used to guide the answering of the main research question:

Which decision tree can support local governments to decide on the implementation of a blockchain-based local loyalty program?

Different subquestions are formulated in line with the different activities of DSR. The subquestions will be used to ensure that each activity of the approach is accounted for and that the main research question will be answered. The research flow diagram presented in Figure 1.4 provides a comprehensive overview between the activities of the DSR, the subquestions, and the deliverables.

Due to the absence of the academic literature on blockchain-based loyalty programs, the artefact derived during the 'design and develop artefact' activity, will be different blockchain-based loyalty program architectures, which will then be translated into program architectures for local purposes. Therefore, the first three subquestions will not address the local aspect of the loyalty programs and will focus on the blockchain-based loyalty programs.

Subquestion 1: What does the problem domain for blockchain-based loyalty programs look like?

The first activity of the DSR is the explication of the problem, the corresponding subquestion will help to understand the blockchain technology, the constructs of the loyalty programs and the opportunities for loyalty programs enabled by blockchain technology.

Subquestion 2: What design decisions can be derived for blockchain-based loyalty programs from literature?

Based on the explicated problem, the requirements for the artefact are defined. The requirements for this research are defined as design decisions. By which the design decisions are choices which have to be made in order to construct a blockchain-based loyalty program.

Subquestion 3: Which different blockchain-based loyalty program architectures can be derived?

Subsequently, the design decisions are used to derive the artefact: different blockchain-based loyalty program architectures.

Subquestion 4: Which blockchain-based loyalty program architecture could be of added value to create local loyalty?

With the blockchain-based loyalty program architectures as an input, this subquestion will be used to translate those architectures into program architectures suited for local loyalty. This step enables us to demonstrate and evaluate the artefact to be focused on: a blockchain-based local loyalty program.

Subquestion 5: What could a blockchain-based local loyalty program look like?

An illustrative demonstration of the artefact will be used to show what is necessary for the feasibility of the artefact. It will be shown that a blockchain-based local loyalty program can indeed be of added value for the creation of local loyalty, and shows how such a program would look.

Subquestion 6: How could a blockchain-based loyalty program be implemented on a local level?

The final activity of the DSR is the evaluation of the artefact. In order to evaluate the feasibility of the derived program, the implementation process of a local loyalty program has to be known and the blockchain-based local loyalty program has to be positioned within this process.

By answering these subquestions a structured approach is used to construct a blockchain-based local loyalty program. These different activities and subdeliverables are combined into a decision tree to structure the subdeliverables and answer the main research question.

1.7. METHODS AND RESEARCH DATA

In order to answer the different subresearch questions different methods are applied and different types of data are needed. This section addresses the issues concerning the data of this research. The methods are introduced, after that the data requirements and the data gathering are expanded upon. Since the research objective is achieved by answering the subquestions, these questions will be used as directive for this section.

For the first subquestion, the problem domain of the blockchain-based loyalty programs has to be described. The subjects of blockchain technology and the loyalty programs will be introduced by performing a literature review. By studying the grey literature, the opportunities for the blockchain-enabled loyalty programs will be derived.

To be able to answer the second subquestion, structured literature reviews and desk research are used to find different design components to structure the design decisions for a loyalty program. For this method to be applied, qualitative data is needed with a broad scope, since the whole spectrum of different design decisions should be mapped. Therefore, secondary data is used, which is found in literature and is gathered by conducting a literature review and desk research. The derived design components for the loyalty programs, are used to structure the opportunities for the blockchain-enabled loyalty programs, resulting in the design decisions for blockchain-based loyalty programs.

For the third subquestion to be answered, the design decisions found by answering the second subquestion will be used to derive different blockchain-based loyalty program architectures. These different program architectures will be presented by using business process modelling. The data necessary for the answering of this subquestion is both originating from the design decisions of the second subquestion and from performing desk research on existing loyalty programs.

In order to answer the fourth subquestion an assessment will be conducted on the program architectures derived. This assessment will be based on a scorecard along different dimensions derived from literature and will be conducted from the perspective of the customer and the retailer. This assessment is merely the synthesis of the data gathered on the prior subquestions and no additional data is needed. Next to the assessment, the translation of the blockchain-based loyalty programs towards the blockchain-based local loyalty program is made. To make this translation tangible a concise desk research is conducted using the city of Delft as an example for implementation.

For the fifth subquestion the value network and its corresponding rules which enable the added value of the blockchain-based local loyalty program will be derived. For the derivation of this value network, business modelling will be used to find the value exchanges between the different actors. In order to apply the business modelling, the different actors, their goals, and their resources are to be known. This data will originate from the synthesis conducted during the prior subquestions.

The data for the sixth, and final, subquestion, is of a qualitative nature. Information is needed to determine the implementation process for the local loyalty program. This primary data is gathered by means of semi-structured interviews among different experts concerning loyalty in the retail sector. This method is chosen since the implementation process is unknown and by the collection of this primary data provided by experts an exploratory approach could be chosen.

1

1.8. RESEARCH FLOW DIAGRAM

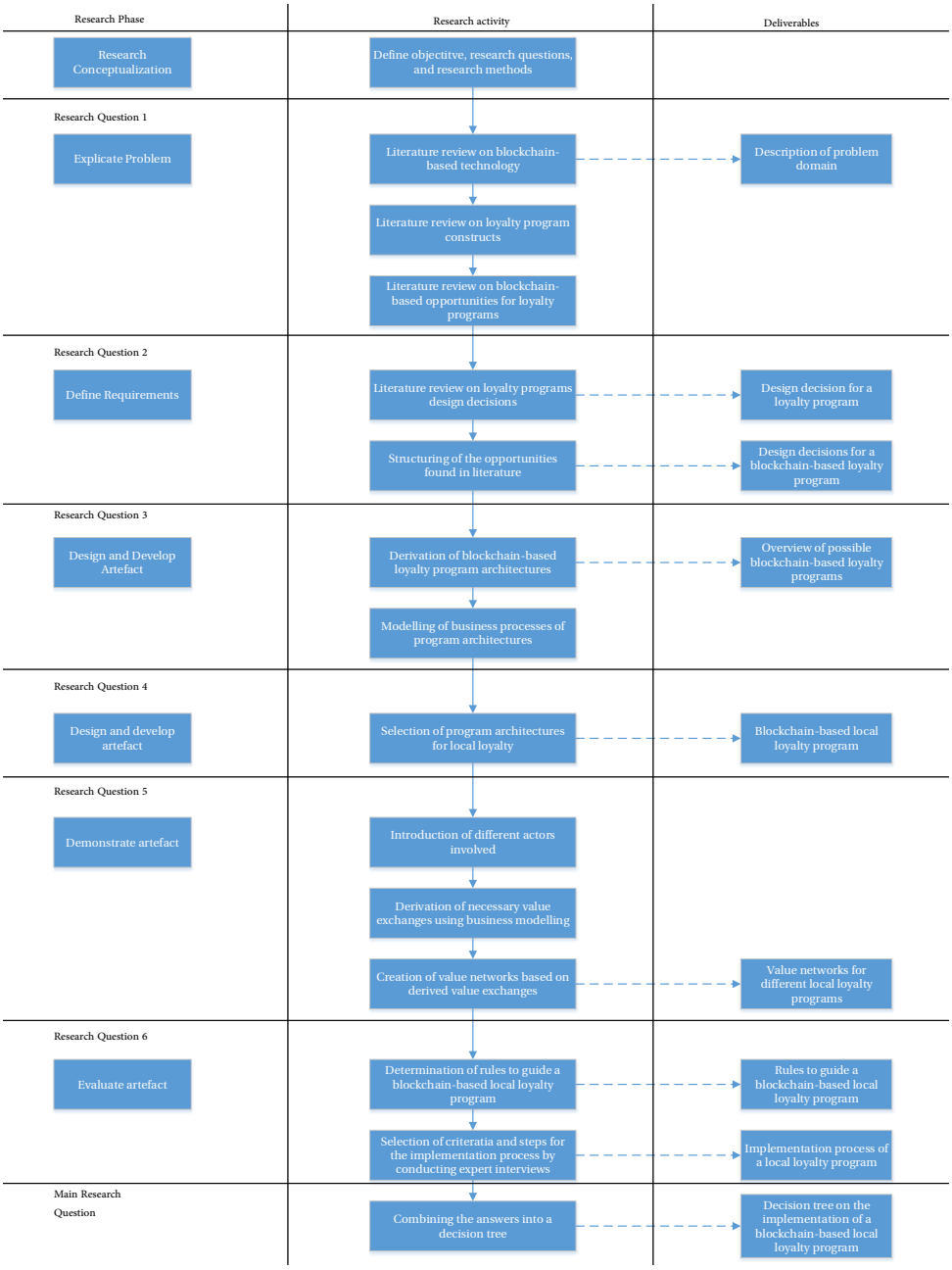


Figure 1.4: Research Flow Diagram

2

DEFINING THE PROBLEM DOMAIN

Subquestion 1: What does the problem domain for blockchain-based loyalty programs look like?

By means of this chapter the first subquestion will be answered, which will result in an in-depth description of the problem domain for blockchain-based loyalty programs. This definition of the problem domain relates to the first step of the Design Science Research method, the explication of the problem. By means of introducing the topics of blockchain technology, loyalty programs, and the opportunities for the blockchain-based loyalty programs the problem domain will be defined and hence the exploration of these programs will be demarcated.

2.1. BLOCKCHAIN TECHNOLOGY

In 2008 Nakamoto published a paper on Bitcoin, which according to the paper was a peer-to-peer electronic cash system (Nakamoto, 2008). Although the identity of Nakamoto remains unknown to this day, its impact is tremendous. By introducing a way to avoid double-spending and create an immutable distributed ledger along with the surpassing of a middleman it really shook the world of electronic payments. Together with the decreasing faith in the financial institutions after the financial crisis in 2008, as a main driver (Helbing and Balietti, 2012; Teigland et al., 2013), the proliferation of the technology had begun. It was only a couple of years later that the benefits of this so-called blockchain technology were searched beyond the financial applications (Tapscott and Tapscott, 2016; Underwood, 2016). These benefits of the technology being, among others, immutable, transparent, secure, fast, trustworthy, open, independent and robust (Morabito 2017a, p. 12; Underwood, 2016). Although it is believed that it will take years for the blockchain technology to reach its full potential (Iansiti and Lakhani, 2017), several applications are already implemented, confirming the exploratory stage the technology is in.

In order to understand how a technology which is mainly known for the enabling of cryptocurrency could have applications beyond that, a distinction should be made. The distinction between the first and the second generation of blockchain technology (Xu et al., 2016, 2017). The first generation blockchain technology was a public ledger with as main application the cryptocurrencies and its transactions (Swan, 2015; Xu et al., 2016, 2017). The second generation of blockchain technology introduced smart contracts and had more of a programmable infrastructure, where the ledger could store the results of the smart contracts.

Smart contracts are pieces of code, which interact autonomous and can express triggers, conditions and business logic (Glaser, 2017; Weber et al., 2016). The idea of smart contracts was first introduced by Szabo (1997), but found its first actual use case in blockchain technology. In order for the smart contract to be triggered or

executed, it has to meet a set of pre-set parameters. Once these parameters are met, the coded action is conducted by the function of the contract. This action could be the generation of a new smart contract or could be a transaction from Alice to Bob.

2.1.1. BLOCKCHAIN 101

Taking the transaction from Alice to Bob as an example, the first generation of blockchain technology, the payment system of Nakamoto (2008), and its concepts could be explained. As mentioned before the main idea of this system is to safely transfer money from one account to another account without the need for any third party. Suppose now Alice wants to pay Bob an amount of $25. This transaction from Alice to Bob can only be executed if Alice has enough liquidity to suffice for this transaction and if both Alice and Bob exist and are really the ones requesting for the money transfer. If these conditions are met the money is transferred from Alice to Bob, resulting in the situation that Alice has $25 less then prior to the transaction and Bob has gained $25. In between however is the magic of the blockchain happening. Several steps are conducted from the moment the request for the transaction is made and the actual transaction, also visualized in figure 2.1.

First there is elaborated upon some concepts important to this technology after which the steps shown in figure 2.1 are briefly explained.

Hashes are the products of an algorithm which generates a sequence of numbers and letters of a fixed length, no matter what size the input was. This algorithm is also known as a hash function (Swan, 2015). The output of this function is unique for every input, but does not reveal anything of its input. The only way to find the input data is to try different inputs until the same output is generated as is provided by the hash. This method is also used to safely store passwords, because in this way only the output of the function has to match its corresponding output and its unknown what the input of the function was.

A **block** contains all the information of a single transaction but also contains information about all the previous transactions that took place in the system (Nakamoto, 2008). These previous transactions are passed through to the next block by means of the hash. In this way it is unknown what the previous transactions were by reviewing only the separate block, but if there is something changed in any way, the hash would be completely different. Next to the information about the transactions, also some extra piece of data is added such that it can be verified that the transactions are valid and are indeed build on all previous transactions. In addition to the extra piece of data, a timestamp is added as extra insurance for the immutability of the chain. In order to verify that the data builds on all previous transactions, only the block of the previous transaction is taken into account, since this one already proofed to be building on the previous ones.

The **consensus protocol** determines how the consensus is reached among the separate nodes in the network (Swanson, 2015). Different consensus protocols could be thought of. The one proposed by Nakamoto (2008) was Proof-of-Work, other consensus mechanisms could be thought of, such as Proof-of-Stake and Proof-of-Burn (Tasca and Tessone, 2018), but the Proof-of-Work consensus protocol is explained to create understanding of the topic. This protocol involves finding the matching input of the hash function when only the output is provided. The only way to do this is by adding your own input in the block and comparing the resulting hash to the one that is asked to find. Your own input are in essence random guesses which continue until someone in the network finds the solution and tells the other parties in the network that the block indeed is valid and builds on the previous ones.

Public and private keys are the ways to link transactions in the network to certain users, without ever revealing their identity (Swan, 2015). When this private key, which is only known to the user, and the transactions are run through a signing algorithm a digital signature is generated. This signature is accessible for everyone to see, it can however only be generated by the person who holds the private key.

With these concepts, the money transfer from Alice to Bob (Figure 2.1), could be explained. The first step after the request is the creation of a block. This block contains information about the transaction request, next to all sorts of relevant information as mentioned before. Once this block is created, it is sent to the network who all have the ledger, therefore it is also referred to as a distributed ledger. Every single participant of the network in turn tries to verify the request by Proof-of-Work. This process of verification, also known as mining, is a process of chance. The node that found the solution receives a small fee and communicates its solution to the network which will be then verified by the remainder of the network. Once the whole network approves of the

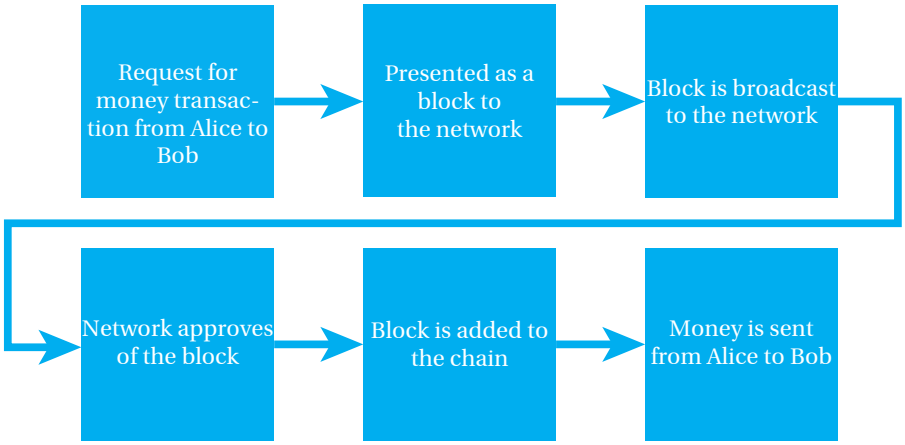


Figure 2.1: Blockchain visualized. (Source: Created for the purpose of this thesis)

solution found, it is agreed upon that the new ledger, which includes the transaction between Alice and Bob, is the ledger to go with. It was mentioned before that the information broadcast by Alice and Bob was presented as a block to the network, since the ledger builds on all the previous transactions in the network, it is called the blockchain. In this chain every block refers to the previous block and if one block somewhere in the chain is being changed by a slight bit, this will work through along the chain and the chain will not be agreed upon by the network. If different chains are being created because of conflicting blocks, the network approves of the longest chain. Resulting in the fact that the only way to change a block in the chain is to change it and build a chain from that block onwards which is longer than the chain approved by the network. But given the design of the system this could only be done if one has more than 50% of the CPU power. Since the block is added to the blockchain and this is the longest chain at that moment, the transaction is automatically completed and included in the new ledger. Meaning that the money is subtracted from Alice's account and added to Bob's account in the new situation.

2.1.2. BLOCKCHAIN 2.0

If this first generation blockchain technology is taken to the next level, by adding smart contracts and being able to not only store transactions, but also for example assets, the opportunities could be endless. Therefore, this innovative technology is not only referred to as a technical innovation but is also an economic innovation (Liebenau and Elaluf-Calderwood, 2016). Given the four phases of a digital innovation life cycle: discovery, development, diffusion and impact (Fichman et al., 2014), it is argued that the technology is now in its development phase, with 2015 as its year of discovery (Glaser, 2017), whereas other authors argue that its still in its discovery phase (Elsden et al., 2018; Zamani and Giaglis, 2018). Due to its innovative nature and the early phase the technology is still in, its benefits, limitations, and risks are not fully understood yet, in particular from the business and the societal perspectives (Lindman et al., 2017). Therefore, it is important to approach the technology with the citation of Glaser (2017, p. 1543) in mind: *"blockchain is an innovative technology in search for use cases"*.

2.1.3. ISSUES OF BCT

Despite all the possibilities enabled by blockchain 2.0, there are still some hurdles to overcome in order for this technology to reach its full potential. Different issues are addressed by different researchers, who realize that even with the disruptive power that blockchain technology has, the technology is not ready yet. In 2015 Swan mentions seven challenges and limitations being: throughput; latency; size and bandwidth; security; wasted resources; usability; and versioning, hard forks, multiple chains (Swan, 2015). During their systematic literature review, Yli-Huumo et al. (2016) identified an eight challenge and added this one to the list of Swan (2015): *privacy*. A year later Zheng et al. (2017) still address the scalability, privacy leakage and selfish mining as

being amongst the major challenges for the blockchain technology, impeding for the technology to be widely adopted. The throughput, latency, size and bandwidth, and the wasted resources limitations all are enclosed in the scalability challenge of Zheng et al. (2017).

The security limitation is covered by the selfish mining. The usability was of question in 2015, but with the uprising of applications based on the blockchain technology (dApps) and the abundance of programs in which even a layman could enrol, this limitation has proven to be overcome. The versioning, hard forks and multiple chains issue is not resolved and was not even addressed in the papers reviewed by Yli-Huumo et al. (2016), but will be given attention since it has some implications for the design of a blockchain structure. Finally, the privacy issue still remains and this issue will be the final issue which will be given attention in this section.

SCALABILITY

Bitcoin has only 7 financial transactions per second which stands in stark contrast to for example VISA, which has about 2,000 (Swan, 2015). This limited amount of transactions per second is due to the time for a block to be added (latency) and the number of transactions per block (size). Which could, when Proof-of-Work is used as consensus protocol, result in a delay of smaller transactions since the miners prefer higher transaction fees with which they are being rewarded when other transactions are completed. According to Zheng et al. (2017) there are two possible types of solutions: storage optimization and redesigning blockchain. The storage optimization is definitely needed because if the throughput reaches the amount of transactions of VISA the Bitcoin network would grow with 214PB [1] per year (Yli-Huumo et al., 2016), as a reference, the size as of the end of July 2018 was 177GB, an increase of 50GB since the same time a year earlier (Blockchain, 2018).

Redesigning efforts are taking place with as main purpose to improve the latency and bandwidth (Eyal et al., 2016).

SELFISH MINING

The network remains vulnerable for selfish miners, since it is sometimes more profitable to act selfishly instead of according to the rules. With the Blockchain-NG introduction two years later, Eyal and Sirer in 2014 already showed that the network is subject to a vulnerability, even if only a small group of the network is selfish (Eyal and Sirer, 2014).

VERSIONING, HARD FORKS AND MULTIPLE CHAINS

Due to the immutability of the blockchain network and the rules of the cryptocurrency being enclosed in the block, it has some implications if the rules of the games are changed later on. This change could result in a part of the network which agrees with the changes, while another part of the network might keep their foot down and still operates by the old rules. This division of the network results in a fork.

PRIVACY LEAKING

Even though the user on the blockchain network is not directly linkable to the person behind that user account, analysing the transactions or the set of node a user is connected to might lead to the user and his pseudonyms (Barcelo, 2014; Biryukov et al., 2014). Zheng et al. (2017) state that the solution to this privacy leaking could be divided into two types of solutions: *mixing* and *zero-knowledge proof*. The main idea of mixing is that instead of directly transferring money from Alice to Bob, Charlie is introduced. Charlie will act as a middleman or escrow service which receives and makes multiple transactions, by which it becomes untraceable which amount Alice has transferred and to whom. The downside of this mixing principle is the introduction of a middleman, whom can be dishonest on its turn.

Zero-knowledge proof is a term which is already out there for a long time and was defined as "those proofs that convey no additional knowledge other than the correctness of the proposition in question" (Goldwasser et al., 1989). In simpler words this means that a proposition is able to be tested without the knowing of the actual underlying information. The most common example to explain the concept of zero-knowledge proof is the example of the red and green billiard balls [2].

[1] $1PB = 10^{15}B$

[2] http://www.math.columbia.edu/ goldfeld/ZeroKnowledge.pdf

2.2. LOYALTY PROGRAMS

In order to understand the opportunities for the loyalty programs identified by multiple companies introducing blockchain-based solutions, the field of the loyalty programs has to be understood. Since the introduction of the loyalty programs, these programs are studied intensively. This section will introduce the different types of loyalty obtained by operating a loyalty program. After introducing these types, the effectiveness of the loyalty programs and the problems encountered are discussed.

2.2.1. PROGRAM LOYALTY VERSUS COMPANY LOYALTY

As the name suggests, loyalty programs should help the company to keep their customers loyal to their company. It however turns out that loyalty to the program, the loyalty that is most easily observed, does not automatically lead to the desired outcome; loyalty towards the company. Although it is found that these two are interconnected, program loyalty does not automatically lead to company loyalty, since the customer might not be deriving its value from the company but only from its program (Dowling and Uncles, 1997; So et al., 2015; Yi and Jeon, 2003). Or as Evanschitzky et al. (2012, page 625) put it: *"Company loyalty primarily attracts customers to a particular provider and program loyalty ensures that once inside the store, more money is spent"*.

2.2.2. ATTITUDINAL LOYALTY VERSUS BEHAVIOURAL LOYALTY

Behavioural loyalty is the loyalty that is observed, the buying behaviour of the customer (Furinto et al., 2009). Where attitudinal loyalty on the other hand goes beyond that and is about the perceived loyalty of a brand or firm (Furinto et al., 2009). Behavioural loyalty is easily observed, and is typically measured along five different dimensions: the percentage of customers shopping at the company, purchase volume per customer, repeated purchase of the customer, the percentage of customers who are 100 percent loyal and the percentage of duplicate buyers: customers who also shop at other companies (Dowling and Uncles, 1997; Yi and Jeon, 2003). Attitudinal behaviour however goes beyond the quantitative methods and has to be measured with qualitative measures. When attitudinal loyalty enforces the behavioural loyalty, resulting in a positive attitude and perception of the company with an increased buying behaviour as outcome, one speaks of "true loyalty" (Bijmolt et al., 2010).

2.2.3. EFFECTIVENESS

Using a 628 respondents of a survey with Likert-scaled items, So et al. (2015) examined Australia's two largest stand-alone loyalty programs and claim that there are six constructs which drive the long-term loyalty relationship between the firm and their customers: reward attractiveness, knowledge benefit, required effort, perceived experiential benefits, group belongingness and disclosure comfort. By which the reward attractiveness, knowledge benefit, and required effort, all three affect the experiential benefits for the customer, which in its turn has influence on the program loyalty. This program loyalty together with the group belongingness and disclosure comfort are drivers of the brand loyalty of the customer. Following this interconnectedness, the reward attractiveness underlies both the brand and program loyalty.

The representation of the connection between the different constructs is shown in Figure 2.2. The program- and brand loyalty are already introduced, the reward attractiveness is the "customer's perception of the economic value, variety, and availability of a reward" (So et al., 2015, page 199). The knowledge benefit uses the ability of the company to provide inside information of for example newly launched products to the customer to enhance his experience. The required effort of the customer reflects different parts of the program and different kinds of effort could be thought of, such as the amount of purchases in order to earn a reward, the time it takes to redeem a reward, or the carrying of a membership card (So et al., 2015). Next is the concept of disclosure comfort, which represents the level of trust a customer has in a company to entrust them with his personal information. Finally, the group belongingness is the feeling of the customer that he belongs to a community which has benefits over persons who are not joining the program.

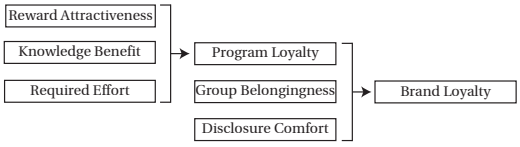


Figure 2.2: Connection between constructs underlying the brand loyalty adapted from So et al. (2015)

2.3. OPPORTUNITIES GREY LITERATURE

No academic work is found on the application of the blockchain technology in the field of the loyalty programs. There are however several mentions of blockchain-based loyalty programs in the so-called grey literature. This section provides a short overview of some of these mentions and serves the purpose of defining the status quo on the possibilities for blockchain-based loyalty programs.

Since the blockchain revolution of 2015, the disruptive side of blockchain technology has gotten much attention in different sectors of the economy. As for the loyalty program sector, this results in several mentions by consultancy firms who claim that blockchain technology is of added value and is the 'next big thing'. Deloitte focusses on the missed opportunities of the loyalty programs, which addresses the confusion by the abundance of loyalty programs as the biggest concern (Fromhart and Therattil, 2016). They however claim that not every loyalty program wants this confusion out of the way, since the provider of the program assumes that 10 percent of its distributed points are not redeemed. KPMG has collaborated with Singapore Airlines to start their blockchain-based loyalty program realizing the possible opportunities of the technology (Singapore Airlines, 2018). Even taking it a step further, PwC talks about loyalty and rewards programs as part of a smart city (PwC, 2018).

2.3.1. OPPORTUNITIES IDENTIFIED FROM GREY LITERATURE

Next to the consultancy firms speculating on what could become possible with the blockchain technology, several companies worldwide are already building or proposing blockchain-based loyalty programs. A few of these companies are building loyalty programs which could be used for retail purposes, these loyalty programs are studied for the use of the unique opportunities provided by blockchain technology.

The blockchain-based loyalty solutions which were found, and documented either by a white paper or by another extensive source, are RetailCoin (RetailCoin, 2018), Chain of Points (Chain of Points, 2017), Loyyal (Loyyal, 2017; Morabito, 2017b), Qiibee (Qiibee, 2018) and Orioncoin (Orioncoin, 2017). All of these blockchain applications have a common goal, which is to increase the added value for both the customer and the retailers. The opportunities of the different applications are not limited to the ones mentioned in this overview, however, these opportunities and benefits were the ones explicitly mentioned for the applications. The overview of the opportunities is not provided such that a comparison could be made between the several applications, they are however selected to find unique blockchain technology opportunities for the loyalty sector.

The opportunities identified by the different applications are also to be found in Table 2.1. During the following sections the opportunities are categorized and in Table 2.1 it is found in which white paper this opportunity is explicitly mentioned.

RETAILERS

Since the blockchain technology allows for a more advanced point than the regular reward points handed out by the retailer, different new opportunities arise. The digital tokens issued by the retailer could be restricted to certain rules providing the retailers with the option to let the customer only redeem its points at certain stores. By that means **asynchronous partnerships** could be realised, since distinctions could be made by the retailer between different competing or partnering firms which are also in the program. By adding the wallet address of the issuing party to the coins issued to the customer, the blockchain-enabled loyalty program is able to initiate multiple payments once a reward is redeemed. Such that for instance 75% of the point value is transferred to the redeeming party and the remainder of the points is transferred back to the issuing retailer.

There are **lowered access barriers** for the retailers to enter such programs, since the whole loyalty program environment is already made available by a third party. Current partnership programs such as the ones from Lufthansa and AirMiles also have these environments which can be extended by adding extra companies. However, these systems ask for the participating companies to work together, but by adding the blockchain technology different non-collaborating companies could use the same partnership program.

Most of the applications also mention the reduced **liabilities** on the balance sheet as being a benefit of the blockchain-based solution because of the immediate distribution and addition to the wallet of the customer. This liability is better understood from the light of the current regulations. According to these regulations, the firm's LP-related deferred revenue is a product of the total number of outstanding points, the value of a point,

Table 2.1: Opportunities for blockchain-based loyalty programs found in white papers (Chain of Points, 2017; Loyyal, 2017; Orioncoin, 2017; Qiibee, 2018; RetailCoin, 2018)

	Opportunity	RetailCoin	Chain of Points	Loyyal	Qiibee	Orioncoin
(Non-)Retailers	Asynchronous partnership	X				
	Multi-vendor alliances	X		X		
	Specific rules for point redemption	X	X			
	Transparent where coins are being redeemed	X				
	Lowered access barriers		X			X
	Dynamic issuance			X		
	Better liability management	X		X	X	
	Stimulate behaviour	X				
Customers	No stamps or plastic cards	X	X	X	X	X
	One digital wallet across multiple vendors	X	X	X	X	X
	Lowered access barriers	X				
	Convert unwanted rewards into liquid value		X		X	
	Receive awards in groups		X			
	Dynamic redemption options			X		
	Personally-tailored program		X			
	Trust in completely decentralized security		X			X

and the redemption rate (Chun et al., 2017). None of these three variables could easily be determined, the outstanding points and the redemption rate should be estimated most of the time and the value of a point is not always straightforward due to varying rewards. As was mentioned by Fromhart and Therattil (2016), the regulations are an impeding factor for better liability management, since the old regulations, which forces to treat the outstanding points as a liability, still apply. They also state that the retail sector at the moment is not ready for a 100% redemption rate, since the retailers are accustomed to a 10% leakage (Fromhart and Therattil, 2016).

When using digital tokens, the points are immediately issued by the company and the customer immediately has a certain value in its possession. Therefore, some of the applications provide the opportunity for immediate **point conversion** into other currencies, providing the customer with more liquid value.

The lowered access barriers allow for multiple vendors to join the same program, which enhances the **data-**

analysis. It could be identified at which retailer the points are being redeemed or if certain customers always convert their points into liquid value. With a more extensive network, it becomes also possible for the smaller shops to tap into the customer data stream and also the bigger shops could improve their analysis, since more data is known from the competing firms.

The enhanced data-analysis is not seen in the current designs of the loyalty programs, since competing firms will not partner up in the same program. The question therefore is, is this a desired situation for all retailers, since his loyalty program served the purpose to distinct himself from his competing parties by creating a more suitable environment for the customer and by retrieving customer data which other stores do not have. For the smaller retailers, who are normally not able to enjoy the benefits of these extensive programs these downsides are less relevant. But for the bigger players the low entry partnership could have its downside since every retailer will be able to create the same loyalty program and by that means, is not unique any more. Dowling and Uncles (1997) stated six goals a retailer wants to achieve by the introduction of their loyalty program, the first three of which are to maintain the sale levels, the increase of loyalty and potential value of the customer, and to stimulate cross-product buying. The next three of these goals are to differentiate themselves from equal brands, pre-empting those brands to enter the market, and pre-empting them to create a similar loyalty program. By introducing a low entry partnership, with the same opportunities for every participating party, the latter three goals will become hard to obtain.

CUSTOMERS

First and foremost, the biggest opportunity for the customer are the **lowered access barriers**, since the customer could enrol in one program instead of in all the separate programs of multiple retailers. This single program instead of multiple ones, has different benefits for the customers next to the lowered access barriers. By having only one program, it is also easier to have an overview of the outstanding points, the redemption of the points is enhanced and the number of plastic cards in the wallet or applications on the smartphone is reduced. The reduction of the plastic cards in the customer's wallet is not new since different applications on the mobile phone already provide the service of replacing such cards by offering a single mobile application to store them all (e.g. Wallet which is automatically installed on the iPhone, or Piggy on which will be elaborated in chapter 3).

The **redemption** of the points is enhanced since the points are collected faster and the rewards provided by the program are more within reach. In some of the applications the customers may not even have to redeem his points at all, since the points could be exchanged for regular currency. Referred to as fiat money throughout the course of this thesis, which is defined as a currency which has been officially declared by the government to be a legal tender (Rollins, 2012).

An **enhanced overview** of the points could be realised since the overview is not only a representation of a plastic card referring to a certain program, e.g. Apple's Wallet, but the overview is a part of the actual program. Since the different programs all have the same token as a reward points, they could easily be added up. When the customers are rewarded with cryptocurrency, the overview is even more simplified, because they can easily make up the balance of their crypto wallet. However, if its just a regular loyalty program which returns a tradeable cryptocurrency, the program could also have just rewarded the customer with a rebate. In this case the customer would have had more money on its regular bank account or in his wallet, which had also provided for a clear overview.

The extent of the loyalty program provides the retailer with more data on the customers, which could **enhance the personalization** for the customers even more than the programs active nowadays. This personalisation is desired by the customers (Fruend, 2017), the downside of this personalization for the customer however could be that more of their personal information is known, which could act as an impeding factor to enrol for the loyalty program (Ashley et al., 2011; Demoulin and Zidda, 2009; Doorn et al., 2007; Noble and Phillips, 2004).

On top of the benefits in terms of empowering the customer to manage his points and programs better, some other opportunities are identified by the applications. One of these opportunities is to **receive points as a group**, meaning that extra points are issued for a group or family. For example a bar owner who grants extra points if a complete soccer team drink their beers in his bar or the family discount people receive when collectively having a Spotify account.

Some of the applications offer the trust in a completely decentralized security. Such that the customer does not have to trust an external party any more for the protection of their data and the reliability of the program. As mentioned in the literature review on the issues for the blockchain, the privacy of the users of the blockchain technology however, still remains an issue.

NON-RETAILERS

Thanks to the lowered access barriers for such a blockchain-based loyalty program, the new parties could be easily added to the program. For the retailers the goal of a loyalty program would be to create loyalty towards their store, company loyalty. However, for different parties the goals obtained by means of the program also vary. If for instance a governmental institution would be added to the program, certain **behaviour** could be stimulated by providing extra points if certain purchases are made.

Next to the retailer and the government, all sorts of non-retailer actors could be added unto the program, for which the same opportunities will apply, however the goals trying to be reached throughout the program might differ.

2.3.2. OTHER RETAIL BLOCKCHAIN SOLUTIONS

Next to the loyalty program solutions offered by the different companies, other companies propose solutions as well for the retail market by using blockchain technology. These programs are not actual loyalty programs targeting the loyalty of the customer, these solutions however are enabling the retailer to pay for the data of the customers.

Two of them are highlighted, since certain aspects are closely related to the loyalty programs. These solutions are Nuggets and Reward Protocol (Nuggets, 2017; Universal Reward Protocol, 2018).

Both these solutions offer a solution by which a customer can earn points by sharing their data with a company requesting for it. Reward Protocol lets retailers or other brands create a smart contract by which they can assign a reward to a task which can be performed by the customer, such as store visitation. In this case the customer is in control over his own data and is free to chose with whom he wants to share it and how much effort he is willing to take in order to earn a reward. Nuggets offers a solution in which the privacy of the customer is priority number one. Everything will be stored on the blockchain and the customer can earn his rewards by all sorts of actions, such as *sign up, refer, pay, login or verify and if you choose to share information* (Nuggets, 2017, page 11), which could also be used for a loyalty program, but is now broader and focussed on the privacy of the customers. The zero-knowledge proofs and its corresponding zk-SNARKS, grants the most privacy and control over his own data for a user of the blockchain (Zheng et al., 2017). These proofs are not used in the Nuggets application, it is however designed such that they can be included (Nuggets, 2017).

2.4. CONCLUSION

In this chapter the first subquestion: *What does the problem domain for blockchain-based loyalty programs look like?* is answered. In order to do this, first the literature of both blockchain technology and loyalty programs was explored to understand the technology and the constructs of a loyalty program. Subsequently the 'grey literature' was used to explore the opportunities supposedly offered by initiators of different blockchain-based loyalty programs for both the retailers and the customers.

The blockchain technology enables to create an immutable and transparent distributed ledger. Thanks to the additional features, referred to as blockchain 2.0, the technology offers the ability to interoperate with other blockchains and smart contracts can be implemented on the technology. The latter enables for the application of contracts on the ledger, by entrusting the system, the middle man, and the corresponding paper work, can be omitted.

By the exploration of the loyalty programs, it was found that it is hard to measure and establish actual loyalty amongst the customers. Since the loyalty measured is behavioural and program loyalty instead of attitudinal and company loyalty.

Novel opportunities for loyalty programs were identified within the grey literature on the blockchain-enabled loyalty programs. Different parties introduce these opportunities by the use of the blockchain-enabled fea-

tures, such as the smart contracts and the decentralized structure of the blockchain.

The opportunities are however unstructured with respect to the loyalty programs and it is not clear what type of programs are possible and how they relate to the current loyalty programs. Therefore, the next chapter will use the design of loyalty program as a starting point to address the blockchain-enabled opportunities.

3

Design Decisions for Blockchain-based Loyalty Programs

Subquestion 2: What design decisions can be derived for blockchain-based loyalty programs from literature?

Central for this chapter is the second subquestion as shown above. Guided by the problem domain defined in Chapter 2, a literature review will be conducted in order to find the requirements for a blockchain-based loyalty program, associated with the second step of the DSR approach. The requirements that have to be met for a blockchain-based loyalty program are defined as design decisions on which has to be decided for a program to be designed. These decisions are choices which have to be made in order to construct a blockchain-based loyalty program. The design decisions will be divided using different design components for a loyalty program derived from literature. These design components will be used to structure the opportunities derived from the grey literature in order to derive the blockchain-based loyalty program design decisions.

3.1. Design Decisions Loyalty Programs

At first a literature review will be conducted on the loyalty programs to find the design decisions which determine the design of a loyalty program.

3.1.1. Sampling of the Literature

For this literature review the most cited papers of Scopus, Web of Science, and Google Scholar on loyalty programs and their designs were screened with the objective to find different design decisions for the construction of a loyalty program. Such that the objective, to find a structured approach for the implementation of a local blockchain-based loyalty program, considers the different possible configurations of the program.

3.1.2. Data Analysis

Based on the papers selected after the screening, the papers were scanned for different configurations of a loyalty program. Berman (2006) and Furinto et al. (2009) already divided the available loyalty programs into different types. According to Berman (2006) the loyalty programs could be divided into four types, all distinguishable by their type of reward: “Members receive additional discount at register”, “Members receive 1 free when they purchase *n* units”, “Members receive rebates or points based on cumulative purchases" and “Members receive targeted offers and mailings". Where others argue there are only two types of loyalty programs

also characterized by their rewards: monetary or non-monetary (Furinto et al., 2009). Combining these different types of loyalty programs Breugelmans et al. (2015) tried to divide the different choices made for a loyalty program into five different components: membership requirements, program structure, point structure, reward structure, and program communication. Using these different design components of a loyalty program, the papers were structured. While structuring the papers, in terms of their topics and the corresponding design component, another design component appeared and is added as a component for the loyalty programs: 'partnership', as shown in Table 3.1.

During the remainder of this section these components will be elaborated on by discussing them individually, a comprise overview of the components is shown in Table 3.2.

MEMBERSHIP REQUIREMENTS

In 2009 Liu and Yang (2009), mentioned the membership requirements as a field of the loyalty programs which had not gotten much empirical research. Even almost a decade later the query *"loyalty program" AND ("participation requirements" OR "membership requirements")* on Scopus returns with a message that no documents were found. Although no studies were performed on this specific issue, several papers mention this design dimension.

Different decisions could be thought of for determining the membership requirements, these decisions will be discussed by addressing three questions.

Who should be able to join the program? At first, the issuing party has to determine which customers should be able to join the program. Berman (2006), suggests that this decision should be based on the profitability of the different customers and that only the profitable customers should be able to join the program. The question arises, who are the profitable customers? Researchers found that the most profitable consumers were the cherry pickers and the light buyers, who only joined for the profit and not the loyal customers or the heavy buyers (Lal and Bell, 2003; Liu, 2007).

How can they join the program? The second question to be answered is the 'how'. Three different methods were distinguished by Blattberg et al. (2008), (1) the customers could automatically become a member of the program, (2) the enrolment could require action from their side by means of a subscription and a fee, (3) or the targeting of the specific member could result in an enrolment by invitation (Blattberg et al., 2008, page 566). These different methods could both be induced by the customer himself, or by the firm offering the program. It was found that the voluntary enrolment had a positive effect on relational behaviours (Dholakia, 2006).

What are the costs for joining the program? If it is clear which customers are selected to join the program and what action is required from them, it should be determined if they should pay for the program by means of a one time purchase (e.g. a certain type of card or a smartphone application), with a subscription with for instance a yearly withdrawal, or their enrolment is free of costs. As with the previous question, the absence of a fee or an action to subscribe enhances the convenience for the customers and could target more potentially profitable customers (Eason et al., 2015).

PROGRAM STRUCTURE

Two different program structures could be thought of: Frequency Reward Programs (FRPs) and Customer Tier Programs (CTPs) (Blattberg et al., 2008; Kopalle et al., 2012). The FRP is the most common form which rewards the customer for being loyal to the program by providing rewards, such as a rebate or free products. The CTP on the other hand, also rewards the customer for being loyal, just like the FRP, but instead of just earning rewards the measured loyalty provides access to or participation in a specific tier which reflects the loyalty of the customer. The tier determines which type of service or benefits is appointed to (e.g. a gold-member has a separate queue at the check-out, free WiFi on the plane, or exclusive access to events). When Kumar and Shah (2004) designed a two-tiered program they had given both the tiers different objectives and hence, different rewards. The objectives for their first tier were, amongst others, to reward all customers for their present and past purchases and to serve as an incentive for the customers to register their purchases while providing the company with data. While the rewards for the second tier had as a target to influence the behaviour of the customer and the attitude towards the brand. To put in terms of loyalty, the two tiers create and enhance both attitudinal and behavioural loyalty (Kumar and Shah, 2004). These type of rewards, which are some sort of 'bonus' on top of the tier 1 rewards which could be earned by all customers, could also make the customer feel

Table 3.1: Literature on the different design components and the corresponding design decisions

Paper	Membership Requirements	Program Structure	Point Structure	Reward Structure	Program Communication	Partnership
Allaway et al. (2003)					Campaign on functionalities and launch of a loyalty program accelerates adoption	
Allaway et al. (2006)	Different user segments can and should be identified per loyalty program				The segments call for individualized strategy initiatives	
Berman (2006)	Membership should be based on profitability of customer					
Bijmolt et al. (2010)				Three types of benefits are distinguished, utilitarian, hedonic, and symbolic		Partnership with one dominant firm or a coalition with external management
Blattberg et al. (2008)	Three types of enrolment are identified: Open enrolment, enrolment by invitation, and fee for enrolment	Frequency Reward Program (FRP) or Customer Tier Program (CTP)			Two types of partners: 'earn' and 'burn' partners	
Breugelmans and Liu-Thompkins (2017)	Understanding of customer is necessary		Expiration date for the points should be determined		Program communication should be tailored to customer	Partnership with one dominant firm or a coalition with external management
Demoulin and Zidda (2009)					Communicating the functions (ease of use and advantages) of the loyalty cards increases profitability	
Dholakia (2006)	Enrolment could be voluntarily or firm-induced					
Drèze and Nunes (2009)			Different number of tiers induce different perceptions of the customers			
Dowling and Uncles (1997)					Approach and reward each type of loyal customers differently	
Eason et al. (2015)	The absence of a fee or action enhances convenience and lowers access, might also attract inactive members		Rewards could be either self beneficiary, altruistic, or a combination			
Henderson et al. (2011)				Focus of the loyalty program should be on the non-financial benefits rather than the financial rewards		
Kivetz and Simonson (2002)			Artificial advancement encourage people to increase their buying	Type of reward which is better valued depends on type of customer		
Kivetz et al. (2006)			The foresight of earning points increases buying			

Paper	Membership Requirements	Program Structure	Point Structure	Reward Structure	Program Communication	Partnership
Kumar and Shah (2004)			A CTP could address customers differently by means of the different tiers and each tier could have its own objective			
Koo and Fishbach (2008)					Reminding what has been and should be accomplished by the customer increases motivation	
Kopalle et al. (2012)		Next to FRP, and CTP, also a combination is possible				
Lal and Bell (2003)	Approach the cherry pickers differently than the price sensitive shopper					
Lemon and Wangenheim (2009)						Cross-buying amongst partners enhances the loyalty to the core company
Liu (2007)	Light buyers became more loyal to the firm throughout a loyalty program with respect to heavy buyers					
Mauri (2003)					Promotional inducements appear to be the engine which gives power to the card scheme, and thus to the generation of consumer knowledge	
Meyer-Waarden and Benavent (2009)	Early adopters are also heavier purchasers; Late adopters are lighter purchasers					
Nunes and Drèze (2006)			The point-pressure mechanism is especially strong for the cherry pickers			
O'Brien and Jones (1995)				Rewards should offer customers a personal relationship		
Simonin and Ruth (1998)						Consumers attitude towards a retailer is influenced by attitude towards partnership; Results for different partners in program differ
So et al. (2015)				The reward attractiveness is a driver for both brand and program loyalty		Two different types of LPs – stand-alone program (SAP) or multi-vendor program (MVP)
Uncles et al. (2003)					Succesful periodic communication with members can results in repeat-purchases	
Wagner et al. (2009)			A downgrade of the tier-level results in a lower loyalty than before the upgrade to a higher tier-level			

being treated more special and enhance its feeling of belonging (O'Brien and Jones, 1995).

The FRP and the CTP could also be combined unto one program on which the customer is able to earn points and also qualify for a certain tier (e.g. Lufthansa's Miles & More and KLM's Flying Blue) (Kopalle et al., 2012).

POINT STRUCTURE

Based on the program structure the point structure takes on different forms. For the CTPs design considerations are on the numbers of different tiers and when someone qualifies for a certain tier. This design aspect is important since different number of tiers induce different perceptions of the customers (Drèze and Nunes, 2009) and a downgrade of the tier-level results in a lower loyalty than before the upgrade to a higher tier-level (Wagner et al., 2009).

For the FRPs the design choices to be considered are on the expiration date of the points and the amount of points resulting in a reward, the value of the points. Both of which are important to be tailored to the customer and the nature of the company because of the points-pressure mechanism. This mechanism is an important driver of the buying behaviour of the customer (Kivetz et al., 2006; Nunes and Drèze, 2006; Taylor and Neslin, 2005). Due to this mechanism the customer will show excessive buying behaviour when they are close to redeeming a reward (in the case of an FRP) or receiving an upgrade in their tier-level (in the case of a CTP).

REWARD STRUCTURE

The type of gift that is rewarded to the customer is determined within the reward structure. According to So et al. (2015) the reward attractiveness underlies both the program and brand loyalty. Henderson et al. (2011) emphasizes the importance of the rewards and suggests that for a long-term commitment of the customers the focus of the loyalty program should be on the non-financial benefits (e.g. gifts and rewards) rather than the financial rewards (e.g. discount). These non-financial and financial rewards could both be utilitarian and hedonistic rewards. By which utilitarian benefits refer to the discount and gifts and hedonistic rewards refer to luxuries or personalized treatment (Bijmolt et al., 2010). By conducting a series of studies amongst 3100 travellers waiting for their domestic flights on an airport in the US Kivetz and Simonson (2002) found that hedonic experiences were better valued as rewards than utilitarian items. Especially for the customers feeling guilty by consuming luxurious goods. Next to the utilitarian and the hedonic rewards, Bijmolt et al. (2010) also mention symbolic benefits of a loyalty program, these are however not rewards, but refer to non-tangible benefits such as belonging and social status (Bijmolt et al., 2010, page 207).

These rewards mentioned all fall in the category self-beneficiary rewards, next to that there is also a category of altruistic benefits, such as charity donations, by studying the effects of both types of rewards and the combination of which, Eason et al. (2015) found that the combination of both is an appealing option.

PROGRAM COMMUNICATION

The communication of the program is important during the different phases in the relationship between the customer and the company. Before the customer is a member of the loyalty program it is important that, if he meets the requirements, he is reached. During his membership it is of importance that he gets updates, offers or other messages through the program. If the enrolment in a loyalty program is encouraged too actively it might also lead to multiple subscriptions of the targeted customer in different programs, which might impede loyalty (Allaway et al., 2006; Mauri, 2003; Uncles et al., 2003). An effective way of reaching out to the customers could lower the threshold to join the program and could increase the adoption rate and therefore the market penetration (Demoulin and Zidda, 2009). The personalization of the offers which was already mentioned (Berman, 2006; Dowling and Uncles, 1997; Meyer-Waarden and Benavent, 2009) is also important for the communication of the program (Breugelmans and Liu-Thompkins, 2017). The point-pressure mechanism, mentioned in section 3.1.2, could also be exploited by reminding what the customers already has accomplished and what should be accomplished in order to gain their next reward (Koo and Fishbach, 2008).

PARTNERSHIPS

The literature on the design components that are being considered relate to a stand-alone loyalty program. However, also partnerships could be formed. Most common distinction between different types of partnerships are programs with one dominant firm (e.g. Miles & More of Lufthansa) or designs with different equally-involved partners and another firm managing the program (e.g. Airmiles) (Bijmolt et al., 2010; Breugelmans

et al., 2015). It is observed that this type of loyalty programs are being created more and more over the last years (Berman, 2006; Capizzi and Ferguson, 2005), driven by the customer's satisfaction for quickly reception of the reward (Fruend, 2017). Partnerships are subject to unique design challenges (Breugelmans et al., 2015) and have their own constructs to be considered, such as cross-buying behaviour (Lemon and Wangenheim, 2009) and spill-over effects (Simonin and Ruth, 1998). These constructs lead to new opportunities, but also the loyalty to one of the individual companies is harder to establish and to measure (So et al., 2015).

The different partners joining the program could both be an 'earn' or 'burn' partner (Blattberg et al., 2008), which assigns a classification to the different partners within the partnership. An earn partner is a partner at which a customer could earn additional points, a burn partner is a partner at which a customer could spend his earned points.

In Table 3.2 an overview of all design components of a loyalty program is provided.

Table 3.2: Design components and their corresponding design decisions for loyalty programs as derived from the structured literature review

Design Components	**Design Decisions**	**Literature**
Membership Requirements	• Who should be able to join the program? • How can they join the program? • What are the costs for joining the program?	Berman (2006); Dholakia (2006); Lal and Bell (2003); Liu (2007); Liu and Yang (2009)
Program Structure	• Adopt a Frequency Reward Program or a Customer Tier Program	Blattberg et al. (2008); Kopalle et al. (2012)
Point Structure	• When does someone qualify for a tier? • When do the points expire? • Which amount of points results in a reward?	Drèze and Nunes (2009); Kivetz et al. (2006); Nunes and Drèze (2006); Taylor and Neslin (2005); Wagner et al. (2009)
Reward Structure	• Utilitarian or hedonistic rewards? • Self benefit or altruistic benefit?	Bijmolt et al. (2010); Henderson et al. (2011); Kivetz and Simonson (2002); So et al. (2015)
Program Communication	• When to send the customer updates and messages? • How personalized is the communication with the customer?	Breugelmans and Liu-Thompkins (2017); Demoulin and Zidda (2009); Koo and Fishbach (2008); Uncles et al. (2003)
Partnership	• Will the loyalty program be a part of a partnership? • What form of partnership should be chosen? • Who should be included in the partnership?	Bijmolt et al. (2010); Breugelmans et al. (2015); Lemon and Wangenheim (2009); Simonin and Ruth (1998); So et al. (2015)

3.2. DESIGN DECISIONS BLOCKCHAIN-BASED LOYALTY PROGRAMS

No academic work was found on the application of the blockchain technology in the field of the loyalty programs. The grey literature on the other hand already mentioned several applications of blockchain-based loyalty programs. These applications and mentions will be used to derive blockchain-based loyalty program design decisions. By the use of the six design components derived for the regular loyalty programs, (membership requirements, program structure, point structure, reward structure, program communication, and partnership), the opportunities identified in the grey literature will be structured, a comprise overview of which is shown in Table 3.3. For the opportunities and design decisions which do not fit within one of the design components already mentioned an extra component is added, 'blockchain'.

3.2.1. MEMBERSHIP REQUIREMENTS

The proposed loyalty programs all have an open enrolment and were free to join for people when downloading a mobile application and therefore no new design options did appear.

3.2.2. PROGRAM STRUCTURE

The selected blockchain-based loyalty programs all had an underlying token as a reward for the loyalty actions performed within the program. Creating an FRP by performing an action n times resulting in a reward. Even though the loyalty actions performed were broader than buying products at a store, but also geo check-in or the provision of other personal information, the program structure identified is still an FRP.

3.2.3. POINT STRUCTURE

The points used within all of the blockchain-based program were altcoins: coins created for the purpose of the loyalty program with their own underlying value. This altcoin could both be tradeable and non-tradeable on a stock exchange.

With the introduction of blockchain technology, also the regular cryptocurrency, such as Bitcoin or Ethereum, could be used to reward the customers for their loyalty (Shelper et al., 2018). Therefore three options are selected as a point for the blockchain-based loyalty program:

- a non-tradeable altcoin,
- a tradeable altcoin, and
- a regular cryptocurrency.

The design decisions on the expiration date could also be translated unto the altcoin (Chain of Points, 2017; Loyyal, 2017). Even extra options for the value of the points could be added, since the points can be labelled, the values can differ for different purposes within the program, the value can be linked to a geographical location or the point value at the redemption differs between partners.

By the use of smart contracts on the blockchain-solution, points could be earned by a group of people as well (Chain of Points, 2017). Whether or not this option is added to the loyalty program is also a design decision which should be taken when deciding on the point structure for the program.

3.2.4. REWARD STRUCTURE

Regardless of the type of token used, the points represent a certain value. Therefore, the reward structure could be determined by the individual partners in the program, and could be either utilitarian or hedonistic, self-beneficiary or altruistic.

3.2.5. PROGRAM COMMUNICATION

Due to the additional options for the actions rewarded, enhanced data-analysis could be performed. With this analysis of the behaviour of the customers, the program communications could also be more personalized and targeted. However no additional design decisions were identified for the blockchain-based loyalty programs.

Table 3.3: Identified opportunities for blockchain-based loyalty programs structured by the design components for a loyalty program

Paper	Membership Requirements	Program Structure	Point Structure	Reward Structure	Program Communication	Partnership	Blockchain
RetailCoin	-	-	Non-tradeable altcoin, with differing values	-	-	Asynchronous partnership	Stimulate behaviour e.g. parking outside the city
Chain of Points	-	-	Tradeable altcoin, with expiration date; can be earned in groups; specific rules for point redemption	-	-	-	-
Loyyal	-	-	Multi-branded altcoin for different merchants or events. Dynamic issuances based on for example time, location or behaviour	-	-	Global and multi-branded partnership	inter- and intraoperability to be connected with geo check-in
Qiibee	-	-	Tradeable altcoin, multi-branded	-	-	-	-
Orioncoin	-	-	Tradeable altcoin	-	-	-	-

- No opportunities were identified

3.2.6. PARTNERSHIPS

A regular, one shop loyalty program, which is owned by the store owner himself and definitely will not co-operate with other firms, is not in need for the introduction of blockchain technology (Peck, 2017). Therefore, the design decisions for the partnership is not *'if a partnership is required?'*, but could immediately be on the design of the partnership. This partnership traditionally could take the form of either an 'externally managed'- or an 'one dominant firm' partnership. By the addition of the blockchain technology however, the access barriers for new partnering firms are lowered and the program could be an open enrolment on the retailers side(Chain of Points, 2017; Orioncoin, 2017), a third form of a partnership. Therefore, the design decision 'what form of partnership should be chosen?' remains.

Regardless of the form of the partnership, the retailer could make distinctions amongst different participating retailers in terms of point value (Loyyal, 2017; RetailCoin, 2018), introducing a new design decision: 'How much are my points worth at each partner?'.

If the form of the partnership is open enrolment for retailers, multiple parties have access to the data on the customers, enabling different parties to target their marketing effort. Due to spill-over effects, an aggressive marketing approach of one party could reflect badly on the other participating parties. Or a costumer receives an abundance of advertisement of the same product by various retailers. Resulting in an additional design decision for the program communication: 'Who is in charge of the communication?'.

3.2.7. UNIQUE BLOCKCHAIN-BASED LOYALTY PROGRAM DESIGN DECISIONS

The design options not addressed by the other six compontents are the interoperability of the system, the intraoperability of the system, and the rewarding of the actions performed by the customer.

Both the interoperability and the intraoperability of the system concern the exchange of information between the loyalty program and another system. This system could either be a blockchain-solution or not, resulting in an intraoperable or interoperable loyalty program respectively. However, since the blockchain technology is still in its early stages it is not known which system will be based on the blockchain technology and which systems will be based on another architecture. Therefore, no distinction could and should be made between the inter- and intraoperability of the system. The design decision boils down to the question: 'does the program exchange information with other systems?'

By the exchange of information the system could for instance be integrated with the parking system such that the customer can use their earned points to pay for their parking (RetailCoin, 2018). The integration opportunities could enable a loyalty program which reaches further than the purchasing of products at a vendor, but could also enable a loyalty towards a lifestyle by rewarding actions of the customer (Universal Reward Protocol, 2018).

3.3. CONCLUSION

In this chapter the second subquestion: *What design decisions can be derived for blockchain-based loyalty programs from literature?* is answered. In order to do this, first the design decisions for a regular loyalty program were derived. After a structured literature review six design components were derived for the design decisions: membership requirements, program structure, point structure, reward structure, program communication, partnership. By using these design components, the opportunities found in the grey literature were structured and additional design decisions were identified. A new design component, 'blockchain', was added for the opportunities which did not fit within the design components for the regular loyalty programs.

Only one of the design decisions for the regular design decisions is not relevant for the blockchain-based loyalty programs, which is the decision on a stand-alone loyalty program or a partnership, since it was argued that the blockchain addition is not of added value if a stand-alone loyalty program is adopted.

The design decisions derived are shown in Table 3.4. These decisions will be used throughout the remainder of the thesis to derive different loyalty program architectures and their rules.

Table 3.4: Design decisions for a blockchain-based loyalty program

Membership Requirements	Who should be able to join the program?
	How can the customers join the program?
	What are the costs for joining the program?
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?
Point Structure	When does someone qualify for a tier?
	Which amount of points results in a reward?
	When do the points expire?
	Do people earn extra points when part of a group? *
	What dimensions are considered for the point redemption value? *
	What type of token is used? *
Reward Structure	Utilitarian or hedonistic?
	Self-beneficiary or altruistic?
Program Communication	When to send the customer updates and messages?
	How personalized is the communication with the customer?
	Who is in charge of the communication? *
Partnership	~~Will the loyalty program be part of a partnership?~~
	Who should be included in the partnership?
	What form of partnership should be chosen?
	How much are my points worth at each partner? *
Blockchain	Does the program exchange information with other systems? *

* Design decisions added due to addition of blockchain technology

4

Modelling Different Loyalty Program Architectures

Subquestion 3: Which different blockchain-based loyalty program architectures can be derived?

To answer the second subquestion, different programs will be explored based on the design decisions for a blockchain-based loyalty program presented in Chapter 3. In order to derive these different programs, the design decisions are categorized in three categories: program architecture, smart contracts, and rules. These categories indicate how the design decisions affect the blockchain-based loyalty program. During this chapter, the first two categories are extended upon and based on these decisions different program architectures and smart contracts will be derived. Business Process Modelling will be used to provide insight into the business processes and the technological design.

4.1. Different Categories of Design Decisions

Even though all the design decisions derived in Chapter 3 determine the design of the blockchain-based loyalty program, not all design decisions have the same consequences for the design of the program. Some of the design decisions concern the *program architecture* of the loyalty program, while others concern the *rules* to structure the co-operation within the partnership. Since this chapter only addresses the program architectures, only the first set of design decisions will be considered.

Due to the blockchain nature of the technological solution, two levels are distinguished for the architecture of the program, some of the design decisions will dictate the architecture, while other design decisions could be implemented as a possible expansion by the use of smart contracts. At first the design decisions dictating the program architecture will be considered.

The full set of design decisions is shown and explained in Table C.1 in Appendix C. The sub elements will be explained in the next sections.

4.2. Derivation of Different Program Architectures

Before the processes of the different loyalty program architectures can be modelled, different program architectures have to be found. Which will be done guided by the design decisions dictating the program architecture.

4.2.1. Program Architectures Design Decisions

The design decisions dictating the program architecture are shown in Table 4.1. For each of these design decisions it will be argued which different possible choices could be made. With these different choices different program architectures will be constructed.

Table 4.1: Design decisions concerning the program architectures

Design Component	Design Decision
Membership Requirements	How can the customers join the program?
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?
Partnership	Who should be included in the partnership?
Unique Blockchain Based Loyalty Program Decisions	Does the program exchange information with other systems?

Membership Requirements

For the membership requirements the design decision to make is 'how can the customers join the program?'. Multiple options have been proposed and used in the history of loyalty programs (Schneider, 2015). However, not all of them could be integrated with blockchain-based programs, for example a stamp card and a punch card do not qualify, since these are non-technical solutions and do not communicate with an underlying database. The remainder of the options for the customers to join the program is either via a mobile application, which generates a QR-code or a barcode for the retailer to be scanned, or by means of a membership card which also contains the barcode.

To optimally use the data-analysis of the partnership program, the customers should also provide some personal information which has to be submitted during the registration process.

Program Structure

For the structure of the program, one could either choose for a Frequency Reward Program (FRP), a Customer Tier Program (CTP), or the combination of both. When looking at an FRP, it should be able to determine how many points a person has and it should also be possible to decrease this amount of points once a person redeems their points for a reward or when their points expire. When there is opted for a CTP on the other hand, the amount of purchases result in an amount of points which is used to appoint the customer to certain products or services. These points of the CTP program however could not be redeemed but could only expire. Both of these programs could be combined since the ledger containing the purchases of the customer could be used to determine both the balance of the FRP and of the CTP, as is shown by the example in Figure 4.1. In this example each purchased euro will result in one point in both the FRP and the CTP.

The implications for the underlying ledger is that for the FRP the retailer should have both reading access on the points balance of the customer and should be able to decrease the points of the customer. For the CTP the retailer only has to know the sum of the purchases made by the customer within the expiry range. So once the FRP system is being expanded with not only registering the amount of points, but also the underlying purchases and the option for the retailer to see these, both programs are made possible based on the same ledger.

Balance of the FRP	
5 January	40 pts
7 January	65 pts
23 January	72.5 pts
1 February	2.5 pts
3 February	17.5 pts
9 February	7.5 pts
10 February	17.5 pts

Activities of Alice

5 January	Purchase	€40.-
7 January	Purchase	€25.-
23 January	Purchase	€7.50
1 February	Reward X	-70 pts
3 February	Purchase D	€15.-
9 February	Reward Y	-10 pts
10 February	Purchase E	€10

Balance of the CTP	
5 January	40 pts
7 January	65 pts
23 January	72.5 pts
1 February	72.5 pts
3 February	87.5 pts
9 February	87.5 pts
10 February	97.5 pts

Figure 4.1: An example of the combination of an FRP and a CTP on the purchases of Alice

PARTNERSHIP

The design decision for the partnership component to consider is 'Who should be included in the partnership?'. A partnership in this sense is however not merely a co-operation between two parties, but should include multiple parties, by which the low entrance barriers could be used. The nature of these parties (e.g. competing or non-competing, non-retail, or producer) will not affect the architecture of the program. The ability for the program to have multiple partners however does dictate that the program should either have multiple earn partners, multiple burn parties, or both.

UNIQUE BLOCKCHAIN-BASED LOYALTY PROGRAM DECISIONS

For the other parties to join the program as well and to create a program which optimally uses the functionalities of the blockchain technology, the answer to the question 'Does the program exchange information with other systems?' should be 'yes'.

With this last design choice, all the decisions were taken to construct different program architectures.

4.2.2. RESULTING PROGRAM ARCHITECTURES

The design choice within the blockchain design component only resulted in the conclusion that the underlying blockchain system should be able to exchange information with other systems and did not bring different program architectures to the table, but did bring a technical requirement. As for the control of the membership requirements, which determined that the registration process should be dealt with by an underlying database and that the customer should provide its personal information during this registration.

The other design decisions resulted in different options for the program architecture and should therefore be used to construct different program architectures, which will be explored by means of business process modelling in the next section to provide insight in the business processes and the technological design.

From a technological point of view, the ledger used for an FRP is easily expanded with a CTP, since all the data required for the CTP is already contained within the data of the FRP. However, if only a CTP was to be adopted less parties should be able to have writing access, and the underlying blockchain-solution might differ. Next to that, the points assigned in this program will not have any value. Therefore, both of the program structures are being modelled in the next section and the combination of both will be automatically included in the FRP.

The design component partnership resulted in different combinations of the number of earn- and burn partners. Hence six different program architectures were found, which can be found in Table 4.2. By which the two dimensions which vary are the program structure and the number of issuing and redeeming parties.

Table 4.2: Selected program architectures based on the design decisions which dictate the program architecture

Customer Tier Program	One earn partner, multiple burn partners	4.4.2
Customer Tier Program	Multiple earn partners, one burn partner	4.4.2
Customer Tier Program	Multiple earn partners, multiple burn partners	4.4.2
Frequency Reward Program	One earn partner, multiple burn partners	4.4.3
Fr equency Reward Program	Multiple earn partners, one burn partner	4.4.3
Frequency Reward Program	Multiple earn partners, multiple burn partners	4.4.3

4.3. BUSINESS PROCESS MODELLING

The business processes for the selected program architectures will be modelled in this section. The models of the underlying business processes will create insight in the differences between the loyalty program architectures. At first the method for this models will be chosen.

Business Process Modelling Notation is a modelling language created by the Object Management Group (OMG) and introduced its 2.0 version in 2011 (Object Management Group (OMG), 2011). This notation for business process modelling is introduced such that al stakeholders within organizations can communicate their procedures in a standard manner (Object Management Group (OMG), 2011). In the BPMN there are four general elements which build up every business model (Bharosa et al., 2015). These four elements are the flow objects, connecting objects, swim lanes, and artefacts (Figure 4.2). The flow objects are used to define the events, activities and gateways in a process performed by the actor. These flow objects are connected by different connections, either a message, association, or a flow connection. Indicating which type of connection is present between the different objects. To assign the tasks to the right actor, swim lanes are used to indicate which actor is responsible for which task. Pools are used to group these different actors to a common responsibility (Bharosa et al., 2015). Finally, the artefacts are used to elaborate on the process, by indicating which type of data is being used, to explain what happened happened, or provide insight on the connection between different elements.

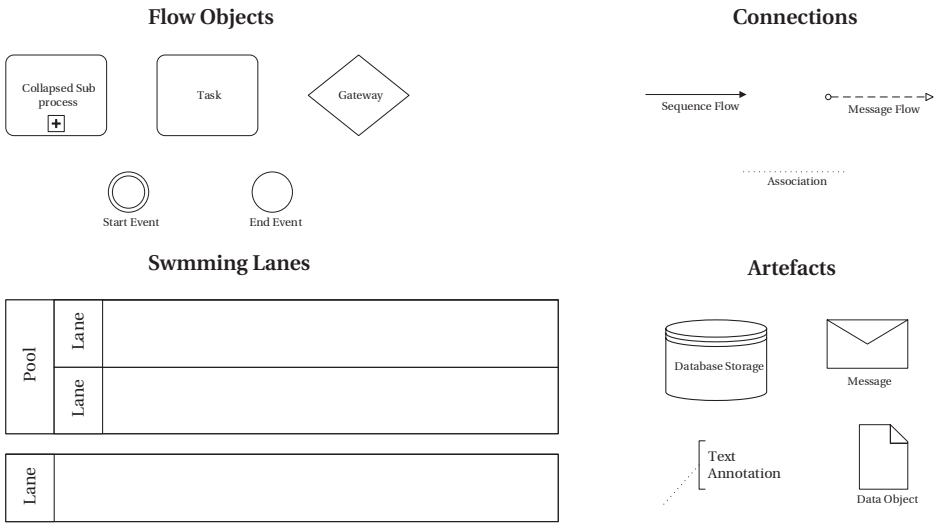


Figure 4.2: Different general elements used in BPMN 2.0

4.4. BUSINESS PROCESS MODELS

Given the selected method for modelling the business processes, this section will be used to model the process of the subscription unto the program, and the business processes of the selected loyalty program architectures.

4.4.1. BECOMING A MEMBER

Regardless of the loyalty program that is chosen, the customer should become a member of the program. The design decision on the membership requirements led to two selected methods to join the program, a subscription by means of a membership card, or the subscription by means of a mobile application.

The corresponding subprocesses for the subscription are modelled using BPMN and are shown in Figure D.1 and Figure D.2 in Section D.1 of the Appendix.

MEMBERSHIP CARD

When a membership card is provided to the customer, the issuing retailer should always ask the customer whether the person is a member of the loyalty program or not. Once the customer decides to join the program, he has to provide the requested personal information and he will be signed up for the program. After this procedure a membership card is handed out to the customer which he should have on him the next time he comes into the store such that the points can be issued. For the redemption of his points, the card should be on him as well.

MOBILE APPLICATION

Stores can also opt for a mobile application, which eases the subscription process for the customer. The customer has to provide his personal information when registering for the application. After which the person can use this mobile application as proof that he is a member of the program. Different variations of which could be thought of, for example Piggy [1] lets the customer scan his personal QR-code by which his points will be added, which requires the retailer to insert the purchase amount. RetailCoin suggests a method by which the barcode of the receipt is scanned by the customer himself, such that the retailer has no extra actions to perform in the process of points issuance. For the redemption of the points both mentioned programs use a generated QR-code, therefore the mobile application should be connected to the database, such that this QR-code can be generated.

Given these methods of subscription unto the program, the processes of the different program architectures can be modelled. The subscription process referred to within these models could refer to both the mobile application and the membership card.

4.4.2. PARTNERSHIP CUSTOMER TIER PROGRAMS

First a partnership Customer Tier Program is presented. A Customer Tier Program divides the different customers over several tiers by means of their actual or potential benefit (Blattberg et al., 2008, p. 579). These different tiers correspond with different services or products which are provided to these customers. A partnership program of this program structure should work with a database which collects the spending, and therefore the loyalty, of the different customers.

ONE EARN PARTNER AND MULTIPLE BURN PARTNERS

The first program architecture to be considered is the program with one earn partner and multiple burn partners. The issuing store will register the purchases of the customer, since the blockchain technology has the characteristic of being immutable, these purchases will be there for an unlimited amount of time. For the multiple redeeming parties it is not necessary to modify the ledger, only the purchases made by the customer are needed to know, a read-only authorization. The business process for the issuance and provision of the loyalty program is modelled in Figure 4.3

MULTIPLE EARN PARTNERS AND ONE BURN PARTNERS

When the business process is modelled for this program architecture it becomes apparent that the process for both this architecture, as the prior architecture are the same. Since the activities of the earn- and burn partners do not change, only the amount of these parties participating in the program.

[1] On which is also elaborated upon in Appendix D and is found on www.piggy.nl

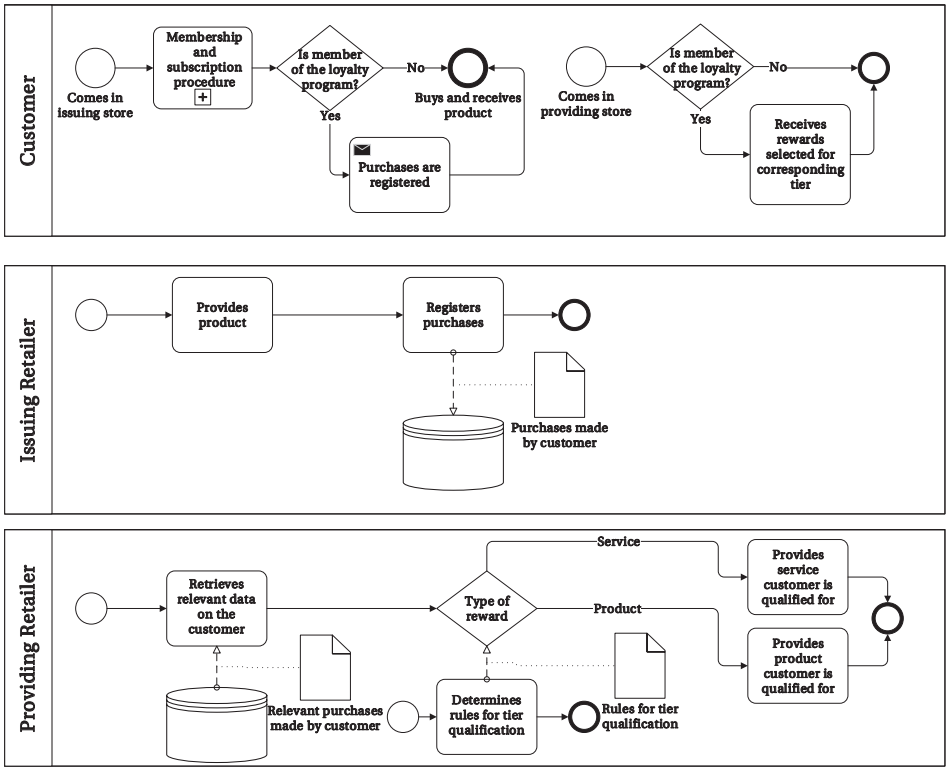


Figure 4.3: A BPMN of a Customer Tier Program with one earn partner and multiple burning partners

Multiple Earn Partners and Multiple Burn Partners

When multiple parties both have the option to issue points and use this point balance to reward the customer for his loyalty, the database structure should grant every participating retailer the same access to the data of the customers and all of which should also be in control of this data as they can add points to the points balance.

For this program also the public blockchain could be selected to optimally use the lowered access barriers of the loyalty program. The decision for either a public or private blockchain will be determined by the purpose of the loyalty program and will be dictated by the rules for the program.

4.4.3. Partnership Frequency Reward Programs

Two main differences are identified between the FRPs and the CTPs, each party who participates in the program should be able to have both read and write access to the database, since the amount of points could be reduced or increased by this party.

Next to that, the points of the program have a value. Therefore a common point should be decided upon and the purchases registered should also be translated to a point amount. In contrast to the CTP, in which only the purchases had to be registered and known.

One Earn Partner and Multiple Burn Partners

The first option to consider for the FRP is a program with only one earning partner and multiple burn partners. Such that the customer could choose from multiple rewards, which creates a more attractive program for the customer. The additional burn partners have to have the ability to read the point amount of the customer

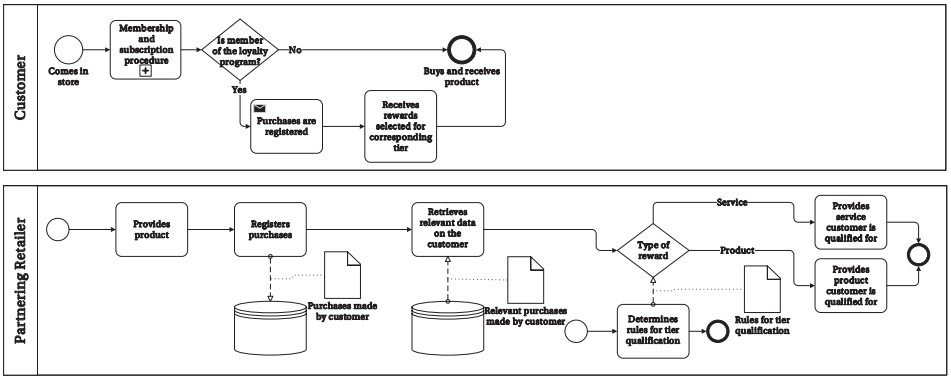


Figure 4.4: A BPMN of a Customer Tier Program with multiple earning partners and multiple burning partners

and register the rewards issued to the customer. The redemption should be communicated to the retailer whom owns the loyalty program, creating a more complex administrative task for the owner. A more advanced option would be that the extra redemption party could also edit the database, such that the communication and administrative work is limited, this option is used in the business modelling in Figure 4.5.

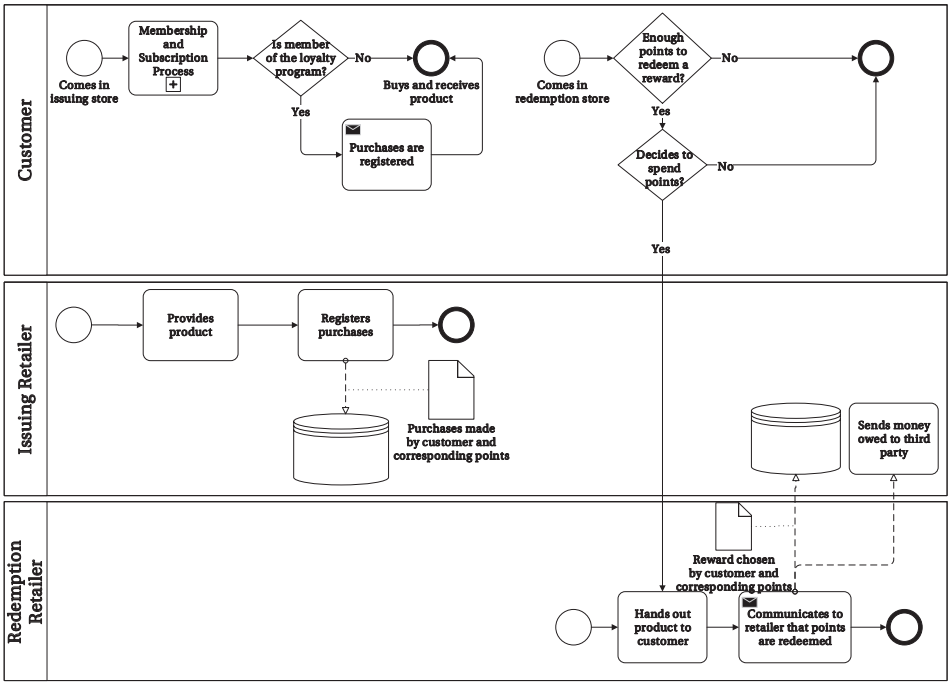


Figure 4.5: A BPMN of a Frequency Reward Program with one earning partner and multiple burning partners

MULTIPLE EARN PARTNERS AND ONE BURN PARTNER

As for the CTP, the second program architecture looked into is the program with only one earn- and multiple burn partners. The amount of points should be updated when points are issued, requiring writing access. Therefore, the FRP could not be used by parties who only have reading access, as is the case for the CTP program.

The business process for multiple earn partners and one burn partner for the customer tier program, was identical to the business process of the single earn and multiple burn partners. For the FRP it appeared to be the same business process as well.

MULTIPLE EARN PARTNERS AND MULTIPLE BURN PARTNERS

The latter scenario of the FRP could easily be expanded to be a partnership program on both ends. In which all the participating stores are able to read and write to the database which contains the memberships, the purchases of the members, and their point amounts. The business process model of this partnership program is shown in Figure 4.6.

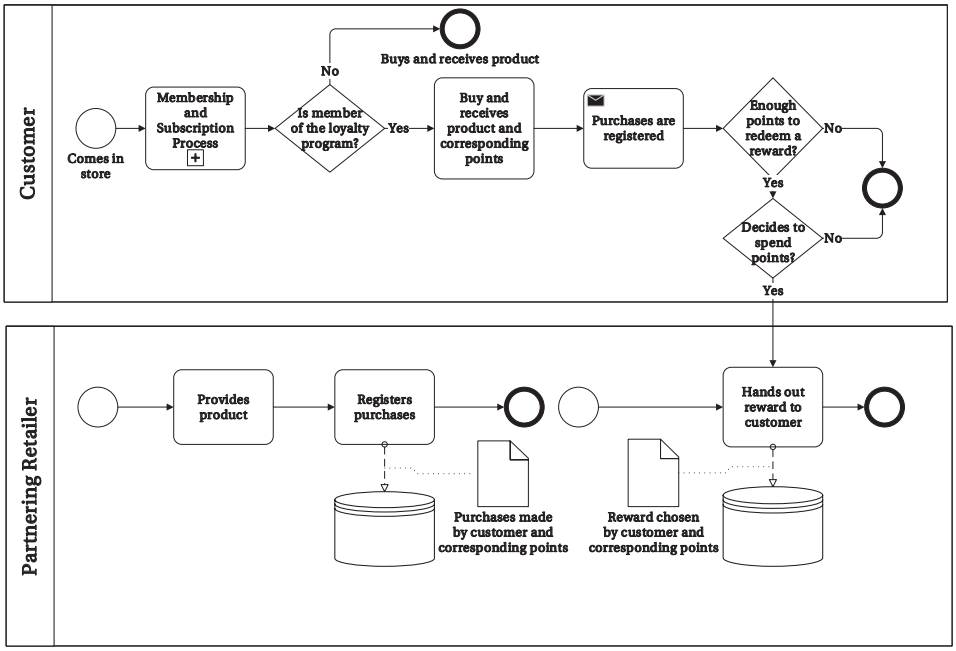


Figure 4.6: A BPMN of a Frequency Reward Program with multiple earning partners and multiple burning partners

Even though the business processes of the FRP and the CTP do not seem to differ except for the point amount which has to be determined, issued and redeemed. The points within these programs do have an underlying value. These values do not appear from the business processes modelled. However, when the blockchain-based loyalty program of RetailCoin for example is modelled, which uses a point with a value, the implications will become clear. Therefore, the business process of RetailCoin is modelled.

Blockchain-based Loyalty Program of RetailCoin

RetailCoin uses blockchain technology and issue a semi-non-tradeable alt-coin as their points on the system. The alt-coin offered is qualified as semi-non-tradeable, since the coins are tradeable on the stock exchange, but this trading is not allowed for the coins earned by means of the program.

RetailCoin already implemented a business process model in their white paper (RetailCoin, 2018), which is shown in Figure D.9 in Section D.5 of the Appendix. The flowchart shown in the whitepaper of RetailCoin suggests that RetailCoin opts for a fully decentralized blockchain, this is however not the case. The actual process is realised with a partially decentralized and partially centralized blockchain which is represented in Figure 4.7. Because of the state the blockchain technology is in at this moment, it will take time for the blockchain to be updated, which is also shown in Figure 4.7.

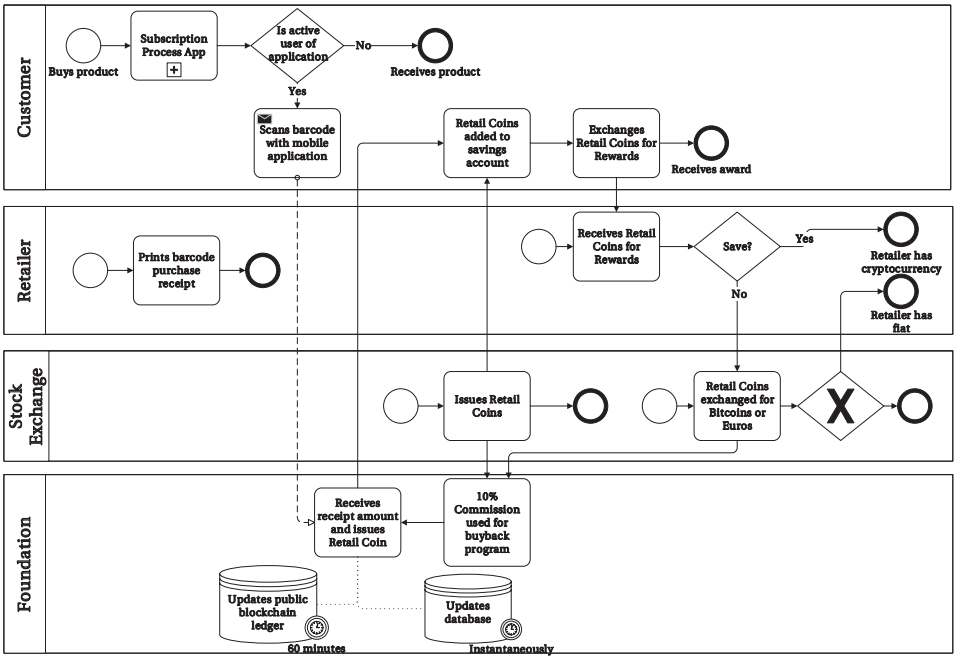


Figure 4.7: A BPMN of the adapted version of the loyalty program of (RetailCoin, 2018)

This model introduces two new actors to the architecture with respect to the other program architectures, the stock exchange and a foundation. Due to the addition of the stock exchange, a liability is automatically introduced for the customers because of the varying value of the points redeemed. Once these points are linked to fiat at both the issuance and the redemption of the points, this liability is not there for the retailers since they can automatically redeem their points for fiat. The foundation is needed to cover the liability on the points issued.

4.5. ADDITIONAL SMART CONTRACTS

Given the option of the blockchain technology for the addition of smart contracts, the six derived and modelled program architectures could be easily expanded by the use of smart contracts. This section will show how the smart contracts could be created and applied in different situations, enabling an expandable program.

4.5.1. SMART CONTRACT CREATION

The process of the creation of a smart contract is shown in Figure 4.8. This process uses a dashboard such that the issuing party could create their own smart contract (Universal Reward Protocol, 2018), which is either continuous or temporarily. A script within this dashboard automatically checks if the rules and the conditions of the proposed smart contract are according to the rules and the conditions set by the program owner.

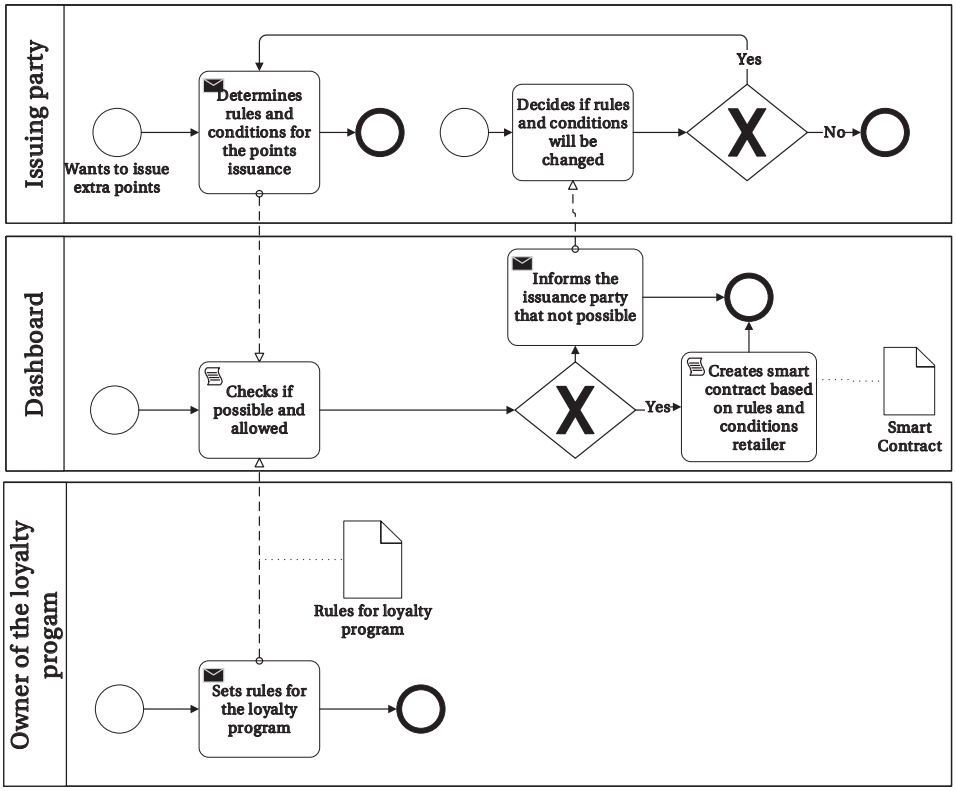


Figure 4.8: A BPMN of the creation of a smart contract

4.5.2. Smart Contract Design Decisions

Given the selected design decisions, shown in Table 4.3 on the smart contracts, different program architectures will be derived.

Table 4.3: Design decisions concerning the additional smart contracts

Design Component	Design Decision
Point Structure	When do the points expire?
	Do people earn extra points when part of a group?
	What dimensions are considered for the point redemption value?
Partnership	Who should be included in the partnership?
	How much are my points worth at each actor?

Point Structure

At first the three design decisions concerning the point structure will be discussed.

The expiration date of the points does not introduce a new program architecture but only introduces a restriction for the structure of the smart contracts.

The design decision on the ability for the customers to earn points as a group, or for the retailer to provide extra points, does introduce a new program architecture: *group loyalty*. This group loyalty will be introduced to see the implications for the program architecture.

To include different dimensions for the point redemption value, the smart contract should be able to contain rules for the point value based on different dimensions. The program architectures enabled by this value distinction will become apparent when discussing the design decisions concerning the partnership.

PARTNERSHIP

It was identified that multiple non-retail businesses and institutions could be added to the program. To create insight and show how this could be implemented on the loyalty program by means of a smart contract, different non-retail parties and their corresponding scenarios will be considered. These program architectures are enabled by the smart contracts, because of the option to have different redemption rules for different earn and burn partners.

By adding the producer of a product to the program as well, *channel loyalty* could be created. Meaning that the producer can provide extra points to the customer when his product is bought, such that he is able to promote his own products, without having a store.

When an organization or an institution, such as the government, is added to the loyalty program, they could have differing interests from the producer who wants to promote his products. However, they could for example promote a certain lifestyle, by rewarding the customer when certain products are bought: *lifestyle loyalty*. Both the options for the channel loyalty and the lifestyle loyalty will be explored.

The other design decision for which a smart contract is necessary, is the value of the points at different participants of the program. This decision does not introduce an additional program architecture, but does determine the structure for the smart contracts.

Table 4.4: Selected program architectures based on the design decisions

Blockchain-Enabled Addition	Group loyalty
Blockchain-Enabled Addition	Channel loyalty
Blockchain-Enabled Addition	Lifestyle loyalty

4.5.3. DIFFERENT SMART CONTRACTS

The different derived program architectures enabled by the addition of smart contracts will be modelled and introduced. The smart contracts necessary for the program architectures will be derived as well.

GROUP LOYALTY

With the blockchain-enabled program it is also possible to earn points as a group or family. This addition lets members of the loyalty program become loyal as a group. By adding smart contracts in which it is stated how big a group has to be, how it should be composed, or how big a family should be to qualify for the extra points, the retailer could create extra incentive for a group of customers to shop at his place. This loyalty could both be connected to a specific product or to a specific retailer. In both cases the composition of the group or family dictates the level of information needed of the customer. For a family for instance the current home address should be added and for a sports team their sports club has to be added as well. By which privacy concerns might be raised by the customers.

The additional smart contract is shown as a BPMN, which could be easily translated to an actual smart contract by software as for instance Caterpillar (López-Pintado et al., 2017).

For the sake of clearness, the BPMN shows a simplified version of the process, however a more complex underlying process, of for instance RetailCoin (Figure 4.7), still applies.

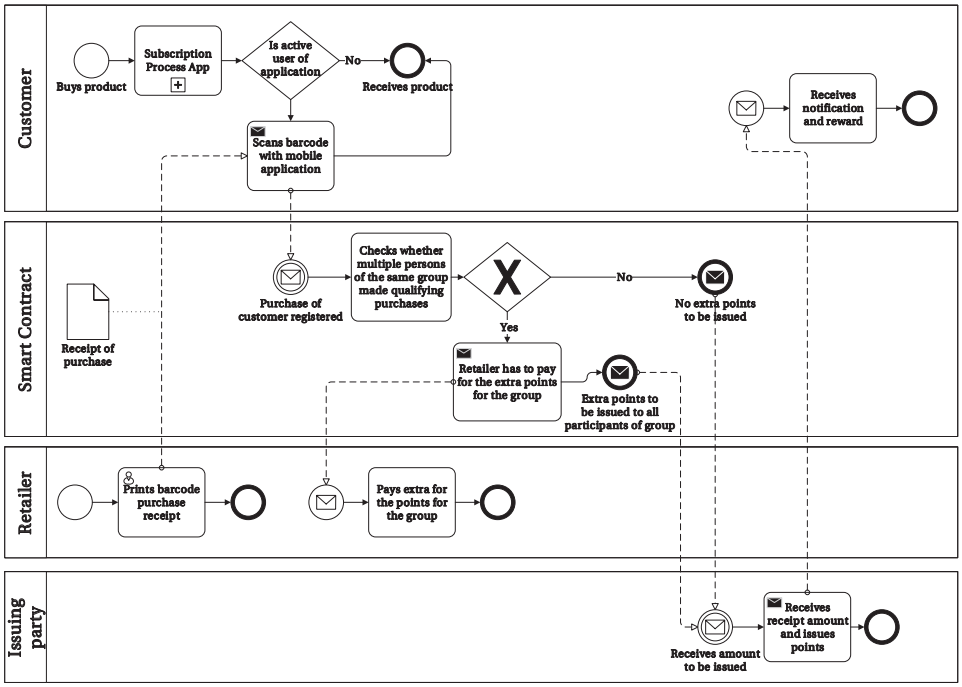


Figure 4.9: A BPMN of the group loyalty added to the blockchain-enabled loyalty program

CHANNEL LOYALTY

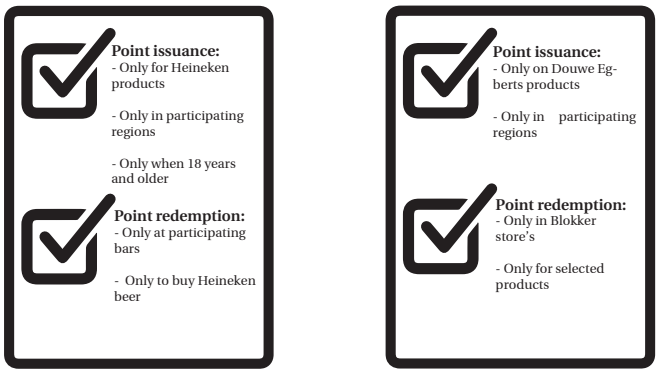
Channel loyalty is already encountered in the Netherlands, two examples of which are Heineken's beercredit and the Douwe Egberts points program. By modelling the processes of both these programs and translating them unto a blockchain-based solution using smart contracts, it appeared that only the rules for the smart contracts have to be set in order to enable such a program. The programs and their corresponding BPMN processes are elaborated upon in Appendix D. The rules for the smart contracts are shown in Figure 4.10 as an example.

Next to the solutions of Heineken and Douwe Egberts, brands also increasingly use cashback systems to reach out to the customer and effectively use these methods to gather information on the customers (van Alphen, 2018; Vana et al., 2015). Different cashback actions are even combined by the means of Scoupy [2], an application which allows a customer to upload their receipt to participate in different cashbacks actions. Scoupy is founded in 2015 and already have had 2 million unique users and has rewarded customers with a total of €10 million according to their blog. These cashback actions are however mostly used to promote new products or only to gather information on the customers and to provide the customer with a discount. Once a customer is loyal to the Scoupy app, the customer is not loyal to a retailer like in the solution provided by Piggy.

LIFESTYLE LOYALTY

As channel loyalty is defined as being the loyalty of the customer to the product instead of the retailer, the lifestyle loyalty is defined as the loyalty of the customers towards a group of products. These products could for instance be vegan or biodegradable and grant the customer extra points issued by an organization or by the government. Since this type of loyalty involves multiple products, the current method used by Heineken and Douwe Egberts will most probably not be suited, since multiple producers have to co-operate and multiple promotions could not be combined.

[2] https://scoupy.com/nl/#/



(a) Heineken (b) Douwe Egberts

Figure 4.10: Example of the Smart Contracts of both Heineken and Douwe Egberts

The cashback option on the other hand could provide a solution for this problem. By uploading the receipt as proof, the customer could earn points by showing that qualifying products for a certain lifestyle are indeed purchased by the customer. The owner of this loyalty program could now decide if he grants the participant money or points which can be redeemed at selected redemption points.

The lifestyle loyalty can also easily be added to the blockchain-solution. Almost in the same way as Heineken or Douwe Egberts could implement their smart contracts onto the program, could an organization grant extra money for certain products bought by the customer. Hence, the lifestyle loyalty is more approachable and could easily collaborate with a another loyalty program. The rules for the smart contracts are shown in Figure 4.11 and enable the owner of the lifestyle addition to set rules for the redemption of the points. An option which is more cumbersome by means of a cashback action, since the customer has to have an additional savings account for these points. In terms of the BPMN, this loyalty program is also almost the same as for the prior scenarios of channel loyalty.

An example for the ease of use of a smart contract solution for the provision of governmental subsidies is provided in Appendix D.

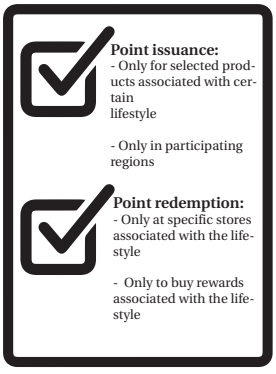


Figure 4.11: The rules and conditions for the smart contract enabling a lifestyle loyalty program

4.6. CONCLUSION

In this chapter the third subquestion *Which different blockchain-based loyalty program architectures can be derived?* is answered. At first the design decisions for the blockchain-based loyalty programs were divided into different categories, program architecture, smart contracts, and rules. Starting from the design decisions for the program architecture, different program architectures were derived. The different program architectures could be divided into two groups, the Frequency Reward Programs (FRP), and the Customer Tier Programs (CTP). In the FRP the points used in the system do have a value, while in the CTP, the points only represent the amount of purchases made, but do not have any value. It was found that the FRP structure could be easily expanded with a CTP structure. For those structures, multiple partnership programs were modelled using Business Process Modelling (BPMN).

By the use of the business models, it became apparent that the partnership programs, in terms of the program structure, could easily be entered by multiple partners.

With the addition of the blockchain technology the loyalty program could be easily expanded by means of the smart contracts, which was explored by addressing the design decisions from the smart contracts category. These expansions of the program resulted in a third group of program architectures: blockchain-enabled additions. This group consists of the group loyalty, channel loyalty, and lifestyle loyalty expansions, also shown in Table 4.5. The modelling of the business processes showed the creation of the smart contracts and showed what is needed to do in order to add new smart contracts to the loyalty program. It showed that if the blockchain-technology is used as an underlying technology, only the rules for the smart contracts need to be stated, which in turn could be implemented unto the program.

These different programs which are introduced will be assessed in the next chapter and a selection will be made on which programs will be of added value for a local loyalty program.

Table 4.5: Derived programs from the design decisions

Program Structures	
Customer Tier Program	One earn partner, multiple burn partners
Customer Tier Program	Multiple earn partners, one burn partner
Customer Tier Program	Multiple earn partners, multiple burn partners
Frequency Reward Program	One earn partner, multiple burn partners
Frequency Reward Program	Multiple earn partners, one burn partner
Frequency Reward Program	Multiple earn partners, multiple burn partners
Blockchain-Enabled Addition	Group loyalty
Blockchain-Enabled Addition	Channel loyalty
Blockchain-Enabled Addition	Lifestyle loyalty

5

Added Value for Local Loyalty

Subquestion 4: Which blockchain-based loyalty program architecture could be of added value to create local loyalty?

The fourth subquestion will by answered by assessing the different program architectures derived in Chapter 4. The assessment conducted is based on different criteria derived from literature from both the perspective of the retailer and of the customer, the actors who need to adopt the system for the program to be feasible. By ranking the different programs on the selected dimensions the blockchain-based loyalty programs which will be of added value for those two parties will appear.

Once this added value is determined, the translation needs to be made towards a local loyalty program. To make the translation for the local program more tangible a test case is used for which the city of Delft is used as an example of implementation to select the program with the most added value from a local perspective.

5.1. Assessment

For the assessment of the programs architectures, different perspectives will be used. The perspectives used will be from the perspectives of the end-users of the program: the customers and the retailers.

A third convenient perspective would be the owner of the loyalty program, for a partnership could also be managed externally Bijmolt et al. (2010). The owner of the loyalty program for a local loyalty program could for instance be the local government or a third party providing the technological solution. This owner would for instance be responsible for the technological solution but also for the management of the different participants, the communication towards the customers, and providing customer support. In most cases the participation of the different retailer will grant the program owner a certain fee from the participating retailers for providing these services.

Once the program is more broadly adopted by both users and retailers the program will have positive network externalities and thus the program will become more valuable (Uzzi, 1996). Therefore, the value of the program of the program owner will depend on the perception of the program by the end-users and the program owner is left out of this assessment.

For each of these end-users assessment dimensions will be determined along which the different program architectures will be ranked. This ranking will be based on assumptions of the author and the weights of the dimensions considered are equally distributed.

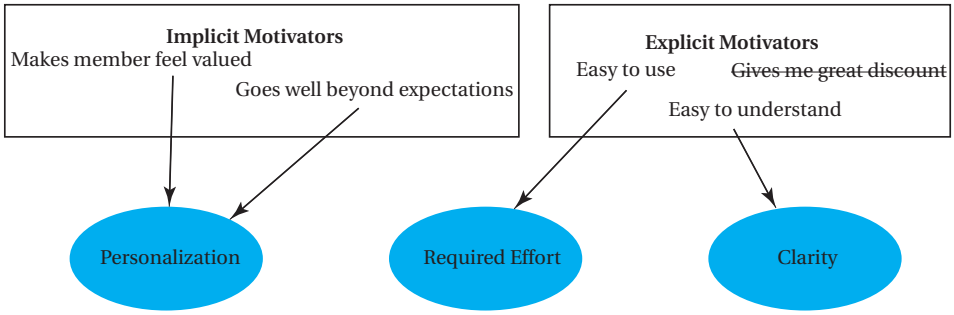


Figure 5.1: Customer dimensions for assessing the scenarios

5.2. CUSTOMER

As the loyalty program should be designed to create the loyalty of the customer (Shugan, 2005), the customer is addressed first. The corresponding assessment dimensions will be derived from literature and will be used to rank the program architectures.

5.2.1. ASSESSMENT DIMENSIONS

As was seen in the literature review, the customer wants the loyalty program to be personalized, have a good user-experience and needs to have an overview of the different programs he is enrolled for (Berman, 2006; Bijmolt et al., 2010; Dowling and Uncles, 1997; Meyer-Waarden and Benavent, 2009). Or to be even more specific, Fruend (2017) mentions three explicit drivers for the program, that the program is easy to use, the program is easy to understand, and that the program gives great discounts. As implicit motivators the people want to feel valued by the program and desires that the program goes beyond their expectations. Given these motivators, the dimensions *personalization*, *required effort*, and *clarity* are selected, as could be seen in Figure 5.1. The explicit motivator 'gives me great discount' is left out since this does not depend on the architecture of the program. For this assessment it is assumed that the type of reward matches the desired reward of the customer.

5.2.2. RANKING OF PROGRAM ARCHITECTURES

The customers perspective will be assessed using the determined dimensions: personalization, required effort, and clarity.

Personalization

Personalization is measured by the amount of data gathered on the customer, in the case that the data is used optimally. The amount of data gathered on the customer is dependent on the number of points of sale and the size of the partnership. Due to the lowered entry barrier for the retailers in the blockchain solution all the programs could be easily extended on both ends, however the program with multiple earn and burn partners is most likely the most extensive one. The addition of the group, channel, and lifestyle loyalty does provide extra information on the customers since there are more possibilities and therefore also more knowledge to gain on the customers. By adding extra points of redemption the customer is also able to bend the program more to his own needs.

Required Effort

The required effort is a sum of the actions required by the customer, for example, the minimum amount of purchases, the complexity of the reward redemption, number of actions, time needed, and the inconvenience of carrying the loyalty card (Noble and Phillips, 2004; O'Malley and Prothero, 2004; So et al., 2015). These actions are however highly determined by the underlying processes which are not all necessarily related to the structure of the program, such as the minimum amount of purchases and the inconvenience of carrying the loyalty card. The minimum amount of purchases however is determined by the number of earn partners, and the complexity and time needed for the redemption of a reward is determined by the number of burn partners. Therefore, the programs with more earn and burn partners will be valued better on this dimension. Since the blockchain-enabled programs are added to another program, this addition will add even more points of issuance and points of redemption, therefore the program will be better valued in terms of required effort.

Clarity
The last dimension for the customers, the clarity of the program, is dependent on different factors. A lot of these factors, such as the possibilities of the program, the personal offers, and the functioning of the help-desk, could be gathered under the term communication. However, these factors are not determined by architecture of the program.

On the other hand, the number of participating parties are determinative for the clarity of the program and does rely on the program architecture. It should be clear for the customer where he is able to redeem his points and where he can earn them. When multiple parties are added to roughly 14 loyalty programs the customer is a member of (Bond Brand Loyalty, 2017), it cannot be expected of him that the 15th program will bring clarity for the customers. However, such a partnership program could also replace a number of programs of which the customer was already a member. Therefore, the clarity of the Frequency Reward Programs and of the Customer Tier Program is mostly determined by the communication, but could also be increased once multiple programs will be replaced by a partnership program.

The additions of the blockchain on the other hand will only add extra issuance and redemption rules and points, which will not replace any of the current options and therefore only reduce the clarity for the customers.

5.2.3. RESULTS OF ASSESSMENT
The results of the assessment along the three dimensions is given in Table 5.1, which shows that the programs with only one point of issuance or one point of redemption are ranked lowest on these three dimensions from the perspective of the customer. The additions enabled by the blockchain technology are scored best, but it should be noted that the clarity of the program will be worsened by this addition and that the communication is key for this program.

Table 5.1: Assessment from the customer's perspective

Program Structure	Personalization	Required Effort	Clarity	**Total**
CTP One earn partner, multiple burn partners	++	+	++	5
CTP Multiple earn partners, one burn partner	++	+	++	5
CTP Multiple earn partners, multiple burn partners	+++	++	++	7
FRP One earn partner, multiple burn partners	++	+	++	5
FRP Multiple earn partners, one burn partner	++	+	++	5
FRP Multiple earn partners, multiple burn partners	+++	++	++	7
BCT Group loyalty	+++	+++	+	7
BCT Channel loyalty	+++	+++	+	7
BCT Lifestyle loyalty	+++	+++	+	7

5.3. RETAILER

Secondly the assessment will be conducted from the perspective of the retailer, his corresponding assessment dimensions will be derived from literature. These dimensions will be used to rank the program architectures.

5.3.1. ASSESSMENT DIMENSIONS

The goals for a retailer to obtain with the introduction of a loyalty program are mainly based on the increase in sales, value of the customers, the induction of cross-product buying, and the creation of a monopoly compared with equal brands, according to Dowling and Uncles (1997). Others argue that in the end the only goal for a corporate initiative is the profitability and the customer loyalty also serves this objective (Kumar and Shah, 2004; Reinartz and Kumar, 2002). Due to the partnership nature of the blockchain solution the creation of a monopoly and the differentiation of the particular brands is harder to accomplish especially with the lowered access barriers for the retailers (Chain of Points, 2017; Orioncoin, 2017). Therefore, the means to distinct oneself is to target the right customers, the effect of which is twofold, since the most profitable customers are easily selected and reached, but also the customer will feel better about the level of personalization of the program. Therefore, the first dimension by which the scenarios will be compared is the *targeting*.

With the increase of the points value in the loyalty program, the fraud conducted with the loyalty programs is increasing. This topic is introduced in Appendix E and three categories are distinguished and elaborated on: member fraud, organized fraud, and staff fraud. With the uprising of the fraud in the loyalty sector, also the dimension *fraud proof* is added, since this will ensure that the retailer's money invested in the program will contribute. Next to the fraud, also liability of the outstanding points and the corresponding liability on the balance sheet might endanger the profitability of the retailer. Especially the smaller retailers, with less buffer to provide for a bulk request of rewards. Therefore, the final assessment dimension is the **financial security**.

5.3.2. RANKING OF PROGRAM ARCHITECTURES

The retailers' perspective will be assessed using the determined dimensions: targeting, fraud proof, and financial security will be assessed.

Targeting

For the retailer the goal is in the end to have high profits, the loyalty as established via the program is just a means (Kumar and Shah, 2004; Reinartz and Kumar, 2002). Therefore, the profitability is seen as the forecast of the people who where not loyal to the retailer at all, but will become more loyal through the program, an important factor in this forecast is the ability for the retailer to target their audience. This targeting is made easier for a program with better options for advanced data analysis, therefore the scores given for the profitability are the same as the ones given for the personalization for the customers.

Fraud Proof

Fraud proof is used as an indicator on how easy the program is tampered with by either the customer, an organized crime group, or the staff of the retailer itself, and what its impact is. For this assessment an equation is introduced based on the ease of fraud and the exposure. The equation is a variation on the credit risk equation used for the loan of a counterparty, given that those loans are independent, which is

$$EL = PD \cdot EAD \cdot LGD. \tag{5.1}$$

In this equation EL stands for expected loss, PD is the probability of default, EAD is the exposure at default, or the value of the loan. Finally, the LGD is the loss given default, meaning the part of the loan which can not be recovered if the other party defaults. The adapted formula for the fraud in the loyalty program then becomes

$$EL_i = PF_i \cdot (PV \cdot NP) \cdot 1, \tag{5.2}$$

resulting in a total expected loss of,

$$EL = EL_{member} + EL_{staff} + EL_{crime} = (PF_{member} + PF_{staff} + PF_{crime}) \cdot PV \cdot NP. \tag{5.3}$$

In which the EL is just as in Equation 5.1 the expected loss, the PF is the probability of fraud, the EAD is replaced with the point value (PV) times the number of points (NP). Finally, the LGD is been replaced with a 1, since the fraudster will not return some of the points he has stolen. Since the research conducted is qualitative, the values assigned to the variables have to be estimated and only serve the purpose to compare the different

scenarios and create a feeling which variables should be taken into account.

The customer will profit from the program by means of member fraud when there are loopholes in the systems and when points are easily falsified. With the introduction of multiple parties, the vulnerability towards the loopholes will increase for the program. The falsification of the points is mostly determined by the underlying technology. Once blockchain technology is introduced for the loyalty programs, it is hard to determine whether or not this will become subject to customer fraud as well. However, since the average customer is most likely not able to commit member fraud with advanced technology such as blockchain technology, the member fraud will be ruled out for the blockchain solution.

The organized crime on the other hand already showed that the blockchain could be susceptible to fraudulent practices. As for example the 'robbery' of Mt. Gox, in which $460 million was stolen (McMillan, 2014). The organized fraud in the loyalty sector is unexplored territory, it is not known to which extent this type of fraud is conducted. The value of the points stolen however will increase significantly if there are multiple burn partners, which is the case some of the program architectures. It is unknown what the consequences of the introduction of blockchain technology will be, so the metric for these programs will be the number of burn partners.

The staff fraud will increase when earn partners are added to the loyalty program. These issuance points enable more staff to profit from the program and for example scan the receipt of a customer, when a mobile application is used, or to scan their own membership card.

So to summarize all three components of fraud, the customer fraud will increase when multiple earn and burn partners are introduced, the staff fraud will increase when multiple earn partners will be introduced, and the organized fraud will increase when multiple burn partners are introduced. The results of which could be found in Table 5.2.

Financial Security
Financial security is twofold, because the investment of the retailer should result in a more profitable situation and the retailer ought to know what its financial situation is.

The profitability of the program is determined by the success of the program and the associated costs. The success of the program could be derived from the assessment of the customers, since they have to adopt the program. The costs of the program are dependent on the owner of the program and on the underlying technology and could therefore not be ranked.

The second part of the financial security is on the retailers financial situation. As was seen in section 2.3.1, the liability management is improved by the usage of blockchain technology for the programs and will be the same for all the blockchain-enabled programs.

5.3.3. ASSESSMENT RESULTS
From the perspective of the retailer the programs with multiple points of issuance and redemption were better valued, as were the blockchain-enabled additions. However, most of the assessment dimensions from both the end-user perspectives were strongly connected. The results for the retailers perspective are to be found in Table 5.2.

5.4. SELECTION
The added value for the blockchain-enabled program architectures was most seen in the additions of the smart contracts to the loyalty program: the group loyalty, channel loyalty, and the lifestyle loyalty. These options provide an edge for the customers and make the program more tailored to their needs. While also providing more data on the customers for the retailers.
For the program to be able to have the additional smart contracts the program should have an FRP structure, since the CTP will not provide the option to earn points, but only to earn a certain tier. Therefore, the program should not be merely a CTP, but the FRP could be extended by an CTP, as was seen in Chapter 4. By adding the CTP the government could for instance appoint special services and goods to people who earned the status 'loyal citizens'.

Table 5.2: Assessment from the retailer's perspective

Program Structure	Targeting	Fraud Proof	Financial Security	**Total**
CTP One earn partner, multiple burn partners	++	++	+++	7
CTP Multiple earn partners, one burn partner	++	++	+++	7
CTP Multiple earn partners, multiple burn partners	+++	+	+++	7
FRP One earn partner, multiple burn partners	++	++	+++	7
FRP Multiple earn partners, one burn partner	++	++	+++	7
FRP Multiple earn partners, multiple burn partners	+++	+	+++	7
BCT Group loyalty	+++	++	+++	8
BCT Channel loyalty	+++	++	+++	8
BCT Lifestyle loyalty	+++	++	+++	8

Given that different points on the program could be labelled for special purposes, all of these expansions could co-exist on the same program. The BPMNs of Chapter 4 showed that the group loyalty, channel loyalty, and lifestyle loyalty only added new partners and by the usage of smart contracts could easily function as expansions on the loyalty program. Given the necessity of the FRP structure to enable these smart contract expansions, a blockchain-enabled FRP, referred to as the basic program, is selected to be explored for the creation of local loyalty.

5.5. TRANSLATION TO LOCAL LOYALTY

To make the translation to a local loyalty program, a test case is used for which the city of Delft is used as an example of implementation to make the program more tangible and select the program suited for a city centre.

Delft was selected as a city since the amount of vacancies is increasing within the city centres than in other places and the city centre of Delft is therefore identified as a city in need. Next to that, the city of Delft already has a local loyalty initiative, the "Delftpas". By selecting Delft as an example for implementation, the possibilities of this card could be explored and translated upon the blockchain-based local loyalty program. If Delft was to adopt such a program, it should be clear for the customers and the program should have at least the same benefits as the current solutions.

The "Delftpas" is a collaboration with nearby towns where citizens can buy a membership card of the municipality Delft for €60 which grants them rebate on 39 activities for 2018 in Delft, both sports-, and culture related, but also private companies use this program to promote their business [1]. Retailers and the catering industry could also temporarily use this card to offer discount. This card can also be used in nearby towns and has a total of over 750 activities [2]. Given the possibilities of the Delftpas, the blockchain-enabled loyalty program should at least do these activities and by which it has to focus on the sports and culture of Delft as well.

To have the ability for the sport and culture of Delft to join the program as well, different partners should be added to the program next to the other non-retail parties: the producer, government and the lifestyle organizations. The implementation process and the structure of the smart contracts will be the same, however the

[1] https://www.rotterdampas.nl/acties/alle-acties?region%5B%5D=Delft/aanbiedingen-delft
[2] https://issuu.com/rotterdampas/docs/rotterdampas_jaargids_2018_issuu

sports and cultural additions only ask to redeem the points earned, not to issue any points, therefore, the umbrella term *non-retail redemption* will be used to refer to the sports, cultural. With the low entrance barriers enabled by the blockchain technology (Chain of Points, 2017; Orioncoin, 2017), these options could easily be added unto the program.

Therefore, it is believed that the basic program derived, the FRP with multiple expansions, could also be expanded by the addition of the non-retail partners on the program on top of the expansions of group loyalty, channel loyalty, and lifestyle loyalty. Since these expansions could co-exist, a basic program is proposed with expansions visualized as optional building blocks. The basic program and its building blocks is shown in Figure 5.2.

5.6. CONCLUSION

In this chapter the fourth subquestion, *Which blockchain-based loyalty program architecture could be of added value to create local loyalty?*, is answered. By assessing the derived program architectures, it was found that the added value for both the retailers and the customers is in the addition of the smart contracts expansions on top of a Frequency Reward Program. By the assessment of the customers, it appeared that due to the increased complexity of the program, the communication towards the customers is key in the added value for them.

To translate the blockchain-based loyalty program to a local solution, Delft was used as an example for implementation, showing that the option to add sport clubs and cultural sights of the city should be available as well. Therefore, the selected loyalty program architecture which adds most value to the creation of local loyalty is a blockchain-based frequency reward program, with the expansions of channel loyalty, lifestyle loyalty, non-retail redemption, and group loyalty (Figure 5.2).

Given these selected program architectures, the next chapter will examine how such a program could look and how the actors involved in the program could create added value for the customer.

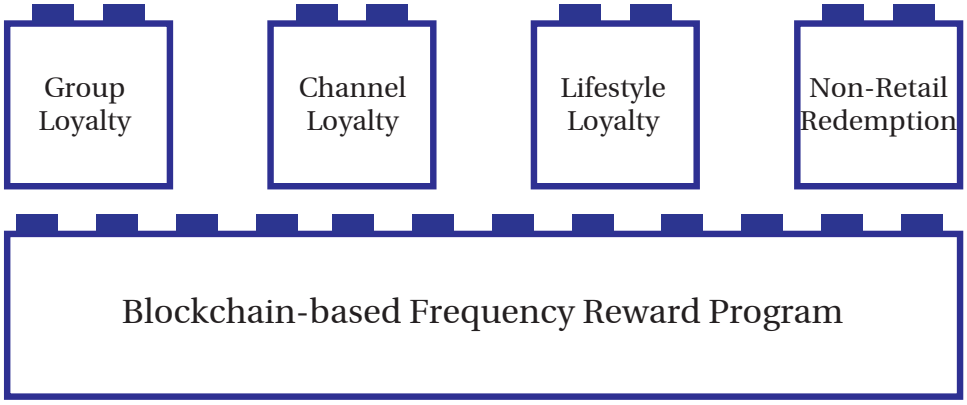


Figure 5.2: Building blocks for Blockchain-Based Local Loyalty Program

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6

Demonstration of the Blockchain-Based Local Loyalty Program

Subquestion 5: What could a blockchain-based local loyalty program look like?

To answer the fifth subquestion the selected program architectures will be demonstrated by which the demonstration of the artefact activity of the Design Science Research is conducted.

In order to demonstrate the program architectures the value networks are derived for each program. These value networks consist of different *actors* with their *own goals* and their *own resources* depending on each other (de Bruijn and Heuvelhof, 2009) and *exchanging value* (Allee, 2009). Therefore, at first the actors are introduced after which the value exchanges are derived using Canvas Business Modelling.

As a final step to demonstrate how a blockchain-based local loyalty program would look, the set of design decisions regarding the rules of the program are decided on.

6.1. The Collaboration as a Value Network

To determine and set the rules to guide collaboration of the actors, at first the common goal for the group of actors should be clear. The course of actions mentioned should be structured such that a sense of local loyalty amongst the customers is enabled by means of a partnership loyalty program. This intended loyalty will be reached by providing a loyalty program with an added value to the customer. By this reasoning the set of actors participating in the loyalty program should co-operate to deliver a value to the customer which could not be provided for by the individual actors. This set of actors could also be seen from the light of the definition of the value network defined by Allee (2009, page 429) as being "any purposeful group of people or organizations creating social and economic good through complex dynamic exchanges of tangible and intangible value". In which tangible assets are goods and services delivered and intangible assets are knowledge and benefits (Allee, 2000).

Hence, the actors participating in the loyalty program could be seen as a purposeful group of organizations creating an added value for the customers. The creation of this added value will be described as being a value network by the definition of Allee (2009). By which the value network consists of different *actors*, having their *own goals* and *resources* depending on each other (de Bruijn and Heuvelhof, 2009).

6.2. BUSINESS MODELING

Following the definition of Haaker et al. (2017) that a business model is "a description of how an organization or network of organizations intends to create and capture value with its products and services", the goals, resources, and necessary value exchanges are determined for each actor in the value network.

The concept of business models is an approach which is suited for decision-making and option considering in fast-moving and unpredictable environments (McGrath, 2010), such as the blockchain technology environment (Lindman et al., 2017).

6.2.1. CANVAS BUSINESS MODELLING

After researching business models and its ontology for his dissertation (Osterwalder, 2004), Osterwalder and Pigneur (2010) proposed the Business Model Canvas along the same definition of business models used as Haaker et al. (2017), but also included the delivery of the value. Together with this value delivery, the definition and the corresponding Business Model Canvas are deemed a good fit to explore the blockchain-based local loyalty program. The Canvas method uses nine building blocks to cover the four broader areas of a business: customers, offer, infrastructure, and financial viability (Osterwalder and Pigneur, 2010). All of which are essential in offering a loyalty program, for the purpose of every loyalty program is to be *financial viable* (Kumar and Shah, 2004; Reinartz and Kumar, 2002), the *customer* has to become a loyal repeated buyer, by *offering* them a reward. The *infrastructure* helps to reach out to the customer. The nine building blocks based on those four main areas are: Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure.

Customer Segments are used to determine for which type of customers the value is created by the company. Next, the *Value Propositions* identify what value will be delivered to the customer, for example performance, design, price, or status. When the right customers are selected and it is decided what value will be delivered to them, the *Channels* are selected to reach out to these customers. These channels can be divided into five different phases, as shown in Figure 6.1. The *Customer Relationships* determine how personal the relations between the company and the customer are, or if a community is added to provide for another type of relationship for the customer. Once these building blocks are filled, the offer to the customers is clear and the first part of the financial viability can be explored, the *Revenue Streams*. With this building block it will be explored how much a customer is willing to pay for the value offered by the company and how this payment will take place. In order to offer the value to the customers the company has to have certain *Key Resources* to fulfil *Key Activities*, these will be determined by the previous building blocks. Some of these key resources and activities cannot be conducted by the company itself and will therefore be performed with or by another party, the *Key Partnership*. By completing the previous building blocks, the final block of the financial viability of the business model could be constructed, the *Cost Structure*. Within this block the costs of the previous blocks will be determined and will be assessed by their importance and expensiveness.

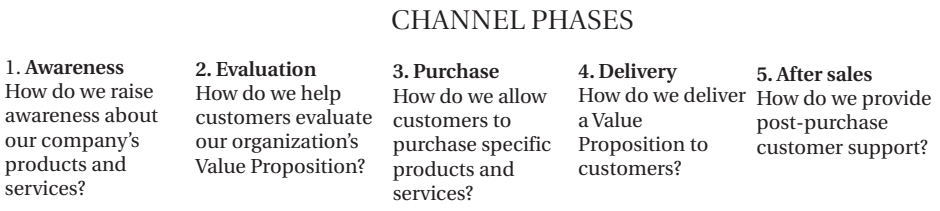

Figure 6.1: Channels in canvas model adapted from (Osterwalder and Pigneur, 2010)

6.2.2. MODELLING THE PROGRAM STRUCTURES

The Canvas Business Model uses these nine different building blocks to ensure that all the areas are covered. The business modelling is used to see which different value exchanges are necessary for the different actors in the network and the key activities and the key resources will appear. These key activities and key resources will be projected on the value network and it will become apparent if new partners are necessary, by which the key partnerships will be derived.

The complete derivation of the canvas business models is provided in Appendix F, within this chapter only the key activities and key resources are given.

6.3. DIFFERENT ACTORS

The different actors introduced during this section are found in Table 6.1.

Table 6.1: Different actors involved in local loyalty programs

Organizing party	6.3.1
Retailers	6.3.2
Producer	6.3.3
Lifestyle Organization	6.3.4
Government	6.3.5
Cultural Sights	6.3.6
Sport Clubs	6.3.7

By identifying the loyalty program as an organizational network, the organizing party could be identified as a core organization managing the network (Boyle, 1993). This core organization carries out their own value exchange to add to the value network and is also in charge of managing the network (Boyle, 1993). The organizing party, or the core organization, initiates and organizes the network and uses the goods and services of those companies to carry out their business (Boyle, 1993).

6.3.1. ORGANIZING PARTY

The first actor to address is the organizing party. This organizing party forms the core of the value network for each program structure (e.g. Figure 6.2). Their goal is to enable the network and ensure that each actor in the network carries out their value exchanging activities, hence ensure that the partnership loyalty program is of added value.

According to Boyle (1993), the core organization could fulfil three different roles: providing value to the other members, using the value of the other members, and linking the providers and the users. It is assumed that the organizing party can provide for a blockchain solution. Therefore, the first role fulfilled by the organizing party is to provide the value by means of the deliverance of the technology. By adopting the role of the provider of the goods and services, and not as a user of these goods and services, the organizing party has less control on the activities of the other participants of the network (Boyle, 1993). The second role the core organization fulfils is to link the different earn and burn partners. When the organization adopts this role, the objective is mainly to serve the interests of the different organizations in the network by providing "support, advice, protection and strategic direction for its members" (Boyle, 1993).

To conclude, for the organizing party, the goal is to deliver the value to the participants of the program. The resources they have to bring to the table are the technology and provision of, amongst others, support and strategic direction.

6.3.2. RETAILERS

The second actor, which is actually a group of different types of actors, are the retailers. They are included in all of the program structures, as is the organizing party. The basic program has low entrance barriers and enables an asynchronous partnership by which all types of retailers are able to join the program.

With the introduction of the internet shopping, there are three types of retailers: the pure-play internet retailers, the bricks-and-mortars, and the bricks-and-clicks (Ancarani and Shankar, 2004). This research focuses on the loyalty towards a municipality, hence the bricks-and-mortar retailers are selected. Within this type of retailers the retailers could be divided by their type of store and the type of ownership (Levy and Weitz, 2008). However, the goal for every retailer is to target the right customers and to have a profitable business (Kumar

and Shah, 2004; Reinartz and Kumar, 2002). Therefore, the goal for each individual retailer, despite of its type, is profit.

The resources which the retailers have to offer to the value network are the data on their customers. How much did the customer buy and when did he buy it. This data is not available for the other retailers to see, when no partnership loyalty program is adopted.
To conclude, for the retailers, the goal is to make profit by selling their products and the resources they can provide are the data on their customers.

6.3.3. PRODUCER

Once the channel loyalty is added to the basic program, also the producer of the products sold by the retailer is able to join the loyalty program. By offering points for their own selection of products the producer can promote their products on the loyalty program. As for the retailer, the main goal for the producer is to have a profitable business. The means to achieve this goal is to target the right audience and sell their products to them at a profitable price. However, the producer does not have their own point of sale and has to use the retailer to sell their products. Therefore, the options to gather information on the customer are also more limited and for example achieved by cashback actions.

The average local retailer does not have the possibility to create a national marketing campaign using all sorts of media. Where the producer has to use such methods to promote their new products for them to become the dominant design (Mohr et al., 2010) or for the customers to adopt habits using these products (Duhigg, 2013). This push-strategy adopted by the producer is enabled by the financial resources the producer has. Therefore, the resources of the producer are the products he has to offer and are finances.

To conclude, for the producers, the goal is to make profit by having retailers sell their products and to gather information on their customers. The resources they can provide are the products they have to offer and are finances.

6.3.4. LIFESTYLE ORGANIZATION

With the introduction of a lifestyle loyalty, also a new actor is introduced into the loyalty program partnership: a lifestyle organization. The goal for such an organization is that a certain lifestyle will be promoted by means of a selection of products offered by the retailers, which are associated with a certain lifestyle. The promotion of the products could also raise awareness for the lifestyle promoted.

The resources offered by the organization are the finances they bring to the table and also extra channels to reach out to potential or current users of the loyalty program.

6.3.5. GOVERNMENT

Next to an organization promoting a certain lifestyle, also the government could promote a certain lifestyle by providing subsidies to certain products. At the time of writing there are eight different subsidies offered by the Dutch government meant for the customers, which serve two different goals according to the governmental service regulating the subsidies in the Netherlands: for the customer to invest and to stimulate[1]. Next to those subsidies, there is also offered a subsidy which is specifically meant for the damage done by the mining industry in the Netherlands, which is left out of the scope, but provides a good example of how the government could temporarily add a subsidy to the program.

The goals for the government are therefore to invest and to stimulate. The financial resources associated with these measures are annually defined by means of the coalitions agreement (Regeerakkoord). For the local government the budget for those subsidies is determined by the municipal executive (B&W)[2] and differ from city to city and differ from the one year to the other.

6.3.6. CULTURAL SIGHTS

For the cultural sights in a town the goal is to attract tourists and have as much as possible visitors to their museum or church. The goals of the cultural sight could also overlap with the goals of the local government

[1] https://www.rvo.nl/subsidies-regelingen
[2] https://media.delft.nl/pdf/Begroting/Programmabegroting_2019_2022.pdf

who wants to boost the town image and the tourism numbers.

The resources they have to offer are the ability for the people to enjoy the city and provide for more attractiveness to the tourists of the city.

6.3.7. SPORT CLUBS

The goal for the sport clubs is to have as many members as the club could handle. The club is not allowed to make any profit, since the club is a foundation, however they have to be financial healthy. As for the cultural sights, also the local government could have overlapping goals with the sport clubs, since health could be promoted by the government.

As a resource they offer the ability for people to join a sports club and exercise the sport they would like.

In Table 6.2 the goals and resources of the different actors are provided. Also the program structures in which they appear are given. With these actors in play, the business models for the program structures are now created, such that the necessary value exchanges will become clear and the value network could be constructed.

6.4. BLOCKCHAIN-BASED FREQUENCY REWARD PROGRAM

To explore the opportunities for the basic program, it is assumed that the loyalty program is adopted by all of the retailers in Delft. Such that it is in fact an enormous partnership and that the points are only to be spend in Delft. The points can be earned by means of a purchase in a brick-and-mortar shop in Delft. When such a purchase is made, the member earns a set percentage of the amount purchased as points (RetailCoin, 2018; R. Weiss, personal communication, September 7, 2018). Once the customer decides to spend his points on a desired gift he can go to one of the participating retailers and redeem his points for the reward selected by the retailer. For this basic program, the rewards redeemed by the customer are all self-beneficiary rewards, they could both be utilitarian or hedonistic, which is based on the selection of the rewards by the retailer himself.

During the description of the program and the revenues and costs associated with it, the possible volatility of the underlying cryptocurrency is not taken into account. The points are however linked to the value of the Euro.

6.4.1. KEY RESOURCES

When all local retailers participate in the program, it is most likely that each retailer will hand out rewards which are already in their assortment. Therefore, the supplier and distribution channel will not change for the retailer when the LP is adopted.

To enable the retailer to participate in the program, the cash register of the retailer has to be updated. Since the register has to be able to scan the QR-code generated by the mobile application or the barcode of the membership card when the rewards are redeemed. For the customer to autonomously use the mobile application, the register has to be able to print a barcode which can be scanned by the customer, some of the receipts printed by the retailer already contain a barcode. In that case a work-around could be thought of for the redemption of the points by using another method, for example a tablet or smartphone, to scan the QR-code by which the points are being transferred to the retailer.

Therefore, the key resource required to deliver ease of use to the customers is of a technological nature. To deliver the personalized feeling to the customer, increased targeting should be enabled by the program requiring for the ability to analyse the data and for the ability to reach out to the customer.

For the final value offered by the program, the rewards, the key resources are the retailers offering the rewards.

6.4.2. KEY ACTIVITIES

The key activities for the values to be offered to the customer are to update and maintain the technological solution. With this up-to-date and working technology the data gathered on the customers should be analysed and processed, such that the personalization could be enabled. To ensure that the customer also experiences this personalization, personal offers should be selected by the retailers and the customer should be made aware of these offers. The choice of the rewards should contribute to the repeat-purchase of the customers

Table 6.2: Different actors present per program structure

Actor	Goals	Resources	Basic Program	Group Loyalty	Channel Loyalty	Lifestyle Loyalty	Non-Retail Redemption
Organizing Party	Deliver value to the participants of the program	Technology and provision of support and strategic direction	X	X	X	X	X
Retailers	Make profit	Data on their customers	X	X	X	X	X
Producer	Make profit	Products and additional finances			X		
Lifestyle Organization	Promotion of a certain lifestyle	Additional channels to reach out to customers and additional finances				X	
Government	Invest and stimulate	Additional finances				X	X
Cultural Sights	Attract tourists and other visitors	Enjoyment of cultural sights					X
Sport Clubs	Have as many members a club could handle	Ability to join and exercise		X			X

and will most likely be selected by trial-and-error, but could also be guided based on the retrieved insights in the shopping behaviour of the customer via the loyalty program. Once the rewards are selected, the retailer should ensure that the rewards offered are in stock.

6.4.3. VALUE EXCHANGES

With the construction of the business model for the basic program, the key resources and key activities and their provider became apparent. By zooming in on the actors involved in the provision of this program, the provided resources and the exchanged values will be found.

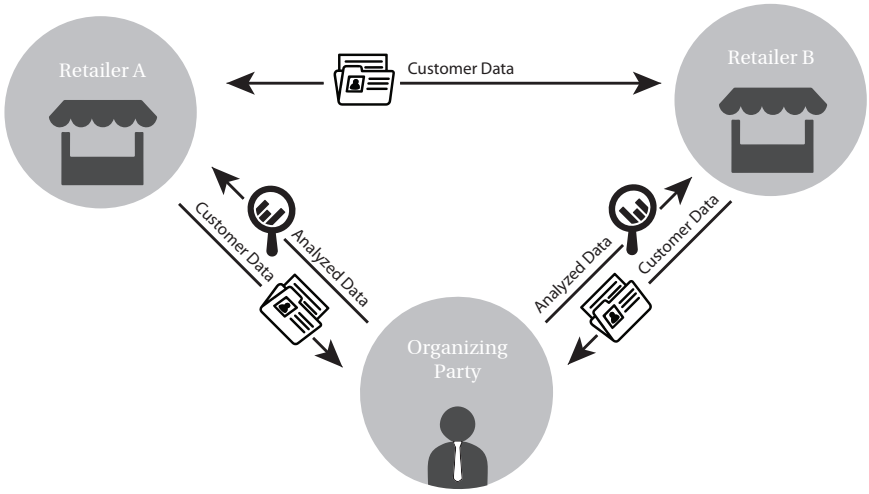

Figure 6.2: Structure of the value network for the blockchain-based Frequency Reward Program

ORGANIZING PARTY AND RETAILER

The organizing party and the retailer depend heavily on one another for the program to function. Without the provision of the rewards or the technology, no program would be possible. For the organizing party to be able to analyse the data, the retailer should be willing to share this data. For the organizing party, the results of the data-analysis should be offered to the retailers. By this means, the retailer is enabled to offer more personalized rewards and the program will become more personalized for the customer.

The knowledge of both the retailer and the organizing party could be combined, since the retailer knows more about the customers behind the numbers, but the organizing party could have more knowledge about the numbers and also on other trends in other cities as well.

RETAILER AND RETAILER

The value exchanges between the different retailers are in terms of knowledge. Since they have to share their valuable customer data with the other retailers as well. Which is not something that is preferred by all the individual retailers (J. Janssen, personal communication, September 6, 2018). The process for implementing such a loyalty program and on the co-operation between these different competing retailers, will be covered in the next chapter.

6.5. GROUP LOYALTY

By enabling customers to earn points as a group or family, this addition lets users of the application become loyal as a group. By adding smart contracts in which it is stated how big a group has to be, how it should be composed, or how big a family should be to qualify for the extra points, the retailer could create extra incentive for a group of customers to shop at his place. This loyalty could both be connected to a specific product or to a specific retailer. In both cases the composition of the group or family dictates the level of information needed of the customer. For a family for instance the current home address should be added and for a sports team their sports club has to be added as well. By which privacy issues may be encountered, but the level of consumer fraud will be reduced.

By the provision of this personal information, the customer could be a member of two groups at the same time, as shown in Figure 6.3.

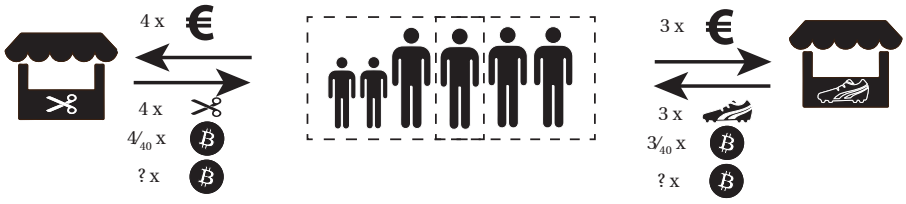

Figure 6.3: Earning extra points as a group or family

Since these points are earned as a group who have a common divider, the points earned could also be labelled with a special purpose. To stick with the example of the sports club, if a group of 10 people from the same sports club buy their kicks at the same store, the retailer issues extra points which are only to be spend in the sports canteen or could be used for the purchase of new equipment for the club.

6.5.1. KEY RESOURCES

The key resources associated with this program are on the personal information of the customer, since it is needed to know whether or not a customer qualifies for a certain group. The retailer also needs the data-analysis on his customer to see if a certain group of customers is not reached and could be targeted.

6.5.2. KEY ACTIVITIES

If a retailer decides to participate in this addition, the targeting of the right groups for their product or store and the communication with them are the most important activities. Once the right group is targeted and reached, the regular service is offered and the points are rewarded to the customers.

6.5.3. VALUE EXCHANGES

With the construction of the business model for this expansion, the key resources and key activities and their provider became apparent. By zooming in on the actors involved in the provision of this program, the provided resources and the exchanged values will be found.
For this value network the value exchange between the different retailers is believed to be identical as the value exchange for the basic program and is therefore left out of this network for clarity.

ORGANIZING PARTY AND RETAILER

The value exchanged between the organizing party and the retailer is the data and the data-analysis on the customers. The organizing party needs this data in order to analyse it and provide the retailer with the analysis on which customer segment could be targeted by means of group loyalty.

RETAILER AND SPORTS CLUBS

If for instance a sports club is added to the group loyalty, the retailer and the sports club should exchange the data on the customers and of the members of their sports club.

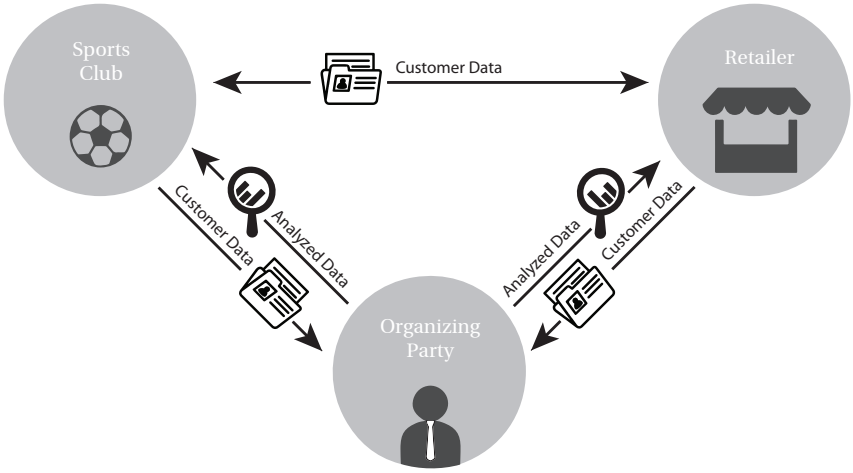

Figure 6.4: Structure of the value network for the group loyalty expansion

ORGANIZING PARTY AND SPORTS CLUB

As for the exchange between the organizing party and the retailer, this exchange consists of data and the data-analysis on the customers.

6.6. CHANNEL LOYALTY

An addition to the basic program which does involve more actors than only the local ones, is the channel loyalty. This type of loyalty connects the producer of the products sold by the retailer with the customer, the options of Heineken and Douwe Egberts were used as an example to introduce the idea of channel loyalty in Chapter 4. Both of these programs also contained a partnership with a third party, a bar and the Blokker, respectively. With the architecture of the blockchain-enabled version this could also be done by labelling the coins to have a specific purpose and a specific redemption point. However, the producer does not necessarily have to choose a particular redemption point, but could use this addition to issue extra points on specific products and let the customer decide where he wants to redeem them.

6.6.1. KEY RESOURCES

This expansion of the program would not work if no producers would be interested to promote their products by means of the loyalty program and are therefore the financial injections of the producers are a key resource for this type of loyalty.

6.6.2. KEY ACTIVITIES

The key activity for the producer is to select the products which qualify for extra points in the system. This could be products which the producer wants to promote because of its newness or since the sales are disappointing. The producer could also use the program to gather information on the customers who are buying their product.

6.6.3. VALUE EXCHANGES

With the construction of the business model for this expansion, the key resources and key activities and their provider became apparent. By zooming in on the actors involved in the provision of this program, the provided resources and the exchanged values will be found.
For this value network the value exchange between the different retailers is believed to be identical as the value exchange for the basic program and is therefore left out of this network for clarity.

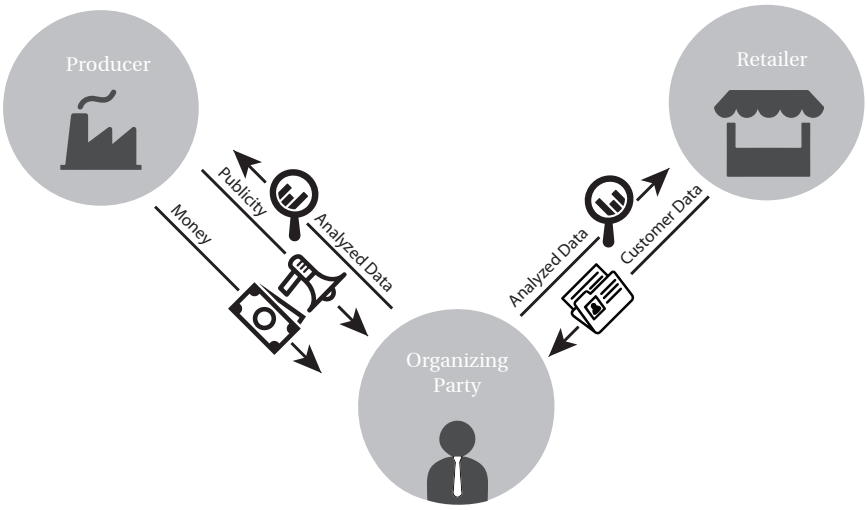

Figure 6.5: Structure of the value network for the channel loyalty program

ORGANIZING PARTY AND PRODUCER

The added value of this expansion of the basic program is the financial benefit for the customer who buys the products of the producer promoting his products on the program. For the value to be delivered to the customer, the producer should select the right products which could be optimized if the organizing party and the producer co-operate with the analysed data on the customers. Therefore, the values offered by the organizing party are the data-analysis and the provisions of the loyalty program. While the producer has its money and the publicity of its brand to offer to the program, by which the latter is qualified as an intangible benefit.

PRODUCER AND RETAILER

The producer and retailer do not necessarily have to have a value exchange for the program to work. They could however opt for a partnership if the producer wants their points to be earned or spend at a specific retailer. By this partnership the costs could be split by the retailer and the producer.

6.7. LIFESTYLE LOYALTY

Loyalty towards a lifestyle could be achieved by two different approaches corresponding to a certain lifestyle: the purchasing of products and the performance of specific activities. The option to promote a lifestyle by the selection of specific products is enhanced even more if the points earned for the purchase of these products are only to be spend and used on the same kinds of products. As is also the case for the performing of the different tasks. A lifestyle is optimally promoted when these approaches are combined.

The selection of the specific products only adds another party who should select the products and pays to issue extra money. The rewarding of specific activities, as does Reward Protocol, adds to the complexity of the blockchain structure, since the Proof-of-Performance should be added (Universal Reward Protocol, 2018). Which will be taken into account when the business model is constructed.

6.7.1. KEY RESOURCES

The required resources for the organization running this program are the money and the selection criteria for the products and activities.

For the introduction of the rewarded activities different investments have to be made to enable for a Proof-of-Performance. Even more activities could be rewarded in the future. Therefore, the organization should always be on the look out for new possibilities and could use their own community as a knowledge platform to see

what new possibilities could be explored.

For the option to redeem the subsidies by means of the loyalty program to be a more convenient option to redeem their subsidies, technical knowledge of this solution should be present within the RVO to assist the customers.

6.7.2. KEY ACTIVITIES

Activities necessary for this addition are acquisition and the selection of the products using the selection criteria created. To build even more value for the customers requires for the organization to organize events and maintain the community.

For the provision of the subsidies by the government, selecting the products which are subsidized is a key activity for this addition to work. However, this selection is not a new activity for the government to conduct.

6.7.3. VALUE EXCHANGES

With the construction of the business model for this expansion, the key resources and key activities and their provider became apparent. By zooming in on the actors involved in the provision of this program, the provided resources and the exchanged values will be found.
For this value network the value exchange between the different retailers is believed to be identical as the value exchange for the basic program and is therefore left out of this network for clarity.

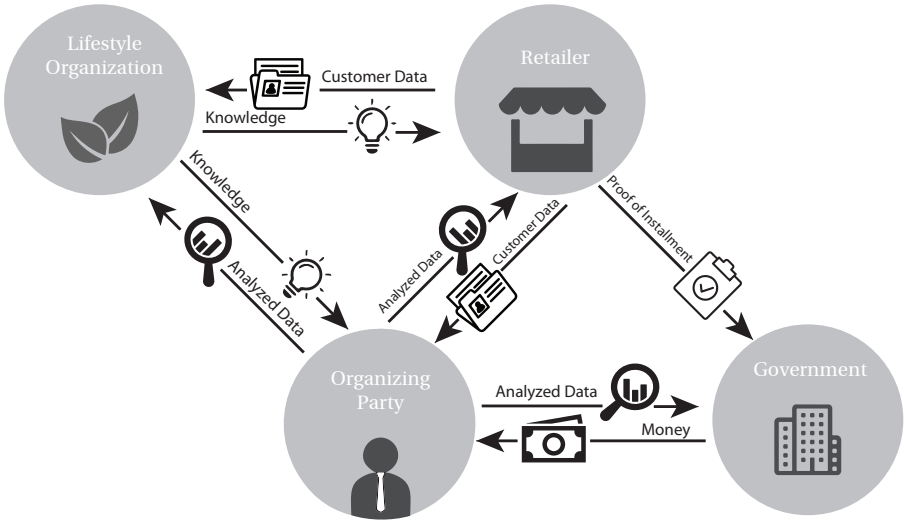

Figure 6.6: Structure of the value network for the lifestyle loyalty program

ORGANIZING PARTY AND LIFESTYLE ORGANIZATION

Once the activities are rewarded different technologies must be adopted and added onto the blockchain-structure. These technologies are to be developed and implemented by the organizing party, or outsourced by them, but they are responsible for managing the technology. Therefore, there should be a constant communication between the organizing party and the lifestyle organization on possibilities for the loyalty program to be expanded. The lifestyle organization could provide insight on what their customers want, based on the online community and events organized.

ORGANIZING PARTY AND GOVERNMENT

The additional costs for this addition should be financed by the government. The benefits for this expansion of the government are an increased adoption of the program and more data on their citizens. This data should

again be analysed by the organizing party and this analysis could be used by the government to tailor their next budget to meet their goals.

GOVERNMENT AND RETAILER

In the specific case of the subsidy for the heat pump, there was also a verification process of the installation in place. By which the RVO assured that a heatpump was installed properly by the proof of instalment provided by a certified contractor. These proofs require the retailer who provides the heatpumps to have a partnership with a certified contractor, such that the retailer could approve for the instalment at the point of sale.

LIFESTYLE ORGANIZATION AND RETAILER

Some of the retailers also promote a sustainable lifestyle (e.g. Marqt [3]). Once the lifestyle organization and such a retailer co-operate, they could both share their data and knowledge to select the right products and by that means support the same lifestyle.

6.8. NON-RETAIL REDEMPTION

For a local loyalty program, different redemption points can be thought of. For the exploration of this option, the sports clubs and the cultural sights were selected. For the matters of this research, both are believed to be ran by a foundation and are therefore non-profit. By which both the sports club and the cultural sight are also foundations which could receive donations from different sponsors. Once these donations are made with points earned by the program, the self-beneficiary reward becomes an altruistic reward (Eason et al., 2015).

As for the lifestyle loyalty, the government could decide to offer additional points to enhance a certain lifestyle, by offering additional points which are only to be redeemed at a sports club when the customer for instance buys his kicks. However, this is considered to be covered by the lifestyle loyalty addition and will not be considered when analysing this expansion of the program.

6.8.1. KEY RESOURCES

The key resource for this expansion of the program are the technological abilities for the multiple added redeeming parties. These parties should be able to handle the points which are redeemed at their places.

6.8.2. KEY ACTIVITIES

In order for this expansion to function the additional redemption points should be promoted. Next to the promotion, it should be clear for the customers on where their points could be redeemed.

6.8.3. VALUE EXCHANGES

With the construction of the business model for this expansion, the key resources and key activities and their provider became apparent. By zooming in on the actors involved in the provision of this program, the provided resources and the exchanged values will be found.
For this value network the value exchange between the different retailers is believed to be identical as the value exchange for the basic program and is therefore left out of this network for clarity.

ORGANIZING PARTY AND GOVERNMENT

The additional costs for this addition should be financed by the government. The benefits for this expansion of the government are an increased adoption of the program and more data on their citizens. This data should again be analysed by the organizing party and this analysis could be used by the government to tailor their next budget to meet their goals.

ORGANIZING PARTY AND SPORTS CLUBS & CULTURAL SIGHTS

The value exchange of the organizing party and the sports clubs and the cultural sights are both similar, since the extra redemption points add to the attraction of the program and provide additional data for the organizing party to analyse. While the addition to the program adds an increase of awareness and users for both the sports clubs and the cultural sights.

[3] https://www.marqt.com/

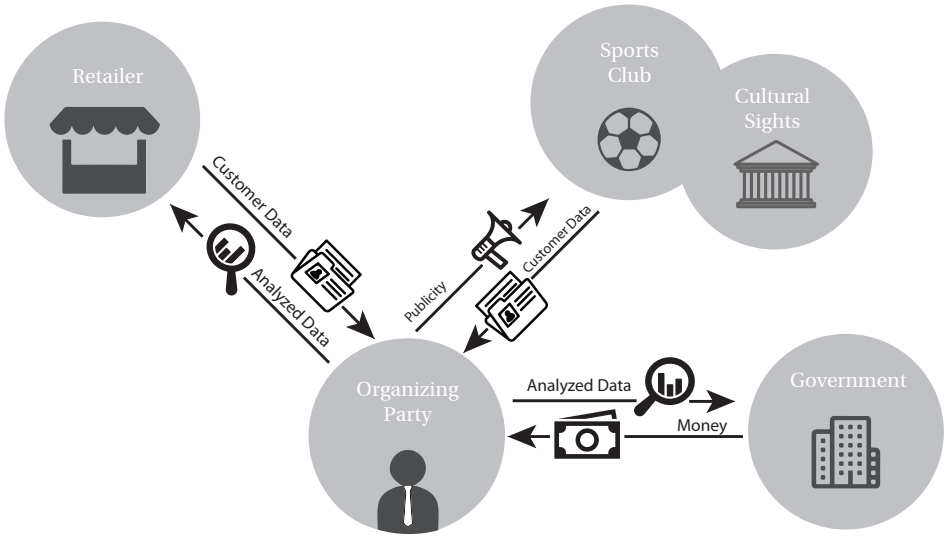

Figure 6.7: Structure of the value network for the non-retail redemption points

6.9. RULES FOR A LOCAL LOYALTY

With the value networks derived based on the different actors and their value exchanges, the rules for the collaboration could be made such that these value exchanges are enabled and that the value propositions of the business models could be delivered to the customer. Guided by the set of design decisions regarding the rules of the loyalty programs, as seen in Table 6.3 , the rules which structure the course of actions are to be found (Scharpf, 1997).

6.9.1. MEMBERSHIP REQUIREMENTS

WHO SHOULD BE ABLE TO JOIN THE PROGRAM?

The additions to the basic program create both the possibility to reach out to the 'day trippers' by means of the discounts at cultural sights and the possibility to reach out to the local citizens by offering them discounts at for example sport clubs, or additional points when the whole family visits a certain hairdresser. Therefore, the program could be used to target both groups and based on the goal of the local loyalty program the membership requirements for the application to the program could be determined.

HOW CAN THE CUSTOMERS JOIN THE PROGRAM?

For the convenience of the customer, the program should have the ability to check the balance for the differently labelled points in the system. Therefore, the option for the mobile application would be the most obvious choice, such that the customer could check his points balance while shopping.

WHAT ARE THE COSTS FOR JOINING THE PROGRAM?

The costs for joining the program are also determined by the customer segment which is targeted. Since these fees increase the future spending of the customers, but would be an extra impediment for the customers to join the program (Eason et al., 2015). Once a loyalty towards the city would be created amongst the day trippers, the costs for joining the program should be absent, since it is assumed that they are only there for one day. If only the local citizens are targeted, these fees could obstruct the adoption of the program, but the loyalty program could generate even more loyal citizens.

6.9.2. PROGRAM STRUCTURE

The FRP structure was chosen because this program structure allows for the additional smart contracts. However, based on the same ledger, also the CTP could be operated by a redeeming party.

Table 6.3: Set of design decisions regarding the rules of the blockchain-based loyalty programs

Design Component	Rules
Membership Requirements	Who should be able to join the program?
	How can the customers join the program?
	What are the costs for joining the program?
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?
Point Structure	What type of token is used?
	When do the points expire?
	Which amount of points results in a reward?
	When does someone qualify for a tier?
	Do people earn extra points when part of a group?
	What dimensions are considered for the point redemption value?
Reward Structure	Utilitarian or hedonistic?
	Self-beneficiary or altruistic?
Program Communication	Who is in charge of the communication?
	When to send the customer updates and messages?
	How personalized is the communication with the customer?
Partnership	Who should be included in the partnership?
	What form of partnership should be chosen?

With the addition of a purely CTP burn partner, meaning that it does not offer any points, but only uses the tier of the customer, the government could use the program as a means to reward citizens who qualify as a loyal citizens based on their loyalty points earned. Since this purely CTP partner does not benefit of the point-pressure of the program and only offers services and products to selected citizens, this CTP party should be financed by the local government, who benefits from the loyalty towards the city.

Next to becoming a loyal citizens towards the local retailers, a producer or lifestyle organization could also use the program and let someone qualify as a customer who is a loyal customer of the brand or of a certain lifestyle, by which he qualifies for selected products and services offered by the producer of lifestyle organization.

Despite the additional value of the CTP, the underlying program structure should always be an FRP by which the parties do have the obligation to issue points and keep the program running. Any individual actor could for himself decided if he wants to offer a CTP on top of that. This program structure could help the retailer to distinguish himself from his competitors.

6.9.3. POINT STRUCTURE

Before the different rules are decided upon for the point structure of the program, at first the underlying token should be chosen.

TYPE OF TOKEN

Three options were presented: a non-tradeable altcoin, a tradeable altcoin, and a regular cryptocurrency. By selecting a tradeable altcoin or a regular cryptocurrency, two problems arise. The first is introduced since the points can be bought on the stock exchange. Therefore, if the customer wants to redeem his points, he could also buy extra points on the stock exchange. The problem which arises when this option is made available is introduced by a short example.

To promote certain products or to try and differentiate oneself from other retailers, an option could be to hand out certain products for less points than their retailer value. However, since the points could be bought on the stock exchange as well, the customer could benefit by buying points and use these points to buy the desired

product at a discounted value. Without having to be loyal to the retailer or to city centre. This type of consumer fraud is referred to as a arbitrage opportunity in the world of economics and is illustrated in Figure 6.8. The customer is able to buy a product with a value of €2,- by only €1,- spending.

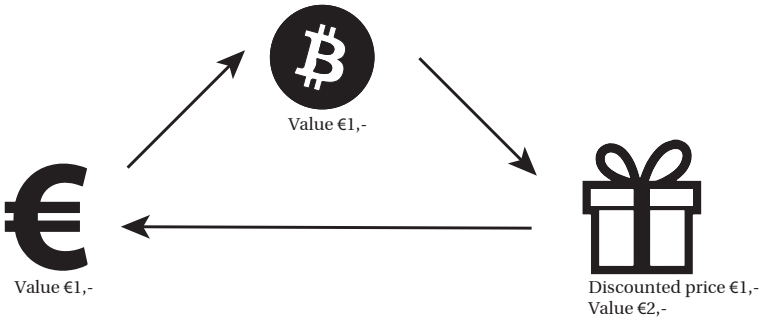

Figure 6.8: Arbitrage opportunity when retailer discounts its rewards

The other problem which arises is the reduced effect of the point-pressure mechanism. Since, the benefits of this mechanism could erode due to the possibility to buy additional points when the customer is short for a certain type of reward.

To prevent these arbitrage opportunities and have still have the point-pressure mechanism a non-tradeable altcoin should be selected. By the selection of this type of token, the points earned in the system could only be spend within the system and if a retailer decides to offer a discount on a reward, the reward could only be paid by the points earned in the system and it is ensured that a local purchase has preceded.

Another consequence of the non-tradeable altcoin is that the customer is not able to exchange their earned points for fiat, such that the earned points could either expire or return to the local economy and generate a local loyalty.

EXPIRATION DATE

Since the underlying program structure is an FRP, the corresponding design decisions for the point structure are the expiration date of the points and the amount of points which have to be handed in to receive a reward. The design decisions associated with the CTP are to be decided upon by the individual participant who offer a CTP on top of their FRP.

The expiration date for this type of program could be set permanently, but could also be dynamic. The idea of a dynamic expiration date is encountered in the application (Chain of Points, 2017) which uses this date to halve the point value and is not encountered in the latest studies on point expiration dates in regular loyalty programs (Breugelmans and Liu-Thompkins, 2017). To stimulate the redemption of the points by the customers, there should be set an expiration date, which is clear at the start of the program, otherwise the sudden expiration date might lead to bad press and disappointed customers. As was the case with the later on added expiration date of the points earned in the AirMiles NL program in 2018. In which 2.9 billion points were bound to expire (van Heerde, 2018).

If the program is targeted at both the local citizens and the day trippers, it is open for everyone to participate resulting in an increase of amount of members. If the 'day trippers' only make small purchases and never come back to spend the earned points, the amount of outstanding points could grow for the participating parties.

AMOUNT OF POINTS FOR REWARD

The amount of points that are issued and qualify for a reward could be set by the individual participants of the program. However, certain rules are to be met. For instance, every participant of the program should issue a minimal percentage of the purchase amount of the customer, in order for every issuing party to participate

equally. If, for instance, a retailer decides to promote a certain product, the retailer should be able to buy extra points and hand those to his customers. As for the reward redemption, the other participants of the program should not be harmed if the redeeming retailer decides to offer a discount, this redemption should be paid for by the redeeming retailer. For a retailer to distinguish himself from his competitors, he could choose to do that at both the issuance or the redemption. For the program to work optimally, a balance should be found between the discount and the amount of points provided. This balance will most likely be found by trial-and-error, but could also be guided based on the retrieved insights in the shopping behaviour of the customers via the loyalty program.

WHEN DOES SOMEONE QUALIFY FOR A TIER?

Each retailer for themselves should determine whether or not a CTP is adopted on top of the FRP. However, when the customer has a different 'tier' qualified for in each store, it might be confusing. Therefore, the rules for the tier qualification must be set beforehand. Most convenient way to qualify for a tier is based on the spending amount of the customer over the different shops. Once a person has qualified for a certain tier, each shop could individually decide which products or services are associated with this tier.

DO PEOPLE EARN EXTRA POINTS WHEN PART OF A GROUP?

The rules for the extra points issued for a group could be decided by the retailer himself. These points should also be subject to the same rules as the points issued by the basic program. Meaning that the points should be available at a minimum amount of redemption points, such that the proliferation of the different points is minimised. The costs for these points should be fully paid by the issuing retailer.

The customers should be able to determine if they are willing to provide the information necessary for the group issuance of points.

DIMENSIONS POINT REDEMPTION VALUE

The value of the points at the point of redemption could differ and this will have to be selected by the retailers themselves. However, certain ground rules have to be established for the program, such as: "the points should be valued 100% at at least 50% of the participating retailers". Also certain organized partnerships could be added to the program. An idea for this asynchronous partnership could for instance be along the lines of the disloyalty card coined by different local coffee shops in England and America (Spors, 2014). By which the local coffee shops co-operate in order to stimulate their business models and join forces against the bigger coffee chains.

Other dimensions on which the points could vary, are options for the retailer to tailor his program and make his points only available at his own store, for specific products sold. Such as a buy "10 cups of coffee and get the 11^{th} for free", on top of the basic program.

6.9.4. REWARD STRUCTURE

The rules for the reward structure are based on two distinctions for the type of rewards offered by the participants.

UTILITARIAN OR HEDONISTIC

Given the possibilities of the program, the retailers could either choose an utilitarian or an hedonistic reward for their customers. By which the type of reward could also highly depend on the type of products the retailer sells. As for example a hardware store has mostly utilitarian products to offer. Since the retailers could only offer the products which are available in their own store, some of the stores might attract other types of shoppers. As for example a store which offers mostly utilitarian products might attract more customers who are looking for financial benefits, the 'cherry pickers' (Bijmolt et al., 2010). Based on the data gathered by the program additional rules are to be set for each different city, since these effects could not be foreseen. The enhanced data-analysis which could be performed thanks to the additional data gathered, could also be used to select the right rewards to redeem.

SELF-BENEFICIARY OR ALTRUISTIC

In the basic program that is offered the gifts could be redeemed at the partnering retailers, which only offer self-beneficiary gifts. However, once the program is extended with multiple non-profit organizations, the program

should also offer the option to donate the points to those parties. By these means the customer could become more attached towards local initiatives and feels that he is helping others by giving something back (Fisher et al., 2008).

6.9.5. PROGRAM COMMUNICATION

The information gathered on the customers could be used to target the customers of the local facilities even better. The design decision taken for the communication corresponding with the targeting are when to send these messages and how personalized the messages are. Both of these decisions are only to be taken for the whole partnership once someone is put in charge of the communication.

WHO IS IN CHARGE OF THE COMMUNICATION?

The objective of the local loyalty program is to enhance the local loyalty of the customers. Therefore, someone with the same objective should be put in charge of the communication, who is most likely someone appointed by the local government with no ties to a commercial party. It should also be guarded by this party that the individual partners of the program, especially the commercial additions to the program, do not use the personal information to reach out to the customers. This targeting by the individual parties might lead to aggressive ways of advertising which could deter customers to use the program and will impede the local loyalty.

WHEN TO SEND THE CUSTOMER UPDATES AND MESSAGES?

The person in charge of the communication should opt for a daily, weekly, or monthly delivery of the offers to the customers. Thanks to the mobile application for the program, the mobile application could also send push-notifications, which could be generated more frequently than a

HOW PERSONALIZED IS THE COMMUNICATION WITH THE CUSTOMER?

The content of these messages consists of the personal offers, which should be automatically generated based on the customers' profile. But could also consist of the promotion of upcoming local initiatives, also based on the customers' interests.

If local loyalty is aspired, the personal offers should not include merely promotion for just the products which are offered, but should focus on the local party which offers the extra points or discount at redemption.

6.9.6. PARTNERSHIP

For the rules on the partnership, every retailer should have the opportunity to be included in the program to offer the maximum value to the customer and actually create a local loyalty. By the introduction of the local loyalty program, the possibility to distinct oneself from another might be endangered and the retailer might act reserved towards this partnership which also includes his competitors. The value proposition of this retailer has to reach further than the added value of the loyalty program itself, since this loyalty program is also offered by the other retailers.

The unique value proposition for this retailer can however be offered on multiple levels, it could be found in the program structure, the point structure, and the reward structure offered by the retailer. The rules for these design decisions and the added value of the individual retailers will be discussed when considering the corresponding design decisions.

WHO SHOULD BE INCLUDED IN THE PARTNERSHIP?

Next to the retailers, also other parties could be included in the loyalty program, the producer, a lifestyle organization, the government, were already introduced. For the loyalty program to be maximizing the potential value of the blockchain technology, these parties should be included, such that it offers more than a regular partnership program. When multiple parties are able to enter the program, thanks to the lowered access barriers offered by the program architecture, the costs for joining such a membership should be decided upon.

WHAT FORM OF PARTNERSHIP SHOULD BE CHOSEN?

To ensure for the program to be structured and that the rules will be followed, a party should be in charge who is able to oversee the process and guide the process when necessary. For the program to create a local loyalty, the program should be tailored to the city and the key partners for this program to function should be included. Therefore, the party in charge of the program should be a local actor, who knows the context of the

city and could also make adaptations when necessary.

Once a partner decides to only offer services and goods for a Customer Tier Program based on the program, he should only have read access on the customer. When a participating party wants to redeem points, the party should also have write access in order to update the points balance of the customer. To protect the data of the customers from the commercial issuing parties, these parties should have only read access on the customers' to whom the points are issued and should only be able to track those points.

6.10. CONCLUSION

In this chapter the fifth subquestion, '*What could a blockchain-based local loyalty program look like?*', is answered. By positioning the collaboration for the blockchain-based local loyalty programs as a value network to create local loyalty, it was found that the actors, their goals, and their resources where necessary for the collaboration to become apparent. The actors involved in the different loyalty programs were introduced with their goals and their resources, after which the business models for these programs were constructed to find the necessary value exchanges, of which the value networks for the different programs were built. With these value networks, the design decisions of the category 'rules' could be taken such that all the design decisions for the blockchain-based loyalty programs were addressed. The rules for the collaboration in order to achieve local loyalty could be found in Table 6.4.

The next chapter will consider the implementation process of a local loyalty program.

Table 6.4: Rules for collaboration within a blockchain-based local loyalty program

	Design Decision	**Rule for local loyalty**
Membership Requirements	Who should be able to join the program?	At least the local customers, when goal of program is also to attract tourists, the enrolment should be open
	How can the customers join the program?	Most convenient for customers is by means of a mobile application
	What are the costs for joining the program?	Depends on the customer segmentation
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?	Each retailer should at least have an FRP
Point Structure	What type of token is used?	Non-tradeable altcoin
	When does someone qualify for a tier?	Determined by individual retailer
	Should the points have an expiry date?	Yes, could either by dynamic or not
	Which amount of points results in a reward?	Set by the retailers, should be reasonable within the expiry range
	Do people earn extra points when part of a group?	Yes, could be set by the individual retailers
	What dimensions are considered for the point redemption value?	Only differing redemption rates amongst different retailers
Reward Structure	Utilitarian or hedonistic?	Depends on the products offered by the retailer
	Self-beneficiary or altruistic?	Non-commercial and local initiatives should have the option for points to be donated
	Will there be differing types of rewards amongst different partners?	Yes
Program Communication	Who is in charge of the communication?	Local non-commercial party
	When to send the customer updates and messages?	Depends on the preferences of the customer
	How personalized is the communication with the customer?	Could be very personalized. Focus should always be on the local retailers and initiatives
Partnership	Who should be included in the partnership?	All local retailers; additional local and commercial parties based on goal of the program, no additional parties? No need for BCT
	What form of partnership should be chosen?	A partnership with a local non-commercial party in charge. The program should have an open enrolment for the local parties.
	How much are my points worth at each partner?	Should be worth 100% at at least a set percentage of retailers

7

PROCESS DESIGN

Subquestion 6: How could a blockchain-based loyalty program be implemented on a local level?

The sixth subquestion will be answered in order to conduct the final activity of the Design Science Research, the evaluation of the artefact. By performing interviews with experts on local loyalty initiatives and on the process of implementing these programs, the implementation process of a local loyalty initiative is derived. The blockchain-based local loyalty program derived will be positioned within this process.

The derived implementation process will be used to structure the decision tree for the local government on the decision to implement a blockchain-based local loyalty program.

7.1. EXPERT INTERVIEWS

The objective of the interviews is to answer the subquestion 'how could a blockchain-based loyalty program be implemented on a local level'. To grasp this process, different experts in the field of local retail projects where interviewed.

7.1.1. INTERVIEW GUIDE

An interview guide, which could be found in Table G.1 in Appendix G, was used to guide the interviews and certify that all topics are covered (Salkind, 2010, page 634). This interview guide is divided in four categories: Introduction, Ground Rules, Questions and Probes, and, Thank You and the Next Steps (Harrell and Bradley, 2009). Probes are defined as questions supporting the interviewer to follow up on incomplete or unambiguous answers (Salkind, 2010, page 634) in order to get a more detailed and elaborate response (Harvard Department of Sociology, 2017). To reduce the involvement of the researcher's own (subjective) "cultural endowment" (Fielding and Thomas, 2008) when creating the questions in the interview guide, the structure is derived from theory on process design of de Bruijn et al. (2010) and the dimensions mentioned by Koppenjan and Groenewegen (2005). This approach ensures that all relevant topics for the design of a process are included.

7.1.2. SELECTION OF INTERVIEWEES

For the selection of the interviewees, purposive sampling is used. This method of sampling ensures that the selected cases, experts in this case, were chosen specifically because they "can teach [...] a lot about the issues that are of importance to the research" (Boeije, 2010, page 35). The sample sizes typically remain small (Boeije, 2010; Yin, 2011) and are preferably determined by the point of saturation (Dworkin, 2012; Mason, 2010).

The definition of an expert used is a person who "has knowledge, which she or he may not necessarily possess alone, but which is not accessible to anybody in the field of action under study" (Meuser and Nagel, 2009, page 18). For the sampling of the experts, Meuser and Nagel (2009) identify an expert as a "potential informant"

if the expert "possesses an institutionalised authority to construct reality" (Meuser and Nagel, 2009, page 19). Therefore, the experts selected for the interviewees should be possessing specific knowledge and has to be able to exert his knowledge within the field of study.

Guided by the definition of Meuser and Nagel (2009) and the criteria for the sample size, at first David Lansen who works as the centre manager of Delft (NL) was interviewed in person. During the course of this interview, new interviewees were selected based on the knowledge Lansen has from within the field. Jan-Willem Janssen and Rob Weiss were proposed by Lansen. Of which Janssen is the director of a company advising the local retailers to distinguish themselves from the online retailers [1] and Weiss is the director at project office "IkOnderneem!", an initiator and guide of innovative projects [2]. The latter participated in the project for the city of Roosendaal (NL), which recently adopted a local loyalty program. The interview with Weiss provided in-depth knowledge about the implementation process of the local loyalty program of Roosendaal. By which it was believed that the point of saturation was reached for the knowledge on the implementation of local loyalty programs in general.

7.1.3. DATA COLLECTION

To prevent data loss as much as possible as well as to prevent the researcher from disturbing the interview by the need to make notes extensively(Fielding and Thomas, 2008; Hermanowicz, 2002), all interviews were recorded. Afterwards, the data was transcribed verbatim as quick as possible since the understanding of possible ambiguous statement by the experts was still fresh in mind. Additionally, verbatim transcription, in comparison to selective transcription, minimises loss of data that could turn out to be valuable in the analysis later in the research process (Fielding and Thomas, 2008).

7.1.4. DATA-ANALYSIS

In a deductive approach, the theoretical concepts listed in the interview guide are used as a guide during the process of analysis (Braun and Clarke, 2006), since for this research guidance by theoretical concepts is preferred deductive thematic analysis was chosen which allows for segmentation of the data in a systematic way (Boeije, 2010). Given this approach, the data was coded "by viewing the data through a certain theoretical lens" (Boeije, 2010, page 88), also known as 'theoretical sensitivity'. The theoretical lens used in this analysis are dimensions of the design of the process offered by de Bruijn et al. (2010) and Koppenjan and Groenewegen (2005).

The interviews were conducted in Dutch and the verbatim transcripts of the interviews are also in Dutch and are also available on the repository[3]. The remarks of the interviewees which were deemed relevant to be quoted throughout the course of the chapter are translated in English, to increase the readability of this report.

7.2. IMPLEMENTATION PROCESS LOCAL LOYALTY

During this section the implementation process of a local loyalty program is researched. The performed interviews guided the consideration of the participants of the process, the auxiliary conditions and the steps conducted during the implementation process. During the course of this section there will be referred to the local loyalty program, as a local loyalty initiative, and not as a blockchain-enabled local loyalty program, since the technology should be the means and not the goal (Weiss). As the goal for the implementation of a local loyalty initiative is to create loyalty and gain knowledge about the customer (Lansen, Janssen, Weiss). With that goal in mind Janssen even stated:

> *I believe 100% that loyalty is one of the rescues of the physical retail. If that does not succeed they will lose the battle to the online retail, since they are already using the loyalty* (Janssen)

Before the implementation phase could begin, first a decision-making phase should precede (de Bruijn et al., 2010). For the construction of the overarching process de Bruijn et al. (2010) mention four core elements: openness, protection of core values, progress, and substance. To create *openness* in the design the participants of the process should be known, for the *protection of the core values* of these participants, the core values should be known. In order to let the process have the required *progress*, an actor should be appointed who

[1] https://www.shiftadvisor.nl/overshiftadvisor/
[2] http://www.ik-onderneem.nl/
[3] http://repository.tudelft.nl/

Table 7.1: List of interviewees

Interviewee	Job title and affiliation with loyalty programs	Date of interview
David Lansen	centre manager Delft	August 31, 2018
Jan-Willem Janssen	Director of Shift Advisor	September 6, 2018
Rob Weiss	Director at IkOnderneem!	September 7, 2018

provides the command and control of the process, this role should be appointed beforehand. For the process to be *substantive*, experts, with no final ruling, should be included in the process. It should be known which experts are needed in the process to have substantive input.

7.2.1. PARTICIPANTS

At first, the actors and their core values will be introduced before the roles, conditions and the implementation process will be researched.

During the prior chapters of this research, multiple actors are considered when designing and assessing the loyalty programs. For the implementation process of a local loyalty program however, according to the three interviewees, there are three parties who always need to be included when implementing a local loyalty initiative: real estate, retailer, and local government (Lansen, Janssen, Weiss), also referred to as the golden triangle (Janssen, Weiss).

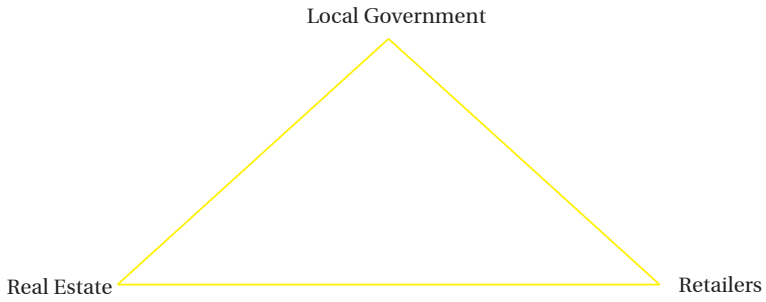

Figure 7.1: Golden triangle for the implementation of local initiatives according to (Janssen, Weiss)

These three actors, who operate very solitary (Weiss), will be introduced and be directive for this implementation process.

REAL ESTATE PARTIES

The real estate operative on a local level is either related to a planned shopping area (e.g. Alexandrium [4]) or an unplanned shopping area, such as a city centre (Lansen, Janssen). In the latter, the properties will be divided amongst different real estate parties (Lansen, Janssen), creating an even more complex technological system. Even though the values of these real estate differ and are unique for each situation (Janssen), the common denominator for these parties is that they want to rent out there properties (Janssen, Weiss).

> *We know that the real estate party does not care whether the buildings are empty, as long as they are receiving their money and are able to rent the place out, regardless of whom it is* (Janssen)

It is important that these real estate parties will be incorporated in the process, since they could also benefit from the loyalty initiative. The first response of such parties however is "Good for them [the retailers], that

[4] https://www.alexandrium.nl/

they want to organize an action and want to reward prices and such, but why would I participate?" (Weiss). Therefore, the argument for their participation should be framed within the lines of their core values. These values are on the renting out of their properties. Once such a local loyalty initiative is initiated and will be used, the real estate party could also use this information to target the audience for their property better, by guaranteeing a certain amount of traffic at a specific property (Weiss).

LOCAL GOVERNMENT

The next actor of the golden triangle is the local government, of these three actors, "the local government is the best organized party" (Lansen), while the other parties are operating individually and often without a strategy (Weiss). "The local government benefits from a good local economy in their city centre" (Lansen), which could be enhanced by a local loyalty initiative and is reached by implementing policies. For these local initiatives to perform optimally and address the right critical points, the right information is needed, which could be generated by a local loyalty initiative (Janssen). The local government on the other hand, also operating solitarily, feels as if that it not something of added value for them and that they should leave it to the retailers (Weiss).

Some of the local governments also has a centre manager who is responsible for the connection between the different acting parties in the city centre, as Lansen for instance is in Delft.

> *A good centre management ensures that its not his only business to serve the entrepreneurial interests of the government and the other parties present in the city. A good centre management also ensures that events are being organized and that everything the retailers and the centre management are undertaking does lead to more customers in the centre, who stay longer and spend more* (Lansen)

RETAILERS

The final group of actors are the retailers, which were already considered as a group of actors throughout the course of the research.

> *A retailer is just doing something, he buys stuff and tells everyone with a loud voice that he has stuff, a bit exaggerated. He has not learned to see which customers are buying his products: "everyone is my customer". No, of course not, if you run a bridal fashion store, not everyone is your customer, only the customers who are planning to get married. However, they keep saying that everyone is their customer. So the lack of knowledge of who could be buying your products and who is actually buying your products, so the potential and actual customer and their corresponding profiles, motivation, and the time slots when they are shopping and so forth, practically nobody is concerned with that* (Weiss)

Hence the retailer believes that he does not need to gain additional information on the customer, Weiss states that if 10% of the retailers in a city centre would use the data even a little bit, that would be much. Even if the retailer would have considered such an initiative, the retailer is biased by the previous attempts which had contained all sorts of promises, but did not work out for the retailer, without realising his own share in this failed initiative (Janssen).

Even if the retailer realises and is willing to admit that his way of doing business is out-dated, another core value of the retailers appears: the resistance to co-operate with the other retailers. A part of this resistance comes from the absence of the necessity seen for the data on their customers, another part of this resistance is based on the protection of their own customers and the fear of providing the competition with valuable data on their customers (Janssen, Weiss). Once the retailers want to get to know their customers they have to realise that a bakery and a butcher shop share 50-60% of their customers, so they are basically serving the same customers (Janssen) instead of getting robbed by the competition (Weiss).

The final remark on this group of actors is the organization of which. The retailers are often part of a retailers association (Lansen, Weiss), this retailers association however, has a board which manages this association in its spare time, creating an amateurishly organized association (Weiss).

7.2.2. ROLES

Once these actors are known and their core values are taken into account, the roles should be appointed for the assurance of the progress during the process. The most important role to appoint is the party which practices

the command and control. Janssen and Weiss share the opinion that it definitely should not be the "ICT-guy", for the process is more than just the technology, the process requires a closer relationship and understanding of the different parties involved. While the ICT-guy might be thinking "this is a perfect system, why do they not use it?" (Weiss). de Bruijn et al. (2010) refer to these qualities as "managerial creativity and sensitivity" (page 63).

The command and control should on the other hand always be exercised by a local actor, such as the centre manager (Janssen, Weiss). Since he is the actor who should be using the data and is responsible for the collaborative processes (Lansen).

For the role of the expert providing the substance for the process, Weiss, who is such an expert, claims that such an expert party should be present to point out the opportunities, but that the centre manager should be seizing these opportunities.

7.2.3. AUXILIARY CONDITIONS

The first condition identified for the implementation process is that it should be appealing for the actors involved. Creating a situation in which each actor could contribute to the decision-making with a protection of their core values (de Bruijn et al., 2010). Lansen argues that a distinction could be made between the retailers who want to co-operate with other retailers and sees the necessity of the co-operation and the group of retailers who only focuses on his own shop (Lansen). This latter group of retailers is needed to form a group of early adopters and the early majority (Rogers, 1965), which should account for roughly 20-25% of the retailers in a town (Weiss). Once these 20-25% of the retailers are reached, it was seen throughout the implementation of local loyalty initiatives in 40 shopping areas helped by Weiss, that the action was noticed by the customers as being an action conducted by the local retailers instead of being a promotion of a single shop.

Once such a critical mass is obtained, the shopping area is "ripe for the market" as Lansen calls it, referring to the retailers who should be aware that they have to co-operate for such a local loyalty initiative to work. When the shopping area is not ripe for the market, this initiative will not work (Lansen).

Even though it might feel obvious, the process for implementing the local loyalty initiative should in the core fulfil the needs of the end-user, the customer (Lansen).

7.2.4. STEPS DERIVED FOR IMPLEMENTATION PROCESS

By analysing in a deductive manner, different steps for the implementation process were identified by means of the interviews. These different steps are introduced and are essential for the implementation process of a local loyalty initiative. The steps represent the implementation process in a chronological order.

PERFORMING EXPERT JUDGEMENT

Both Weiss and Janssen, state that not all areas are qualified for the implementation of a local loyalty initiative. At first a concise analysis of the area has to be performed by an expert, in which Janssen says that he will just walk through the city and ask difficult questions, based on the reactions to these questions he will start his process. Weiss conducts this analysis on a more institutional level, by which his requirement to proceed to the next step of the process is to see if the retailers' association is co-operating instead of drinking coffee together. If the latter is the case: there is no need to even consider such an initiative (Weiss).

PREPARING

The next step in the process is the preparation before the retailers and other local parties are officially approached. Before the next step is taken a lot of preparation already have to be done, such as the stakeholders analysis, otherwise the process and dynamics between the actors cannot be understood (Janssen). Lansen also refers to the communication plan, which describes the business model and an implementation plan. The latter include which licenses and subsidies are needed and who is going to finance the program (Lansen).

CONVERSING

Once these steps are taken, all three of the interviewees mentioned the organizing of an evening for the local actors, to present the initial ideas and to create a sense of urgency (Lansen, Janssen, Weiss). These ideas should be clear, thought-out, and tailored to the local retailers (Janssen). If on such an evening it turns out that

nobody shows up, or that if the parties who do show up are not willing to co-operate, or do not see the added value of the presented solution, the process should be stopped immediately (Janssen, Weiss). If however, more than 20% is willing to co-operate, these retailers who are willing should be used and the next step could be conducted (Weiss). The other retailers will follow if the program will become a success (Janssen).

CREATING THE PROGRAM OF REQUIREMENTS

Based on the retailers who are willing to co-operate, the process could proceed to the phase in which the plan for the local loyalty initiative emerges. This plan should be focused on the institutionalization of change (Janssen, Kotter, 2014). Therefore, Weiss only co-operates with people who are willing to make a long-term commitment to the idea. This commitment will only be made when the trust of the retailers is earned, which grows over time, by conversing and giving presentations to the actors (Weiss).

Once the trust is earned the program requirements should be drawn up based on the long-term commitment and long-term vision for the local loyalty (Janssen, Weiss). With these program requirements the technology which fits the requirements best is chosen (Weiss).

ADAPTING AND EXPANDING

Based on this technology the pilot version will be implemented since the technologies and solutions implemented are not proven yet (Janssen, Weiss). Based on this pilot version the program should be adapted and expanded such that the technology and the program will fit the needs of the participants and could be expanded.

Think carefully about every part. Twist that piece, tinker it, do it carefully, just as with the communication of the promises (Janssen)

In the previous projects performed by Janssen, these steps were not always performed successfully. Once these step are not performed well, it was seen that a party willing to co-operate could turn into an enemy (Janssen). During these final steps of the process, support should always be provided, both technical (Janssen) and organizational (Weiss).

7

7.2.5. LITERATURE ON INNOVATION

The steps identified and described for the implementation of a local loyalty initiative closely resemble the literature on innovation described by two widely adopted models: Design Thinking and Lean Startup (Mueller and Thoring, 2012; Plattner et al., 2009; Ries, 2011; Thoring and Mueller, 2011). Both of these models represent the innovation process as a user-centred process. The model as identified by Plattner et al. (2009) focuses on the customer and sees the innovation process as a means to solve a wicked problem (Plattner et al., 2009; Rittel and Webber, 1973). The corresponding steps identified in the design thinking are all also identified in the process for the implementation of a local loyalty initiative, despite having different names. For the lean startup method the first three steps of the design thinking are skipped (Mueller and Thoring, 2012), but the steps corresponding with the adapting and expanding of the program, by means of a Minimum Viable Product (MVP) are more extensive (Ries, 2011).

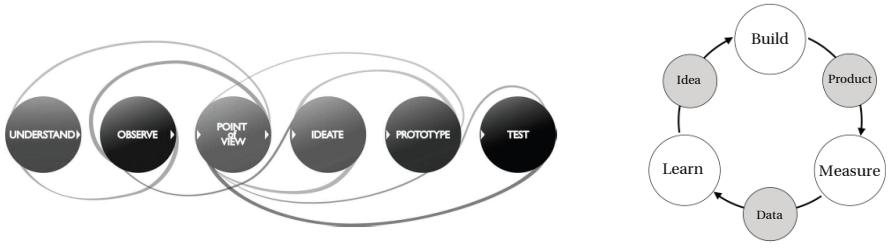

Figure 7.2: The process of both design thinking (left) and lean startup (right) (Plattner et al., 2009; Ries, 2011)

7.3. TRANSLATION TOWARDS BLOCKCHAIN-BASED LOYALTY

[on the perfect technology] No, that does not exist, that is my firm conviction. I do not believe IT people who tell that they can do anything. (R. Weiss, personal communcation, September 7, 2018)

When the local loyalty initiative to be implemented is a blockchain-based local loyalty program, the steps identified for the implementation of a local loyalty initiative should be conducted as well. However, not all steps of the process are depending on the technical solution of the loyalty program. The first step during which the technology chosen for the loyalty initiative is encountered is during the final stages of the creation of program requirements, based on these requirements a technology fit for the provision of the program should be selected.

For a loyalty program which might enjoy the expansions made possible by the addition of smart contracts, and therefore the additional extra actors unto the loyalty program, blockchain technology might be selected. Also for this loyalty program, at first the basic program should be enrolled to perform as a prototype or MVP. Based on this basic program, the adapting and expanding step could be performed.

Since an expansion of the loyalty program by means of a smart contract does not only require a scalable technological solution, but could also introduce new participants to the loyalty program, such as the producer or a lifestyle organization, a distinction is made between the adaptation and the expansion of the program. The adaptation of the program is more focused on the improvement of the MVP as was identified in the Lean method by Ries (2011). The faster this endless circle of activities is been used and the product is improved by the user- and data-driven input, the better the product is adapting to the end-user of the program (Ries, 2011).

When the program is expanded, also new groups of actors are introduced into the multi-actor decision-making process. Therefore, the MVP could not simply be built, but a new understanding of the current situation should be derived and the wicked problem present has changed, and therefore its solution might have changed as well (Plattner et al., 2009; Rittel and Webber, 1973).

Since the program is easily expandable by smart contracts, the building of the renewed MVP will not take much effort. The measuring of the user-experiences is already been done by means of the basic loyalty program, and this data should already be accessible for the party in charge. The final step of the lean startup model, learning, is the hardest step during the expansion of the program. Guided by a local actor with managerial creativity and sensitivity, the implications of the new possibilities as sketched within the prior chapters of this research, should be explored.

7.4. CONCLUSION

In this chapter the sixth and final subquestion, *How could a blockchain-based loyalty program be implemented on a local level?*, is answered. By conducting multiple expert interviews, the implementation process for a local loyalty initiative was derived. Different key actors, their roles, and auxiliary conditions for the implementation process were determined. The implementation process for a local loyalty initiative consists of five different steps which closely resemble the Design Thinking method of Plattner et al. (2009): Performing Expert Judgement, Preparing, Conversing, Creating the Program of Requirements, and Adapting and Expanding. This process should be guided by the program of requirements constructed by the collaboration of the centre manager, an expert, and the golden triangle (retailers, real estate party, and the local government) and should be done incrementally, starting by a simpler version of the program.

Once there is opted for a blockchain-enabled program as a local initiative, at first the basic program should be introduced and adapted to the needs of the users. Once it is determined that this basic program should be expanded upon by the use of smart contracts, the earlier steps as identified by Design Think should be conducted, started by an understanding of the problem which is tried to be resolved by the usage of smart contracts. The centre manager is expected to use his managerial creativity to look for possible adaptations and expansions of the loyalty program, fitting the needs of the city.

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8

CONCLUSIONS AND DISCUSSIONS

Which decision tree can support local governments to decide on the implementation of a blockchain-based local loyalty program?

8.1. CONCLUSIONS

In order to obtain the research objective *to enable the local government to decide whether a local loyalty program will contribute to the promotion of the city centre and to decide whether this loyalty program has to be blockchain-based*, first the main research question was derived: '*Which decision tree can support local governments to decide on the implementation of a blockchain-based local loyalty program?*'. In order to find the answer to this research question, this question was divided into six different subquestions guided by the Design Science Research, by which the answers of these subquestions provide the input for the answering of the main research question.

Given the novelty of the blockchain technology, no research was found in the literature on the application of blockchain technology for loyalty programs. Therefore, the first three subquestions were used to research the blockchain-based loyalty programs, after which the translation was made towards the local loyalty.

The first subquestion *What does the problem domain for blockchain-based loyalty programs look like?* was used to define the problem domain. The literature of both blockchain technology and loyalty programs was explored to understand the technology and the constructs of a loyalty program. Subsequently the 'grey literature' was used to explore the opportunities supposedly offered by initiators of different blockchain-based loyalty programs for both the retailers and the customers.

The blockchain technology enables to create an immutable and transparent distributed ledger. Thanks to the additional features, referred to as blockchain 2.0, the technology offers the ability to interoperate with other blockchains and smart contracts can be implemented on the technology. The latter enables for the application of contracts on the ledger. By building trust within the system, the middle man, and the corresponding paper work, can be omitted. By the exploration of the loyalty programs, it was found that it is hard to measure and establish actual loyalty amongst the customers, since the loyalty measured is behavioural and program loyalty instead of attitudinal and company loyalty. Novel opportunities for loyalty programs were identified within the grey literature on the blockchain-enabled loyalty programs. The opportunities were however unstructured with respect to the loyalty programs and it was not clear what program architectures are possible and how they relate to the current loyalty programs.

To structure the opportunities found in the grey literature, the design of the regular loyalty programs was explored by means of a structured literature review. This literature review resulted in six design components for

Table 8.1: Design decisions for a blockchain-based loyalty program

Membership Requirements	Who should be able to join the program? How can the customers join the program? What are the costs for joining the program?
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?
Point Structure	When does someone qualify for a tier? Which amount of points results in a reward? When do the points expire? Do people earn extra points when part of a group? * What dimensions are considered for the point redemption value? * What type of token is used? *
Reward Structure	Utilitarian or hedonistic? Self-beneficiary or altruistic?
Program Communication	When to send the customer updates and messages? How personalized is the communication with the customer? Who is in charge of the communication? *
Partnership	Who should be included in the partnership? What form of partnership should be chosen? How much are my points worth at each partner? *
Blockchain	Does the program exchange information with other systems? *

* Design decisions added due to addition of blockchain technology

a loyalty program: membership requirements, program structure, point structure, reward structure, program communication, partnership. By using these design components, the opportunities found in the grey literature were structured and additional design decisions were identified. A new design component, 'blockchain', was added for the opportunities which did not fit within the design components for the regular loyalty programs.

By the introduction of blockchain technology to the loyalty programs, one of the design decisions for the regular design decisions is not relevant anymore, which is the decision on a stand-alone loyalty program or a partnership, since it was argued that the blockchain addition is not of added value if a stand-alone loyalty program is adopted. The overview of the design decisions can be found in Table 8.1.

Given these design decisions, the third subquestion, *Which different blockchain-based loyalty program architectures can be derived?*, could be answered. By addressing the set of design decisions concerning the program architecture, different program architectures were derived. The different program architectures could be divided into two groups, the Frequency Reward Programs (FRP) and the Customer Tier Programs (CTP). In the FRP the points used in the system do have a value, while in the CTP, the points only represent the amount of purchases made, but do not have any value. It was found that an FRP structure could be easily expanded with a CTP.

For both the FRP and CTP structure, multiple partnership programs were modelled using Business Process Modelling (BPMN). By the use of the business models, it became apparent that the partnership programs, in terms of the program architecture, could easily be entered by multiple partners. With the addition of the blockchain technology the loyalty program could be easily expanded by means of smart contracts, which was explored by addressing the set of design decisions concerning smart contracts. These expansions of the program resulted in a third group of program architectures, labelled as Blockchain-Enabled Addition in Table 8.2. The modelling of the business processes showed the creation of the smart contracts and showed what is needed to do in order to add new smart contracts to the loyalty program. It showed that if the blockchain-technology is used as an underlying technology, only the rules for the smart contracts need to be stated, which in turn could be implemented unto the program.

Table 8.2: Derived programs from the design decisions

Program Structures	
Customer Tier Program	One earn partner, multiple burn partners
Customer Tier Program	Multiple earn partners, one burn partner
Customer Tier Program	Multiple earn partners, multiple burn partners
Frequency Reward Program	One earn partner, multiple burn partners
Frequency Reward Program	Multiple earn partners, one burn partner
Frequency Reward Program	Multiple earn partners, multiple burn partners
Blockchain-Enabled Addition	Group loyalty
Blockchain-Enabled Addition	Channel loyalty
Blockchain-Enabled Addition	Lifestyle loyalty

After the derivation of the program architectures, the fourth subquestion, *Which blockchain-based loyalty program architecture could be of added value to create local loyalty?*, was used to translate the blockchain-based loyalty programs into a local loyalty program. By assessing the derived program architectures, it was found that the added value for both the retailers and the customers is in the addition of the smart contracts expansions on top of a Frequency Reward Program. These expansions are the channel loyalty, lifestyle loyalty, and group loyalty. To translate the blockchain-based loyalty program to a local solution, Delft was used as an example for implementation, showing that the option to add sport clubs and cultural sights of the city should be available as well. Given the ability of the blockchain-based program to be easily expanded, the same program could be used with an addition of the sport clubs and cultural sights: non-retail redemption points.

To provide the smart contract expansions and to enable non-retail redemption the selected program architecture which adds most value to the creation of local loyalty is a blockchain-based Frequency Reward Program, with the expansions of channel loyalty, lifestyle loyalty, non-retail redemption, and group loyalty (Figure 8.1).

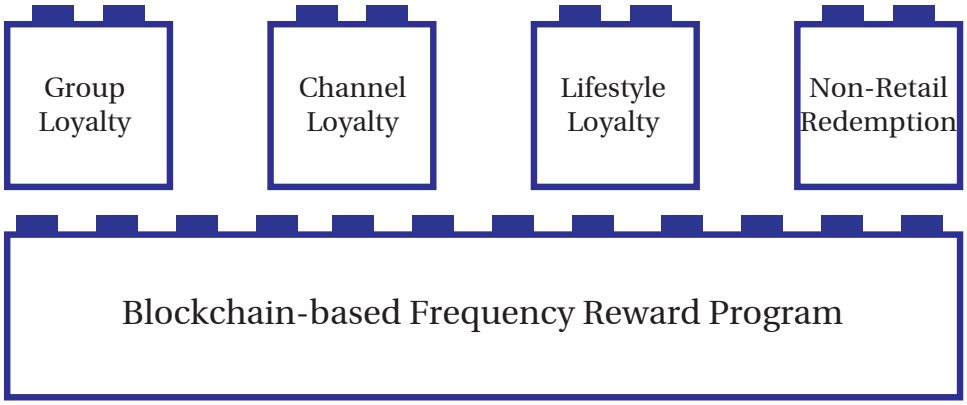

Figure 8.1: Building blocks for Blockchain-Based Local Loyalty Program

The fifth subquestion, *How could a blockchain-based loyalty program be implemented on a local level?*, is used to demonstrate the derived blockchain-based loyalty program. By positioning the collaboration for the blockchain-based local loyalty programs as a value network to create local loyalty, it was found that the actors, their goals, and their resources where necessary for the collaboration to become apparent. The actors involved in the different program architectures were introduced, after which the business models for these programs were constructed to find the value exchanges necessary to create local loyalty. These value exchanges were to to build value networks for the different program architectures. With these value networks, the set of design decisions concerning the rules of the program could be taken such that all the design decisions for the blockchain-based loyalty programs were addressed. The rules for the collaboration in order to achieve local

loyalty can be found in Table 8.3.

Table 8.3: Rules for the institutional design of a blockchain-based local loyalty program

	Design Decision	Rule for local loyalty
Membership Requirements	Who should be able to join the program?	At least the local customers, when goal of program is also to attract tourists, the enrolment should be open
	How can the customers join the program?	Most convenient for customers is by means of a mobile application
	What are the costs for joining the program?	Depends on the customer segmentation
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?	Each retailer should at least have an FRP
Point Structure	What type of token is used?	Non-tradeable altcoin
	When does someone qualify for a tier?	Determined by individual retailer
	Should the points have an expiry date?	Yes, could either by dynamic or not
	Which amount of points results in a reward?	Set by the retailers, should be reasonable within the expiry range
	Do people earn extra points when part of a group?	Yes, could be set by the individual retailers
	What dimensions are considered for the point redemption value?	Only differing redemption rates amongst different retailers
Reward Structure	Utilitarian or hedonistic?	Depends on the products offered by the retailer
	Self-beneficiary or altruistic?	Non-commercial and local initiatives should have the option for points to be donated
	Will there be differing types of rewards amongst different partners?	Yes
Program Communication	Who is in charge of the communication?	Local non-commercial party
	When to send the customer updates and messages?	Depends on the preferences of the customer
	How personalized is the communication with the customer?	Could be very personalized. Focus should always be on the local retailers and initiatives
Partnership	Who should be included in the partnership?	All local retailers; additional local and commercial parties based on goal of the program, no additional parties? No need for BCT
	What form of partnership should be chosen?	A partnership with a local non-commercial party in charge. The program should have an open enrolment for the local parties.
	How much are my points worth at each partner?	Should be worth 100% at at least a set percentage of retailers

By following the activities of the Design Science Research, the demonstrated artefact should now be evaluated, which is done by means of the sixth and final subquestion, *How could a blockchain-based loyalty program be implemented on a local level?*. By conducting multiple expert interviews, the implementation process for a local loyalty initiative was derived. Different key actors, their roles, and auxiliary conditions for the implementation process were determined. The implementation process for a local loyalty initiative consists of five different steps which closely resemble the Design Thinking method of Plattner et al. (2009): Performing Expert Judgement, Preparing, Conversing, Creating the Program of Requirements, and Adapting and Expanding. This process should be guided by the program of requirements constructed by the collaboration of the centre manager, an expert, and the golden triangle (retailers, real estate party, and the local government) and should be done incrementally, starting by a simpler version of the program. Once there is opted for a blockchain-enabled program as a local initiative, at first the basic program should be introduced and adapted to the needs of the users. Once it is determined that this basic program should be expanded upon by the use of smart contracts, the earlier steps as identified by Design Think should be conducted, started by an understanding of the problem which is tried to be resolved by the usage of smart contracts. The centre manager is expected to use his managerial creativity to look for possible adaptations and expansions of the loyalty program, fitting the needs of the city. The feasibility of such an implementation process depends on the managerial capabilities of the centre manager and the willingness to share the customers by the local retailers.

8.1.1. CONSTRUCTION OF THE DECISION TREE

By deriving the different blockchain-based local loyalty program architectures from literature, demonstrating them and positioning the choice of the program architecture within the implementation process of a loyalty

initiative, a structured approach is used to derive a blockchain-based local loyalty program. With the answers on the research questions the decision tree can be constructed and the main research question can be answered. This tree focusses on the local government as actor.

The decision tree starts at the problem which led to the consideration of a local loyalty program: the vacancies within the city centre. It was however identified by Neer (2017) that also a reduced liveability, a reduced number of visitors, and reduced revenues of the retailers might inflict more retail vacancies. Therefore, either of those possible encountered problems might be the starting point for the local government for the decision tree to consider a local loyalty initiative. This consideration is guided by the derived steps for implementation: Performing Expert Judgement, Preparing, Conversing, Creating the Program of Requirements, and Adapting and Expanding. Which are used as phases for the decision tree.

PERFORMING EXPERT JUDGEMENT

Before the an expert should judge the situation within the city centre, at first a few checks can be derived, based on the expert interviews conducted and the value networks constructed. From which appeared that the organizing party should be conducting the data-analysis and should exchange that with multiple parties. The interviews showed that the organizing party should be regulated by a local actor, such as a centre manager.

Once such an actor is appointed, it should be asked whether or not the retailers, local government and the real estate parties are willing to co-operate, since this golden triangle is key for a local initiative.

Finally it should be known if at least 20% of the retailers is willing to share their customer data with their competitors.

PREPARING AND CONVERSING

Even though these two steps for implementation are of utmost importance, to guide the initial decision on the consideration for the implementation of a blockchain-based local loyalty program, these two steps are omitted and been taken care of by the estimation of the support the retailers.

CREATING THE PROGRAM OF REQUIREMENTS

Given the inefficient current loyalty programs blockchain technology was proposed to address these problems. Guided by the opportunities derived from grey literature different program architectures were derived. It was found that for the blockchain-based program to be of added value, the expansions enabled by means of the smart contracts provided the edge over the current loyalty programs. To derive at a guide to decide on the program architecture and on a blockchain or non-blockchain-based solution the problems encountered with the current loyalty solutions are approached from the light of the local loyalty program.

Problems Encountered

Six problems were identified throughout the introduction, the first problem is that there is an abundance of loyalty programs from the customers' perspective, when applying a local loyalty initiative, this amount of loyalty programs will be reduced. The second problem was the inactivity of the customers on the loyalty programs of which they are a member, by creating a program which spans multiple retailers within their home town, more applications of the loyalty program are created for the customer, by which the customer will be more active in the program. The next problem identified was the focus of the retailers on the data and not on the loyalty, this problem is not addressed by the local loyalty program offered. The fourth problem, the privacy concerns of the customers, are not addressed with the current methods of the blockchain technology. However, the program could be programmed such that the zero knowledge proofs could be implemented when they are ready for adoption. The increase of the online marketing and the corresponding decrease in the physical retail is addressed by means of this local loyalty program. Which, if implemented correctly, should stimulate the customers to go to the city and buy their products at a physical store. The final problem, which was actually a solution, was the demand of the customers for more personalized offers and communications. By means of an extensive local loyalty program, the customers could be targeted better and a broader range of offers could be provided to them.

Necessity to Use Blockchain Technology

By addressing five out of the six problems identified, the blockchain-based local loyalty program proposed could provide a lot of possibilities for the local retailers. However, only one of those five solutions depended

on blockchain technology, and this solution, the zero knowledge proof, is not even ready for implementation. Therefore, one might ask: is the addition of the blockchain-technology even necessary? The answer found by means of this research is: it depends. Since the addition of the smart contracts, either temporarily or continuous, and therefore a more elaborated and flexible loyalty program, is not easily conducted by the means of a regular program. Once these possibilities offered by the smart contracts are believed to be relevant for the city implementing the local loyalty program, the blockchain-technology could be used. If this is not the case, the local retailers should focus on the co-operation with the other local retailers in order to attract more customers, instead of focusing on new technological solutions.

ADAPTING AND EXPANDING

The phase of adapting and expanding is added to the decision tree to stress the importance of the implementation of a pilot version before the actual program is implemented.

The decision tree based on the research conducted on the blockchain-based local loyalty initiative can be found in Figure 8.2.

8.2. CONTRIBUTIONS

The contributions provided by this research are both of scientific and managerial nature.

8.2.1. SCIENTIFIC CONTRIBUTION

Both the topics of blockchain-based loyalty programs and local loyalty programs were absent in academic literature. This research filled both these gaps and also introduces a new application for the blockchain technology in the academic literature: the blockchain-based local loyalty programs.

The activities used to derive the decision tree resulted in the design components for a loyalty program. By using these components to structure the opportunities of the blockchain-based loyalty programs design decisions for a blockchain-based loyalty program were derived, which forms a basis for the exploration of the blockchain-based loyalty programs.

Due to the absence of literature on local loyalty programs, the interviews exploring the implementation process of these programs adds a new field of research unto the promotion of the city centre.

8.2.2. MANAGERIAL CONTRIBUTION

By structuring the opportunities of the blockchain-based loyalty programs, a structured approach is offered for a designer of a blockchain-based loyalty program. The design components, moreover, the design decisions, of a blockchain-based loyalty program also enhance the design of a loyalty program by covering all decisions necessary to design such a loyalty program.

The exploration of these blockchain-based loyalty programs for local loyalty and the corresponding decision tree on the implementation of a blockchain-based local loyalty program contribute to the decision-making process for the promotion of the city centre by the local government. Who is enabled to make an initial decision on the implementation of a blockchain-based loyalty program, despite the complexity of the technology.

8.3. LIMITATIONS

This section addresses multiple limitations of the research and the research design.

8.3.1. DESIGN SCIENCE RESEARCH

The framework used to guide the multiple activities to create a blockchain-based local loyalty program was the Design Science Research (Hevner et al., 2004; Iivari, 2007; Johannesson and Perjons, 2014; Peffers et al., 2007). Due to this framework or the manner of application of this framework different limitations arose.

DEMONSTRATION

For the demonstration of the artefact, not an actual application was build and given the novelty of the blockchain technology and the absence of any applications in the literature for both blockchain loyalty and local loyalty,

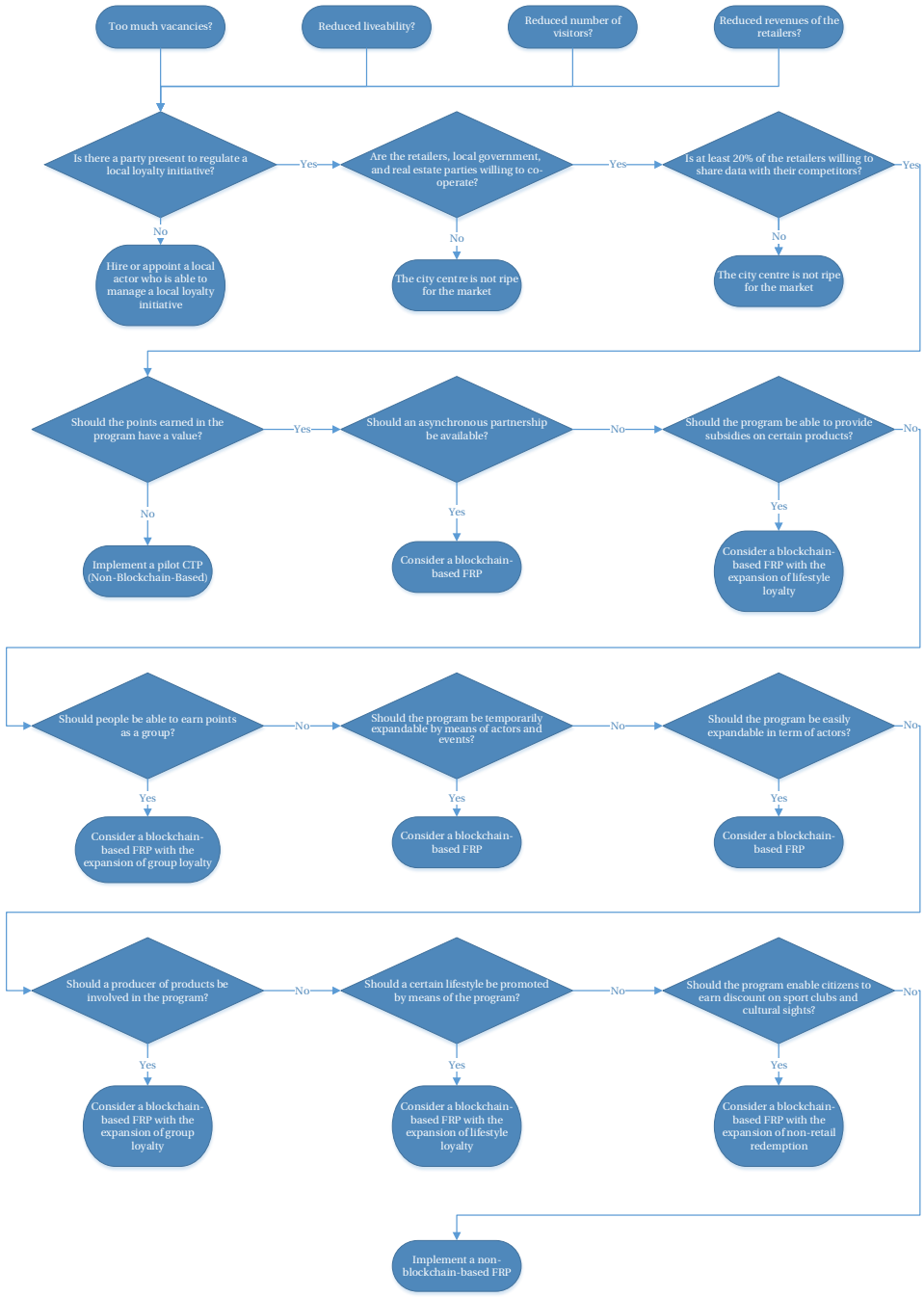

Figure 8.2: Resulting structured approach for the implementation of a local loyalty initiative

no best practices or actual findings could be used.

The design decisions for the rules of the local loyalty initiative are based on the program of requirements created by the actors present in the system. Therefore, the demonstration of the local loyalty would require a process starting by the design of the process, after which the rules for the loyalty program could be tailored. This design of the process could have been added to the 'Define Requirements' activity of the DSR.

EVALUATION

Due to the absence of the actual application, the evaluation of the blockchain-based local loyalty systems was merely an exercise of logical thinking. No actual customers'- or retailers'-experiences could be gathered during the assessment of the different programs.

8.3.2. INTERVIEWS

During the final phase of the research three different experts were interviewed on the implementation of a local loyalty program, David Lansen (centre manager Delft), Jan-Willem Janssen (ShiftAdvisor), and Rob Weiss (IkOnderneem!). Two limitations were identified on the sampling of the interviews.

INTERVIEWEES BIAS

Even though all the interviewees work for different institutions in different cities, all of the interviewees were in a way connected to the knowledge and network collaboration "Platform De Nieuwe Winkelstraat" (DNWS)[1]. Janssen was one of the initiators of the platform[2], Lansen was account manager up until last August[3], and Weiss is account manager local projects[4]. DNWS's goal is to have multiple actors involved in the innovations for the city centres and to share knowledge on this topic, and not to sell a product. Thanks to this non-commercial viewpoint of the knowledge platform the bias towards certain methods of implementation or against certain technologies or practices might be limited. However, the differing viewpoints needed to ensure that the whole topic of interest is covered could be questioned (Yin, 2011).

SAMPLE SIZE OF INTERVIEWS

On top of the possible interviewees bias, the number of interviews conducted with experts was limited. Since the expert interviews were used in an exploratory nature, the responses of the interviewees contributed to the exploration of the implementation process, however, different steps and conditions might not be addressed due to the small sample size.

8.3.3. NOVELTY OF BLOCKCHAIN TECHNOLOGY

Due to the novelty of the blockchain technology a lot of misconceptions are present and no standardizations are yet determined for the usage of the technology. No best practices are present which limited the options to assess the blockchain-based solution. The actual added value of the technology remains uncertain, since no actual blockchain-based loyalty program was created.

Next to the uncertainty of the added value also the problems encountered with the technology (scalability, selfish mining, versioning, hard forks and multiple chains, and privacy leaking) still need to be overcome to optimally use the potential of blockchain technology.

8.4. FUTURE RESEARCH DIRECTIONS

During the performing of the research different new questions and knowledge gaps arose, either originating by knowledge gaps which were encountered during the search for data, or by the likes of the untested and unresearched deliverables proposed by this research.

8.4.1. EMPIRICAL RESEARCH ON BLOCKCHAIN-BASED LOYALTY PROGRAMS

Given the exploratory nature of this research, multiple program structures were constructed which seem promising. However, no empirical data on these programs could be gathered. Therefore, two future research directions are proposed to be added to the research agenda on blockchain technology and loyalty programs.

[1] www.dnws.nl
[2] https://www.shiftadvisor.nl/overshiftadvisor/
[3] https://www.linkedin.com/in/davidlansen/
[4] https://www.linkedin.com/in/ikonderneem/

VALIDATION OF PROGRAM ARCHITECTURES

By means of formulating design decisions for blockchain-based loyalty programs different program structures were derived. When an application of these program structures could be build and implemented research should be conducted on the validity of these program structures.

In order to perform such a research, it was found that a group of retailers should be 'ripe for the market' (D. Lansen, personal communication, August 31, 2018). The easiest group of actors who is ripe for the market are the retailers of a planned shopping area (e.g. Alexandrium [5], who could all be enforced by the real estate owner of the area to participate in such a program (J. Janssen, personal communication, September 6, 2018). When different suitable shopping areas are found, the different program architectures derived by means of this research could be applied, based on their program of requirements. The data collected on the customers will show the redemption rate of the points, which could be a suitable metric for the program loyalty. The loyalty towards the shopping centre could be tested by means of a questionnaire aimed at the members of the program, for instance by sending them an email when they have provided their email address at the registration of the program.

ADDED VALUE OF THE SMART CONTRACTS

The smart contracts which are introduced for the purpose of local loyalty are derived based on assumptions and already implemented loyalty schemes. The proposition for these smart contracts to be added to a local loyalty initiative is however new and not implemented yet. The actual added value for the end-users and for the 'golden triangle' is to be researched.

When the program architectures are validated and are proven to be an efficient means to create either program loyalty or shopping area loyalty, the local owner of the program should look at the design decisions of the smart contracts and see what possibilities could arise for his specific case. With his expert judgement, the additional smart contract should be proposed to the potential and current actors of the program.

If the added value for each individual smart contract is to be tested they should be introduced separately and should be optimized, driven by the data gathered by the program. When multiple smart contracts are to be tested and are only added temporarily, it should be noted that the expiry date of the points should be reasonable and customers should not be earning points which they are not able to redeem.

RESEARCH ON DECISION-MAKING FOR LOCAL LOYALTY

By the addition of the smart contracts unto the loyalty program new actors would be introduced into the decision-making process. When for instance channel loyalty is introduced, international producers should be co-operating with local actors, creating new dynamics for the decision-making process. New steps should be considered and new conditions might appear for this process. As a starting point for this research the conditions derived during this research should be met.

CASE STUDY ON LOCAL LOYALTY FROM A TIP-PERSPECTIVE

Guided by the TIP-approach of Koppenjan and Groenewegen (2005) a case study on a specific city could be performed. Since such a process would start by the process design, which will dictate the institutional- and technological design, the outcome of this case study is not necessarily a blockchain-based loyalty program.

When researching the process design for such a local loyalty program, at first a city should be selected which is 'ripe for the market' (D. Lansen, personal communication, August 31, 2018). This selection could be done by contacting multiple centre managers who should be asked if they think that their city qualifies and could prove it by having multiple retailers (at least 25% (R. Weiss, personal communication, September 7, 2018)) agree to be interviewed. For these selected retailers individual interviews should be performed to find their core values (de Bruijn et al., 2010). Based on these core values a program of requirements should be constituted together with the centre manager, who is considered to be an expert for the case.

Before the program of requirements will be translated into a technological solution, the baseline should be determined for the city loyalty of the customers. Randomized questionnaires should be sent to the citizens of

[5] https://www.alexandrium.nl/

the city by which their city loyalty will be tested. Next to the city loyalty, last year's revenues of the different retailers which will participate in the case study, should be known as well.

The next step would be the building of a technological solution, based on the program of requirements. Once the program is up-and-running and most of the 'teething pains' are considered to be handled, the monthly revenues should be compared to the revenues of the same month the year before, to cancel out the possible seasonal effects. The comparison of the monthly revenues could function as metric for the program loyalty. After a year of running the finalized version of the program, the same randomized questionnaires should be send out to again to different local citizens to see if the city loyalty is improved.

8.4.2. LOCAL LOYALTY

The program structures based on the blockchain technology were proposed to increase a sense of local loyalty, such that the increase in the online sales in the Netherlands, the vacant buildings in the city centres, and the unsatisfying loyalty programs would be countered. However, it is not known if such a local initiative would be the rescue that the city centres need, research should be done into the motives for the customers on what the underlying cause is for the reduced visits to the city and what would be the motivators to make these visits.

8.5. REFLECTION

After presenting the limitations, and the future research directions which appeared during the conduction of this research, this section will reflect on the choices made for this research and their implications.

8.5.1. LOCAL LOYALTY

Due to the focus of this research on the local loyalty as a countermeasure for the increase of vacancies, local loyalty was defined as the physical purchase in a local city centre. Therefore, the research was limited to the physical retailers as a point of sale, the so-called 'bricks-and-mortars'. Different points of sale could however be thought of such as the bricks-and-clicks, who combine their physical store with an online one. With the growth of the online purchases in the Netherlands, it could be argued that a local initiative should be targeted at the online sales of the local retailers as well.

This shift in target would however change the definition of the local loyalty which guided this research. Since the local loyalty was defined as a customer who went to the city and purchased his products at the bricks-and-mortars, such that the retailers and the surrounding shops would attract visitors.

8.5.2. TECHNOLOGY-PUSH VERSUS DEMAND-PULL

The research conducted was a combination of a technology-push and a demand-pull innovation study. The *demand-pull* was encountered by vacancies within the city centres and the necessity for a manner to promote the city centre. The innovative nature and nascent state of blockchain technology provided for the *technology-push* aspect in the research.

The early stages of the study mostly focused on blockchain technology and the corresponding technology-push aspect. Due to the early stage of the technology it is still searching for use cases and no academic literature was found on the blockchain-based loyalty programs. Therefore, the research was mainly based on the opportunities encountered within the grey literature, which provided for the technology-push. The latter stages of the study used the derived program architectures to fill the gap for the local actors to enhance the local loyalty.

The local loyalty program combines both the technology-push (grey literature) and the demand-pull (necessity to promote the city center). Due to the absence of academic literature the technology-push had to be used as a starting point to structure the proposed opportunities. However, during this research it appeared that when designing such a program, it should be tailored to the needs of the city and for a city to design such a local loyalty program. Therefore, when designing a loyalty program the demand should be used as a starting point, which is enabled by the design decisions derived in this research.

8.5.3. BEST DESIGN

Guided by the derived design decisions, multiple program architectures were found. However, given the complexity of the underlying loyalty constructs, such as the distinction between attitudinal loyalty and behavioural loyalty, it is unknown what might work best for each specific city centre. Therefore, this research should not

be used to blindly apply one of the derived program architectures, but should only be used to structure the implementation and thoughts regarding these programs.

Given the opportunity to label different coins, multiple programs could co-exist on the same underlying technological structure and even a dominant design could be proposed by a company. However, for some of the applications this solution will be a more complex solution than the situation asks for. Therefore, as was stressed during the latter stages of this thesis, a clear program of requirements should be constructed, which might result in a non-blockhain-based loyalty program or even in a loyalty initiative which is not a loyalty program.

An important driver of the implementation of a loyalty program is to distinguish oneself from the other, whether this distinction is on a retailer- or on a city centre level. Therefore, a dominant design will most probably not work and should not be aimed, for since new ideas and solutions will probably arise to support this need for distinction. The goal of the implementation of a loyalty initiative should not be to be innovative, but should be focussed on the customers in order to generate 'true loyalty'.

8.6. LINK TO MOT PROGRAM

During my Management of Technology (MOT) studies at Delft University of Technology, I have learned to gain a different perspective to the technologies I had been studying at my bachelors of Applied Physics. The technologies were placed in a light of the end-users and the underlying principles for the innovation, investment, and adoption of these technologies were considered. To quote the MOT criteria for graduation *"MOT graduates learn to explore and understand how firms can use technology to design and develop products and services that contribute to improving outcomes, such as customer satisfaction, corporate productivity, profitability and competitiveness."* [6] While conducting this research different methods learned during my master studies were applied to gain knowledge about the technology at stake and the blockchain-technology was applied to research what the implications of the blockchain-technology would be for different actors. These methods, a literature review, Business Process Modelling, a stakeholder analysis, Business Model Canvas, expert interviews, were used to see what the road ahead would look like for the usage of blockchain-technology and how different actors could potential benefit from the addition of the technology.

[6] https://teams.connect.tudelft.nl/sites/tbm/graduate/SitePages/Home.aspx

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BIBLIOGRAPHY

Air Miles. Air Miles, 2018. URL https://www.airmiles.nl/.

Allaway, A. W., Berkowitz, D., and Souza, G. D. Spatial diffusion of a new loyalty program through a retail market. *Journal of Retailing*, 79:137–151, 2003. doi: 10.1016/S0022-4359(03)00037-X.

Allaway, A. W., Gooner, R. M., Berkowitz, D., and Davis, L. Deriving and exploring behavior segments within a retail loyalty card program. *European Journal of Marketing*, 40(11/12):1317–1339, 2006. ISSN 0309-0566. doi: 10.1108/03090560610702830. URL http://www.emeraldinsight.com/doi/10.1108/03090560610702830.

Allee, V. Reconfiguring the value network. *Journal of Business Strategy*, 21(4):36–39, 2000.

Allee, V. Value Creating Networks: Organizational Issues and Challenges. *The Learning Organization Special issue on Social Networks and Social Networking*, 6(6):427–442, 2009. ISSN 0969-6474. doi: 10.1108/09696470910993918.

Ancarani, F. and Shankar, V. Price Levels and Price Dispersion Within and Across Multiple Retailer Types: Further Evidence and Extension. *Journal of the Academy of Marketing Science*, 32(2):176–187, 2004. ISSN 00920703. doi: 10.1177/0092070303261464.

Ashley, C., Noble, S. M., Donthu, N., and Lemon, K. N. Why customers won't relate: Obstacles to relationship marketing engagement. *Journal of Business Research*, 64(7):749–756, 2011. ISSN 0148-2963. doi: 10.1016/j.jbusres.2010.07.006. URL http://dx.doi.org/10.1016/j.jbusres.2010.07.006.

Barcelo, J. User Privacy in the Public Bitcoin Blockchain. Technical report, 2014.

Beck, R. and Müller-Bloch, C. Blockchain as Radical Innovation: A Framework for Engaging with Distributed Ledgers as Incumbent Organization. In *50th Hawaii International Conference on System Sciences*, pages 5390–5399, 2017. ISBN 9780998133102.

Berman, B. Developing an Effective Customer Loyalty Program. *California Management Review*, 49(1):123–148, 2006. ISSN 0008-1256. doi: 10.2307/41166374. URL http://journals.sagepub.com/doi/10.2307/41166374.

Berwyn, E. Mind the gap: Creating opportunities for empty space. *Urban Regeneration & Renewal*, 6(2):148–153, 2012. URL https://www.ingentaconnect.com/content/hsp/jurr/2012/00000006/00000002/art00007.

Bharosa, N., van Wijk, R., de Winne, N., and Janssen, M. *Challenging the Chain: Governing the automated exchange and processing of business information.* 2015. ISBN 9781614994978. doi: 10.3233/978-1-61499-497-8-i.

Bijmolt, T. H. A., Dorotic, M., and Verhoef, P. C. Loyalty Programs: Generalizations on Their Adoption, Effectiveness and Design. *Foundations and Trends® in Marketing*, 5(4):197–258, 2010. ISSN 1555-0753. doi: 10.1561/1700000026. URL http://www.nowpublishers.com/article/Details/MKT-026.

Biryukov, A., Pustogarov, I., and Khovratovich, D. Deanonymisation of clients in Bitcoin P2P network. *Proceedings of the 2014 ACM SIGSAC Conference on Computer and Communications Security*, pages 15–29, 2014.

Blattberg, R. C., Kim, B.-D., and Neslin, S. A. *Database Marketing - Analyzing and Managing Customers.* Springer Science+Business Media, LLC, New York, 2008.

Blockchain. Blockchain, 2018. URL https://www.blockchain.com/.

Boeije, H. *Analysis in Qualitative Research*. Sage Publications, London, 2010.

Bond Brand Loyalty. The Battle for Love & Loyalty: The Loyalty Report 2017 (Executive Summary). pages 1–22, 2017.

Boyle, E. Managing Organizational Networks: Defining the Core. *Management Decision*, 31(7):23–27, 1993.

Braun, V. and Clarke, V. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101, 2006.

Breugelmans, E. and Liu-Thompkins, Y. The effect of loyalty program expiration policy on consumer behavior. *Marketing Letters*, 28(4):537–550, 2017. ISSN 09230645. doi: 10.1007/s11002-017-9438-1.

Breugelmans, E., Bijmolt, T. H. A., Zhang, J., Basso, L. J., Dorotic, M., Kopalle, P., Minnema, A., Mijnlieff, W. J., and Wünderlich, N. V. Advancing research on loyalty programs: a future research agenda. *Marketing Letters*, 26(2):127–139, 2015. ISSN 0923-0645. doi: 10.1007/s11002-014-9311-4. URL http://link.springer.com/10.1007/s11002-014-9311-4.

Buterin, V. A next-generation smart contract and decentralized application platform. *Etherum*, (January):1–36, 2014. ISSN 19233299. doi: 10.5663/aps.v1i1.10138. URL http://blockchainlab.com/pdf/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf.

Capizzi, M. T. and Ferguson, R. Loyalty trends for the twenty-first century. *Journal of Consumer Marketing*, 22 (2):72–80, 2005. ISSN 0736-3761. doi: 10.1108/07363760510589235. URL http://www.emeraldinsight.com/doi/10.1108/07363760510589235.

Chain of Points. Chain of Points: Transforming Loyalty into Rewards. Technical Report January, Chain of Points, 2017. URL https://www.slideshare.net/StefanCrnojevi/chain-of-points-whitepaper.

Chargebacks911. How Loyalty Program Fraud Takes Travel & Entertainment for a Ride, 2017. URL https://chargebacks911.com/loyalty-program-fraud/.

Charlton, A. What is Auroracoin? Icelandic Cryptocurrency Passes Litecoin With $1 Billion Valuation, 2014. URL https://www.ibtimes.co.uk/what-auroracoin-icelandic-cryptocurrency-passes-litecoin-1-billion-valuation-1438833.

Chun, S. Y., Iancu, D. A., and Trichakis, N. Loyalty Program Liabilities and Point Values. *Working Paper*, pages 1–46, 2017.

Cidon, A. Threat Spotlight: The airline phishing attack, 2017. URL https://blog.barracuda.com/2017/03/30/threat-spotlight-the-airline-phishing-attack/.

de Bruijn, H. and Heuvelhof. *Management in Networks*. Routledge, 2009.

de Bruijn, H., ten Heuvelhof, E., and Veld, R. I. t. *Process Management - Why Project Management Fails in Complex Decision Making Processes*. Springer, 2010. ISBN 0-7876-6556-8. doi: 10.1007/978-3-540-24798-2.

Demoulin, N. T. M. and Zidda, P. Drivers of Customers' Adoption and Adoption Timing of a New Loyalty Card in the Grocery Retail Market. *Journal of Retailing*, 85:391–405, 2009. doi: 10.1016/j.jretai.2009.05.007.

Dholakia, U. M. How Customer Self-Determination Influences Relational Marketing Outcomes: Evidence from Longitudinal Field Studies. *Journal of Marketing Research*, 43(1):109–120, 2006. ISSN 0022-2437. doi: 10.1509/jmkr.43.1.109. URL http://journals.ama.org/doi/abs/10.1509/jmkr.43.1.109.

Doorn, J. V., Verhoef, P. C., and Bijmolt, T. H. A. The importance of non-linear relationships between attitude and behaviour in policy research. *Journal of Consumer Policy*, 30(2):75–90, 2007. doi: 10.1007/s10603-007-9028-3.

Dowling, G. R. and Uncles, M. Do customer loyalty programs really work? *Sloan management review*, 38(4): 71–82, 1997.

Drèze, X. and Nunes, J. C. Feeling Superior: The Impact of Loyalty Program Structure on Consumers' Perceptions of Status. *Journal of Consumer Research*, 35(6):890–905, 2009. ISSN 0093-5301. doi: 10.1086/593946. URL https://academic.oup.com/jcr/article-lookup/doi/10.1086/593946.

Duhigg, C. *The power of habit: Why do we do what we do in life and business.* Random House, 2013.

Dworkin, S. L. Sample size policy for qualitative studies using in-depth interviews. *Archives of Sexual Behavior*, 41(6):1319–1320, 2012. ISSN 00040002. doi: 10.1007/s10508-012-0016-6.

Eason, C. C., Bing, M. N., and Smothers, J. Reward me, charity, or both? The impact of fees and benefits in loyalty programs. *Journal of Retailing and Consumer Services*, 25:71–80, 2015. ISSN 09696989. doi: 10.1016/j.jretconser.2015.04.001. URL http://dx.doi.org/10.1016/j.jretconser.2015.04.001.

Elsden, C., Manohar, A., Briggs, J., Harding, M., Speed, C., and Vines, J. Making Sense of Blockchain Applications: A Typology for HCI. In *Conference on Human Factors in Computing Systems*, pages 1–14, 2018. ISBN 9781450356206.

Ernst & Young LLP. The Big Data Backlash. Technical report, Ernst & Young LLP, 2013.

Evanschitzky, H., Ramaseshan, B., Woisetschläger, D. M., Richelsen, V., Blut, M., and Backhaus, C. Consequences of customer loyalty to the loyalty program and to the company. *Journal of the Academy of Marketing Science*, 40(5):625–638, 2012. ISSN 00920703. doi: 10.1007/s11747-011-0272-3.

Experian. The 2017 Global Fraud and Identity Report. Technical report, Experian, 2017.

Eyal, I. and Sirer, E. G. *Majority Is Not Enough : Bitcoin Mining Is Vulnerable*, volume 8437. Springer, 2014. ISBN 9783662454725.

Eyal, I., Sirer, E. G., and van Renesse, R. Bitcoin-NG : A Scalable Blockchain Protocol. *Proceedings of the 13th USENIX Symposium on Networked Systems Design and Implementation*, 2016.

Fichman, R. G., Dos Santos, B. L., and Zheng, Z. E. Digital Innovation as a Fundamental and Powerful Concept in the Information Systems Curriculum. *MIS Quarterly*, 38(2):329–343, 2014. ISSN 02767783. doi: 10.25300/MISQ/2014/38.2.01. URL https://www.researchgate.net/publication/261400539_Digital_Innovation_as_a_Fundamental_and_Powerful_Concept_in_the_Information_Systems_Curriculum.

Fielding, N. and Thomas, H. Qualitative interviewing. In *Researching social life*, pages 245–267. Sage Publications, Los Angeles, 3rd edition, 2008.

Fisher, R. J., Vandenbosch, M., and Antia, K. D. An Empathy-Helping Perspective on Consumers ' Responses to Fund-Raising Appeals. *Journal of Consumer Research*, 35(3):519–531, 2008. doi: 10.1086/586909.

Fromhart, S. and Therattil, L. Making blockchain real for customer loyalty rewards programs. Technical report, Deloitte, 2016. URL https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-making-blockchain-real-for-loyalty-rewards-programs.pdf.

Fruend, M. An In-depth Analysis of Where Loyalty Is Now ... and Where It's Headed. Technical report, COLLOQUY, 2017.

Furinto, A., Pawitra, T., and Balqiah, T. E. Designing competitive loyalty programs: How types of program affect customer equity. *Journal of Targeting, Measurement and Analysis for Marketing*, 17(4):307–319, 2009. ISSN 09673237. doi: 10.1057/jt.2009.20.

Geng, D. Data analytics on consumer behavior in omni-channel retail banking, card and payment services. Pacific Asia Conference on Information Systems, 2016. ISBN 9789860491029. URL https://www.scopus.com/record/display.uri?eid=2-s2.0-85011076094&origin=resultslist&sort=plf-f&src=s&st1=%22loyalty+programs%22+AND+blockchain&st2=&sid=9a8a39e0c542009230d02fe8559305b8&sot=b&sdt=b&sl=38&s=ALL%28%22loyalty+programs%22+AND+blockchain%29&rel.

Glaser, F. Pervasive Decentralisation of Digital Infrastructures: A Framework for Blockchain enabled System and Use Case Analysis. *HICSS 2017 Proceedings*, pages 1543–1552, 2017. ISSN 1556-5068. doi: 10.1145/1235.

Goldwasser, S., Micali, S., and Rackoff, C. The knowledge complexity of interactive proof systems. *SIAM Journal on computing*, 18(1):186–208, 1989.

Haaker, T., Bouwman, H., Janssen, W., and de Reuver, M. Business model stress testing: A practical approach to test the robustness of a business model. *Futures*, 89(April):14–25, 2017. ISSN 00163287. doi: 10.1016/j.futures.2017.04.003. URL http://dx.doi.org/10.1016/j.futures.2017.04.003.

Harrell, M. C. and Bradley, M. A. Data collection methods. Semi-structured interviews and focus groups. Technical report, RAND National Defens Research Institute, Santa Moninca, CA, 2009.

Harvard Department of Sociology. Strategies for qualitative interviews. *Harvard University*, (part II):1–4, 2017. URL http://sociology.fas.harvard.edu/files/sociology/files/interview_strategies.pdf.

Helbing, D. and Balietti, S. *Agent-Based Modeling*. 2012. ISBN 1853467960. doi: 10.1126/science.1247727.

Henderson, C. M., Beck, J. T., and Palmatier, R. W. Review of the theoretical underpinnings of loyalty programs. *Journal of Consumer Psychology*, 21(3):256–276, 2011. ISSN 10577408. doi: 10.1016/j.jcps.2011.02.007.

Hermanowicz, J. C. The great interview: 25 strategies for studying people in bed. *Qualitative Sociology*, 25(4):479–499, 2002. ISSN 15737837. doi: 10.1023/A:1021062932081.

Hevner, A. R., March, S. T., Park, J., and Ram, S. Design Science in Information Systems Research. *Design Science in IS Research MIS Quarterly*, 28(1):75–105, 2004. ISSN 02767783. doi: 10.2307/25148625.

Humby, C., Hunt, T., and Phillips, T. *Scoring points: How Tesco is winning customer loyalty*. Kogan Page Publishers, 2003.

Iansiti, M. and Lakhani, K. R. The Truth About Blockchain. *Harvard Business Review*, (Januari-Februari):1–11, 2017.

Iivari, J. A Paradigmatic Analysis of Information Systems As a Design Science A Paradigmatic Analysis of Information Systems As a Design Science. *Scandanavian Journal of Information Systems*, 19(2):39–64, 2007. ISSN 09050167. doi: 10.1.1.218.2636.

INretail. Retail 2030. Technical report, INretail, 2018. URL https://www.inretail.nl/special/retail-richting-2030/.

Johannesson, P. and Perjons, E. *An introduction to design science*. 2014. ISBN 9783319106328. doi: 10.1007/978-3-319-10632-8. URL https://link.springer.com/content/pdf/10.1007%2F978-3-319-10632-8.pdf.

Kazan, E., Tan, C.-w., and Lim, E. T. K. Towards a Framework of Digital Platform Disruption : A Comparative Study of Centralized & Decentralized Digital Payment Providers. *25th Australasian Conference on Information Systems*, (2010):10, 2014. ISSN 0718-1876. doi: 10.4067/S0718-18762016000300005.

Kivetz, R. and Simonson, I. Earning the Right to Indulge: Effort as a Determinant of Customer Preferences Toward Frequency Program Rewards. *Journal of Marketing Research*, 39(2):155–170, 2002. ISSN 0022-2437. doi: 10.1509/jmkr.39.2.155.19084. URL http://journals.ama.org/doi/abs/10.1509/jmkr.39.2.155.19084.

Kivetz, R., Urminsky, O., and Zheng, Y. The Goal-Gradient Hypothesis Resurrected: Purchase Acceleration, Illusionary Goal Progress, and Customer Retention. *Journal of Marketing Research*, 43(1):39–58, 2006. ISSN 0022-2437. doi: 10.1509/jmkr.43.1.39. URL http://journals.ama.org/doi/abs/10.1509/jmkr.43.1.39.

Kobie Marketing. Loyalty Fraud Cases & Categories for Fraud, 2018. URL http://blog.kobie.com/2018/04/loyalty-fraud-cases-categories-for-fraud/.

Koo, M. and Fishbach, A. Consumer Motivation : Identifying Factors that Increase Goal Adherence. *Advances in Consumer Research*, 35:93–96, 2008.

Kopalle, P. K., Sun, Y., Neslin, S. A., Sun, B., and Swaminathan, V. The Joint Sales Impact of Frequency Reward and Customer Tier Components of Loyalty Programs. *Marketing Science*, 31(2):216–235, 2012. ISSN 0732-2399. doi: 10.1287/mksc.1110.0687. URL http://pubsonline.informs.org/doi/abs/10.1287/mksc.1110.0687.

Koppenjan, J. and Groenewegen, J. Institutional design for complex technological systems. *International Journal of Technology, Policy and Management*, 5(3):240–257, 2005.

Kotter, J. P. *Accelerate: Building Strategic Agility for a Faster-Moving World*. Harvard Business Review Press, 2014.

Kruijff, J. D. and Weigand, H. Understanding the Blockchain Using Enterprise Ontology. In *International Conference on Advanced Information Systems Engineering*, number June, pages 29–43. Springer, Cham, 2017. ISBN 9783319595368. doi: 10.1007/978-3-319-59536-8.

Kumar, V. and Shah, D. Building and sustaining profitable customer loyalty for the 21st century. *Journal of Retailing*, 80(4):317–330, 2004. ISSN 00224359. doi: 10.1016/j.jretai.2004.10.007.

Lal, R. and Bell, D. E. The Impact of Frequent Shopper Programs in Grocery Retailing. *Quantitative Marketing and Economics*, 1:179–202, 2003. ISSN 1573-711X. doi: 10.1023/A:1024682529912. URL http://link.springer.com/article/10.1023/A:1024682529912.

Lemon, K. N. and Wangenheim, F. The Reinforcing Effects of Loyalty Program A Longitudinal Analysis. pages 357–370, 2009. doi: 10.1177/1094670508330451.

Levy, M. and Weitz, B. Types of Retailers. In *Retailing Management*, chapter 2, pages 34–65. Mcgraw-Hill Education - Europe, 2008.

Liebenau, J. and Elaluf-Calderwood, S. Blockchain Innovation Beyond Bitcoin and Banking, mar 2016. URL https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2749890.

Lindman, J., Rossi, M., and Tuunainen, V. K. Opportunities and risks of Blockchain Technologies in payments–a research agenda. *HICSS 2017 Proceedings*, pages 1533–1542, 2017. ISSN 19326203. doi: 10.1371/journal.pone.0163477.

Liu, Y. The Long-Term Impact of Loyalty Programs on Consumer Purchase Behavior and Loyalty. *Journal of Marketing*, 71(4):19–35, 2007. ISSN 0022-2429. doi: 10.1509/jmkg.71.4.19. URL http://journals.ama.org/doi/abs/10.1509/jmkg.71.4.19.

Liu, Y. and Yang, R. Competing Loyalty Programs: Impact of Market Saturation, Market Share, and Category Expandability. *Journal of Marketing*, 73(1):93–108, 2009. ISSN 0022-2429. doi: 10.1509/jmkg.73.1.93. URL http://journals.ama.org/doi/abs/10.1509/jmkg.73.1.93.

López-Pintado, O., García-Bañuelos, L., Dumas, M., and Weber, I. Caterpillar: A Blockchain-Based Business Process Management System. In *Proceedings of the BPM Demo Track and BPM Dissertation Award co-located with 15th International Conference on Business Process Modeling*, pages 1–5, Barcelona, 2017.

Loyyal. Enhancing the customer experience with Loyyal, Blockchain, Big-Data and AI. Technical report, Loyyal, 2017. URL https://www-01.ibm.com/events/wwe/grp/grp308.nsf/vLookupPDFs/LoyyalIntroShannonv2/$file/LoyyalIntroShannonv2.pdf.

Madeira, A. What is a premine? | CryptoCompare.com, 2018. URL https://www.cryptocompare.com/coins/guides/what-is-a-premine/.

March, S. T. and Smith, G. F. Design and natural science research on information technology. *Dss*, 15:251–266, 1995.

Mason, M. Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 11(3):Art 8., 2010. ISSN 1438-5627. doi: ISSN1438-5627.

Mauri, C. Card loyalty. A new emerging issue in grocery retailing. *Journal of Retailing and Consumer Services*, 10(1):13–25, 2003. ISSN 09696989. doi: 10.1016/S0969-6989(02)00036-X.

McGrath, R. G. Business Models : A Discovery Driven Approach. *Long Range Planning*, 43(2-3):247–261, 2010. ISSN 0024-6301. doi: 10.1016/j.lrp.2009.07.005. URL http://dx.doi.org/10.1016/j.lrp.2009.07.005.

McMillan, R. The inside story of Mt. Gox, Bitcoin's $460 million disaster. *Wired*, March, 2014.

Meuser, M. and Nagel, U. The Expert Interview and Changes in Knowledge Production. In *Interviewing Experts*, pages 17–42. Palgrave Macmillan UK, London, 2009. doi: 10.1057/9780230244276_2. URL http://link.springer.com/10.1057/9780230244276_2.

Meyer-Waarden, L. and Benavent, C. Grocery retail loyalty program effects: Self-selection or purchase behavior change? *Journal of the Academy of Marketing Science*, 37(3):345–358, 2009. ISSN 00920703. doi: 10.1007/s11747-008-0123-z.

Mohr, J., Sengupta, S., and Slater, S. *Marketing of high-technology products and innovations*. Pearson Prentice Hall, 2010. ISBN 9780136049968.

Morabito, V. *Business Innovation Through Blockchain*. Springer International Publishing, Cham, jan 2017a. ISBN 978-3-319-48477-8. doi: 10.1007/978-3-319-48478-5. URL http://link.springer.com/10.1007/978-3-319-48478-5.

Morabito, V. Blockchain Practices. In *Business Innovation Through Blockchain*, chapter 8, pages 145–166. Springer International Publishing, Cham, 2017b. ISBN 9783319484785. doi: 10.1007/978-3-319-48478-5.

Mueller, R. M. and Thoring, K. Design thinking vs. lean startup: A comparison of two user-driven innovation strategies. In *Leading Innovation Through Design - Proceeding of the DMI 2012 International Research Conference Boston*, pages 152–161, 2012.

Muniz, A. and O'Guinn, T. Brand Community. *Journal of Consumer Research*, 27(March):412–432, 2001.

Nakamoto, S. Bitcoin: A Peer-to-Peer Electronic Cash System. *Www.Bitcoin.Org*, page 9, 2008. ISSN 09254560. doi: 10.1007/s10838-008-9062-0. URL https://bitcoin.org/bitcoin.pdf.

Neer, M. T. V. *Vacant retail space, should the municipality intervene?* PhD thesis, Delft University of Technology, 2017. URL https://repository.tudelft.nl/islandora/object/uuid%3A8096c13b-9a07-48f4-82b3-759765a204f3?collection=education.

Nieman, A. A few South African cents' worth on Bitcoin. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, 18(5):1978, feb 2016. ISSN 1727-3781. doi: 10.4314/pelj.v18i5.25. URL http://www.ajol.info/index.php/pelj/article/view/130781.

Noble, S. M. and Phillips, J. Relationship hindrance : why would consumers not want a relationship with a retailer ? *Journal of Retailing*, 80:289–303, 2004. doi: 10.1016/j.jretai.2004.10.005.

Nuggets. Nuggets [White Paper V16]. Technical report, Nuggets, 2017.

Nunes, J. C. and Drèze, X. Your Loyalty Program Is Betraying You Your Loyalty Program Is Betraying You. *Harvard Business Review*, (April):1–11, 2006. ISSN 00178012.

Object Management Group (OMG). Business Process Model and Notation (BPMN) Version 2.0. *Business*, 50 (January):170, 2011. ISSN 13507540. doi: 10.1007/s11576-008-0096-z. URL http://books.google.com/books?id=GjmLqXNYFS4C&pgis=1.

O'Brien, L. and Jones, C. Do rewards really create loyalty. *Harvard Business Review*, 73(3):75–82, 1995. URL https://hbr.org/1995/05/do-rewards-really-create-loyalty.

O'Malley and Lisa. Can loyalty schemes really build loyalty? *Marketing Intelligence & Planning*, 16(1):47–55, 1998. ISSN 0263-4503. doi: 10.1108/02634509810199535.

O'Malley, L. and Prothero, A. Beyond the frills of relationship marketing. *Journal of Business Research*, 57: 1286–1294, 2004. doi: 10.1016/S0148-2963(02)00450-2.

Orioncoin. The Decentralized Digital Hyperpower [White paper v1.1]. Technical report, Orioncoin, 2017. URL https://www.orioncoin.io/whitepaper/orioncoin_whitepaper.pdf.

Ossokina, L., Sviták, J., Teulings, C., and Zwaneveld, P. Winkelleegstand na de crisis. Technical report, Centraal Plan Bureau, 2016. URL https://www.cpb.nl/sites/default/files/omnidownload/CPB-Policy-Brief-2016-04-Winkelleegstand-na-de-crisis_0.pdf.

Osterwalder, A. *The business model ontology: A proposition in a design science approach*. PhD thesis, 2004.

Osterwalder, A. and Pigneur, Y. *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons, 2010.

Pasidis, I., Koster, H. R. A., and Van Ommeren, J. Shopping externalities and retail concentration: Evidence from Dutch shopping streets. (September):1–11, 2017. URL https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3018470.

Peck, M. Do you need a blockchain? This chart will tell you if the technology can solve your problem. *IEEE Spectrum*, 54(10):38–60, 2017.

Peffers, K., Tuunanen, T., Rothenberger, M. A., and Chatterjee, S. A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*, 24(3):45–77, 2007. ISSN 07421222. doi: 10.2753/MIS0742-1222240302. URL http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=28843849&site=ehost-live&scope=site.

Plattner, H., Meinel, C., and Leifer, L. *Design Thinking*. mi-wirtschaftsbuch, Munich, 2009.

PwC. Blockchain: The next innovation to make our cities smarter. Technical report, 2018. URL https://www.pwc.in/assets/pdfs/publications/2018/blockchain-the-next-innovation-to-make-our-cities-smarter.pdf.

Qiibee. Loyalty on the blockchain [White Paper v2.1]. Technical report, Qiibee, 2018. URL https://static.qiibee.com/qiibee-White-Paper-v2.1.pdf.

Raatgever, A. Winkelgebied van de toekomst. pages 1–138, 2014. URL http://www.platform31.nl/publicaties/winkelgebied-van-de-toekomst#.

Reid, F. and Harrigan, M. An analysis of anonomity in the bitcoin system. In *Security and privacy in social networks*, pages 197–223. Springer, New York, NY, 2013. ISBN 9781461441380.

Reinartz, W. and Kumar, V. The Mismanagement of Customer Loyalty. *Harvard Business Review*, 80(7):86–95, 2002. URL https://hbr.org/2002/07/the-mismanagement-of-customer-loyalty.

RetailCoin. RetailCoin [White Paper v1.6]. Technical report, RetailCoin, 2018. URL https://retailcoins.eu/wp-content/uploads/2018/05/whitepapermay.pdf.

Ries, E. *The lean startup: how today's entrepreneurs use continuous innovation to create radically successful businesses*. Crown Business, New York, 2011.

Rittel, H. W. J. and Webber, M. M. Dilemmas in a General Theory of Planning. *Policy Sciences*, 4:155–169, 1973.

Rogers, E. *Diffusion of Innovations*. Simon and Schuster, 1965.

Rollins, M. *Money and Investments 1928*. Nabu Press, 2012.

Rowley, J. Building brand webs: Customer relationship management through the Tesco Clubcard loyalty scheme Building brand webs Customer relationship management through the Tesco Clubcard loyalty scheme. *International Journal of Retail & Distribution Management*, 33(3):194–206, 2005. doi: 10.1108/09590550510588361.

RVO. Investeringssubsidie duurzame energie ISDE | RVO.nl, 2018. URL https://www.rvo.nl/subsidies-regelingen/investeringssubsidie-duurzame-energie-isde.

Salkind, N. J. *Encyclopedia of Research Design*. Sage Publications, 2010. ISBN 9781412961271. doi: http://dx.doi.org/10.4135/9781412961288.n137. URL http://knowledge.sagepub.com/view/researchdesign/SAGE.xml.

Scharpf, F. *Games Real Actors Play*. Westview Press, Boulder, 1997.

Schneider, H. The History of Loyalty Programs. Technical report, Kobie Experience Loyalty, 2015.

Shae, Z. and Tsai, J. On the Design of a Blockchain Platform for Clinical Trial and Precision Medicine. In *37th International Conference on Distributed Computing Systems*, pages 1972–1980, 2017. doi: 10.1109/ICDCS.2017.61.

Shelper, P., Lowe, A., and Sydney, U. Experiences from the Field : Unify Rewards - A Cryptocurrency Loyalty Program. In *Proceedings of the Symposium on Foundations and Applications of Blockchain*, pages 1–6, 2018.

Shugan, S. M. Brand Loyalty Programs: Are They Shams? *Marketing Science*, 24(2):185–193, 2005. ISSN 0732-2399. doi: 10.1287/mksc.1050.0124. URL http://pubsonline.informs.org/doi/10.1287/mksc.1050.0124.

Simonin, B. L. and Ruth, J. A. Is a Company Known by the Company It Keeps? Assessing the Spillover Effects of Brand Alliances on Consumer Brand Attitudes. *Journal of Marketing Research*, 35(1):30, 1998. ISSN 00222437. doi: 10.2307/3151928. URL http://www.jstor.org/stable/3151928?origin=crossref.

Singapore Airlines. KrisFlyer To Launch World's First Blockchain-Based Airline Loyalty Digital Wallet, 2018. URL https://www.singaporeair.com/en_UK/sg/media-centre/press-release/article/?q=en_UK/2018/January-March/ne0518-180205.

So, J. T., Danaher, T., and Gupta, S. What do customers get and give in return for loyalty program membership? *Australasian Marketing Journal*, 23(3):196–206, 2015. ISSN 14413582. doi: 10.1016/j.ausmj.2015.02.002. URL http://dx.doi.org/10.1016/j.ausmj.2015.02.002.

Spors, K. Disloyalty Programs: The Surprising New Way to Get Loyal Customers, 2014. URL https://www.americanexpress.com/us/small-business/openforum/articles/disloyalty-programs-the-surprising-new-way-to-get-loyal-customers/.

Swan, M. *Blockchain: Blueprint for a new economy*. O'Reilly Media, Inc., 2015. ISBN 9781491920497.

Swanson, T. Consensus-as-a-service: a brief report on the emergence of permissioned, distributed ledger systems. *Report available online*, pages 1–66, 2015.

Szabo, N. Formalizing and Securing Relationships on Public Networks. *First Monday*, 2(9), 1997. URL http://ojphi.org/ojs/index.php/fm/article/view/548/469.

Tapscott, D. and Tapscott, A. *Blockchain Revolution: How the technology behind bitcoin is changing money, business, and the world*. Penguin, 2016.

Tasca, P. and Tessone, C. J. Taxonomy of Blockchain Technologies. Principles of Identification and Classification. *arXiv ID: 1708.04872v2*, 2018. ISSN 1556-5068. doi: 10.2139/ssrn.2977811. URL http://arxiv.org/abs/1708.04872.

Tasca, P., Thanabalasingham, T., and Tessone, C. J. Ontology of Blockchain Technologies. Principles of Identification and Classification. *arXiv ID: 1708.04872v1*, 2017. ISSN 1556-5068. doi: 10.2139/ssrn.2977811. URL http://arxiv.org/abs/1708.04872.

Taylor, G. A. and Neslin, S. A. The current and future sales impact of a retail frequency reward program. *Journal of Retailing*, 81(4):293–305, 2005. ISSN 00224359. doi: 10.1016/j.jretai.2004.11.004.

Teale, M. The challenges of attracting investments back to the high street. *Urban Regeneration & Renewal*, 6(2):145–163, 2012. URL https://www.ingentaconnect.com/content/hsp/jurr/2012/00000006/00000002/art00008.

Teigland, R., Yetis, Z., and Larsson, T. Breaking out the bank in Europe-exploring collective emergent institutional entrepreneurship through bitcoin. *SSRN Electronic Journal: 2263707*, 2013. doi: 10.2139/ssrn.2263707.

Thoring, K. and Mueller, R. M. Understanding design thinking : A process model based on method engineering. In *INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION*, pages 493–498, London, UK, 2011.

Thuiswinkel.org. Nederlandse consumenten besteedden € 22,5 miljard online in 2017, 2018. URL https://www.thuiswinkel.org/nieuws/3710/nederlandse-consumenten-besteedden-22-5-miljard-online-in-2017.

Turcsik, R. A Retailer's Best Friend: In these turbulent economic times a strong loyalty program can increase the number of a store's most faithful shoppers. *Progressive Grocer*, pages 60–61, 2004.

Turner, J. J. and Wilson, K. Grocery loyalty : Tesco Clubcard and its impact on loyalty. *British Food Journal*, 108 (11):958–964, 2006. doi: 10.1108/00070700610709995.

Uncles, M. D., Dowling, G. R., and Hammond, K. Customer loyalty and customer loyalty programs. *Journal of Consumer Marketing*, 20(4):294–316, 2003. ISSN 0736-3761. doi: 10.1108/07363760310483676. URL http://www.emeraldinsight.com/doi/10.1108/07363760310483676.

Underwood, S. Blockchain beyond bitcoin. *Communications of the ACM*, 59(11):15–17, 2016. ISSN 00010782. doi: 10.1145/2994581. URL http://dl.acm.org/citation.cfm?doid=3013530.2994581.

Universal Reward Protocol. Universal Reward Protocol [White Paper v1.02]. Technical report, Universal Reward Protocol, 2018.

Uzzi, B. The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The Network Effect. *American Sociological Review*, 61(4):674–698, 1996. URL https://www.jstor.org/stable/2096399.

van Alphen, F. Hoe werkt de cashbackactie en waar moet je op letten?, feb 2018. URL https://www.volkskrant.nl/economie/hoe-werkt-de-cashbackactie-en-waar-moet-je-op-letten.

van Heerde, J. Cashen voor het te laat is, want Air Miles hebben een vervaldatum, sep 2018. URL https://www.trouw.nl/home/cashen-voor-het-te-laat-is-want-air-miles-hebben-een-vervaldatum.

Vana, P., Lambrecht, A., and Bertini, M. Cashback Is Cash Forward : Delaying a Discount to Increase Future Spending. 2015.

Wagner, T., Hennig-Thurau, T., and Rudolph, T. Jeopardize Loyalty ? *Journal of Marketing*, 73(May):69–85, 2009. ISSN 0022-2429. doi: 10.1509/jmkg.73.3.69. URL http://www.atypon-link.com/AMA/doi/abs/10.1509/jmkg.73.3.69.

Weber, I., Xu, X., Riveret, R., Governatori, G., Ponomarev, A., and Mendling, J. Untrusted Business Process Monitoring and Execution. *International Conference on Business Process Management*, pages 329–347, 2016. doi: 10.1007/978-3-319-45348-4.

WeLocals. Local Loyalty Program for Your Community. URL https://www.wethelocals.com/.

Weltevreden, J. W. J. and van Rietbergen, T. The implications of e-shopping for in-store shopping at various shopping locations in the Netherlands. *Environment and Planning B: Planning and Design*, 36:279–299, 2009. doi: 10.1068/b34011t.

Xu, X., Pautasso, C., Zhu, L., Gramoli, V., Ponomarev, A., and Chen, S. The Blockchain as a Software Connector. In *Software Architecture (WICSA)*, pages 182–191, 2016.

Xu, X., Weber, I., Staples, M., Zhu, L., Bosch, J., Bass, L., Pautasso, C., and Rimba, P. A Taxonomy of Blockchain-Based Systems for Architecture Design. *Proceedings - 2017 IEEE International Conference on Software Architecture, ICSA 2017*, pages 243–252, 2017. doi: 10.1109/ICSA.2017.33.

Yeow, K., Gani, A., Ahmad, R. W., and Ko, K. Decentralized Consensus for Edge-Centric Internet of Things: A Review, Taxonomy, and Research Issues. *IEEE Access*, 6:1513–1524, 2018.

Yi, Y. and Jeon, H. Effects of Loyalty Programs on Value Perception, Program Loyalty, and Brand Loyalty. *Journal of the Academy of Marketing Science*, 31(3):229–240, 2003. ISSN 0092-0703. doi: 10.1177/0092070303253082. URL http://jam.sagepub.com/cgi/doi/10.1177/0092070399274003.

Yin, R. *Case Study Research: Design and Methods*. SAGE Publications, 2011.

Yli-Huumo, J., Ko, D., Choi, S., Park, S., and Smolander, K. Where Is Current Research on Blockchain Technology? — A Systematic Review. *PLoS ONE*, 11(10):1–27, 2016. doi: 10.1371/journal.pone.0163477.

Zamani, E. D. and Giaglis, G. M. With a little help from the miners: distributed ledger technology and market disintermediation. *Industrial Management & Data Systems*, 118(3):637–652, 2018. ISSN 0263-5577. doi: 10.1108/IMDS-05-2017-0231. URL http://www.emeraldinsight.com/doi/10.1108/IMDS-05-2017-0231.

Zheng, Z., Xie, S., Dai, H., Chen, X., and Wang, H. An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends. *2017 IEEE International Congress on Big Data (BigData Congress)*, (June):557–564, 2017. doi: 10.1109/BigDataCongress.2017.85.

Zyskind, G., Nathan, O., and Pentland, A. S. Decentralizing privacy: Using blockchain to protect personal data. *Proceedings - 2015 IEEE Security and Privacy Workshops, SPW 2015*, pages 180–184, 2015. ISSN 9781479999330. doi: 10.1109/SPW.2015.27.

Appendices

A

DESIGNING WITH BLOCKCHAIN TECHNOLOGY

A.1. DESIGNING WITH BCT

To derive design decisions for the blockchain-based loyalty program, first the design decisions for the blockchain technology should be considered. Since the technology is still in its early stages and this research addresses the decision on whether to adopt a blockchain-based loyalty program or not, the design decisions sought for will not be on a technical level.

When designing a blockchain application Tapscott and Tapscott (2016) and Xu et al. (2017) consider some properties as being essential and fundamental for the design of the technology, for instance the distributed power, integrity, the inclusion and the equal rights. In this section these properties will be leading in the construction of design choices for the blockchain application.

STRUCTURED LITERATURE REVIEW APPROACH

To conduct the literature review on the design decisions for blockchain technology applications, different search terms were used in both Scopus and Web of Science (WoS). The search terms used,the number of results, and the useful papers, are shown in table B.1 in appendix B. The first searches resulted in an abundance of papers to review. On Scopus, a lot of the results turned out to be conference proceedings addressing multiple papers and topics. In which the separate papers only partly matched the query, no individual paper however addressed the topic searched for. After specifying the search fields to only the "Title, Abstract, and Keywords" and "Topic and Title" and by focusing the search terms more on the design decisions for blockchain applications, by adding quotation marks and adding the term "decision*", the abstracts were read. By reading the abstract it was determined whether or not the paper was indeed about the design of blockchain applications. Only six papers matched these criteria. Given the limited results, more rigorous manners were used, by using Google Scholar, which will return more hits based on their algorithms. The same search terms were used and a quick scan of the first few pages resulted in an extra paper of Tasca and Tessone (2018), on the ontology of blockchain technologies. Besides that one, a paper of Lindman et al. (2017) was found on the opportunities and risks of blockchain technology and placed the question *"How are design decisions made in different systems relying on blockchain technology?"* on the research agenda. Next, the first six papers found were studied for possible extra sources, the combined results are shown in table A.1.

A.1.1. LITERATURE REVIEW RESULTS

Lindman et al. (2017) states that blockchain technology fits the description of a digital platform of Kazan et al. (2014): “a proprietary or open modular layered technological architecture that support efficient development of innovative derivatives, which are embedded in a business or social context.” Which implies that when designing an application which uses blockchain technology, a decentralized application (Buterin, 2014), the cri-

Table A.1: Papers after structured literature review

Paper	Main Findings	Found Via
Beck and Müller-Bloch (2017)	An analysis on how incumbents can pursue blockchain as a radical innovation, by addressing the three phases of discovery, incubation, and acceleration.	Zamani and Giaglis (2018)
Elsden et al. (2018)	A typology of emerging blockchain applications; Identification of the distinguishing features of blockchain technology	Scopus
Kruijff and Weigand (2017)	Guidance on what blockchain actually is; Comparison between blockchain and traditional transaction systems	Scopus, WoS
Lindman et al. (2017)	A research agenda to broaden our understanding of blockchain technology based services and platforms	Google Scholar
Shae and Tsai (2017)	Blockchain platform architecture for clinical trial and precision medicine; Discussion of various design aspects; Insights in the requirements and challenges of the technology	Scopus
Tasca and Tessone (2018)	A taxonomy as navigation tool across different blockchain architectural configurations	Google Scholar
Xu et al. (2017)	Proposition on how to classify and compare blockchains; assistance for designing and assessing blockchains;	Scopus, WoS
Yeow et al. (2018)	Pros and cons of state-of-the-art decentralized consensus systems; Thematic taxonomy on existing decentralized consensus systems for IoT	Scopus, WoS
Zamani and Giaglis (2018)	BCT will disrupt today's commerce; Money with smart contract properties; Adoption barriers; Mindset barriers	Scopus, WoS

teria of such platforms have to be kept in mind. Given this blockchain context Xu et al. (2016) arrived at five application design decisions for blockchain as a software connector, on which is build upon by Xu et al. (2017). Xu et al. (2017) compares different architectural characteristics and discusses the impact of design decisions. The design decisions for the design process described by Xu et al. (2017) are a mixture of both technical and practical decisions. Tasca et al. (2017) used a bottom-up approach in order to find building blocks for the blockchain and arrived at an ontology matrix for the blockchain applications, which they revisited and deemed the term taxonomy more of a fit (Tasca and Tessone, 2018). This approach led to eight main components, which were on their turn divided into sub and sub-sub components. For these components, several layouts were compared. Xu et al. (2017), Tasca and Tessone (2018) and Yeow et al. (2018) all have proposed a taxonomy for blockchain technology, however, the last one has a focus on the Internet of Things(IoT)). The remainder of the papers mainly focus on the adoption of the disruptive technology and what factors should be taken into account and which decisions should be made while doing so. Beck and Müller-Bloch (2017) propose a strategy for incumbents, by carefully addressing the different phases of the innovation process, discovery, incubation, and acceleration. This process is build on the disruptive nature of blockchain technology, which stresses the importance of the discovery phase. The discovery of new applications of the technology is also encouraged by Elsden et al. (2018), who found application areas for the technology during a qualitative study on 200 blockchain start ups, the areas being, among others: underlying infrastructure, currency, financial services and identity management. These areas highlight the believed possibilities for the blockchain technology. Zamani and Giaglis (2018) kept their view on the applications more general, by addressing the application function of the blockchain technology, which encapsulates the mentioned application areas of Elsden et al. (2018).

By establishing a three-layered ontology Kruijff and Weigand (2017) offer a roadmap for the development of blockchain applications. By first specifying the application on a business level, the design parameters would automatically be generated by the use of the ontology. The three layers of this ontology are on an essential,

infological and datalogical layer and are respectively: *transactions as commitments and economic events for resources, transactions as inputs and outputs between accounts stored on a ledger,* and *transactions as cryptoghrapically verified and stored indefinitely in a chain.* These layers support the translation of the business requirements of a blockchain application to the requirements on a technical level.

A.2. DESIGN DECIONS

As only Xu et al. (2017) and Tasca and Tessone (2018) have proposed a taxonomy for blockchain technology systems, those two are combined to find relevant design decisions for loyalty program purposes. These design decisions are not on a technical and in-depth level, as this is not within the scope of the research. The resulting design decisions are to be found in table A.2 and are elaborated upon in the remainder of this section.

One of the most promising features of the blockchain technology is the surpassing of the middle man, by means of **decentralization**. Hence the Bitcoin was able to create a currency without the need of a bank (Nakamoto, 2008). This absence of the middle man also eliminates the single point of failure. However, a blockchain application could also opt for options which are less decentralized as was proposed by Nakamoto (2008). Three options are available: fully centralized, fully decentralized, and partially centralized & partially decentralized (Tasca and Tessone, 2018; Xu et al., 2017).

For the **access and control** of the blockchain different questions should be asked and answered on who is able to write, read or change the rules. Three designs are proposed: public blockchain, permissioned public blockchain, and a permissioned private blockchain (Tasca and Tessone, 2018). In the case of a public blockchain, everyone is allowed to alter the blockchain. For the permissioned blockchain the rights are a bit more limited. All the participants are still able to read all of the information on the blockchain, however, in order to write something, one should be provided permission. This permission should be granted by pre-selected nodes. The last and most limited form of the access and control for the blockchain is the permissioned private blockchain. This type of blockchain has a central organisation who determines who is able to read and write on the blockchain.

Blokchains offer **incentives** for participating in the verification of the blockchain, what is the underlying so-called native asset. Three options are identified by Tasca and Tessone (2018): None, Own Cryptocurrency and Convertible Multiple Assets. If a private blockchain is constructed, there is no need to create an incentive for the participants of the blockchain. If however a public blockchain, either a permissioned one or a regular one, is decided on, the participants should be rewarded for helping verifying the blockchain. This could either be the cryptocurrency which is used in the network itself (as seen by bitcoin (Nakamoto, 2008)), or convertible multiple assets. The latter is based on blockchains which use a different currency to execute a task (e.g. Gas by Ethereum (Buterin, 2014)). But instead of using Gas, a native asset of another blockchain could be used, or an overarching one. The advantage identified by Tasca and Tessone (2018, p. 23) is the allowing for exchange markets.

Once it is determined which native asset is chosen, design decisions should be made in terms of the **asset supply management**. The supply could either be Limited, Unlimited or Pre-mined (Tasca and Tessone, 2018). In both the cases of the limited and unlimited supply of assets, new assets are being issued during the course of the existence of the blockchain. In case of the pre-mined asset supply, the assets are distributed beforehand and will be redistributed later on. An example of a premined asset is the Auroracoin, a cryptocurrency which was introduced as an alternative currency for the Icelandic people after their banking system collapsed (Charlton, 2014; Madeira, 2018). Before the currency could be used, people were already able to mine the currency. Once the currency became available, the amount of premined coins was also freely distributed amongst the citizens of Iceland.

Interoperability is the ability to exchange information with non-blockchain-based systems outside of the blockchain, this option could either be included or not (Tasca and Tessone, 2018). If a blockchain should be interoperable depending on data from outside the system, a verifier must be appointed, who is, or in case of a group, are in charge of the verification of the data (Xu et al., 2017). If the input for the blockchain system is delivered by means of pre-programmed software, it is referred as an oracle (Xu et al., 2016).

Next to the information exchange between other systems, also information exchange with other blockchains could be thought of, this is referred to as **intraoperability** (Tasca and Tessone, 2018). As for the interoperability,

Table A.2: Design Decisions Blockchain Technology

Design Components	**Design Decisions**	**Literature**
Design Decisions	**Design Options**	**Literature**
Decentralization	• Fully decentralized • Fully centralized • Partially decentralized & Partially centralized	Tasca and Tessone (2018); Xu et al. (2017)
Incentives	• None • Own Cryptocurrency • Convertible Multiple Assets	Tasca and Tessone (2018)
Asset Supply Management	• Limited • Unlimited • Pre-mined	Tasca and Tessone (2018)
Interoperability	• Interoperable • Not interoperable	Tasca and Tessone (2018); Xu et al. (2017)
Intraoperability	• Intraoperable • Not intraoperable	Tasca and Tessone (2018)
Governance Rules	• Open-Source Community • Technical • Alliance	Tasca and Tessone (2018)
Access and Control	• Public Blockchain • Permissioned Public Blokchain • Permissioned Private Blokchain	Tasca and Tessone (2018)
Identity	• Know-Your-Customer • Anonymous	Tasca and Tessone (2018)

the decision is either to take it into account or not.

By dividing the **governance rules** of the blockchain system in two types of rules: the self-governing technical rules of the technology and the regulatory rules of an external body, Tasca and Tessone (2018) find three possible layouts for the governance of the blockchain. These layouts are: Open-Source Community, Technical, and Alliance. For the open-source community every participant of the blockchain is able to update the set of rules for the blockchain. The technical layout lets a central company apply the rules which align with their vision. In case of the alliance, companies have to meet certain criteria in order to be able to earn blockchain governance (Tasca and Tessone, 2018).

The users of the blockchain might be concerned about the **identity** of the other blockchain users. If that is the case, there could be opted for the Know-Your-Customer-option (Tasca and Tessone, 2018). This implies that the blockchain should be able to identify and validate the users. It could also be decided for the users to maintain their anonymity, it could however in this case not be guaranteed that the users remain anonymous, for Reid and Harrigan (2013) have shown in their analysis of different users and their decentralized information.

B

Search Results of Literature Review

Table B.1: Search terms and their results

Search Terms	Search Engine	Search Fields	Number of hits	Useful Papers
blockchain AND design AND applications	Scopus	All	552	
blockchain AND design AND applications	Scopus	Title, Abstract, Keywords	96	
blockchain AND design AND applications	Web of Science	Topic and Title	57	
blockchain AND design AND applications AND decision*	Scopus	All	137	
blockchain AND design AND applications AND decision*	Scopus	Title, Abstract, Keywords	8	(Xu et al., 2017; Zamani and Giaglis, 2018)
blockchain AND design AND applications AND decision*	Web of Science	Topic and Title	3	(Xu et al., 2017; Zamani and Giaglis, 2018)

continues on next page

Search Terms	Search Engine	Search Fields	Number of hits	Useful Papers
blockchain AND "design decisions"	Scopus	Title, Abstract, Keywords	1	(Xu et al., 2017)
blockchain AND "design decisions"	Web of Science	Topic and Title	1	(Xu et al., 2017)
"blockchain applications" AND design	Scopus	Title, Abstract, Keywords	8	(Elsden et al., 2018; Shae and Tsai, 2017)
"blockchain applications" AND design	Web of Science	Topic and Title	1	
blockchain AND taxonomy	Scopus	Title, Abstract, Keywords	5	(Xu et al., 2017; Yeow et al., 2018)
blockchain AND taxonomy	Web of Science	Topic and Title	6	(Xu et al., 2017; Yeow et al., 2018)
blockchain AND ontology	Scopus	Title, Abstract, Keywords	24	(Kruijff and Weigand, 2017)
blockchain AND ontology	Web of Science	Topic and Title	8	(Kruijff and Weigand, 2017)

C

Categorization of the Design Decisions

Table C.1: Design decisions categorized

	Program Architectures	**Smart Contracts**	**Rules**
Membership Requirements	How can the customers join the program?		Who should be able to join the program?
			How can the customers join the program?
			What are the costs for joining the program?
Program Structure	Frequency Reward Program or Customer Tier Program or a combination of both?		Frequency Reward Program or Customer Tier Program or a combination of both?
Point Structure		When do the points expire?	When does someone qualify for a tier?
		Do people earn extra points when part of a group?	Which amount of points results in a reward?
		What dimensions are considered for the point redemption value?	When do the points expire?
			Do people earn extra points when part of a group?
			What dimensions are considered for the point redemption value?
			What type of token is used?
Reward Structure			Utilitarian or hedonistic?
			Self-beneficiary or altruistic?
			Will there be differing types of rewards amongst different partners?
Program Communication			When to send the customer updates and messages?
			How personalized is the communication with the customer?
			Who is in charge of the communication?
Partnership	Who should be included in the partnership?	Who should be included in the partnership?	Who should be included in the partnership?
		How much are my points worth at each actor?	What form of partnership should be chosen?
			How much are my points worth at each actor?
Unique Blockchain Based Loyalty Program Decisions	Does the program exchange information with other systems?		

C.1. MEMBERSHIP REQUIREMENTS

C.1.1. WHO SHOULD BE ABLE TO JOIN THE PROGRAM?

For the selection of the members of the program, only the rules have to be determined by the party in charge on who should be able to join the program.

C.1.2. HOW CAN THE CUSTOMERS JOIN THE PROGRAM?

How the customers are able to join the program determines the architecture of the program. Since this decisions will have consequences for the information provided by the customer and hence the targeting abilities will be affected by this decision.

C.1.3. WHAT ARE THE COSTS FOR JOINING THE PROGRAM?

The decision on the cost for joining the program is categorized as rules, since this decision is taken in the latest stages of the implementation of the program and does not affect the program structure, nor does it require any additional smart contracts.

C.2. PROGRAM STRUCTURE

C.2.1. FREQUENCY REWARD PROGRAM OR CUSTOMER TIER PROGRAM OR A COMBINATION OF BOTH?

For the structure of the program, one could either choose for a frequency reward program (FRP) or a customer tier program (CTP). This design choice influences program architecture of the program, since the FRP should have a point system which resembles a currency. In a CTP on the other hand the points are used to appoint the customer right to certain products or services. However, both of these program structures use a point system in which points could be earned and in which the redeeming party should be able to know the amount of points the customer has earned. Since the underlying value of the CTP points is absent, the necessity for a blockchain-enabled solution with an underlying token of value is no longer there.

Next to the influence on the program architecture, the structure of the program is to be decided upon by participants of the program, or the party in charge of the program. This decision should be taken and rules should be created around this decision.

C.3. POINT STRUCTURE

C.3.1. WHEN DOES SOMEONE QUALIFY FOR A TIER?

When the program structure opted for is a CTP, there should be rules about the qualification of the customers for a certain tier, this is to be decided upon and will not influence the program architecture, or the additional smart contracts.

C.3.2. WHICH AMOUNT OF POINTS RESULTS IN A REWARD?

Once the program structure is an FRP, there also should be rules about the value of the points and which amount of points would result in a reward.

C.3.3. WHEN DO THE POINTS EXPIRE?

The expiration date should be determined for the whole program at once, therefore, it should be included in the rules of the program. The expiration date of these points within the program could however also be dynamic. Meaning that the value of the points degenerate over time, this degeneration of the point value is enabled by the addition of the smart contracts.

C.3.4. DO PEOPLE EARN EXTRA POINTS WHEN PART OF A GROUP?

For the group loyalty, a smart contract has to be added unto the program, which generates the opportunity for a retailer to issue additional points when a number of people qualifying for the same group makes their purchases at a certain retailer. It should be determined in the rules of the program if this is allowed for the different retailers and what types of groups are considered.

C.3.5. WHAT DIMENSIONS ARE CONSIDERED FOR THE POINT REDEMPTION VALUE?

For the value of the point redemption different dimensions could be considered, by which the expiration date and the choice for a specific partner were already introduced. However, by means of the additional smart

contracts, other dimensions might be enabled as well. These dimensions are enabled by the addition of the smart contracts, but should be decided upon within the rules of the program.

C.3.6. WHAT TYPE OF TOKEN IS USED?
The blockchain technology allows for multiple tokens to be used, which type of token is used is determined by the rules of the program and the goal of the program.

C.4. REWARD STRUCTURE
C.4.1. UTILITARIAN OR HEDONISTIC?
The choice of the rewards redeemed does not affect the program architecture, neither is a smart contract needed for the choice for the rewards. The rules of the program will determine the nature of the rewards being redeemed by the participants.

C.4.2. SELF-BENEFICIARY OR ALTRUISTIC?
The choice of the rewards redeemed does not affect the program architecture, neither is a smart contract needed for the choice for the rewards. The rules of the program will determine the nature of the rewards being redeemed by the participants.

C.5. PROGRAM COMMUNICATION
The communication from the program to the customers has to be regulated, these decisions are however managerial decisions which do not influence the technological design of the program. Therefore, all design decisions with respect to the communication are categorized as only to influence the 'rules' of the program.

C.6. PARTNERSHIP
C.6.1. WHO SHOULD BE INCLUDED IN THE PARTNERSHIP?
This design decision affects all three categories. Since the inclusion of a partnership requires the program architecture to be open for multiple actors, but also requires for the smart contracts enabling the actors to set the rules for the partnership. On top of that, once multiple actors are able to join the program, there should be decided upon the rules for the partnerships as well.

C.6.2. WHAT FORM OF PARTNERSHIP SHOULD BE CHOSEN
Before the loyalty program could be implemented, at first it should be determined if there is an external party in charge, if it is a collaborative ownership or if the program is open for enrolment. This decision does not affect the program or the smart contracts and only affects the rules for the program.

C.6.3. HOW MUCH ARE MY POINTS WORTH AT EACH PARTNER?
For the different point values amongst the different partners, smart contracts have to be arranged on top of the Frequency Reward Program. Once the smart contracts are in place, rules should be determined amongst the different partners of the program.

C.7. BLOCKCHAIN-ENABLED DESIGN DECISIONS
C.7.1. DOES THE PROGRAM EXCHANGE INFORMATION WITH OTHER SYSTEMS?
The remaining design decision for the blockchain-enabled loyalty programs is the interopability, which is an umbrella term for all the remainder decisions identified in the previous chapter. This interoperability concerns the underlying technology and therefore the architecture of the program.

D

Business Processes for Different Loyalty Programs

D.1. SUBPROCESSES FOR REGISTRATION

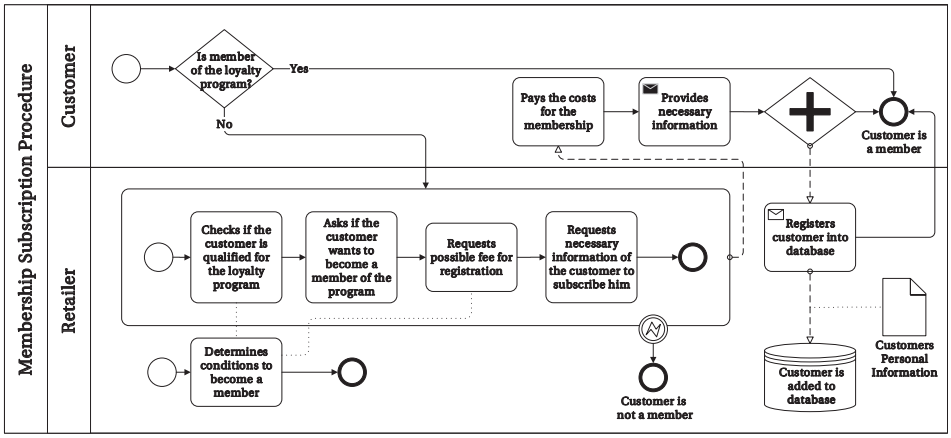

Figure D.1: A BPMN of the subprocess for the registration for a membership card

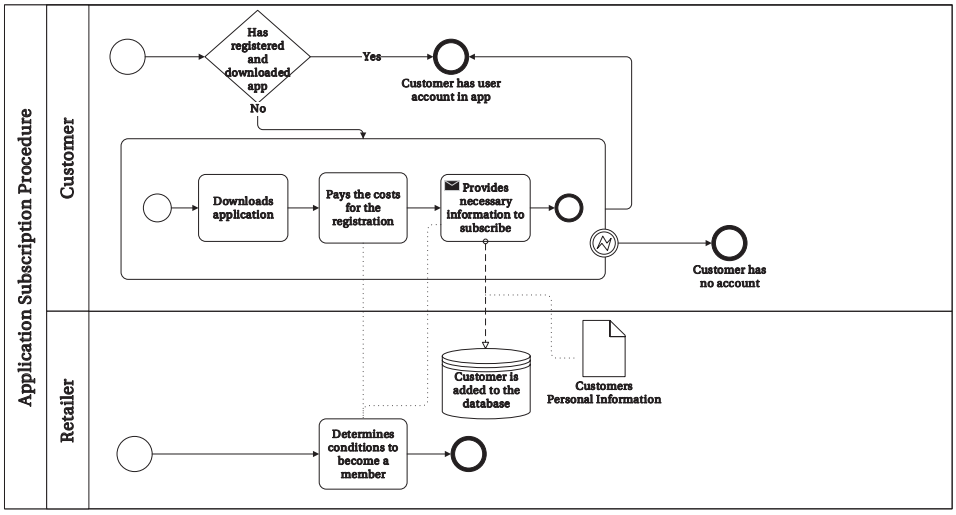

Figure D.2: A BPMN of the subprocess for the registration using a mobile application

D.2. EXAMPLES OF PARTNERSHIP FRPS

Multiple loyalty programs were identified throughout the search for different structures for loyalty programs, a few of which are elaborated upon to provides examples for such a partnership program.

D.2.1. AIR MILES

The first example of a partnership frequency reward program is Air Miles. With over 4 million members, Air Miles is the largest loyalty program of the Netherlands (Air Miles, 2018). By the partnering of six different retailers and 32 redemption parties on top of their own stores, this program has multiple issuing and multiple redemption parties. Characteristic for this program is the mix of the participating parties, which are barely competing with each other on a product and service level. Since all of these parties of different products, except for a small overlap of the Albert Heijn with both the Praxis and the Etos.

This scenario is sketched in order to give an idea of how a partnership could be executed. For smaller retailers however,it is not possible to enter the Air Miles program, since this partnership is restricted to the six parties already present. When it comes down to the BPMN, it is shown that the program of the Air Miles is in its essence a partnership with multiple parties at both the issuing and redemption side of the program (Figure D.3).

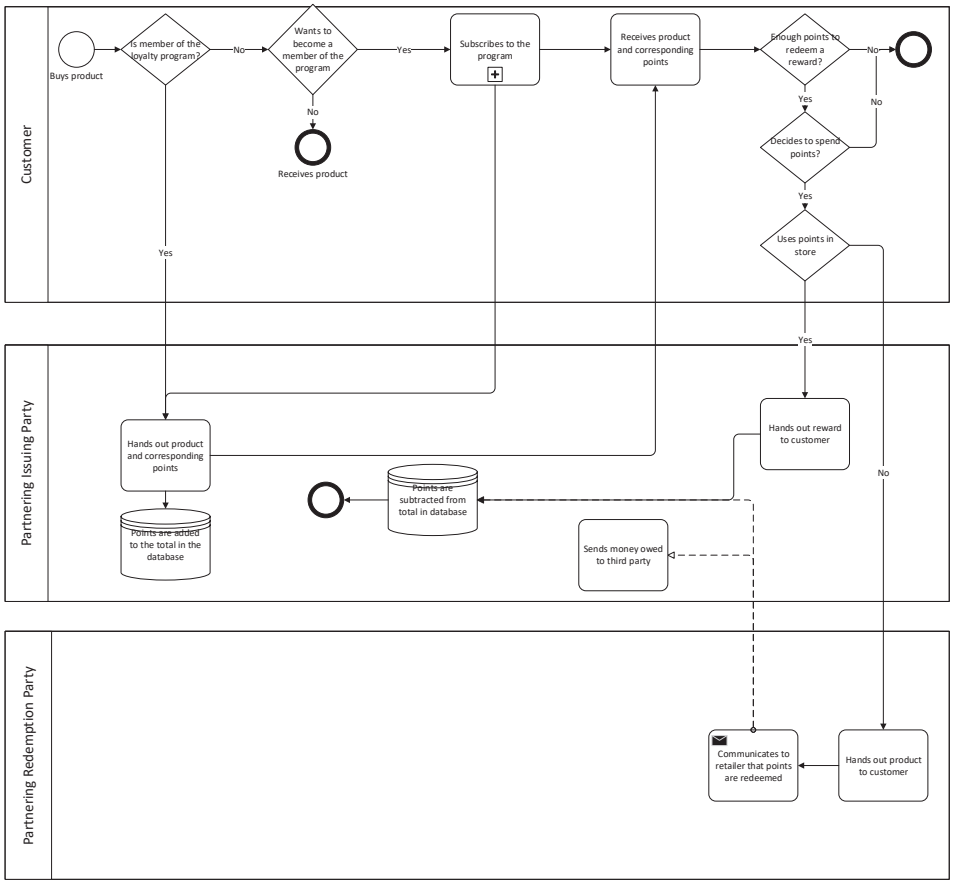

Figure D.3: A BPMN of the loyalty program of Air Miles NL

D.2.2. PIGGY

Another example which is already constructed for a partnership as a way to overcome the proliferation of different loyalty programs for the customer is Piggy. The application they built provides an overarching structure for loyalty programs, shown in Figure D.4. By which the customer only has to have one mobile application installed on his smartphone and is able to use this application at all the participating stores. Since all the loyalty programs on the application have the same program structure, a frequency reward structure, the application works straight-forward and the complexity of the multiple programs is reduced.

This type of loyalty program has an owner, Piggy, and is not a partnership in terms of that the different retailers do not cooperate by the issuing and redemption of points, but do use the same loyalty program. For the retailer therefore, no extra issues arise in terms of the costs for loyalty which is to another retailer instead of themselves. The costs associated with the program are the purchase of an iPad which could scan the mobile application and the rewards which are handed out.

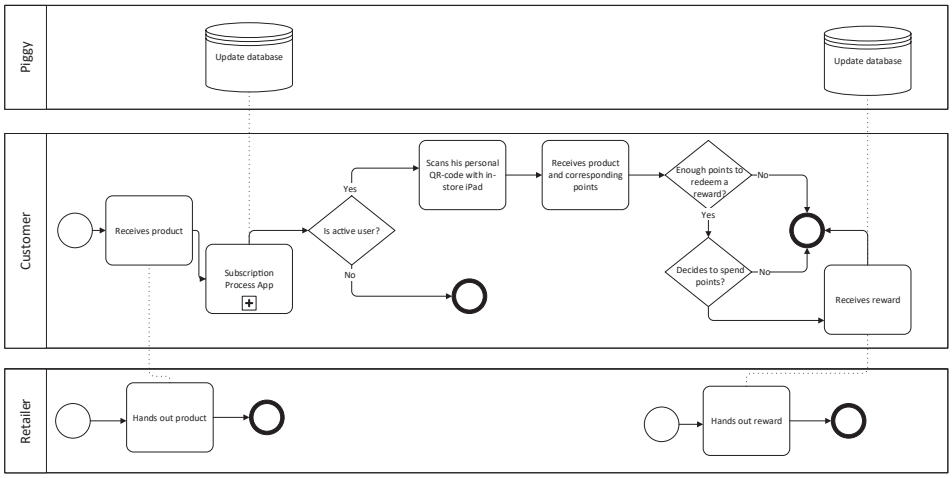

Figure D.4: A BPMN of the loyalty program structure of Piggy

D.3. CHANNEL LOYALTY

Heineken's beercredit is based on an application on the smartphone, by which a customer who buys a six pack or a crate of beer in the supermarket or at a gas station, can earn free Heineken beers in a bar. This process is depicted in Figure D.5. Douwe Egberts, which is a dutch coffee and tea producer, has a program which is over 90 years old. On every package they sell they have printed a coupon which represents a certain amount of points. Once the customer buys one of their products, the customer can cut the points and save them in order to redeem a reward at a partnering store, the Blokker. The process of the Douwe Egberts' program is to be found in Figure D.6.

Once Heineken's and Douwe Egberts's programs are stripped down to the essentials it can be seen that both of the parties select a reward for their customers for which they can save and their saved points can only be redeemed at specific redemption points. In both of the programs a retailer is involved at the point of sale, the retailer however does not do anything on top of selling the product. If the issuance and the redemption point are both connected to the blockchain solution and are able to respectively print out the receipts with the purchase and to scan a QR-code to register the points, the process could be replaced by means of a smart contract. The issuance and redemption rules are shown in Figure 4.10. For the Heineken the rule for the point redemption of being over 18 is added. Since this is the legitimate age to buy alcohol in the Netherlands and in the case of customer fraud, when a kid is scanning the receipt of someone else, he should not accidentally receive points to order a beer at a bar.

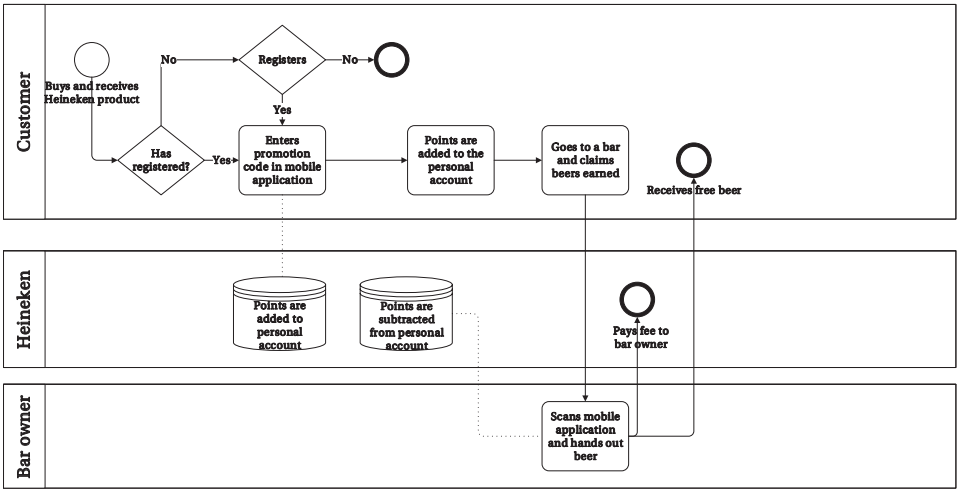

Figure D.5: A BPMN of the channel loyalty program of Heineken

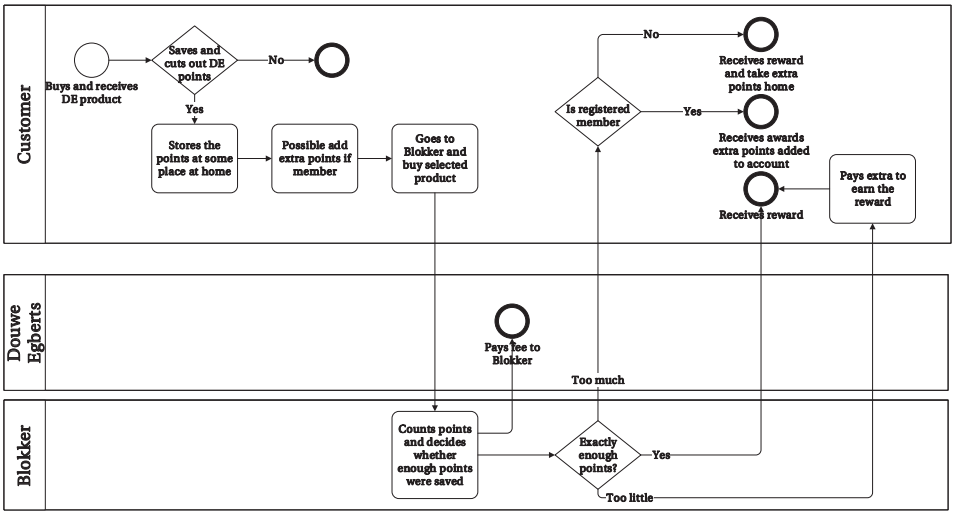

Figure D.6: A BPMN of the channel loyalty program of Douwe Egberts

Once these contracts are implemented in the loyalty program, the program itself should be able to handle the rest. The program, of which a simplified version is shown in Figure D.7, contains both the smart contract of Heineken and Douwe Egberts. They are referred to as the producer. This BPMN only shows the issuing side of the process. The issuing party can label the coins as the producer asks him to do.

Since Heineken's program already stores data on where the points were earned and where they are redeemed, the switch to the blockchain technology would not offer new opportunities. As for the Douwe Egberts they could obtain more data on where there products are bought and which products are combined with what type of rewards.

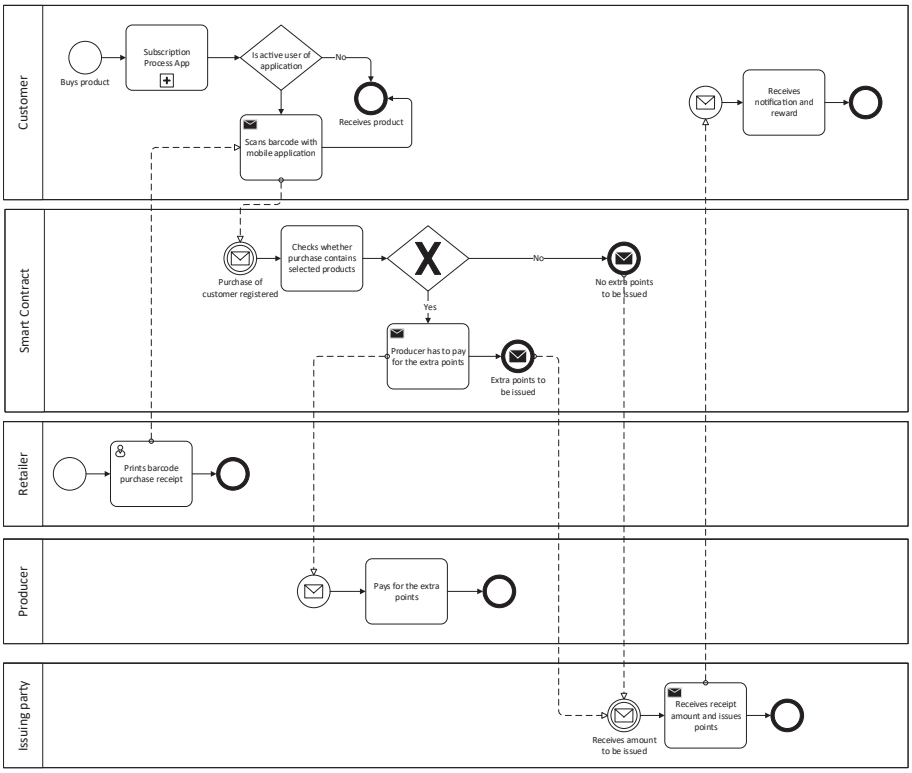

Figure D.7: A BPMN of a channel loyalty program constructed with blockchain technology

D.4. LIFESTYLE LOYALTY

D.4.1. SUBSIDIES FROM GOVERNMENT

If a blockchain-based loyalty program is adopted for the loyalty towards a lifestyle, this idea could be taken to the next level by adding subsidies of the government. These subsidies will no longer be handled by request, but could also be implemented within the same program. Smart contracts could verify the investments made and automatically grant the subsidy the customer deserves. As use case for this scenario we use the Dutch subsidy for renewable energy (InvesteringsSubsidie Duurzame Energie (ISDE)). With the information provided by the RVO (2018), the scenario is constructed first for the current course of events (Figure D.10 in Section D.5) and after that a blockchain-based scenario is constructed (Figure D.11 in Section D.5), which is an adaptation of the loyalty program as is offered by RetailCoin. If this subsidy structure is implemented, the points earned for the customers take on significant forms. As for example in the case of the heatpump, the customer receives amounts up until €1800. A customer does not want to redeem such amounts only on free cups of coffee and loyalty rewards like that. Once this option is added to the system, the system should also support the ability to exchange them on the money exchange right away, at least for these subsidy points.

Even though the blockchain-based option seems less complex than the current way to apply for government subsidies, there are a few points of attention which will not make such a scenario likely in the near future, or maybe not at all.

Once the value of the redeemed subsidy is based on a cryptocurrency, it might reflect badly on the government when the customer loses his subsidy or sees its value go down. Next to that, the government is not able

to set aside a certain amount of money unto the blockchain, because their investment, which is substantial (€100 million for this year (RVO, 2018) could for example only be worth half of it due to a dip in the stock exchange. By which the subsidy fund has shrunk. Therefore, the subsidy could not be stored in an account on the blockchain, but a transaction should only be made once a subsidy is granted.

Next to the issues with the volatility of the cryptocurrency, there are also some issues with the reliability of the transactions made. The RVO has introduced several checks in order to ensure that the subsidy is indeed rightfully earned by the customer. Once all these checks have to be transferred to the blockchain-based option, it implies that the customer has to store its current address social security number into his membership to the loyalty program, which would endanger the privacy of the customer too much. Different options are already being explored for a zero proof identity, in which a customer can have their own digital personality. This personality does not show any personal information, but it can be checked if one possesses for example a valid social security number and lives in the Netherlands.

The other checks executed by the RVO are the check for the proof of purchase, payment, and installation. The first two are already covered by the scanning of the receipt, but the proof of instalment will add the requirement that a package deal is made by the retailer and a contractor, or that the contractor also prints a receipt, which can be added to the blockchain and by which a smart contract will ensure the instalment.

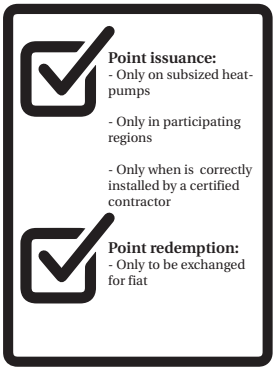

Figure D.8: The rules and conditions for the smart contract enabling the subsidy of a heatpump on the loyalty program

D.5. OTHER BPMNS

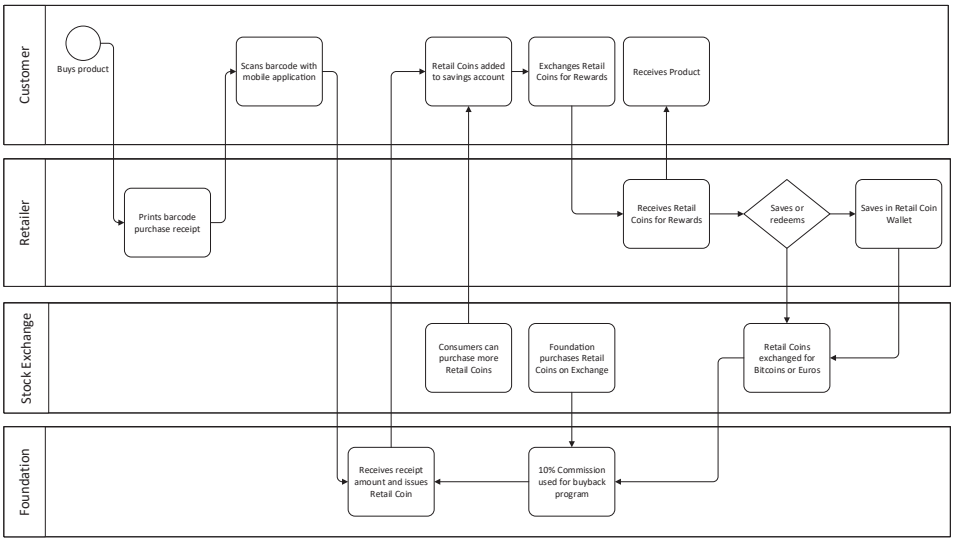

Figure D.9: A BPMN derived from the (RetailCoin, 2018) WhitePaper

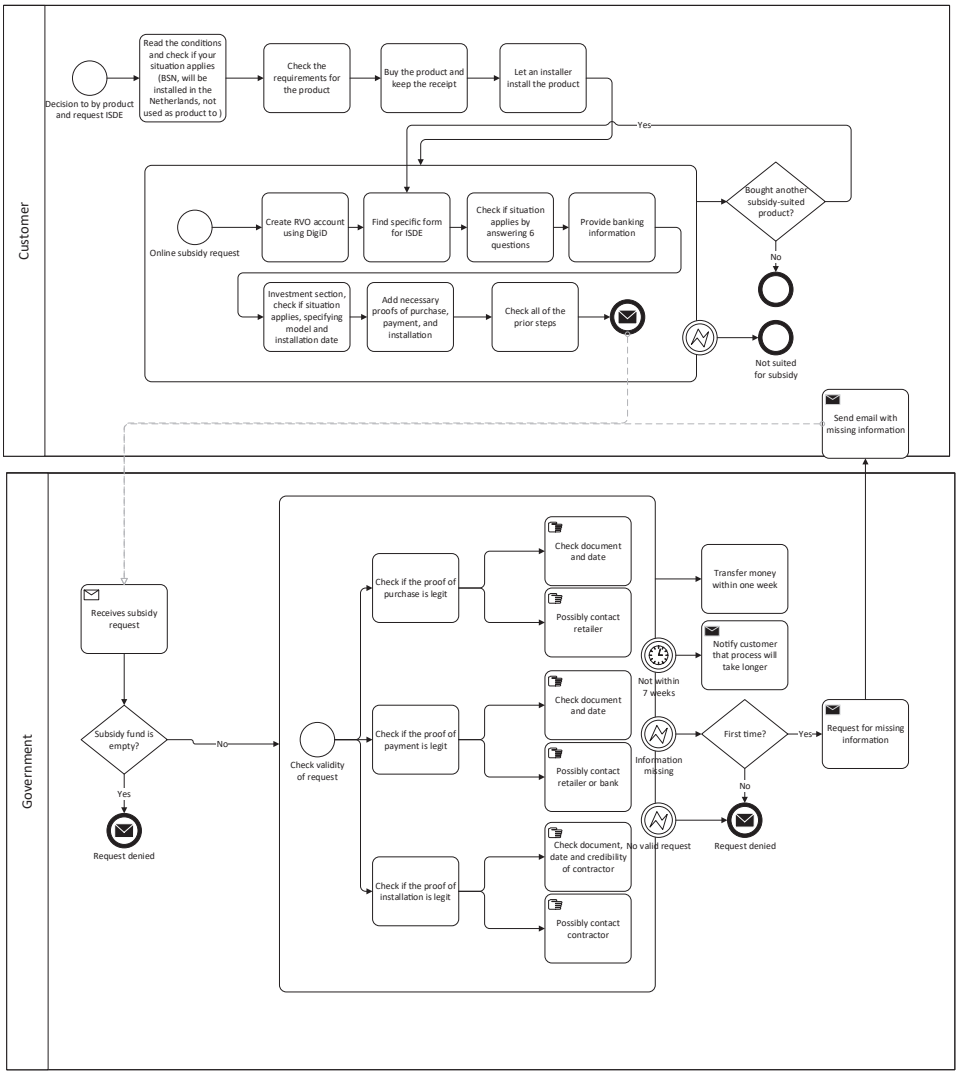

Figure D.10: A BPMN of the current process of the subsidy retrieval of a heatpump

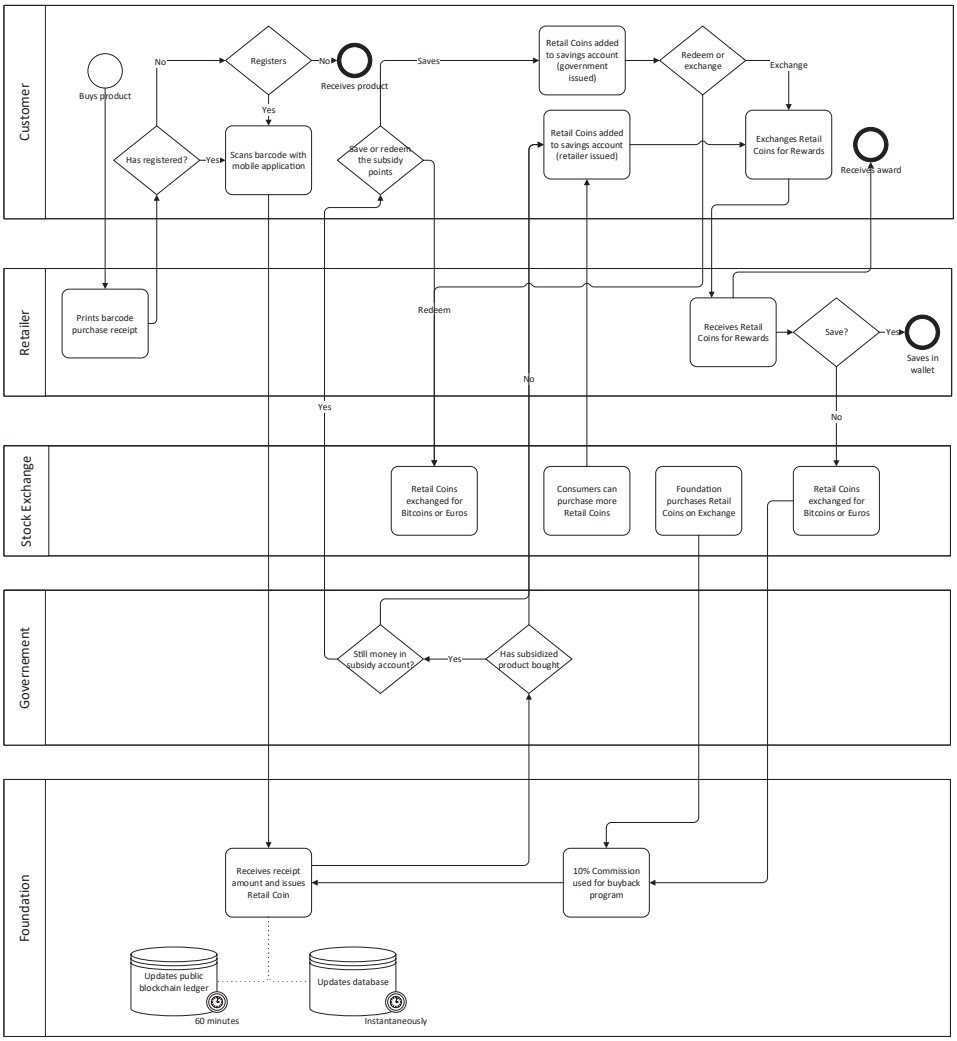

Figure D.11: Scenario Government subsidies

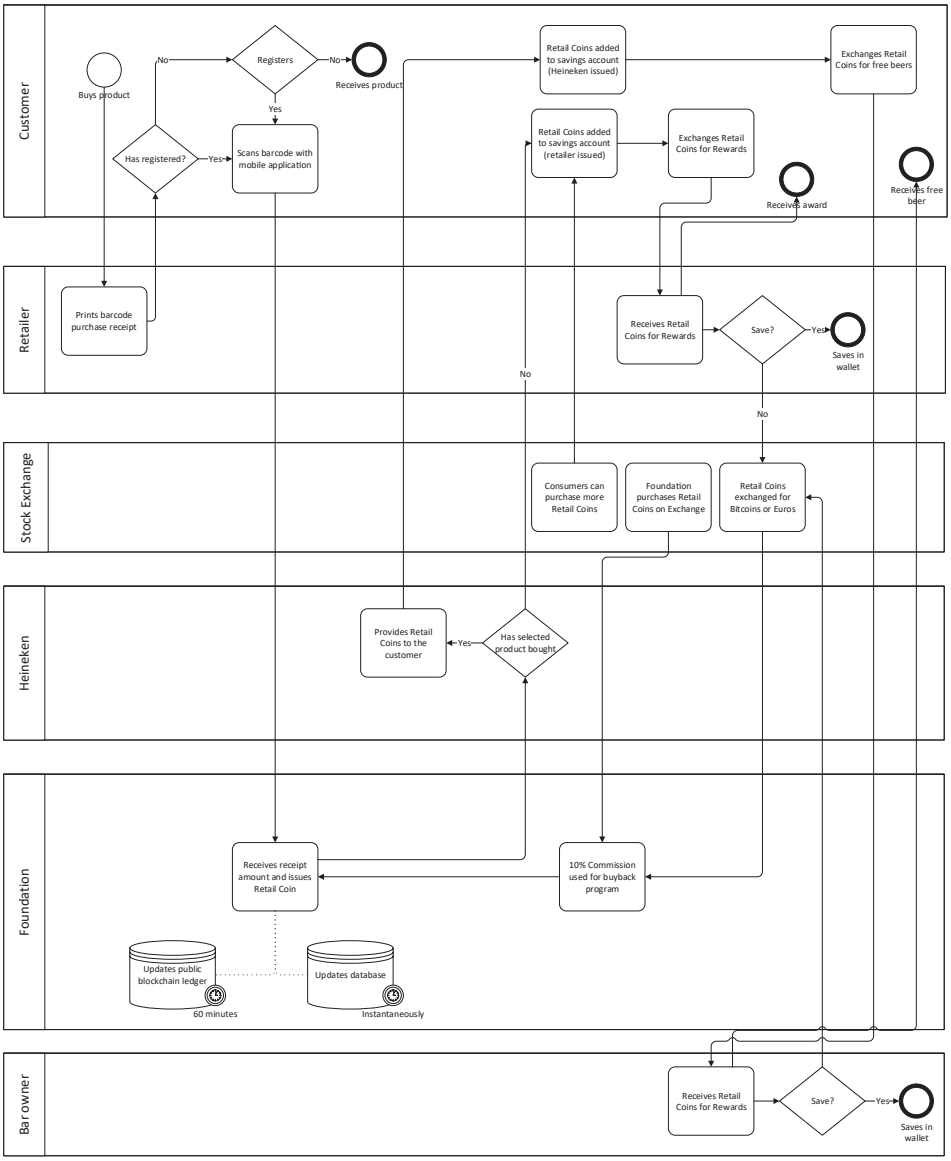

Figure D.12: Scenario Channel loyalty with BCT

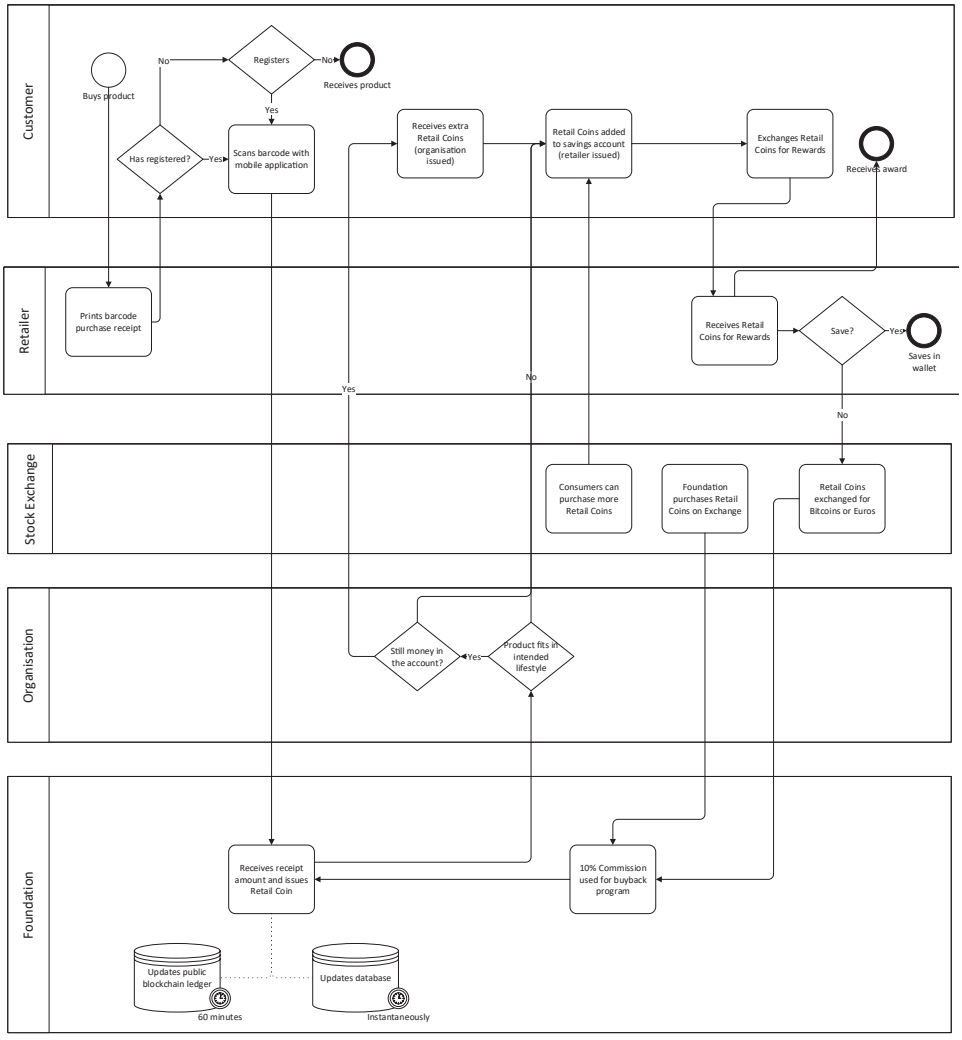

Figure D.13: Scenario Lifestyle loyalty

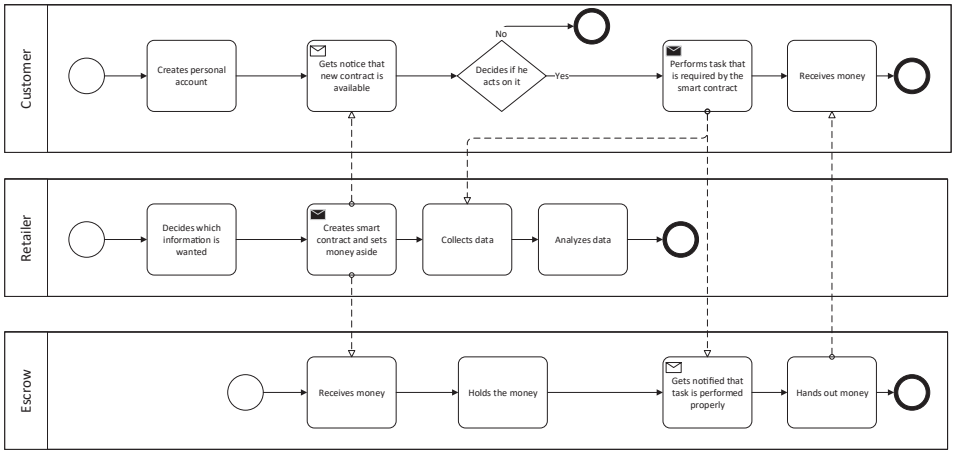

Figure D.14: A BPMN of the Universal Reward Protocol

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E

FRAUD

Loyalty programs are designed and invested in to keep the customers loyal to the company. However, these programs are also susceptible for fraud, which, in this context, is defined as the misuse of the loyalty program. With as consequence that the investment of the company to create loyal customers will be subject to leakage. Three types of fraud are identified, the member fraud, organised fraud, and staff fraud, also referred to as gaming fraud, external fraud, and internal fraud respectively (Kobie Marketing, 2018).

E.1. MEMBER FRAUD

With the increasing applications for the points of the loyalty programs, also the value of the points earned in the program is increased. Therefore it is more lucrative for the customers to falsify their loyalty reward points. However, it is not always achieved as fraud by the member himself, since he might just be exploiting a loophole of the program. That is why this type of fraud is also referred to as gaming fraud.

E.2. ORGANISED FRAUD

One speaks of organised fraud if it is attempted to trick multiple people out of their points at once, or when points are unrightfully appointed to persons on a large scale. Also driven by the increasing value of the points in the programs. Lots of these fraudulent activities are being committed through phishing scams, in which people provide their user information for the loyalty programs. Often these attacks go unnoticed since people are not aware of their point balance in every loyalty program they are enrolled in. But also new ways of organized fraud are being explored, online IDs of people are being used to buy plane tickets after which the fraudulent party ends up with the frequent flyer points (Chargebacks911, 2017). With the possibilities to tailor these emails to the victim, the phishing attacks using airline information has a success rate of 90% which is one of the highest success rates for these kind of attacks (Cidon, 2017), creating a perfect opportunity for organised fraud. That people use this opportunity is also seen in Experian Global Fraud Report, which found that globally 75% of the loyalty programs has experienced a fraud attack (Experian, 2017). These attacks lead to a break with the corresponding company in 17% of the cases.

E.3. STAFF FRAUD

This kind of fraud is when the employee does not scan the membership card of the customer, but instead scans his own membership card, either when the customer wanted the points or did not want the points. In this way it does not cost the company extra money. However, the money was meant to build customer loyalty, which is not achieved if the staff itself receives the loyalty points for the purchase of the customer.

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F

Business Models Blockchain-Based Programs

F.1. Basic Program

To explore the opportunities for the basic program, it is assumed that the loyalty program is adopted by all of the retailers in Delft. Such that it is in fact an enormous partnership and that the points are only to be spend in Delft. The points can be earned by means of a purchase in a brick-and-mortar shop in Delft. When such a purchase is made, the member earns a set percentage of the amount purchased as points (RetailCoin, 2018; R. Weiss, personal communication, September 7, 2018). Once the customer decides to spend his points on a desired gift he can go to one of the participating retailers and redeem his points for the reward selected by the retailer. For this basic program, the rewards redeemed by the customer are all self-beneficiary rewards, they could both be utilitarian or hedonistic, which is based on the selection of the rewards by the retailer himself.

During the description of the program and the revenues and costs associated with it, the possible volatility of the underlying cryptocurrency is not taken into account. The points are however linked to the value of the Euro.

F.1.1. Customer Segments

The main purpose of the program is to target the local citizens of Delft and of the nearby towns, to become loyal to Delft and along with that towards the retailer. The target audience could reach further than only the local citizens, since some of the stores will also be recognized by the 'day trippers'.

F.1.2. Value Propositions

The value delivered to the customer are the ease of use and a more customized program. These values are assisted by the rewards the customer receives for the earning and redeeming of the points.

F.1.3. Channels

The five phases indicated by (Osterwalder and Pigneur, 2010) are used to determine what channel should be used for this program.

Awareness

The initial awareness of the program amongst the citizens of Delft and surroundings could be managed by local campaigns and advertisements at the check-out of the different retailers in Delft. The awareness when the program is running is been taken care of by personal advertisements based on the enhanced data analysis enabled by the program. The awareness could for instance be raised either by push notifications within the mobile application or by sending a frequent e-mail in which the user is updated about the products and rewards he might be interested in.

Evaluation
This channel phase is to help the customer evaluate the value proposition of the retailer. The value propositions of the program are the ease of use, customization and the rewards offered by the program. Once these are assisted by one overarching personal account, the customer could be made aware of these benefits.

Purchase
The purchases are all in the brick-and-mortar stores in Delft and do not require any additional channel.

Delivery
The added value for the customer has to appear and be delivered while he is shopping in the city center. Therefore, the delivery of this value should take place while shopping and should be assisted by the local retailers.

After sales
The after sales support and communication should also be taken care of the by the personal account of the customer, supported by an e-mail or push notifications.

F.1.4. CUSTOMER RELATIONSHIPS
The addition of the loyalty program will not change the relationship with the customers for the retailers. Depending on the type of retailer will this relationship remain a self-service or personal assistance relationship (Levy and Weitz, 2008).

F.1.5. REVENUE STREAMS
The revenue streams are the expected repeat-purchases and the possible extra money earned when the rewards are sold for the points. To explain this latter revenue stream, the reward program is simplified in Figure F.1 for the process of buying a cup of coffee, the customer also spends his earned points at the same retailer. As an example, the structure and percentages of RetailCoin are used, where each purchase yield a 2.5% point value in points and the retailer has to pay a fee of 10% to the foundation when exchanging his points for fiat. The result of which is that, if the retailer does not offer a reduced point price, the retailer receives 90% of the regular price for the 41^{th} cup of coffee sold. A simplified calculation of the markup creates insight in the amount of money a retailer makes for the rewards.

This calculation assumes that the selling price (SP) of the retailer consists of two parts, the purchase price (PP) and a gross profit, expressed as a part of the purchase price, the markup (MU). The selling price consists of two parts, the net revenue (NR) and the 10%-fee (F) for the foundation enabling the program. Resulting in the following equation,

$$(1 + MU) \cdot PP = NR + F = (0.9 + 0.1) \cdot SP \tag{F.1}$$

The retailer will break even when the purchase price equals the net revenue, removing it from both sides and simplifying of the equation results in a markup of at least 11% which has to be added on top of the purchase price. This calculation does not take into account any other costs than the purchase price, since the fixed and variable costs are unique for every retailer.

Hence, when the markup of the retailer is higher than 11%, there also will be a revenue from the 'free' cup of coffee for the customer. Given that the typical gross margins for a supermarket and a convenience store are between 25 and 45% (Levy and Weitz, 2008), it is most likely that also this cup of coffee will generate a revenue.

Since the points could have been earned by another retailer, the retailer should not lose money over the sales of the reward. To prevent this loss the markup of 11% can be used as a rule of thumb for the decisions regarding the reward structure.

F.1.6. KEY RESOURCES
When all local retailers participate in the program, it is most likely the retailer will hand out rewards which are already in their assortment. Therefore, the supplier and distributions channel will not change for the retailer when the LP is adopted.

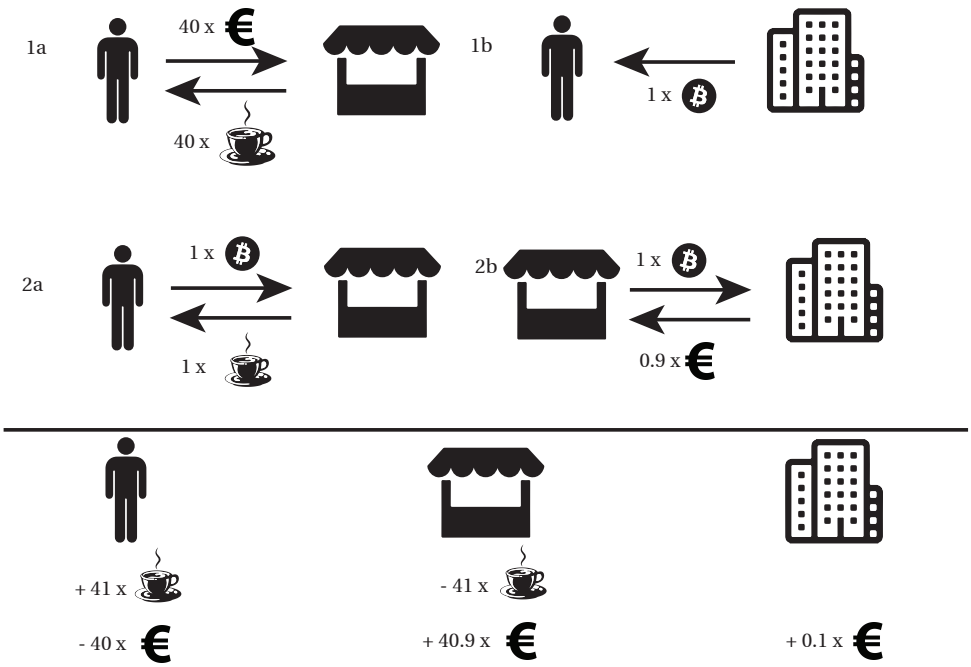

Figure F.1: Example of money flow in basic program for the purchase of a cup of coffee

To enable the retailer to participate in the program, the cash register of the retailer has to be updated. Since the register has to be able to scan the QR-code generated by the mobile application or the barcode of the membership card when the rewards are redeemed. For the customer to autonomously use the mobile application, the register has to be able to print a barcode which can be scanned by the customer, some of the receipts printed by the retailer already contain a barcode. In that case a work-around could be thought of for the redemption of the points by using another method, for example a tablet or smartphone, to scan the QR-code by which the points are being transferred to the retailer.

Therefore, the key resource the overall program requires is of a technological nature to deliver ease of use to the customers. The increased targeting enabled by the program, which requires that the data gathered by the program should result in a personalization feeling for the customer, requires for the ability to analyse the data and for the ability to reach out to the customer.

For the final value offered by the program, the rewards, the key resources are the retailers offering the rewards.

F.1.7. KEY ACTIVITIES

The key activities for the values to be offered to the customer are to update and maintain the technological solution. With this up-to-date and working technology the data gathered on the customers should be analysed and processed, such that the personalization could be enabled. To ensure that the customer also experiences this personalization, personal offers should be selected by the retailers and the customer should be made aware of these offers. The choice of the rewards should contribute to the repeat-purchase of the customers and will most likely be selected by trial-and-error, but could also be guided based on the retrieved insights in the shopping behaviour of the customer via the loyalty program. Once the rewards are selected, the retailer should ensure that the rewards offered are in stock.

F.1.8. COST STRUCTURE

The most expensive key resource for this program is the data gathering and analysis. These activities require for an advanced technology, and for persons to be responsible for maintenance and analysis, costs which are continuous. Next to these continuous costs, there are also costs for the installation and the provision of the technology, which require a one time investment.

F.2. GROUP LOYALTY

By enabling customers to earn points as a group or family, this addition lets users of the application become loyal as a group. By adding smart contracts in which it is stated how big a group has to be, how it should be composed, or how big a family should be to qualify for the extra points, the retailer could create extra incentive for a group of customers to shop at his place. This loyalty could both be connected to a specific product or to a specific retailer. In both cases the composition of the group or family dictates the level of information needed of the customer. For a family for instance the current home address should be added and for a sports team their sports club has to be added as well. By which privacy issues may be encountered, but the level of consumer fraud will be reduced.

By the provision of this personal information, the customer could be a member of two groups at the same time, as shown in Figure F.2.

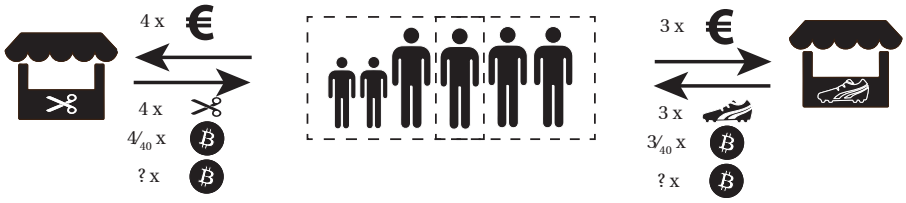

Figure F.2: Earning extra points as a group or family

Since these points are earned as a group who have a common divider, the points earned could also be labelled with a special purpose. To stick with the example of the sports club, if a group of 10 people from the same sports club buy their kicks at the same store, the retailer issues extra points which are only to be spend in the sports canteen or could be used for the purchase of new equipment for the club.

F.2.1. BUSINESS MODEL

F.2.2. CUSTOMER SEGMENTS

The customer segment highly depends on the type of retailer offering the extra points, but the common divider for these segments are that they should be a group of persons who have something in common or are family.

F.2.3. VALUE PROPOSITIONS

The added value for the customer could be financial, but also might be the group belongingness (So et al., 2015). The latter is a result of the selected rewards offered by the retailer, which are not offered to the regular customers, which makes them feel close and identify with the firm (Muniz and O'Guinn, 2001).

F.2.4. CHANNELS

Therefore, it is important that if such an addition is opted for, this is communicated well and provides the customer a certain edge over people who do not belong to such a group. This communication is both associated with the awareness of this additional value and with the after sales communication, which should enhance this group belongingness of the customer.

Next to the mobile application or the personalized e-mail which could make the customer aware of these types of groups. Important channels are the clubs and associations which could make the customers qualify for such points. These clubs and associations might have their own sponsored campaign that encourages people to do things as a group.

F.2.5. CUSTOMER RELATIONSHIPS
Since these people are targeted because of their belonging to a specific group, the relationship should be on a more personal level with these customers, to emphasize the belonging to the group.

F.2.6. REVENUE STREAMS
The group belongingness created by this addition is a driver of the brand loyalty, by which their share of purchases is increased (So et al., 2015), leading to a stream of revenues in the future. Next to that the extra sales of the selected products will also increase sales, the amount of extra sales depends on the level of loyalty beforehand.

F.2.7. KEY RESOURCES
The key resources associated with this program are on the personal information of the customer. Since it is needed to know whether or not a customer qualifies for a certain group. The retailer also needs the data-analysis on his customer to see if a certain group of customers is not reached and could be targeted.

F.2.8. KEY ACTIVITIES
If a retailer decides to participate in this addition, the targeting of the right groups for their product or store and the communication with them are the most important activities. Once the right group is targeted and reached, the regular service is offered and the points are rewarded to the customers.

F.2.9. COST STRUCTURE
The costs for this addition are the extra points issued within the program and the costs for starting a campaign at the relevant clubs and associations.

F.3. CHANNEL LOYALTY
An addition to the basic program which does involve more actors than only the local ones, is the channel loyalty. This type of loyalty connects the producer of the products sold by the retailer with the customer, the options of Heineken and Douwe Egberts were used as an example to introduce the idea of channel loyalty in Chapter 4. Both of these programs also contained a partnership with a third party, a bar and the Blokker, respectively. With the architecture of the blockchain-enabled version this could also be done by labelling the coins to have a specific purpose and a specific redemption point. However, the producer does not necessarily have to choose a particular redemption point, but could use this addition to issue extra points on specific products and let the customer decide where he wants to redeem them.

F.3.1. CUSTOMER SEGMENTS
The customers that are reached could be anyone, depending on the producer, the only boundary condition is that they have to visit the stores in Delft.

F.3.2. VALUE PROPOSITIONS
The extra value offered by the producer is the financial benefit for the customers by buying there products. When additional information on the purchasing behaviour of the customer is already known, the producer could also offer personalized promotions for their products.

F.3.3. CHANNELS
The producer could use the mobile application or an e-mail to notify that a certain product will grant the customer additional points and make the customer aware. Next to that a campaign targeted at Delft could be used, if the adoption of the basic program is still in its early stages, the owner of the loyalty program could also chip in for the costs, since it will benefit both the producer and the program. When the customer uses the offered extra points on the selected product and decides to buy the product, the producer providing the product should be able to provide for the after sales communication, to ensure a brand loyalty.

F.3.4. CUSTOMER RELATIONSHIPS
For the actors already present in the basic program, the organizing party and the retailer, the customer relationship with their customers does not change. The producer on the other hand could enhance its personal relationship with its customers. This relationship is however outside of the scope of the loyalty program.

F.3.5. REVENUE STREAMS
For the program the revenue streams will be generated by the higher attractiveness for the customer. This attractiveness might result in higher volume of sales and repeat-purchases for the retailers. The producer gains access to information which can normally not be accessed and also gets the ability to increase the sales and attention of his product. By means of the program the producer could also induce a sense of producer loyalty by offering additional points to the customer.

F.3.6. KEY RESOURCES
This expansion of the program would not work if no producers would be interested to promote their products by means of the loyalty program and are therefore the financial injections of the producers are a key resource for this type of loyalty.

F.3.7. KEY ACTIVITIES
The key activity for the producer is to select the products which qualify for extra points in the system. This could be products which the producer wants to promote because of its newness or since the sales are disappointing. The producer could also use the program to gather information on the customers who are buying their product.

F.3.8. COST STRUCTURE
The costs associated with this addition are the costs for the issuance of the additional points. The price for these points have to be decided by the owner of the loyalty program.

F.4. LIFESTYLE LOYALTY
Loyalty towards a lifestyle could be achieved by two different approaches, the purchasing of products and the performance of specific activities both corresponding to a certain lifestyle. The option to promote a lifestyle by the selection of specific products is enhanced even more if the points earned for the purchase of these products is only to be spend and used on the same kinds of products. As is also the case for the performing of the different tasks. A lifestyle is optimally promoted when these approaches are combined.

For this program to work an organization should be responsible for the selection of the activities and products and should pay the extra issued points. These points could be financed by the governance or by people who are supporting the idea of the organization.

The addition of the selection of the specific products only adds another party who should select the products and pays to issue extra money. The rewarding of specific activities, as does Reward Protocol, adds to the complexity of the blockchain structure, since the Proof-of-Performance should be added (Universal Reward Protocol, 2018). Which will be taken into account when the business model is constructed.

The lifestyle that will be promoted by means of the loyalty program in this example is a sustainable lifestyle, since this lifestyle could be identified on terms of products and activities. For products different products could be selected such as sustainable electronics, products which are more environmentally friendly, and recycled products. Activities that could be thought of are the recycling of products, carpooling, and the sorting of waste. The activities which are suggested all require a IoT-blockchain solution, the realisation of these solutions are outside the scope of this research.

F.4.1. CUSTOMER SEGMENTS
The customers targeted are all the people who are able to buy the products and perform the activities. While the purchasing of the products should not be a problem most of the time, the performing of the activities is not always a possibility, for example the parking of the car outside of the city center, which is not an option for the non-car-owners. But either person who is in the possibility to perform the action and buy the product is a target of the expansion of the program.

F.4.2. VALUE PROPOSITIONS
The value offered is in terms of the rewarding for the activities performed associated with a certain lifestyle. So the offered value is of a purely financial nature for the people who are just happened to buy these products. For the people however who are trying to live a sustainable life for themselves, they also get the recognition for

the extra effort they are putting into their lifestyle choices.

For the subsidies offered by the government, the program also offers ease of use with respect to the current way of collecting the subsidy.

Next to heatpumps the government could also stimulate the youth to play sports[1], which could offer financial benefits the local citizens.

F.4.3. CHANNELS

On top of the communication by means of the mobile application or e-mail associated with the program, the organization who issues the money could already have their established channels to reach the people supporting this lifestyle, for example a newsletter or events.

For the government their website should be up-to-date with the possibilities for the customers to claim their subsidies by means of the program.

F.4.4. CUSTOMER RELATIONSHIPS

The retailers and the government do not have to change their customer relationship with the customers. The lifestyle organization on the other hand could initiate a community by which people could share their sustainable lifestyle choices and the products which are associated best with this lifestyle might be selected by the members of the community. These communities stimulate the group belongingness for the customer, which is an important driver for the company loyalty (So et al., 2015). Since this belongingness is identified as a driver for the company loyalty and not the program loyalty, the customers might feel more connected to the organization issuing the points or to the retailer who offers the broadest selection of sustainable products.

F.4.5. REVENUE STREAMS

The revenue stream for the organizing party is based on the subsidies from the government and the donations of people supporting such an organization. Since the revenue might therefore be limited and uncertain, the issuance of these extra 'sustainability points' might be temporarily rather than continuous. Fundraisers could be organized to finance such a temporary issuance.

Once the government decides to provide subsidies via the program, the current way for a subsidy to be granted should be present as well. Therefore, there will be no direct new revenue streams or cost cuts. However, it could be that the hurdle to buy subsidized products will be lowered for the customers, which increases the efficiency of the measures taken by the government.

F.4.6. KEY RESOURCES

The required resources for the organization running this program are the money and the selection criteria for the products and activities.

For the introduction of the rewarded activities different investments have to be made to enable for a Proof-of-Performance. In the future even more activities could be rewarded than can be done right now. Therefore the organization should always be on the look out for new possibilities and could use their own community as a knowledge platform to see what new possibilities could be explored.

For the option to redeem the subsidies by means of the loyalty program to be a more convenient option to redeem their subsidies, technical knowledge of this solution should be present within the RVO to assist the customers.

F.4.7. KEY ACTIVITIES

Activities necessary for this addition are acquisition and the selection of the products using the selection criteria created. To build even more value for the customers requires for the organization to organize events and maintain the community.

[1] https://www.delft.nl/inkomen/weinig-geld-gemeente-helpt/vergoeding-voor-sporten

For the provision of the subsidies by the government, selecting the products which are subsidized is a key activity for this addition to work. However, this selection is not a new activity for the government to conduct.

F.4.8. COST STRUCTURE
The costs for this expansion are the costs for the issuance of the extra points, both for the lifestyle organization and the government.

F.5. NON-RETAIL REDEMPTION
For a local loyalty program, different redemption points can be thought of. For the exploration of this option, the sports clubs and the cultural sights where selected. For the matters of this research, both are believed to be ran by a foundation and are therefore non-profit. By which both the sports club and the cultural sight are also foundations which could receive donations from different sponsors. Once these donations are made with points earned by the program, the self-beneficiary reward becomes an altruistic reward (Eason et al., 2015).

As for the lifestyle loyalty, the government could decide to offer additional points to enhance a certain lifestyle, by offering additional points which are only to be redeemed at a sports club when the customer for instance buys his kicks. However, this is considered to be covered by the lifestyle loyalty addition and will not be considered when analysing this expansion of the program.

F.5.1. CUSTOMER SEGMENTS
The target customers for the sport clubs are the local citizens which could have a membership or an affiliation with the local sport clubs. For the cultural sights also the day trippers could are an interesting group to target, both to earn a discount for the entrance of such places or to burn their points earned when they are not planning to have a return visit.

F.5.2. VALUE PROPOSITIONS
The value offered is the ease of use, since the points earned in the loyalty program could be used for even more purposes. By adding the redemption options, the customer is more in charge on where to spend his points, giving him more control and by which the program could be made more personal for the customer, by the customer himself.

The other value added by the program is when the customer decides to donate his points, the customer could feel better for both selfish and altruistic reasons (Fisher et al., 2008).

F.5.3. CHANNELS
To bring this value to the customer, it should be known to him where he is able to redeem his loyalty points. A marketing campaign could add to this, both at the point of sale and on the added point of redemption.

F.5.4. CUSTOMER RELATIONSHIPS
Once the customer decides to donate his points to either a sports club or a cultural sight, the relationship should become more personal. By this enhanced relationship with the customer, the person becomes more involved with the party he donated his points to and the positive feeling associated with the donation of the points might be enhanced even more.

F.5.5. REVENUE STREAMS
With more option to redeem their points, the program will be adopted more, therefore the revenue created with this expansion are the revenues of the additional users of the program.

F.5.6. KEY RESOURCES
The key resource for this expansion of the program are the technological abilities for the multiple added redeeming parties. These parties should be able to handle the points which are redeemed at their places.

F.5.7. KEY ACTIVITIES
In order for this expansion to function the additional redemption points should be promoted. Next to the promotion, it should be clear for the customers on where their points could be redeemed.

F.5.8. COST STRUCTURE

The costs associated with this expansion of the program are the possible costs for the upgrade of the payment systems by the added redemption points. These costs should be paid by the municipality, since they will benefit most from this program and are able to effectively invest in the sports, culture and tourism in Delft.

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Interview Guide for the Expert Interviews

Table G.1: Interview Guide for Contextual Factors

Category	Topic	Description
Introduction	Purpose of the interview and the research	The purpose of the interview is to support the research I'm conducting for my master thesis. For the purpose of this research I've studied both blockchain technology and the loyalty programs. I'd like to research if such a system could be applied to create a local loyalty. I've created multiple blockchain-based loyalty programs, about which I can tell you more after the interview. During this interview I'm conducting with you I'd like to focus on the process side of the implementation of a local loyalty system. The process that precedes the implementation and the technological design of the system.
Ground Rules	Style of interviewing	This interview will be recorded, are you fine with that?
Questions and Probes	Introduction of Interviewee	What is your job, responsibilities, background, affiliation with local loyalty?
Questions and Probes	Participants of design process	Who should be included in the design process of a local loyalty system? What are their core values? Which roles should be fulfilled during the implementation process? Who should provide the command and control? How should the process be supervised?

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Category	Topic	Description
		Who are the experts providing substance to the process?
Questions and Probes	Conditions for the process	What are the auxiliary conditions for the process? When will such a process succeed?
Questions and Probes	Implementation process	What steps should be taken during the implementation process? How should such a program be implemented? What subjects should be considered? How would such a process look like?
Questions and Probes	Other	If a local loyalty program would be adopted which risks do you see?
Thank you and next steps	Rounding up	• Are there some topics you want to discuss, which we did not talk about? • Could I contact you if I have some follow-up questions?