WHAT IS THE STRATEGIC FEASIBILITY OF NFC MOBILE PAYMENTS IN THE NETHERLANDS?

How the individual strategies of stakeholders affect the NFC mobile payment ecosystem as a whole

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Foreword

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Best regards,
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Abstract

In this report the strategic feasibility of NFC mobile payments services in the Netherlands has been assessed. Near Field Communications (NFC) is the enabling technology for proximity mobile payments, which forms the focus of this research. The primary goal was to assess the influence of strategies of individual organizations on the NFC ecosystem as a whole, since collaboration between different stakeholder groups is required in order to deliver an NFC mobile payment service to consumers. As a result, the strategic feasibility has been defined. During this qualitative research grounded theory has been applied in order to find and understand the relevant concepts that define whether NFC mobile payments are feasible in the Dutch market. The research question of this report is:

“What is the strategic feasibility of NFC mobile payments in the Netherlands and how do strategies of individual organisations involved affect the NFC ecosystem as a whole?”

Three value networks have been identified in the Dutch payment market, which are either competing or dependent on the progress of the other network. These are:

- TRAVIK, a joint venture owned by three large retail banks and two mobile network operators. The infrastructure of this will be introduced to the market in early 2013. The joint venture is establishing a Trusted Service Manager, that will enable service delivery to NFC enabled mobile phones. They will develop an open ecosystem, in order to allow competition in the service domain. The goals of TRAVIK are broader than payments, but NFC mobile payments is the first service that will be offered.

- The OV Chip Card. This payment scheme for public transport will soon be equipped with a digital wallet, that allows users of this card scheme to pay with the OV Chip Card at stores in and around stations. The users of this card require speed and convenience and typically make low-value payments. Also, the merchants in and around stations are largely controlled by one of the card scheme owners, making the strategic alignment less complex.

- International card schemes. Visa and Mastercard are offering contactless banking cards, as well as NFC mobile payment wallets for clients. They have an incentive to have large payment volumes, the services they will offer in the Netherlands are compatible with the technology used in other countries. Banks are deciding when their clients get new banking cards however.

Based on the outcomes of this research, the conclusion is drawn that the Dutch payment market is a difficult market for NFC mobile payments to succeed. Current payment methods have low transaction costs, debit card payments have a large market penetration and banking cards and payment terminals have just replaced during the transition to EMV banking cards. However, if strategies are optimized in order to offer contactless payment methods before or similar with offering NFC mobile payment services, the feasibility of this new payment method is expected to be high.

Each of the three options mentioned has benefits. The OV Chip Card has the benefit of having ‘the right client base’, since this card is used by consumers for whom speed is important. TRAVIK has the benefit of a large market coverage, when their project goes live they can offer services to approximately 90% of the Dutch consumers. The benefit of the large card schemes is that they benefit from economies of scale, can offer interoperability with existing payment networks worldwide and can benefit from international experiences. However, the international cards schemes need partners to offer their services, they do not deliver directly to consumers.

The OV Chip Card is currently the payment scheme for public transport, with many travellers using it on a daily basis. Recently is has been announced that the OV Chip Card will be equipped with contactless payment functionality, which allows the users to pay with this card in and around stations. By enabling contactless payments from this card, the installed base at the side of the consumers is used. The benefits for this payment scheme are that the owner of payment scheme also controls most of the merchants in and around the stations, making stakeholder alignment much easier. Adoption is expected to be large once this service is offered.
Therefore, on the short term, contactless payments with the OV Chip Card are expected to have large potential, they are considered as the largest threat for the payment volume of retail banks and for the value network of NFC mobile payments. This research has indicated the need of assessing NFC mobile payments combined with contactless payments, therefore the outcome of this analysis can be considered as surprising.

The opportunity for the OV Chip Card to develop into an accepted payment scheme for low-value payments is caused by alignment conflicts between the three retail banks in TRAVIK. The conflict between banks has resulted in the decision not to offer contactless banking cards from Visa or Mastercard on the short term. This opens opportunities for other payment schemes to offer contactless payment services. The OV Chip Card, although not as secure as normal banking cards, is expected to have large potential in and around stations. Due to network externalities, installed base and lock-in effects several risks for traditional card schemes have been indicated.

The practical contribution of this research is found in several domains. The current status and developments in the Dutch payment market have been assessed, as well as the payment behaviour of Dutch consumers and the influence of payment platforms. With the research model that has been developed in chapter 2 and 3 and explained in chapter 4, the strategic feasibility has been assessed with data collected from sixteen interviews with representatives from five different stakeholder groups. With this data, cross-stakeholder conflicts have been determined, as well as conflicts within certain stakeholder groups. The role of strategies of individual organizations on ecosystems as a whole has been assessed, with the conclusion that the defined research model is complete and relevant for this market. However, future research is required in several domains. The researcher recommends future research on technology adoption, technology lockout and platform competition for this specific context. Due to the specific focus on proximity payments, several elements of NFC that are likely to add value, such as loyalty schemes and couponing, have not been taken into account.

The theoretical contribution of this research comes from the combination of the organizational domain of the STOF business model framework (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008) with platform-related concepts, taken from economic research, from strategic management literature and from industrial economics. This approach has been successful for mobile payment applications: the combination of several research streams resulted in a better understanding of the behaviour of stakeholders and the dynamics between different networks. The followed approach has contributed to existing literature on several levels. First, defining the boundaries of complex networks has been identified as difficult and very influential on the outcome of the analysis. As a result, stakeholder identification and stakeholder management are difficult in complex ecosystems and value networks. Future research is required to optimize the research model and to assess the influence of individual concepts on strategic feasibility.

The approach presented in this research can be applied to research on mobile applications, on payment services and mobile payments more specifically. The approach presented here has been explored for usability in a specific context. In order to develop a theoretical framework to assess mobile applications in a more general context, future research is required.
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1. Introduction

Due to the availability and acceptance by consumers, the mobile phone is expected to be the best carrier of mobile payment functionalities and to replace the use of cash money (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). It is seen as a very suitable technology to replace cash, since it provides convenience and mobile phones have an important role in the daily life of consumers. Due to the costs involved with cash money, like storage, theft and errors, retailers are looking for methods to reduce cash payment volumes. The actual development and acceptance of mobile payments in the markets around the world have not met the expectations yet however. Only in very specific markets mobile payments have reached mass market, but in most European markets no large success has been reported. When looking at the Netherlands, several attempts to introduce mobile payments have been made, but most failed and disappeared again, others only have reached small niche markets. Why is the development in the Dutch market so difficult and slow?

Several solutions for mobile payments with Near Field Communication (NFC) technology could be feasible in the Netherlands. NFC mobile payments are made by holding a smartphone very close to a reader in a shop. However, contactless payments with cards will also be taken into account, since they use similar technology and require the same acceptance infrastructure. Three main solutions have been determined and will be analysed as possible implementations to introduce NFC payments in the Dutch market on a short term:

- **Creating a new and universal solution for the Dutch market**, as is currently foreseen by the TRAVIK consortium. This joint venture, owned by three major Dutch banks and the two network operators in the Netherlands, aims to develop the infrastructure required for NFC payments in the Netherlands. The five partners will create a Trusted Service Manager, which will enable service delivery with regards to NFC mobile payments. This should result in an open ecosystem, in which organizations can compete based on their value proposition. Due to the market power this joint venture will have once they become operational, their situation is now analysed by the European Commission.

- **Adding contactless payment functionality to the OV Chip Card** (the RFID card used in Dutch public transport). In that case the card can also be used to make small payments at the shops around the stations. Since approximately 9 million (Trans Link Systems, 2012) Dutch consumers have this card, the step towards introducing this payment method is rather small. The installed base of this contactless card is rather high. Once readers have been installed in the stores, they could then be used for mobile payments, due to backward compatibility of the technology. This strategy has been successful in Japan, the same roll-out strategy could be applied to the Netherlands. Once the readers are installed in the stores, mobile phones can be developed to be compatible with this technology.

- **Contactless payment products from the international cards schemes**. In the US and the UK many debit and credit cards have been replaced by ‘smart cards’, which are RFID enabled banking cards (Paypass from Mastercard and payWave from Visa). With these cards payments can be made by swiping the card in front of a reader in shops, public transport or other points of sale. Payments under 15 euro can be made without a code, but above consumers will be asked for their private code. Banks are currently in control on the decision to introduce a new banking card, but the card schemes are also establishing collaborations with smartphone producers and mobile network operators. Some NFC enabled smartphone models are already compatible with payWave or Paypass technology (or both), making the step to adopt NFC mobile payments rather small for consumers (since they already make contactless payments with their banking card). However, banks decide when their clients get new payment cards. The acceptance infrastructure is missing in the Dutch market at the moment, since contactless banking cards are not available on the Dutch market yet.

The three different approaches to NFC payment technology in the Netherlands already give a small glimpse of the complexity and the struggle between standards to reach the market. Two solutions are based on the national characteristics and available infrastructures in the Netherlands, while the third approach is evolving on a global scale. This research will contribute to the reduction of uncertainty and complexity, by assessing the role of strategies of individual organizations on the NFC mobile payment ecosystem.

This chapter describes the approach followed and the structure of this report. Chapter 1.1 gives a background on mobile payments and the different types that can be identified. Chapter 1.2 introduces the requirements for an
NFC ecosystem and the important stakeholders. Chapter 1.3 explains the research problem and the classification of research phases. Chapter 1.4 elaborates on the relevance of this research, chapter 1.5 gives the objectives that the researcher aimed to achieve during this research. The research questions, research methods and scope of this research are explained in the three subchapters of chapter 1.6.

1.1. Mobile payments

Mobile payments, which are defined by (Mallat, 2007) as “the use of a mobile device to conduct a payment transaction in which money or funds are transferred from payer to receiver via an intermediary, or directly, without an intermediary”, receive a lot of attention lately. Since 97% of the Dutch population had a mobile phone at the end of 2009 (PwC, 2011a), the market potential for payments by phone is very large and many players want to get their part of the market. Especially in the field of micro- (up to 2€) and mini-payments (2-20€), where speed and efficiency are most important, mobile payments seem to be very promising (Kim, Tao, Shin, & Kim, 2010). In the case of the Netherlands, this opportunity can arise within a couple of years, since it is expected that the Chipknip, a payment system for micro-payments, will cease to exist (Chipknip, 2012a). Mobile payments are different from mobile banking, since mobile banking offers similar functions as a desktop computer. Mobile payments are often more innovative, since they enable additional services outside the traditional banking methods, like couponing or marketing.

In general, mobile payments can be classified in four categories, where the categories are divided by the distance between buyer and seller and the type of buyer and seller. As shown in Table 1, mobile payments can be made either from a distance (through internet or SMS) or when buyer and seller can see each other. This research will be focused on the second type, which are the consumer to business payments. And then, based on an extensive literature research and preference of the researcher, the focus will be on the proximity payments. These are situations where payments are either done by ‘contactless swiping’ of the mobile phone across a reader or by using a banking card in the conventional way, but with a mobile device to process and verify the payment over the cellular network of the phone.

Table 1 Classification of mobile payment possibilities (Innopay, 2012)

<table>
<thead>
<tr>
<th>Proximity</th>
<th>Consumer to consumer (P2P)</th>
<th>Consumer to business (C2B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contactless payments (Bump)</td>
<td>Contactless payments (NFC)</td>
<td></td>
</tr>
<tr>
<td>Mobile point of sale (Square)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>Mobile money transfers (Paypal)</td>
<td>Mobile online payments (webshops/iTunes store)</td>
</tr>
</tbody>
</table>

In the field of C2B proximity payments two technological trends are most promising, namely ‘Near Field Communication’ and ‘mobile points of sale’:

- **NFC mobile payments** are possible when an antenna, an RFID (radio frequency identification device) chip and a secure element are located in the phone. This secure element can be placed either in the device (embedded), at the SIM-card or at a micro-SD card. The location of the secure element will become important later in this report. Contactless payments can then be made by holding a phone in front of an NFC enabled payment terminal. NFC mobile payments offer several benefits when compared to payments with contactless cards (or traditional cards), since it combines the advantages of contactless communication (quick, easy to use) with the display of the smartphone (for authentication or other communication purposes). In some cases the mobile internet capabilities can also enhance the functionality of the NFC enabled smartphone.

- **Mobile points of sale** are devices like an iPad or iPhone that are enabled to handle card transactions, as an alternative to the current card systems (like VISA and Mastercard) with their fixed infrastructure. An example comes from the service provider Square (Square, 2012), a US based company that sells a device that is plugged in to a smartphone and then uses the 3G or wifi connection to handle the payment. Square is a payment service provider that uses the payment platform developed by IP Commerce, a Software as a Service (SaaS) platform for the handling of payments (IP Commerce, 2012). This platform lays over the current payment systems, is compatible with different card systems and is expected to revolutionize the payment industry (Webster & Evans, 2010). The platform based payment systems can be classified as Payment Service Providers (PSP) and is seen as a potentially disruptive innovation for payment systems.
What is interesting about developments in the field of mobile payments is that some banks do not seem to be involved in the innovations (Bareisis, 2011). They develop applications for clients to access their banking account from the phone (mobile banking applications), but the real innovations in hardware and software are left to others. In general it can be seen that the innovations in the field of hardware are created by mobile phone producers (especially in the field of Near Field Communication). A potential cause could be the assumption that telecom operators and phone producers will benefit more from NFC technology than banks (Thompson, 2012). The innovations in the field of applications are often created by payment service providers or independent application developers.

This scope of this research is on the Netherlands and on payments from consumers to merchants. Mobile points of sale will be left outside the scope. Payment platforms will be in scope, since they can offer significant benefits to merchants and consumers, as will be explained in chapter 2.3.2.

### 1.2. Near Field Communication

Near Field Communication technology (NFC) has created high expectations in the market (Webster & Evans, 2010). With NFC technology an RFID (radio frequency identification device, like found on the OV-chip card or other contactless cards) chip is integrated with a mobile phone. The added value of the combination of an NFC antenna and a mobile phone is mostly the screen of the mobile phone, that can be used for authorization purposes, but also for advertising or other forms of communication with the customer. Next to the screen, the cellular network and GPS functionalities could be used in order to create a better experience for consumers. Value can be found in terms of advertising, loyalty schemes, clients information or access approval. The ultimate goal would be a ‘digital wallet’, a situation where all cards are combined into the mobile phone. Consumers can then use the mobile phone to pay, to use the public transport, to receive information when they enter a store or to get discounts.

In order to deliver NFC services, a whole ecosystem of actors is required. In most NFC models, as given in Figure 1, the technology depends on 5 groups of actors (Smart Card Alliance, 2009): financial institutions, telecom operators, Trusted Service Managers, consumers and merchants. But there are also models possible where banks are not involved at all or models where about 20 actor groups are identified.

![Figure 1 Simple model of the NFC ecosystem (Smart Card Alliance, 2009)](image)

The dependency on other organisations could be the reason for the problems with introducing NFC technology to the mass market. As indicated before, expectations about this technology are high, but the implementation successes are rather limited. NFC payments have reached mass market in Korea and Japan, where payments were initially made with RFID enabled cards (Mallat, 2007) and then evolved into NFC mobile payments. When looking at the Netherlands, several pilots have been introduced, but so far they all failed. A historical analysis of mobile payments solutions in the Netherlands will be given in chapter 2.6.

Literature suggests that the gains of NFC are largest for the telecom providers (Thompson, 2012), since NFC payments could result in payment traffic going over the network of these telecom operators. Also, the secure element could be placed on the SIM-card of a phone, which is owned by the telecom provider. This could potentially reduce churn (due to lock-in of the clients), because changing the provider is more difficult when payments are also performed with the smartphone. But this assumption, that gains are largest for network operators, is not shared everywhere: in the Netherlands T-Mobile stepped out of the joint venture (TRAVIK) that aims to develop the infrastructure in order to enable an NFC ecosystem in the Netherlands (Webwereld,
The company (a telecom provider) indicated that the value proposition of this technology was not good enough for them.

Banks are also expected to be an important stakeholder in this new payment method, because of the knowledge in these organizations about security, about value creation from client data and since it allows them to improve their client management activities (PwC, 2011b). But the role of banks is not guaranteed, since banks have many other concerns at the moment. Two very important concerns at the moment for banks are:

- Payment service providers seem to be quicker with providing demanded services to the retail market, thereby forming a threat to the retail banking industry. Paypal for instance takes a growing share of the payment volume with their innovative services for webshops and for mobile phones. Since enabling transactions is one of the core activities of a bank, a reduction in payment volume potentially means a reduction in income or in client commitment. NFC mobile payment services can be created without banks involved, meaning that banks could lose an important connection with their clients. Currently the logo of a bank is visible on banking cards, which are used on a daily basis.
- Basel III legislation, which becomes active very soon, restricts the activities of banks and sets boundaries to the capital requirements and the leverage (McKinsey & Company, 2010). This makes it more and more important to maintain good relationships with clients, in order to get the trust needed for consumers and retailers to store their money at the bank. New legislation makes compliance the number one priority for banks, but client relationship management including branding and customer service should also have a high priority. The battle for clients could be fought with interest rates, but innovative additional services on the mobile phone could also recruit new clients, especially for the younger generations (PwC, 2011b). NFC mobile payment services could help banks to connect with their clients in a way not possible before, since smartphone applications, like a digital wallet, also offer a platform for client relationship management. This could potentially increase the customer satisfaction and reduce the fluctuations in client base.

The short introduction above already revealed some of the problems that arise when competing companies from different sectors have to work together to provide a service to the customers. Not only do the participants of a certain platform have to defend their individual stakes, ‘their’ network of companies also has to compete with other platforms, since they all want to become the dominant standard. The primary goal of this thesis is to assess the strategic feasibility of NFC mobile payments in the Dutch market. But another very important aspect of this thesis will be the assessment of how individual strategies of stakeholders within an ecosystem affect the ecosystem as a whole.

### 1.3. Research problem

The sections above already pointed out some of the difficulties that arise when multiple companies from multiple industries need to collaborate in order to provide a standardized service for consumers. The strategies and goals of stakeholders in the ecosystem are central in the research, in order to assess feasibility and to assess the influence of individual strategies on the ecosystem as a whole. The research can be divided into three groups of problems, in order to bring the researcher and the reader towards a thorough understanding of the current status of NFC technology in the Netherlands and how the problems that are identified could be solved.

#### 1.3.1. Domain

First, the domain in which this research is set needs to be thoroughly understood. Therefore the technology required and the offered services will be analysed. The current payment methods of Dutch consumers will be assessed, as well as previous mobile payment pilots and projects. This is essential in defining whether a new payment method is feasible, to understand why the chances of NFC mobile payments are estimated to be largest with small payments and why previous services failed. The domain description will also consist of a stakeholder analysis, in order to assess the positioning of relevant stakeholders in the Dutch NFC mobile payment ecosystem. In the domain description, the relevant variables to express the organizational and strategic aspects of an NFC mobile payment service will be determined.

In the academic literature NFC ecosystems and its consequences have been thoroughly described. To name a few: in 2007 an extensive literature review has been done in order to highlight the missing parts of the literature (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). Research is done on the consequences of
implementing NFC and the economic frameworks involved (Crowe, Rysman, & Stavins, 2010). Other articles have focused on the consumers’ willingness to adopt this new technology and their concerns (Kim, Tao, Shin, & Kim, 2010). The stakeholders within NFC ecosystems have also been described, in terms of collaboration models and the role of standards and certifications (Smart Card Alliance, 2009). But most articles focus on either the United States or on Asia, where consumer needs and payment behaviour are different than in the Netherlands. Most importantly, in the Netherlands micro-payments are rather well covered by the debit card and Chipknip payments, unlike in the other areas in the world where cash and credit cards dominate the payment market. Recently, all debit cards in the Netherlands have been replaced with EMV banking cards, so all banking cards and payment terminals are rather new. Another indication of the specific Dutch problem, as specified before, is the recent development in the TRAVIK consortium, which consists of three Dutch banks and two telecom operators (three before). Recently one of the members stepped out of the joint venture, since the expected revenues would be too low (Webwereld, 2011). A detailed assessment of the NFC ecosystem and the Dutch payment systems is needed in order to assess the opportunities for a new payment method and the role of Dutch banks and telecom operators in this ecosystem.

1.3.2. Concepts

The second group of problems centres around the theoretical concepts that influence the Dutch NFC ecosystem and the mobile payment developments. Which concepts can be applied to the situation in the Netherlands and what do the conceptual approaches and theories indicate as key variables for NFC mobile payment success in the Netherlands? This chapter is based on the knowledge obtained in the domain description, where design variables of payment services have been determined. Chapter 3 analyses how these variables are linked to theoretical concepts from the STOF business model framework (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008) and platform related theories, coming from different streams in literature. Concepts will be taken from industrial economics, from strategic management and from network economics. These two groups of theoretical concepts form the research model that will be tested with industry experts.

1.3.3. Theory development

The first two phases are essential in understanding the problem and assessing the key concepts, but in the third and last phase the lessons learnt will be tested, in order to assess the relevance of concepts and to indicate conflicts between stakeholders groups. The goal is to understand which stakeholders are the key influencers in the ecosystem and which concepts have a significant influence on the feasibility of an NFC mobile payments service in the Dutch market. Still, the focus is on the organizational domain.

This last phase of the research consists of a qualitative research, where the research model will be tested in semi-structured interviews. Most subjects will be from the banking sector and the telecom operators, since they are expected to have the largest market power, when TRAVIK enters the market. The theoretical contribution of this research is found in the application of the STOF business model framework (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008) with concepts coming from three other literature streams. This combination of conceptual frameworks could result in a better understanding of strategies of networked companies.

1.4. Relevance

This research is very relevant for several reasons:

- Scientific literature on the NFC ecosystem in the Netherlands is either outdated or unavailable. Most literature focuses on areas of the world where consumer needs and payment systems are different. The area specific needs should be taken into account in order to assess the relevant stakeholders. Business literature is available, but this is not linked to economic theories.

- NFC ecosystems can be built without banks involved. Telecom providers or payment service providers could provide the role of financial service provider, which could have large financial consequences for retail banks. The strategic behaviour of banks and telecom operators has a large impact if, when and how NFC mobile payments services can diffuse into society and reach mass market. Knowledge on the current state and the dependency of the ecosystem on individual strategies is essential for different stakeholder groups involved.

- Banks are facing more and more legislation issues, making compliance a core activity for banks (McKinsey & Company, 2010). Because of the focus on compliance, banks seem to miss the innovations in the mobile payment industry and face strong competition from telecom operators and payment service providers (more on this topic later) in the struggle for client information and client ownership.
in the NFC ecosystem. NFC mobile payments can have a large influence on the transaction volume handled by banks, and the relationship between banks and consumers. Therefore knowledge is needed on the expected developments in the near future.

- The mobile phone is a very personal device with a large penetration in the Dutch society, especially with the younger generations (PwC, 2011a). Controlling the payment platform on this mobile device potentially results in large economic benefits, but only when the right strategy is followed. Business models of individual companies need to be in line with the business model of a collective organization, in order to be competitive as a platform.
- The complexity of the NFC ecosystem seems to slow down the technological development and the diffusion of NFC technology into society. Knowledge on how strategies of individual organizations influence the development of the ecosystem as a whole is necessary and adds value to decision makers.

By identifying the concepts that influence the success of NFC payment in the Netherlands, decision makers can develop strategies to influence the other organisations within the ecosystem, or they can focus their resources on other emerging technologies.

### 1.5. Research objective

The primary goal of this research is to assess how strategies of individual organizations in a value network affect the ecosystem as a whole. The secondary goal is this research is to assess the feasibility of an NFC mobile payment ecosystem in the Netherlands. The primary objective will result in a conceptual framework that can be used for strategic feasibility studies on mobile payment services or mobile applications. While the first goal results in a theoretical contribution, the second goal has more relevance for practitioners and the stakeholder groups identified in this research.

The goal of the first phase of this research, the domain description, is to come to a thorough understanding of the Dutch payment market, NFC technology and previous projects. Also, the stakeholders will be assessed based on the ecosystem suggestions posed by literature. This chapter, just like the chapter where concepts will be analysed, are all providing the base for interviews. The concepts will be determined based on a case study of previous pilots and services and current trends. With the variables assessed, the belonging theoretical concepts will be analysed.

The second phase focuses on providing the key concepts that are suggested to define success of NFC mobile payments. The concepts will come either from the STOF business model framework (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008) or concepts related to platforms. The goal of this phase is to identify key concepts and reflect them on the domain of NFC mobile payments in the Netherlands, to make an assessment of their relevance.

The third and final phase of this research is most interesting, since all insights gained during the first phases will be tested with key stakeholders, in order to assess which concepts they recognize from their professional experience and in order to assess which concepts are missing. Not only will the concepts be tested in order to assess the strategic feasibility of NFC mobile payment services in the Dutch market, strategies will also be assessed. With the interview results, the stakeholders with a large influence on the ecosystem will be identified and their strategy will be determined. With the insight coming from this phase of research, final conclusions can be drawn.

### 1.6. Research approach

The approach followed during this research is split in three elements, as given in this chapter. The introduction of the topic and motivations and goals of this research are given before.

#### 1.6.1. Research questions

The layout of the research has been extensively described above. The core research questions are listed below, followed by a breakdown of the three subquestions in work packages.

“What is the strategic feasibility of NFC mobile payments in the Netherlands and how do strategies of individual organisations involved affect the NFC ecosystem as a whole?”
This question can be split into several groups, which can then be split into research questions.

1. Domain description
   1. What are mobile payments?
   2. What is NFC technology?
   3. What are ecosystems and payment platforms?
   4. Which payment methods are currently used in the Netherlands?
   5. Which stakeholders are involved in the Dutch NFC mobile payments ecosystem and what are their roles and objectives?
   6. Which mobile payment services have been available in the Dutch market before?

2. Concepts
   1. What are the conditions for viable business models for services provided by networked companies?
   2. What are the characteristics of two-sided or multi-sided markets?
   3. What is the role of network externalities with NFC payments?
   4. What is platform competition and what are the effects?
   5. How does platform openness affect an ecosystem?
   6. What is the role of platform leadership and how can leaders be identified?
   7. How do lock-in effects affect the adoption and use of a technology?

3. Interviews
   1. Research model
   2. Selection of participants
   3. Structure of the interview
   4. Data analysis methods

4. Results

5. Conclusion and discussion

1.6.2. Research methods

The first phase of the research, where the NFC ecosystem of the Netherlands will be modelled, consists mainly of a literature review. Most of the data is available, the combination of different datasets will deliver a comprehensive and clear snapshot of the Dutch NFC ecosystem in 2012. In order to provide both scientific and practical value to this research, a combination of primary and secondary sources will be used. With the domain description obtained the relevant concepts can be analysed, in order to assess which seem to be most relevant in the determination of failure or success. Platform theory will be combined with the organizational domain of the STOF business model framework, in order to determine key design variables that define NFC mobile payment feasibility. During the interviews, concepts derived from literature will be tested with industry experts.

The conceptual framework will first be assessed based on the sources from literature, corporate information and patent applications. All this serves as the foundation for the interviews, where the data will be triangulated with the use of overt observations. In the interviews, the researcher takes the role of ‘observer as participant’, since the expertise and theory development will come from the experts in the field.

This research is set up as a loose design process, where steering will be possible once new insights have been obtained, either through literature or through interviews. For that reason the structuring of the research was left rather open at the early stages of reason, as suggested in the book on grounded theory by (Strauss & Corbin, 1998). After the phase where interviews are held with experts in the field, coding will result in a theory that answers the research question. Coding is likely to be done through a process of open coding after literature review, followed by axial and selective coding in order to condense the final theory to answer the core question. In order to define the number of interviews required for a valid conclusion, the saturation principle will be applied. With the codified answers of the subjects, analysis can be done between the stakeholder groups, but also within stakeholder groups.

By following grounded theory, the researcher aims to build knowledge, deduce relevant variables that define success and then test these variables with industry experts. The research model that will be tested in the interviews, will be developed according to the insights gained in the domain description.
1.6.3. **Scope of the research**

For quick reference for the reader, the NFC mobile payment features that are in and out scope are listed below.

In scope:

- Literature analysis of mobile payments
- Extensive literature analysis of proximity mobile payments (consumer to business)
- A detailed analysis of payment behaviour in the Netherlands
- Historical overview of previous mobile payments pilots / projects / services
- The role of payment platforms on NFC mobile payments
- Stakeholder analysis for the Dutch NFC mobile payment ecosystem
- Analysis of current developments at these stakeholders
- Conceptual analysis of the relevant theories with regards to the strategic elements of NFC mobile payment services
- Interviews with Dutch industry experts
- Cross-stakeholder analysis for stakeholders within the NFC mobile payment ecosystem, with regards to the concepts in the research model
- Assessment of the strategic feasibility of NFC mobile payment services for the relevant stakeholder groups.

Expected outcomes:

- Feasibility assessment for NFC mobile payments in the Netherlands
  - Expected platform leader
  - Assessment of competing networks
- Contribution to literature by adding platform related concepts to concepts from the STOF business model framework
  - The role of strategies of individual organizations on the ecosystem
  - Assessment of the usability and value of the research model proposed, where the STOF business model framework is combined with concepts from platform related theories, in order to get a better understanding of the strategic behaviour of organizations.
2. Domain

This chapter focuses on current developments and trends in the payment market, in general and in the Netherlands more specifically. In order to assess feasibility later on, it is crucial to understand what mobile payments are, how the technology works and which lessons can already be learnt from history.

Chapter 2.1 analyses what mobile payments are, in order to understand the classification and why NFC mobile payments are chosen specifically as research topic. Chapter 2.2 will focus on Near Field Communications technology, the enabling technology for the payment method central in this research. Then, in chapter 2.3 ecosystems and platforms will be analysed, in order to understand the complexity of this new payment technology and what mechanisms cause delay in market penetration. Chapter 2.4 analyses payment methods in the Dutch market, in order to assess the possibilities for a new payment method and to understand how Dutch consumers are currently behaving when it comes to payments. Chapter 2.5 then discusses the stakeholders involved when NFC mobile payments are introduced in the Dutch market and the current developments at these organizations. Chapter 2.6 analyses previous pilots and services, in order understand which design variables have been tested, by which stakeholders groups, and the success this has brought to the organizations. The domain will be concluded in chapter 2.7, where the lessons learned will be summed up. Chapter 3 will then build on these lessons and explain the economical theories and business model frameworks than can be used or applied in order to understand which design variables define NFC mobile payment feasibility.

2.1. Mobile payments

As indicated in Table 1 on page 11, mobile payments can be divided into four groups. This research focuses on the consumer to business payments (C2B) in the proximity area, so mobile payments that are made when buyer and seller are within reach. This type of mobile payments is divided into mobile proximity payments through NFC and mobile points of sale.

2.1.1. Proximity mobile payments

Mobile payments can be made through different mediums, like SMS, WAP, Wifi, Unstructured Supplementary Services Data (USSD, the #1234# codes that can be dialled with a mobile phone to request information or pay for a service) or NFC. The unique selling point of NFC technology embedded in mobile phones is that it does not require a touch of a button. Depending on the design, a payment can be done just by holding or swiping the phone in front of a reader. This can provide significant savings in time, for instance in shops or at the entrance of sport arenas, therefore the focus of this research will be on NFC mobile payments. Also, the convenience for users is much larger and the technology is very easy to use, a requirement for technologies to diffuse into the mass market (Kim, Tao, Shin, & Kim, 2010). Since SMS and USSD payments are considered to be an insufficient solution for in-store payments, they are not in scope of this research.

Proximity mobile payments are defined as “payments to a merchant that are initiated from a mobile phone that uses Near Field Communication (NFC) technology and that is held close to the merchant’s POS (point of sale) equipment” (Smart Card Alliance, 2009). The technological aspects of NFC technology will be analysed later in chapter 2.2, the focus here is on the implications of mobile payments and their expected applications.

Mobile payments can be linked to several services (Portio Research, 2011). The services that can be provided by proximity mobile payments are bold in the list below:

- Mobile applications and in-app payments
- Mobile ticketing
- Mobile coupons
- Transportation and parking payments
- Mobile content (wallpapers, ringtones)
- Physical goods

Not all these applications are possible with proximity payments, since the term mobile payments covers a whole range of services. Due to the possibilities that NFC offers, applications can be expected in the range of physical access control (for public events, public transport or office buildings) or for small payments in shops or vending...
machines. People can, for instance, purchase or download an entry code that gets transmitted wirelessly to the NFC reader, permitting the user physical access to the service requested, or providing them with a discount. The user experience with contactless payments is generally assumed to be better than with normal banking cards (Hendry, 2007). Damage will occur less quickly (since a card does not have to be inserted in a ‘slot’), the card does not have to be clean in order to initiate contact between reader and device, and size of the payment card is also less important (which allows implementation in mobile phones).

Another advantage of proximity mobile payments is that they are enabled by a device that is fully diffused and accepted into society. According to recent figures, 97% of the Dutch population owns a mobile phone and 64% does not leave the house without their phone (PwC, 2011a). This provides a unique platform for payments, since it is already accepted by users, incorporated in their daily habits and often enabled with mobile internet, generating even more possibilities for services.

### 2.1.2. Mobile points of sale

Next to NFC mobile payments, C2B proximity payments can also be made with a ‘mobile point of sale’. Mobile points of sale are devices like smartphones and tablets that are enabled to handle credit or debit card payments. The best known example is Square, an American company that offers the hardware and software to start handling mobile payments over an iPad or iPhone (Square, 2012). The company provides small merchants with a device that can be inserted in the headphone jack of an iPhone, in order to enable the smartphone to read credit and debit cards. Payments are processed over the network of the smartphone, either 3G or Wifi, in order to be processed by the Square servers. Square provide security and reliability, while charging merchants with 2.75% of the transaction value. By offering this service to small merchants, they provide convenience and professionalism without the necessity for high fixed costs. Recently Paypal announced a similar service, called Paypal Here, allowing their clients to accept all types of US cards, but also payments by Paypal accounts (Paypal, 2012a). Another service is offered by iZettle, which also accepts payments with EMV cards, so this solutions would be more suitable for the Dutch market (iZettle, 2012).

Mobile points of sale require a capability of the device to deal with multiple types of card systems. Square for instance is compatible with VISA, American Express and Maestro, the three most used card systems in the United States (Webster & Evans, 2010). This reduces the need for installing several devices at the counter of a retailer or in a taxi, since one device (the smartphone or tablet of the merchant) can handle everything. The possibility for services like the one provided by Square has emerged rather recently, as a result of the development of a payment platform by IP commerce. This ‘payment platform as a service’ offers an open platform for innovation (IP Commerce, 2012). Paypal offers a similar payment platform with the name ‘Paypal X’, which they define as an “open commerce ecosystem that enables merchants, solution providers and developers to create the next generation of commerce solutions” (X.Commerce, 2012). This platform goes even further, not only taking care of the payments for their clients, but offering a complete solution for the process of buying and selling between merchants and consumers. Platforms like the ones mentioned here provided the technical foundation for payment services like Square and Paypal Here.

The emergence of platforms and their details will be discussed in more detail in chapter 2.3, in order to understand why the trend of platforms potentially has a large influence on NFC mobile payment success.

### 2.2. Near Field Communication (NFC) technology

In order to understand the current state of NFC technology, it is good to take history into account. This makes it easier to understand the technological implications and to understand the concerns in society. Since NFC technology is an extension of RFID technology, the analysis will start with RFID. This will then be used to introduce NFC technology and its applications. The last part of this chapter analyses the concerns that can be identified with the use of this technology, in terms of security and in terms of privacy.
2.2.1. Radio Frequency Identification Device (RFID)

The patent on RFID technology was filed in 1980 by Charles A. Walton with the following abstract:

“An automatic identification system wherein a portable identifier, preferably shaped like a credit card, incorporates an oscillator and encoder so as to generate a programmable pulse position-modulated signal in the radio frequency range for identification of the user. The identifier can be made to generate the identification signal constantly or can be made for stimulated transmission responsive to an interrogation signal. The identification signal can be preset or can be programmable by use of a programmable memory.” (Walton, 1980)

The patent was issued by the US patent office in 1983. Originally, RFID tags were expected to have the same function as barcodes. The main goal was to be able to track goods during the manufacturing process, during logistics or in the retail process. The large advantage of RFID chips over barcodes is that RFID tags can be read from a distance and that line of sight is not required, making it possible to scan inventory with one push of a button (or even continuously). As indicated in the patent description, the chip can be programmed, so valuable product information can be easily stored on the product and read from a distance. The signal transferred is only a reference number in most cases, so the data to be transferred of often only a few bits. This reference number is read by the reader, which is connected to a server, where the reference number can be found in the database.

In current society, RFID cards can be found everywhere in daily life. People use RFID cards to get access to their office, to open or close lockers at the university, to track products in warehouses or animals in national parks, to authorize access to public transport networks, to authenticate users of printers/scanners etc. The benefits of contactless authorization can be found in terms of speed, but also in terms of convenience (no need for typing in passwords or codes) and reliability, if RFID cards have right security protocols embedded. RFID tags can be active or passive, which is related to their energy source and their transmission intensity.

- Passive RFID cards have no power source embedded in the cards, they consist of at least three elements: a memory chip, a radiofrequency transmitter and a radiofrequency reader. The reader picks up a signal of a reading device, which can be the entry port at a building or gates at the exit of a warehouse. If the frequency is within the required range, the memory chip and transmitter get activated. The proximity of an electromagnetic field induces a current in the card, which activates the identification chip and the RF transmitter. This results in the emission of the identity of the product, which can then be read by the reader. Passive RFID cards are rather inexpensive to produce, are compact in size and have a low weight, making them suitable as entry passes or as banking cards. Due to the limited strength of the RF transmitter, the reading range of the cards is very small. The OV Chip Card and the contactless banking cards like payPass from Visa and Paypass from Mastercard can be classified as passive RFID cards.

- Active RFID tags have a built in energy source and send out signals continuously or in a fixed time-pattern. Since they have an embedded energy source, they have a rather large range of about 1-100 meters and typically have a larger memory (Institute for Prospective Technological Studies, 2007). But the costs and weight of active RFID tags are rather high, making them unsuitable for application in fast moving consumer goods. Also, due to their embedded energy source, their life span is limited. Applications can be found in transportation, for instance at electronic toll collection on highways, or for tracking of (high-value) trailers, combined with GPS.

A short overview of the two types of RFID is given in Table 2. Due to the large range in products, even within the passive and active types of RFID, only a general comparison is made here. The general technological implication of active RFID is the limitation in size due to the energy source, so they are often not very small. The current record for a passive RFID tag is a dust-size tag of 0.15 x 0.15 mm, with a thickness of 7.5 µm. This very tiny chip can be written once (write-only, like most passive RFID tags) and can be easily attached to any object. It operates at 2.45 GHz frequencies, allowing it to send 128 bit ID codes to the reader (Hitachi, 2006).
Table 2: Key characteristics of the two types of RFID systems (Finkenzeller, 2003)

<table>
<thead>
<tr>
<th></th>
<th>Passive RFID</th>
<th>Active RFID</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>- No battery required</td>
<td>- Reading distance up to 100 m</td>
</tr>
<tr>
<td></td>
<td>- Long life span (possibly unlimited)</td>
<td>- Initiating communications</td>
</tr>
<tr>
<td></td>
<td>- Small and light</td>
<td>- Can operate in rough conditions</td>
</tr>
<tr>
<td></td>
<td>- Inexpensive</td>
<td>and under water</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>- Short distances only (1 m maximum)</td>
<td>- Battery life limits the lifetime of the</td>
</tr>
<tr>
<td></td>
<td>- Remains readable once the product is disposed</td>
<td>RFID chip</td>
</tr>
<tr>
<td></td>
<td>- Difficult to send signal through water/metal</td>
<td>- Expensive</td>
</tr>
<tr>
<td><strong>Applications</strong></td>
<td>- Clothing and consumer goods</td>
<td>- Physically larger than passive RFID</td>
</tr>
<tr>
<td></td>
<td>- Inventory control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Entry pass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Public transport access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Supply chain management</td>
<td></td>
</tr>
</tbody>
</table>

An important variable for RFID tags is the frequency, since it partly defines the reading distance and the readability through different media. RFID tags, either active or passive, can operate in different frequency ranges, depending on their design and their proposed functionalities. An overview of the frequencies is given in Table 3. The range depends on the frequency used, as can be seen in the overview. The higher the frequency, the higher the reading range. The downside of high frequencies is that these electromagnetic waves have trouble getting through liquid mediums, so soda cans or water bottles can cause problems.

Table 3: Frequency bands and reading ranges of RFID applications (Institute for Prospective Technological Studies, 2007)

<table>
<thead>
<tr>
<th></th>
<th>Low frequency (LF)</th>
<th>High frequency (HF)</th>
<th>Ultra High Frequency (UHF)</th>
<th>Microwave</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency range</strong></td>
<td>~ 10 cm</td>
<td>10 – 13.56 MHz</td>
<td>860 – 960 MHz</td>
<td>2.4 – 5.8 GHz</td>
</tr>
<tr>
<td><strong>Read range</strong></td>
<td>~ 10 cm</td>
<td>~ 1 m</td>
<td>2 – 5 m</td>
<td>~ 100 m</td>
</tr>
<tr>
<td><strong>Coupling</strong></td>
<td>Magnetic / electric</td>
<td>Magnetic, electric</td>
<td>Electromagnetic</td>
<td>Electromagnetic</td>
</tr>
</tbody>
</table>

2.2.2. NFC technology

One of the problems with RFID technology is that the communication typically flows in one direction. In the case of a reader and an RFID tag, the information of the RFID tag gets sent to the reader (after verification of the frequency range). This poses a large limitation to the technology, since most RFID tags cannot be changed during their lifetime. In the case of a supply chain, it can be useful to store the status of the product in the tag instead of in the information system reading the tag. So, the largest limitation of RFID is that the tag is not ‘smart’. Near Field Communication technology brings a solution to the limitation of RFID, it allows two ‘smart’ devices to communicate. Still, NFC can be classified as an extension to RFID, since it uses the same basic principles. NFC devices can take the role of ‘initiator’ or ‘target’. The most basic form of an enabled device is a mobile phone (with or without mobile internet) with an embedded RFID chip. This combination results in the advantages of the mobile phone (mobility, personal, customization, connectivity) with the possibilities of contactless sharing of information. This information can be payment details, contact information or authorization information. With this setup however, the mobile phone can only play the role of target, limiting the functionalities.

Three types of information sharing are possible with NFC, as depicted in Figure 2. Here the benefit of NFC over RFID technology is clearly visible, since with traditional RFID only the first (upper) type of connection was possible, so the device can only be a target. In the second figure the NFC device initiates a connection, by creating a magnetic field on which the RFID interaction point reacts by sending back information. In the last setup, two NFC devices can communicate by being either a target or an initiator, depending on the moment in time.
The roots for Near Field Communication (NFC) have been created by Nokia, Philips and Sony in 2004. One of the inventors of this technology, defines NFC like this:

“NFC stands for Near Field Communication - a wireless communication technology operating at 13.56 MHz over a short distance of about maximum 10 cm. This technology enables communication among electronic devices brought into close range of each other, as well as between such devices and conventional contactless IC cards. This technology is drawing much attention as an easy-to-use method to exchange data by simply ‘touching’ devices to each other.” (Sony, 2012b)

In 2004 Nokia, Philips and Sony founded the NFC Forum, an industry association where collaboration was stimulated in order to set standards for NFC technology, to encourage interoperability and to educate the market about the possibilities of NFC. Today the NFC Forum has 160 members, including companies that are involved in the development of the technology and all complementary services (NFC Forum, 2012). NFC technology is based on the ISO/IEC 18092 (NFCIP-1) standardization (Sony, 2012b) and is designed to be compatible with ISO/IEC standards 14443 (proximity cards) and 15693 (vicinity cards) and with Sony’s FeliCa contactless smart card system (Falke, 2007). The FeliCa smart card system is very successful in Japan, where the RFID enabled cards are used in public transport and for small payments in stores, so the incentive of compatibility was mainly based on installed base motivations (Sony, 2012a).

From Table 3 it becomes clear that NFC technology uses the High Frequency (HF) range for communication. Coupling is achieved by a magnetic field which is created by the initiator, which creates a small current (caused by induction) in the target device, which powers the identification chip and the radiofrequency transmitter. The NFC reader is typically a magnetic dipole antenna. The reading range of the RFID chips operating with high frequencies is typically up to 1 m, but for NFC this range is about 10 cm, what would be the reason?

The answer lies in the characteristics of the magnetic field from the reader, which activates the NFC device. According to the ISO/IEC 14443 standard for proximity-coupling of smart cards (which also applies to NFC technology), the magnetic field \( H \) generated by the reader should be between \( H_{\text{min}}=1.5 \text{ A/m} \) and \( H_{\text{max}}=7.5 \text{ A/m} \) (Ampère turn per meter), in order to ensure operability of the smart cards (ISO14443-2:2010). A mobile handset should therefore be able to generate this magnetic field as well, in order to communicate with other NFC devices and smart cards. With a lower field strength, the identification chip and the radiofrequency transmitter of the NFC device cannot function, since they need a minimum amount of energy. If we assume that the NFC reader, so the device generating the magnetic field, is cylindrically shaped, in a flat plane, the magnetic field can be described with the following function:

\[
H = \frac{I \cdot N \cdot r^2}{2\pi^3 x^3}, \text{ so } H \sim x^{-3}
\]

where \( r \) is the radius of the coil in the reader (typically in the range 1-10 cm), this coil generates the magnetic field. I is the current going through this coil, \( N \) is the number of windings of this coil (typically in the range 1-6). \( x \) is the distance from the source, with \( x=0 \) as the closest possible to the NFC reader (Rolf & Nilsson, 2006). A thorough analysis of the physical principles underlying the RFID and NFC technology is outside scope for this research, but from the formula it can be easily seen that the magnetic field decreases with \( x^3 \). So if the distance is doubled, the magnetic field decreases by a factor 8. Since the magnetic field cannot be very strong at the source, mainly due to health regulations, the ‘usable’ area in front of an NFC reader is rather small. But this is considered a good characteristic, since a limited range provides more control for the user when it can bring the NFC device towards the reader when required. It also reduces the number of simultaneous readings for the initiator, providing more accuracy, enhanced security (due to visibility of other devices within this short range) and a better performance (Finkenzeller, 2003).
When designing NFC or RFID payment systems, several variables need to be specifically chosen (Hendry, 2007):

- Single-function vs. Function-rich
  - Transport ticketing only, or also stored value functionality and identification?
- Single dataset vs. Multiple datasets
  - Should the card allow sharing of data between the datasets?
- Single static application vs. Multiple static applications
  - One or multiple applications (programs) on the device/card?
- Multi-application operating systems (allows updates only) vs. Multi-application OS with downloading
  - Should the user get a fixed service, or should users be allowed to download additional applications to meet their personal preferences (payments/public transport/couponing)?
- Proprietary operating system vs. Open operating system
  - Open or closed platform?
- Single organization vs. Multiple organizations
  - One organization in charge of the services? Or several organizations which all offer their services from the same card / NFC smartphone?

In the discussion above, RFID and NFC are both mentioned as an option for contactless payments. The reason lies in the backward compatibility with regards to the payment terminals. For a merchant, a contactless banking card or an NFC enabled smartphone (with the right technology) will be perceived similarly. For that reason, the contactless banking card has to be taken into account, since they can provide complementary benefits for both merchants (larger client base) and consumers (option to pay with card or with mobile). The benefits of NFC over RFID cards still hold however, the user perception with NFC mobile payments will be significantly different once well-implemented. For instance: receipts can be viewed on the phone, authorization can be done from the phone, and other non-payment related services can be offered.

2.2.3. Concerns with RFID and NFC

In this discussion the comparison between card payments and mobile payments will be made, since taking all concerns of RFID and NFC into account results in a very extensive report, of which some parts are not relevant for this research. The ethical discussion about client profiles and the storage of information is left outside scope. The concerns mentioned here are based on literature on adoption of mobile payment services, but also on overt observations of the researcher, while discussing the topic with others.

With regards to safety and security, several things are important to have in mind. When a consumer makes a payment with its NFC enabled mobile phone, the transactions are protected with the same mechanisms as with conventional card payments. So, in terms of transaction security there is no difference with the current card payments (Smart Card Alliance, 2009), since the same EMV chip is used. An EMV chip is already present on each debit card in the Netherlands, it enables a secure transaction between card holder and merchant. PCI DSS (Payment Card Industry Data Security Standards) security protocols, the standards which already protect debit and credit card payments currently, also apply to NFC mobile payments (PCI DSS, 2010).

Another concern some consumers have is the readability of the device from a distance. As indicated before, the small range where readings are possible is caused by the limited strength of the transmitter in the NFC device. So installing a very strong magnet at a public place will not result in a larger range where financial or other private information can be read, since the mobile phone cannot transmit its information further than approximately 10 cm (depending on the design). Even if the information would be intercepted, several security mechanisms protect the essential data. As mentioned before, several NFC payment designs are created in a form that payments under a certain threshold, for instance 10 euro, will always be accepted. Several consumer groups expressed their fear for a repetitive process where a criminal stands at a public place, or walks within centimetres of you (not unlikely in a busy train or bus), and charges your card with an amount just below this threshold. Financial organizations have well-developed mechanisms and models to detect this kind of transactions, so card and phones can quickly be blocked. A recent patent application of Apple even mentioned a technology that enables consumer to choose a ruleset for transactions with the new MobilePay functionality (Patently Apple, 2012a). With this innovation consumers will be able to set limits to their transactions, either in terms of geographical zones, daily limits or merchants that are allowed to initiate a transaction. This mechanism can provide consumers with the trust and flexibility they need for adapting the technology. Other
NFC designs require that the consumer opens a special app, in order to allow transaction request, or even to give a personal code at each transaction.

Concerns are not only expressed by subjects when they hear about NFC mobile payment possibilities, in literature several studies have been performed already. A short overview of the concerns mentioned in the study and the proposed mechanisms to overcome potential adoption barriers are given below. These will be taken into account in the further analysis of NFC mobile payment adoption, since this will partly define the success of the services provided.

Several studies have indicated that trust and security are two essential factors defining the willingness of consumers to adopt mobile payments technology. Sensitive and personal data is sent wirelessly from the phone to the merchant, the main concerns with regards to security and privacy are related to authentication and confidentiality issues. Also unauthorized access to payments and user data are considered main issues with this technology (Mallat, 2007).

Trust is a “subjective belief that a party will fulfil his or her obligations according to the expectations of the trusting party” (Lu, Yang, Chau, & Cao, 2011). The positive relationship between trust in mobile payments and the intention to use these services has been shown in the article by Lu et al. (2011). They also concluded, based on a quantitative research involving a survey, that the initial trust in mobile payment service negatively affects the perceived risk by these consumers. This trust can also be transferred from earlier experiences with payment services on the internet. When a consumer has a high level of trust with using the internet banking or payment services from a certain organization, the consumer is more likely to trust and to adopt the mobile payment services offered by the same company. This relationship seems to provide a competitive advantage for financial institutions, since they have a rather elaborate experience with banking through internet, which they offer to their clients.

Security of mobile payments can be analysed more objectively than trust. Security mechanisms of mobile payments are thoroughly described in literature, mainly because they are rather similar to the current mechanisms as used with card payments or with RFID inventory control. Security consists of both data integrity and data security. Due to the extensive knowledge already present in the market about RFID technology, most controlling principles can be used for the implementation of NFC technology.

- Data integrity focuses on complete and accurate data, which is important for all parties in the ecosystem. RFID technology typically encounters problems with interference, when multiple RFID tags are responding to an initiating signal. The signals that get transmitted to the reader can interfere, causing (undesired) changes in the data. Due to the long experience in the market with RFID technology, several techniques have been developed in order to guarantee security of the transmitted signal, both in terms of completeness and in terms of reliability. Two groups of methods have been developed to handle this problem (Finkenzeller, 2003).
  - Checksum procedures (which consists of three methods: parity checking, XOR sum and CRC) are used to recognize transmission errors and to initiate corrective measures, when multiple signals arrive at the reader.
  - Multiple-access procedures (SDMA, FDMA, TDMA and CDMA) on the other hand focus on the data collection of multiple signals at the same time, by applying one of the four mentioned techniques here. Although these techniques have been well-developed and the problems of interference and multi-access are overcome, proximity mobile payments techniques are especially designed to prevent these problems. Due to the very small distance required between the NFC enabled phone and reader, about 5-10 cm, only one card or phone can be held within range (or it will be visible when a second device is also in range). This makes sure that only one device is involved in the transaction required.
- Data security focuses on unauthorized access to the system, or unwanted listening. The advantage for NFC technology is that RFID technology is already used in a whole range of high-security applications, like access systems at corporations, payment systems for public transport cards and the issuance of tickets. These applications have the similar mechanisms as with proximity mobile payments, so lessons and experiences can be transferred to NFC. On the side of the retailer, the process of handling the payment is not different than for card systems, the same security mechanisms apply. The largest risk for NFC technology is the operating system of the phone, since this can contains leaks or applications
with malware can be installed by the user. With sensitive payment details of the user, like bank account numbers, unauthorized access to this data is imaginable. For this reason, most NFC phone designs contain a separate ‘secure element’, which functions outside the operating system of the phone.

A large part of the security of NFC mobile payments depends on the systems design, for instance when private data is stored at a separate secure element. A secure element will provide more control on the data accessibility, but also increases the costs of the device slightly. Later, in the interviews, the system design will be part of the questions, since it partly defines which organization ‘owns’ the secure element, and therefore part of the data generated by the consumer.

In this chapter we have seen that NFC mobile payment technology benefits both from experience with RFID technology and card payment protocols. A more elaborate discussion on technological aspects of this technology is out of scope for this research, but based on the insights gained from several sources it can be concluded that the technology is mature enough for large-scale diffusion in the market. Security of NFC mobile payments is close or equal to current card payment mechanisms. The next chapter will focus on the organizational aspects of the provision of an NFC mobile payment service.

2.3. Ecosystems and platforms

This chapter discusses the role of platforms on NFC mobile payment services and why organizations involved in offering these services, can be described as a digital ecosystem. Platforms are gaining importance in several markets, they provide an important functionality (bringing buyers and sellers together) in the current digital era. Organizations are collaborating intensively, in order to be agile and competitive. Organizations exchange information and value in order to provide the services wished by the market, and can adapt scale and content quickly due to the partnerships. This intensive collaboration results in ecosystems where competing organizations have a large interdependency, therefore this chapter will introduce the importance and layout of ecosystems for NFC mobile payments.

2.3.1. The NFC ecosystem

It is generally acknowledged that the introduction of NFC payment technology in society should be based on a collaboration model, since the expertise of different companies is required to offer a uniform service (Smart Card Alliance, 2009). The ultimate goal is to provide a complete range of services, for instance paying in public transport, payments in supermarkets, parking payments, mobile ticketing or mobile couponing. This requires the input of many actors, investments from different organisations and commitment to this technology, making ecosystem governance very complex. The economic concept of an ecosystem will be explained and analysed in chapter 3.1, this chapter focuses on the actors that are indicated in literature to play a role in the NFC technology.

For the implementation of NFC payments in a national market, an ecosystem should consist of at least six stakeholder groups (Smart Card Alliance, 2009):

1. Financial Institutions / Banks / card schemes
   o NFC payments allow banks to offer new, differentiated payments services to their customers, to increase their debit and credit card transaction volumes and extend their brands. Mobile payment applications for smartphones open a communication channel between client and bank, which can be used to enhance the client commitment.
   o Payment brands like Visa and Mastercard have millions of payment cards (credit or debit) circulating in all parts of the world and are typically owned by groups of banks. NFC enabled banking cards (so-called smart cards) are already distributed in the US and UK, which are compatible with the NFC readers according to the ISO 14443 standard. Mobile payments allow payment brands with the ability to attract early adopters, to appear innovative and to maintain the leading position of payment solutions.

2. Trusted Service Managers (TSM)
   o The TSM could function as a central point between the consumer and all organisations offering their services, making service provision more comprehensive for consumers. The TSM operates as the platform regulator/operator. NFC payment technology allows new organisations to provide the function of TSM in the Dutch market. The role of a TSM is not crucial however,
since a bank, MNO or Payment Service Provider can also provide this role, in order to have more control on the platform.

3. Mobile Network Operators (MNO)
   - Mobile Network Operators are expected to obtain significant economic benefits from the NFC technology, including “new customers, revenues from new, payment- and NFC-related service and possibly reduced customer churn” (Deloitte & Touche, 2004). Also, revenues are expected when the secure element, required for NFC mobile payment services, will be placed on the SIM-card of a mobile phone. This SIM-card is owned by the MNO.

4. Mobile device producers
   - Smartphone producers have the task to provide consumers with NFC enabled devices, they can gain competitive advantage by being early to the market or by offering innovative mobile applications. This can result in new customers and in business partnerships, for instance with mobile network operators or with banks.

5. Consumers (with their NFC device)
   - Advantages for consumers are expected in terms of convenience, speed of transaction, additional services like couponing or ticketing and product information on the screen.

6. Retailers / merchants (with a Point of Sale)
   - NFC payments can help retailers to establish stronger client relationships and to encourage client loyalty. Also, NFC technology can help merchants to influence the behaviour of their clients both inside and outside their stores.

The NFC Forum, the organisation that promotes NFC technology, aims to set industry standards, encourages development and educates consumers and enterprises about NFC globally, defines the NFC ecosystem even broader. It takes into account the users, all suppliers of the technological components and services, but also universities and schools, as can be seen in Figure 3. So every actor that could have some influence on the technology, has been implemented in the model.

Defining an ecosystem model that is applicable to every market is close to impossible, since the market conditions are different in each country. There are models imaginable where the mobile network operator takes the role of bank, so banks are excluded from the ecosystem. But the role of mobile network operators can also vary, ranging from ‘just providing the traffic of data’ to a strategic partner of the other stakeholders, where the network operator owns the client profiles and the platform on which the services are offered. The concept of ecosystems will be elaborated on later in this report. The layout of the ecosystem in the Netherlands, with all stakeholders involved will be mentioned in chapter 2.5.

2.3.2. Payment platforms

Payment platforms are included in this research, since they can provide the solution for NFC implementation issues and standardization. As indicated in chapter 2.1.2, payment platforms potentially have an important role in the development of NFC mobile payments and mobile points of sale. Platforms provide the technical infrastructure that enables an NFC smartphone or a reader in a shop to accept multiple card systems. This defines part of the success of a platform, it has to be compatible with Visa, Mastercard or others, in order to provide convenience to the potential users and to reduce entry barriers. This subchapter assesses the role of platforms and explains why they serve an important role for NFC payments.

Software platforms are often called ‘invisible engines’, since they allow other organizations to offer their services, by making part of their code available to programmers (Webster & Evans, 2010). So-called ‘Application Programming Interfaces’ (API’s) allow developers to use the intellectual property of the platform owner for their own purpose, in order to develop services which are viable. By doing this, less effort is needed and compatibility is guaranteed. The platform serves as an intermediate between developers, users and other stakeholders and gets its value from the number of users and services offered on the platform. The platform owner, in return, provides the assurance for security, privacy and stability, by monitoring and/or by a selection procedure.
Many of the recent business successes come from online platforms, where the number of users largely defines the value of the platform. Youtube is the platform on which videos are shared, Facebook is the social networking platform where people can find friends and where organizations can interact with consumers. The Apple App store is another recent example, where consumers and application developers can interact on the platform created for iOS devices (Apple, 2012a).

The creators of a platform sometimes open up their code for free, but viable business models are also possible. Apple, for instance, keeps 30% of the revenues of the applications that are sold through the App Store (Apple, 2012b). Platform openness and motivations to open or close a platform will be analysed in chapter 3.5. Platforms depend largely on multi-sided market theory, where the value of the platform is defined by the number of users, the number of services available and many other variables. More on this theory will be explained in chapter 3.2. Also the other core concepts with platform theory (network effects, platform openness, platform leadership and platform competition) will be explained in chapter 3.

When zooming in on the payment industry, several platforms have entered the market recently (Paypal X, IP Commerce, Serve by American Express and many others). Payment platforms provide a basis for other services and applications, by creating a secure and innovative platform and then allow developers to use API’s for their own purposes. If the platform is well-managed and applications are audited before they are allowed, the platform can provide security and stability while still providing innovative services. They also make it easier for developers to reach a large group of consumers, which results in lower transaction costs.

![Figure 4 Payment processing when a payment platform is used (GlobalCollect, 2012). More information is given in Appendix B.](image)

Payment platforms differ from the traditional card networks like VISA and American Express in several ways, as graphically represented in Figure 4:

- VISA and Mastercard are seen as different highly secure private networks, while a platform is the network overlapping these networks and ensuring compatibility with all these systems. Web shops for instance, only have to install one application on the site in order to process all types of payments.
- Platforms need to be accessed over the Internet. With traditional card schemes this was also possible through a dedicated intranet for payments only.
- Payments are handled ‘in the cloud’ when payment platforms are used. This means that very limited hardware capacity is required to handle the payment, since all data is stored at the servers of the platform provider. It also means that consumers can find it difficult to understand which data is stored where.
- Due to the storage of payments ‘in the cloud’, data centre become even more interesting for hackers and other people with bad intentions. Data security should be a core priority for the platform operators.
- Traditional payment schemes required large fixed and variable costs, due to the dedicated network and specialized card readers. A payment platform offers the services typically in the ‘software as a service’ model, where a monthly or annual fee is required for accessing the services, so both hardware and software.
- Innovations are stimulated by the platform, since developers can use an established platform to provide their services on. Due to compatibility with all payment systems, developers can reach a large audience in a short time, while offering a universal service.
A large part of the problems involved with NFC mobile payment services are caused by the business model that needs to be used. Should telecom operators be in charge of the payment handling, banks or payment service providers? Payment platforms can be a strong force on the NFC market, since they can provide services to desktop computers, to mobile phones and to tablets, and be compatible with all payment methods. Later in this research the role of payment platforms will be assessed in more detail, where the focus will be on the Dutch proximity payments market.

From this chapter it can be concluded that the role of payment platforms can be very crucial in the success of NFC mobile payments, due to the compatibility it guarantees and the flexibility it provides for external parties to customize a service according to their wishes. We have also learned that the provision of an NFC mobile payment service depends on a large number of organizations, each with their own expected gains and goals. The ecosystem that emerges as a result, provides many chances for the stakeholders involved, but potentially creates alignment issues when value and information needs to be exchanged.

2.4. Payment methods in the Netherlands

With a background on the definitions of mobile payments, NFC technology and emerging platforms providing online payment services, we can now zoom in on the Netherlands. In order to assess the feasibility of NFC mobile payments (the primary goal of this research), an understanding of the payment market in the Netherlands is required. As mentioned before, literature suggests that chances for mobile payments in general are mainly for small transaction amounts (Mallat, 2007). This subchapter will analyse if the Dutch payment market offers possibilities in the small payment range.

De Nederlandsche Bank (DNB), the organization in charge of safeguarding financial stability in the Netherlands, has conducted an extensive survey under 7,499 respondents in 2010, in order to assess the use of cash money by Dutch citizens (De Nederlandsche Bank, 2010). Since the objective of this research aimed at finding the use of cash, electronic transfers of money are not taken into account, as well as collection of monthly fees. By asking the respondents to keep a record of all their spending during one day, they could estimate the total use of each payment method. The outcomes of the research are summed up in Table 4.

<table>
<thead>
<tr>
<th>Number of transactions (million)</th>
<th>Value of transactions (billion EUR)</th>
<th>Average value per transaction (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>5.045</td>
<td>61.9</td>
</tr>
<tr>
<td>- At the counter</td>
<td>4.371</td>
<td>53.3</td>
</tr>
<tr>
<td>- To other citizens</td>
<td>674</td>
<td>8.6</td>
</tr>
<tr>
<td>Debit card</td>
<td>2.154</td>
<td>80.9</td>
</tr>
<tr>
<td>Chipknip</td>
<td>178</td>
<td>0.5</td>
</tr>
<tr>
<td>Credit card</td>
<td>36</td>
<td>4.0</td>
</tr>
<tr>
<td>Total</td>
<td>7.413</td>
<td>147.3</td>
</tr>
<tr>
<td>- At the counter</td>
<td>6.739</td>
<td>138.7</td>
</tr>
</tbody>
</table>

The consumer to business payments are highlighted in the table, since these are the relevant numbers for this research. The research compared the outcomes of 2010 with the outcomes of a similar research in 2007, in order to indicate trends in payment volumes and payment values. The results are given in Table 5, where the numbers only include the payments ‘at the counter’, so the in-store payments. The researchers of De Nederlandsche Bank also made a differentiation between payment method and transaction amount. The results are shown in Figure 5.

<table>
<thead>
<tr>
<th>Payments volume</th>
<th>Payments value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>74%</td>
</tr>
<tr>
<td>PIN</td>
<td>23%</td>
</tr>
<tr>
<td>Chipknip</td>
<td>2%</td>
</tr>
<tr>
<td>Credit card</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

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Several conclusions can be drawn from the report:

- The relative share of cash money in the total payment volume and value is decreasing, but cash is still dominant in the total transaction volume.
- Debit card payments are gaining popularity and are more often used for small payments (large increase in the payment volume, modest increase in the payments value).

The most interesting conclusion of the report from De Nederlandsche Bank, with regards to proximity mobile payments, is that the largest gain for cash substitution can be made in payments under 20 euro. In that range people are most willing to adopt a novel payment technology. This result was obtained through the interviews DNB researchers performed, following the survey results as presented in Figure 5 and Table 6. The category ‘other’ in Table 6 consists of Chipknip payments, OV Chip Card transactions in public transport and others.

According to several studies performed (Kim, Tao, Shin, & Kim, 2010), the opportunities for proximity mobile are largest in the area of micro- (<2 euro) and mini-payments (2-10 euro). This seems to match well with the market conditions in the Netherlands. This area is now mainly served by cash and partly by Chipknip, but NFC technology could be a convenient replacement for these payment methods. Potential benefits of replacement are speed, convenience (no more searching for change) and security (cash is more easily stolen). Another advantage is the replacement of a conventional wallet, when all payment services can be provided with an NFC enabled smartphone. So the research from De Nederlandsche Bank seems to indicate that the willingness of Dutch citizens to adopt a new payment technology is in line with the suggestions from literature.

Reasons to reduce cash are not only found in terms of convenience for consumers, economic benefits can also be achieved, for banks and merchants, but also for society. Even though transaction costs in the Netherlands are very low, costs of cash are now placed at merchants and banks, so they have the incentive to reduce cash by electronic payment mechanisms. The analysis of this chapter has shown that the Dutch payment behaviour is in line with the suggestions in literature, that NFC mobile payments have the largest opportunities for small payments. It can be concluded that payment systems in the Dutch market are well-developed and that Dutch consumers are used to pay with a banking card. Cash however is still very important for small payments, NFC mobile payments could be the solution to the reduction of cash usage.
2.5. Stakeholder analysis of the Dutch NFC ecosystem

So far we have learned that feasibility does not seem to depend on the technology and payment behaviour of the consumers. Therefore we must look at the organizations and stakeholder groups involved with NFC mobile payments, in order to assess their backgrounds, strategies and goals. Understanding their goals and behaviour is essential in order to understand which types of collaboration are possible when introducing a new NFC mobile payment service.

2.5.1. Mobile Network Operators

There are three Mobile Network Operators (MNO’s) in the Netherlands:

- KPN
- T-Mobile
- Vodafone

All other brands known to the Dutch public (Hi, Tele2, Telfort, etc.) are using the network of one of the three MNO’s and are called Mobile Virtual Network Operators (MVNO’s). Since the MNO’s own and control the mobile network, they are the relevant stakeholders in the NFC ecosystem. The subscription number and the market shares of the three MNO’s are given in Table 7.

<table>
<thead>
<tr>
<th>MNO</th>
<th>Number of subscribers</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPN</td>
<td>9.8 million</td>
<td>~49%</td>
</tr>
<tr>
<td>T-Mobile</td>
<td>4.8 million</td>
<td>~24%</td>
</tr>
<tr>
<td>Vodafone</td>
<td>5.4 million</td>
<td>~27%</td>
</tr>
</tbody>
</table>

In 2009 three MNO’s have formed a collaborative institution with three major Dutch banks to establish NFC mobile payments in the Dutch market. This consortium has the name TRAVIK (after the six founding companies: T-Mobile, Rabobank, ABN AMRO, Vodafone, ING Bank and KPN) and runs the SIXPACK program which aims to bring NFC payments to the market (Webwereld, 2011). They want to do this by creating a new Trusted Service Manager (TSM), so a separate and independent entity in charge of operations of NFC services in the Netherlands, which is owned by the six companies. Initially the consortium announced to introduce an NFC service in the Netherlands in the second half of 2012. But this is delayed for two reasons:

- TRAVIK will have significant market power when they will offer a collaborative service, since every MNO in the Netherlands is represented and the banks and MNO’s involved take about 90% of the market. If they introduce NFC into the Dutch market, it is very likely that they immediately set the standard. Due to the expected market power that will be established with TRAVIK, the creation of a Trusted Service Manager has to be approved by the European Commission, since antitrust is an important issue in this case. This process takes time and causes delays in the project progress (Balaban, 2011).
- T-Mobile recently stepped out of TRAVIK, since they found “the expected revenues too unsure with regards to the necessary investments” (Webwereld, 2011). The return on investment could not be guaranteed, which is a common problem with NFC implementation for the different partners. This could be partly caused by the German activities of T-Mobile International (the owner of T-Mobile, which is owned by Deutsche Telekom) with regards to NFC technology, although they claim this is not the case. Just like with Vodafone, which has the headquarters in the UK, it can be important for the strategic behaviour whether the company is steered from the Netherlands or from abroad.

From the three MNO’s in the Netherlands, KPN is the only company which is fully controlled from the Netherlands. T-Mobile is part of a multinational corporation with the headquarters in Germany and Vodafone has its headquarters in the United Kingdom. The global offices of the corporations also have their own agendas with respect to NFC implementation. To name some partnerships:

- Vodafone and Visa have formed a global initiative to bring contactless payments to consumers in 30 countries, including the Netherlands. NFC payments will be possible with the VISA PayWave cards and the Vodafone mobile phones. (FinExtra, 2012)
• In the US, T-Mobile has teamed up with AT&T and Verizon Wireless in the ISIS NFC Joint Venture, which will introduce NFC payments to the US market (Isis, 2012). How T-Mobile will develop a mobile wallet for its European customers is not decided however (Campbell, 2011).

Mobile network operators have the reduction of churn as one of their strategic goals. Churn is the case when consumers choose to go to another (competing) network operator after the contract has ended. So they provide several incentives to keep clients on board, like loyalty points or reduction of monthly fees for loyal customers. NFC mobile payments could serve an important role in the reduction of churn, since consumers only accept mobile payments with organizations they trust (Lu, Yang, Chau, & Cao, 2011). If the provider is successful in providing a good communication service, and the mobile phone also serves as a payment tool, the consumer could be more likely to renew the contract or to adopt this technology. The secure element can be placed on the SIM-card of a mobile phone, which is an important asset for the MNO. This is one of the reasons why MNO’s have large incentives to get NFC mobile payments with their SIM-cards.

For both banks and mobile network operators there is a friction between differentiation and universality. As indicated before, choosing a standard is difficult but essential for success. For consumers a universal solution would be preferable, which would be the case if all MNO’s and banks offer a service based on the same technology. Also for financial managers of the organizations involved, this would be a good situation, since the payment volume can be very large (higher acceptance, more transactions and lower transaction fees). For people working in marketing, a universal service would be inconvenient however, since promotion will be harder if the exact same service is also provided by other organizations. With an exclusive service they can bind consumers and make the company more attractive, but a universal service can be found at every company. This friction could potentially cause internal conflict and slow down the progress of the technology.

2.5.2. Banks / Financial Institutions / Card Schemes

There are 290 banking institutions in the Netherlands, which serve in total over 24 million accounts (Committee on Payment and Settlement Services, 2012). Besides these banks, there are 18 other institutions offering payment services to non-banks, so to consumers or businesses. Also there are 3 institutions offering electronic money services. Of all these institutions, only a small portion offers banking services to consumers. The five largest retail banks in the Netherlands are:

• ABN AMRO
• ING Bank
• Rabobank
• SNS Bank
• Fortis bank

As indicated before ABN AMRO, ING Bank and Rabobank are part of the TRAVIK consortium, so they are involved in the implementation of proximity mobile payments in the Netherlands. These three retail banks account for 90% of the market (TRAVIK, 2012). Rabobank is, next to being active within TRAVIK, promoting NFC payments also with their Minitix digital wallet service (more on this in chapter 2.6.3). This does not mean that all their attention is focused on the development of NFC mobile payments services however. Banks are facing difficult times, due to the recent financial crisis and the following strict legislation, forcing banks to deleverage and to look for other sources of income (PwC, 2011b). Client relationship management will become more important when the Basel III legislation will come into force, since the process of deleveraging makes it even more important for banks to be a trusted party for consumers, making the consumers store their savings at the bank of their choice (McKinsey & Company, 2010).

Since VISA is owned and operated by its 4600 members, which are European banks (Visa Europe, 2011), the card schemes will be collected under this stakeholder group. The objectives of card schemes and banks can be considered to be in line with each other, since they want to be in charge of the development of the platform on which proximity mobile payments are made. They risk losing control to platforms like Google Wallet or Isis, therefore they have large incentives to be active with NFC mobile payment solutions.

When looking at the card payment systems in the Netherlands, one central organization can be identified and two card systems:
• Currence
  o Currence is the organization in charge of the payment traffic in the Netherlands, including all non-cash forms. The organisation was created by eight Dutch banks, including all previously mentioned retail banks. Currence has led the transition from PIN (with a magnetic stripe) to the more secure ‘pin and chip’ method, where a secure EMV chip is used during the transaction instead of the magnetic stripe (Het nieuwe pinnen, 2011). This large scale operation resulted in a replacement of all 270,000 POS machines, where the new PoS machines are able to process the Maestro-cards from Mastercard and V-Pay cards from VISA. Although the costs of this transition were rather low for merchants (the replacement was done at the renewal of the payment contracts with Currence) merchants and consumers are now in the process of getting used to the new method of payment. Introducing yet another payment method and payment terminals (as required for contactless payments) would possibly confuse the users of the systems.
  Non-cash payment methods in the Netherlands are debit and credit cards, chipknip, transaction forms (acceptgiro), claims and collections (incasso) and iDeal. Debit cards and Chipknip can be used in stores, transaction forms and claims are mainly used for written bills and iDeal is used for online payment in webshops (Currence, 2012b).

• Maestro
  o Maestro is the debit card brand of Mastercard International. Practically every debit card in the Netherlands has the Maestro logo on it, meaning that the payments are processed by Maestro. The brand was introduced when the ‘het nieuwe pinnen’ was introduced, so the cards are equipped with a secure EMV chip. All Dutch bank account holders received a Maestro card when their previous debit card expired. Worldwide there are over 500 million Maestro cards, which can be used at almost 10 million locations in 93 countries (MasterCard, 2012).
  Mastercard is distributing new PayPass cards in other areas of the world already, which are debit and credit cards which are enabled to make contactless payments. In the US many points of sale are already installed, since consumers get a PayPass once their previous payment card is expired. Payments under 25 euro can be made by only ‘swiping’ the PayPass at the reader, payments over 25 euro demand a PIN code after the card has been swiped. Also with small payments a code can be demanded, for instance when the algorithmic models of Maestro detect suspected behaviour of the card holder.
  Due to the large market share of Maestro in the Netherlands and due to the PayPass technology which will probably also be introduced in the Netherlands, Maestro could become a very powerful actor in the NFC ecosystem. Once all Maestro cards are replaced with PayPass cards, just like in the UK and in the US, points of sale will also be adapted to enable contactless payments. This creates opportunities for mobile phones which are compatible with the PayPass technology (like Google Wallet). Banks are deciding when their clients get a new banking card however, since Mastercard is mainly a B2B supplier to banks.

• Visa
  o Although the market share of Visa is small in the Netherlands, this stakeholder has to be included in this stakeholder analysis, because of the payWave cards, which are rather similar to PayPass cards. Visa recently signed several collaboration contracts with mobile phone producers and telecom providers, in the UK and in the USA. At the end of 2011, 26 million payWave cards had been distributed in Europe and 175,000 acceptance terminals were installed (Visa Europe, 2011). Due to recent contracts with Vodafone (300 million potential customers), with the Olympic Games 2012 in London and with public transport in London (subway travels can be directly paid with payWave cards, so without Oyster cards) the adoption rate of Visa is high (WSJ, 2012). Due to compatibility with other countries it can be expected that consumers expect or require payWave cards from their banks (Visa Europe, 2012).

Banks and card systems have several reasons to take a leading role. The most important is the establishment of client relationships, by making the brand visible in the daily life of the consumer. This is now mainly done through the logos on the banking cards. Offering innovative services that consumers use in their daily life can be the solution to create the trust required to make consumers store their assets at the bank. Another reason to take a leading role is to avoid the risk of being excluded from a payment system that has the potential to capture a large part of the market. As indicated before, NFC ecosystems can be built without a bank involved. The MNO could be in charge of all payments, for instance by handling the payments through the monthly bill of the
customer. Banks also face the emergence of payment service providers, NFC payments could be a strong solution for maintaining the leading position in payments.

2.5.3. Consumers

At the end of 2011, the Netherlands had approximately 16.7 million inhabitants (CBS, 2012). These inhabitants had about 20 million mobile subscription at the end of 2010, and had a total of over 30 million banking cards (Committee on Payment and Settlement Services, 2012).

Researches like the one from De Nederlandsche Bank (2010) indicate that Dutch consumers are willing to use e-money and proximity payments instead of cash money. The use of Chipknip is an indication, as well as the growth of the use of the MiniTix service, which went from 30,000 users in early 2008 to over 150,000 users at the end of 2009 (Rabobank, 2011a). At the end of one of several MiniTix pilots a survey was held with the users of the service, resulting in a consumer satisfaction of an 8 (on a 10 point scale). Information on the usage intensity and the number of adopters that left the innovation after several usages is not publicly available.

Within the NFC ecosystem, consumers are seen as crucial, since they are the actual users of the systems. With the design of a mobile payment service, trust and security are key design issues (Lu, Yang, Chau, & Cao, 2011), as was discussed in chapter 2.2.3. Research has shown that users are more likely to accept mobile payment technology if they have good experiences from internet banking or mobile banking, since this increases their level of trust in the offering institution. Also, convenience is a crucial factor, since the value proposition of proximity mobile payments has to be found in the area of speed at the counter. In order to address many users, the service has to be easy to install and easy to use. Privacy is also a key factor for a large group of consumers. When all payments are digital, it matters if, when and where the transaction details are stored. With Google for instance, several consumer groups have expressed their concerns with the privacy statements. But these discussions will occur with all parties offering services where data is stored, since many consumers do not like the idea of client profiles. With the previous mentioned items and the privacy issue combined, the consumers form a key stakeholder.

2.5.4. Merchants

The retail industry is also considered as a crucial actor in the NFC ecosystem. The potential benefit for merchants can be found in speed of processing payments at the counter and in terms of personalized marketing. With mobile payments, retailers are able to integrate loyalty programs to the phone, making it possible to create complete client profiles. These profiles are considered very valuable, since they can create binding between retailers and client, resulting in a lock-in. The goal is to create more value per consumer, by giving consumers incentives to return to the same store/chain.

Cash reduction has a high priority for the retail industry (SBEB, 2009). Transaction costs when cash is used are rather high, due to the storage, the transfer to banks and the risk on theft. Due to this need, retailers are investing in several digital payment systems, like the several debit card, credit card or Chipknip systems. This will to invest in new technology is necessary, since proximity mobile payments require special readers and an adaptation of the IT infrastructure. The report of SBEB, which was assigned by the branch organization for retailers, investigated how cashless payments can become reality in 2014. The main outcome was that technically there are no real threats to cashless payments, but that acceptance of clients could be difficult. The goal is to make the retail shops completely cashless, since 98% of the consumers in the Netherlands have a debit or credit card, but this could be a step too far in the near future.

The costs for points of sale are often embedded in service contracts with payment service providers like Currence, making the costs of a new reader not directly a pitfall for acceptance by merchants. An important characteristic of the readers is compatibility. There are already readers on the market that accept MiFare cards (as produced by Philips), PayPass from Mastercard and payWave from VISA. When installed, a reader like in Figure 6 reduces the risk of being unable to process a payment and reduces the investments, just like it's currently the case with most PIN machines in the Netherlands, which accept both VISA and Maestro cards.
Since the payment behaviour of consumers is rather well known in terms of the distribution of method per transaction amount, applications can be focused on transactions with a low value and where speed matters. The pilots indicate that retail organizations are willing to innovate if the technology provides them with more clients and if convenience is guaranteed. The business case also has to be right for merchants, they need to see the benefits of this new technology before they will consider adopting it.

2.5.5. Public transport

In 2002 the joint venture ‘Trans Link Systems’ was formed by the five largest public transport companies in the Netherlands (NS, RET, GVB, Connexxion and HTM). These five companies offer 80% of all public transport facilities, so bus, tram, metro, train and boats, in the Netherlands. The new joint venture was formed to create a new payment method based on RFID cards. With these cards the example of the ‘Octopus-card’ from Hong Kong, the ‘FeliCa-cards’ in Japan and the ‘T-money cards’ in Korea was followed, since the implementation in the other regions was very successful (Trans Link Systems, 2012). Public transport users can purchase an RFID card, charge it with their bank account and then start using the services. When their credit is insufficient, access is denied and they are requested to go to a charging point. Recently the option to charge automatically (once the credit comes under a certain threshold) became available, providing more convenience for the travellers. The tender to provide the technology for a new RFID system was won in 2003 by a consortium which consisted of Thales, Vialis and Accenture. These organizations worked together with two Hong Kong-based organizations (MTR Corporation and Octopus Cards Ltd.), which provide the successful Octopus system in the Hong Kong public transport.

The OV Chip Card, the name of the Dutch RFID card, started life in 2005, when the cards were first used in the local transport system of Rotterdam, as provided by RET. In several rounds, the OV Chip Card was introduced to more travellers and more organizations. The complexity of the system consists partly of the different organizations involved. A traveller can start by travelling in the metro (RET or GVB), then use the train (NS) and finish with a bus trip (Connexxion for instance). The division of costs and responsibility posed many problems with the implementation, but the system is currently stable and fully functional. The system is designed as an offline system, with card based storage of the products.

Public transport organizations are potentially an important stakeholder, since NFC payments with the mobile phone can also serve as a replacement of the OV Chip Card. For instance, the NFC mobile phone could emulate the functions of the OV Chip Card, making the usability very large all of a sudden. This also works the other way around, so people with only the OV Chip Cards could then pay at points of sale in shops or other locations where small purchases are possible. Since there are already over 9 million OV Chip Cards active, out of which 6 million are personal cards, the installed base is already present. If the NFC technology from banking cards would be compatible with the OV Chip Card, the investments required for retailers would be easier to negotiate. This does not seem to be the case however, so merchants potentially have to choose to either accept the OV Chip Card as a contactless payment mechanism or the contactless banking card.

The interest for NFC mobile payments of the public transport company is likely to be low. The reason is that Trans Link Systems has made very large investments in the deployment of the OV Chip Card. Now they have control on the card issuance and the user data, while with NFC payments they have the risk to lose control. This could be the case if Google phones or payWave cards are also allowed to ‘check-in’ at the train station. Or if the example of London is followed, where the metro network of London will soon already be accessible with the payWave card of Visa. This makes it possible for public transport companies to completely abandon the separate card system, the charging points and the control on this infrastructure (WSJ, 2012), if payWave cards are widely accepted by consumers. So the willingness of the public transport company to allow payWave cards results in a loss of autonomy, but potentially increase of convenience and a reduction of costs.

2.5.6. Mobile phone producers

Practically every mobile phone producer is researching the options of NFC within their product range. NFC can provide a competitive advantage, especially when the ‘right standard’ is integrated in the device. The right standard means that the mobile handset should be compatible with the largest number of readers, since then the network value of the NFC capabilities will be high, making the perceived value of the mobile phone higher as well. NFC technology has been defined in several ISO standards, but the location of the secure element, the location of secure data, is not standardized yet.
There are three locations for the secure element (SE):

1. Embedded secure element
   - When this design is chosen, mobile phone producer is the owner of the SE, so they have the control with regards to the type of technology. Once the consumer buys the phone, he/she becomes owner of the payment functionality in the phone. With this design, mobile phone producers can integrate the NFC capabilities rather easily into the operating system of the phone and add additional features if required by the market. The advantage of control over the technology brings some disadvantages as well. For instance, when a phone is lost, stolen or replaced, the NFC payment chip is less easily replaced (probably for a higher price).

2. SIM-based secure element
   - When the secure element is placed at the SIM-card, the MNO can rent part of the SIM card to service providers, when they need to place their application on the secure element. The reason is that a MNO owns the SIM during the contract duration (T-Mobile, 2007). With this setup the MNO has control on the NFC services that the consumer will use and the consumer has risk that the mobile payment wallet will be disabled once the contract is unpaid, changed or cancelled. The mobility is increased however, since people can change their phone without having to set up new payment functionalities.

3. A secure element on a micro-SD card
   - With this design, other organizations can also be in charge of the NFC functionality. If consumers want to change their ‘digital wallet’, then can just use another SD-card. With this setup VISA can, for instance, be the platform owner, or any other organization that has a large group of adapters. An SD-slot is required on the phone.

Ownership of the NFC capability is source of a competitive process, which can already been seen in the current market. For mobile phone producers NFC can become a unique selling point, since it can be one of the variables on which consumers will base their choice. The first NFC enabled devices have entered the Dutch market already. The limitation posed, in case of an embedded secure element, is the reduced power for MNO’s in the Netherlands. Earlier in this report the need for a global or European standard was already given (hence the ISO standards), but implementation can be more difficult due to different market characteristics. Due to the small size of the Netherlands, the power in deciding the standard is expected to be rather low. Just like consumers expect to use their mobile phone while being abroad, they would also like to use the payment functionality abroad.

When looking on a global scale, Visa recently announced a partnership with several smartphone producers, which results in a compatibility with the Visa payWave technology (Visa Europe, 2012). New models of Blackberry, LG and Samsung will be enabled with the same technology as embedded in the payWave contactless card technology, as already rolled out in the USA. The smartphones are then able to make payments. Since payWave cards already have a rather large market penetration in the USA and the UK, the step for consumers to NFC mobile payments is rather small. Since there are already readers installed for the processing of payWave debit cards, the installed base of readers is sufficient to enable American and UK consumers to pay with their mobile phones. This type of readers has not entered the Dutch market yet, but a similar pattern could be followed in the Netherlands.

There is competition from other phone producers however, from Google with the Android operation system and from Apple with iOS. Google is not a mobile phone producer, but has a large influence on several phone producers through the development of Android operating systems. Google has already developed and introduced Google Wallet, a service where a mobile phone can be used for in-store or online payments with NFC. Google delivers the service and creates the platform on which consumers can add bank accounts to their Google Wallet account and can see their transactions (Google, 2012). Apple, an important player on the mobile phone market, recently got a patent granted that allows them to provide the so-called ‘iWallet’ service on new mobile devices. The application that will probably be introduced into the market later, enables consumers to add banking accounts to their Apple iTunes account, after which they can make payments and review their transactions. They can also set rules, either for a certain time-frame, a location or an amount, in order to limit the risk of unwanted transactions, which was not possible before (PatentlyApple, 2012b). All types of banking accounts, so debit and credit and Visa or Mastercard, can be added to their account.
2.5.7. Government

The project to replace all banking cards with EMV enabled cards, with the name 'het nieuwe pinnen', was initiated by European laws. In order to create a European payment market, with compatibility of the cards in all European countries, banking cards and banking systems had to be adapted (SEPA NL, 2012). The new banking cards have a highly secured chip embedded, which is more secure than the traditional magnetic stripe.

The governments, either national or European, are important stakeholders for the payment traffic in the Netherlands. As can be seen with the SEPA legislation, the wish to unify the countries within Europe in terms of financial systems has had an important impact on all consumers. The EMV chip that is now required in each banking card is also integrated at PayPass and payWave cards, so the same security level can be guaranteed. The trend of contactless cards is therefore not expected to be interrupted with legislation on a short term. When the technology for NFC payments is compatible with the EMV-chip readers, it can be expected that governments will not see problems in the new technology. When the ISO standards are followed, which limits for instance the magnetic field strength, the technology can be used. Although the influence of governmental institutions on the short term is estimated to be small, the potential power of this stakeholder is large, not only in terms of technological terms but also in terms of privacy and (restriction of) data collection.

2.5.8. Positioning of stakeholders and overview of NFC implementation possibilities

Based on the information provided in the subchapters above, the stakeholders that need to be managed when introducing NFC payments in the Netherlands cannot be placed in a stakeholder map, in order to quickly review their importance. For this multi-sided market, a stakeholder map would not represent reality, since the groups of stakeholders presented here are too broad to group. This means that within banking, to name an example, the different retail banks have different strategies and goals in terms of consumer services. Rabobank appears to be very innovative with contactless payment services, while other banks show no public signs of working on mobile payment services. Because of this, a stakeholder map would not be very valuable at this point. The stakeholder analysis given above gives a general overview of the current actors in the Dutch NFC ecosystem, but the interviews later in this research will provide more detailed information on the actual goals and objectives of the individual companies involved.

The description of each stakeholder group has revealed several possibilities of introducing NFC mobile payments in the Dutch market. The possibilities that seem most feasible or most realistic are summed up in Table 8, where the methods are grouped according to the organizational design variables that seem most interesting and the strategies for market diffusion.

<table>
<thead>
<tr>
<th>Payment method</th>
<th>Carrying device</th>
<th>Organization in charge</th>
<th>Strategy for diffusion</th>
<th>Current Market</th>
<th>National or international?</th>
</tr>
</thead>
<tbody>
<tr>
<td>OV Chip Card</td>
<td>RFID enabled card</td>
<td>Public transport organization</td>
<td>Expand functionality of installed base</td>
<td>Public transport users</td>
<td>National</td>
</tr>
<tr>
<td>Minitix</td>
<td>SMS / NFC sticker / social network</td>
<td>Bank</td>
<td>Multi-channel / market focus / closed loops</td>
<td>Specialized services for school, sporting clubs and restaurants</td>
<td>National</td>
</tr>
<tr>
<td>Visa PayWave / Mastercard Paypass</td>
<td>RFID payment card and NFC enabled smartphones</td>
<td>Bank / card scheme</td>
<td>Push technology to consumers, force merchants to follow and then use this for NFC mobile payments / multichannel</td>
<td>All debit and credit card users of Visa or Mastercard</td>
<td>International</td>
</tr>
<tr>
<td>TRAVIK</td>
<td>NFC enabled smartphone</td>
<td>Banks and MNO’s (joint venture)</td>
<td>Create large market power by collaboration and then push a service to the market</td>
<td>All Dutch consumers</td>
<td>National</td>
</tr>
</tbody>
</table>
The large variety of service designs already reveals some of the complexity for organizations aiming to introduce an NFC mobile payments service in the market. Not only on a national, but also on an international scale these trends are visible. The variables chosen in Table 8 were determined based on the information provided by the stakeholder analysis. These design variables are chosen for now, but can change after new insights coming from the case study of previous pilots and services in chapter 2.6 or from the conceptual analysis in chapter 3.

2.6. Previous mobile payment services in the Netherlands

In order to assess future success of NFC mobile payment services, it is important to understand which services have existed before in the Dutch market, how they were organised and why they failed. This knowledge needs to be taken into account with future products and services. An overview of previous NFC or other mobile payment services is given below, with a focus on the pricing, the organization and the strategy applied by the organisation during market introduction. The lessons from previous projects will then be compared with the outcome of the previous chapter.

2.6.1. KPN, LogicaCMG, NXP, Rabobank and C1000 (2007)

In fall 2007, a group of companies organised an NFC mobile payment pilot with a very limited scope (Schuitema, 2008). 100 consumers were selected to make NFC mobile payments with an NFC enabled phone, which was provided by the organisers of the project. Payments could only be made in one supermarket, a C1000 supermarket in Molenaarsgraaf, where the consumers had to pay all their groceries with their phone during a period of six months. Another functionality provided was found at the bottle returning machine, where refunds could be added to the account of the consumers. The mobile phones were connected to the banking account of the participants. Payments were made by holding the mobile phone next to the NFC reader and then to type in the four-digit personal code, in the same way as is currently done with debit cards.

The project was concluded with two surveys, in which all participants were positive about their experiences with NFC mobile payments. The final report concluded that the largest cause of disappointment at the participants was that the pilot ended, meaning that they were very satisfied with the service. During the pilot, staff of the supermarket assisted the pilot participants with questions, but the consumers learnt quickly. The participants also concluded that they found it annoying that not all merchants accepted NFC payments, since now they still had to bring their debit cards. The results were tested by the organizing companies and can therefore be biased. The consumers were individually selected by the supermarket owner, with the goal to distribute the participants with regards to age and gender, but since the owner knew many of his clients, it is likely that he selected only customers with a positive attitude towards his organization.

Another interesting conclusion of the project was that consumers experienced no insecurity while using the technology and that the payment system was even more secure than the PIN-method used at the time (this method of payment with magnetic stripes is now replaced by the Maestro EMV-cards). The NFC readers were not integrated with the IT systems of the supermarket, due to the small scale. The NFC reader was linked to the debit card terminal, so only minor adjustments were required.

The interests of the companies in the pilot were mainly focused on building knowledge and testing whether this technology could be provided in a feasible way. The pilot was set up as an ending project from the start, but the positive pilot outcomes have not directly resulted in follow-up projects. Since this pilot only ran for a limited time, with the goal to gain knowledge on NFC mobile payments in supermarkets, the costs were all taken by the organizations.

2.6.2. Payter

In 2007, another large NFC payment service started in Rotterdam, with the name Payter (Ringlesteyn, 2009). The service consisted of a full ecosystem of payment possibilities, so consumers could use their NFC phone in supermarkets, for parking payments, for cinema visits and in restaurants. The service had a different design than the previous system of C1000 and Rabobank and had the goal to be a sustainable service, unlike the previous pilot with a fixed end-date.

With the Payter service, consumers received 15 euro credit for free, when they adopted the service (Tylee, 2008). Charging the account could be done through a mobile phone or from a computer, through a secured
website. Charging costs were 70 eurocents per transaction, which was considered as expensive by several consumers. Consumers also had to pay 2.50 euro per month for the use of the service. In return, the organization offered a loyalty point system (called Tsjing), with which consumers could collect points per purchase. This could then be used for mobile content like ringtones or wallpapers for the phone.

In contrast with the previous pilot, which was a collaboration of different experts, Payter was independent of banks or MNO’s. Due to the lack of a track record, merchants were not eager to invest in a new and separate payment terminal. Consumers also showed reluctance, since the Payter service was built as a prepaid system. Consumers first have to transfer money to their Payter account, with a limited certainty about whether they get it back or not. Payter was essentially a marketing company, their business model was based on income from marketing campaigns targeted at their users, which did not improve the trust at clients. Companies could, for instance, buy NFC enabled posters where Payter users could scan and order products.

The service lasted for about two years. At December 1st 2009 the service stopped, when they had 1400 users and 100 acceptance points (Hamel, 2009). The company acknowledged that merchants in Rotterdam were refusing to install NFC readers in their store, even after very interesting incentives, like large discounts on the hardware. The company has now evolved into a supplier of NFC readers, contactless cards and other hardware.

When looking at the strategy of the organisation underlying the NFC payment service, we see significant differences with the earlier example. Not only is the Payter service organized by an independent organization, the service is also a prepaid service instead of a linkage between bank account and mobile phone. Verification is done on the phone, through a dedicated application on the mobile phone, instead of a four-digit code on the point-of-sale. The strategy of Payter to demand monthly fees from its users and to subsidize merchants to install points of sale resulted in low adoption from both sides. The funding mechanism through marketing mechanisms made both merchants and consumers reluctant to create a user profile or to invest in this organisation. Just like for the other examples here, the analysis is given in Table 9.

2.6.3. MiniTix

Rabobank, a Dutch retail bank, seems to be innovating with contactless payments. They tried with the retail project at C1000 and now they have several other projects with contactless payments, three will be explained in this chapter. These projects are enabled from the Minitix payment engine, which can handle payments independent from the large card schemes. Therefore the transaction costs are low, although they can be further decreased if the payment volume would go up. The fact that Rabobank is the owner of Minitix creates dependency, but the service is opened for all consumers.

With the C1000 example, the phone was linked directly to the bank account of the user, but in later pilots and projects the bank approached mobile payments differently. Consumers can create an account, called the Minitix digital wallet, from their computer (MiniTix, 2012a). This account is linked to their email-address and their mobile number, in order to log in. Once the account has been created, payments can be made through SMS, through NFC payments or on the social network Hyves. Minitix is owned by Rabobank, but the service is independent of the bank and network provider of the consumer. This makes the service accessible to anyone with a bank account. Retailers however need to have a banking account at Rabobank. With several names and projects, Rabobank tries to focus on different markets, like MyOrder for restaurants and bars and “Cashless Betalen” for schools and sports clubs. The Minitix account created can then be used for the different applications, so Rabobank is using a multi-channel strategy.

In June 2011 Rabobank revealed an NFC mobile payment package for hockey clubs, since this type of organization seems to experience large benefits from NFC mobile payments (Rabobank, 2011b). Restaurants and bars of the clubs are often staffed by volunteers and the payments made are small in value. A digital payment system can provide the board with a larger accuracy in their finances, more security for the volunteers (smaller risk on theft and robberies), larger convenience for the members and better control for parents, since they can have insights in the purchases of their kids. The bank offers sport clubs that have their banking activities with Rabobank a complete NFC payment infrastructure. Membership cards can then be used to pay for drinks and snacks, but members can also attach stickers to their mobile phone or request a keyholder. The NFC chip is linked to a Minitix account, the online wallet service which is used by Rabobank (MiniTix, 2012a). Clients can charge their account either online or through their mobile phone. Also, they can have personal accounts or accounts with a team, which can be charged through the individual accounts.
Rabobank also offers a contactless payment service for smartphone users. RFID stickers are placed on a mobile phone, allowing the owner of the phone to swipe this device at a payment terminal in an Albert Heijn supermarket in Amsterdam (Clark, 2011). The payments are handled with the Minitix digital wallet service, where consumers can create an account and can charge and view their account online or through a dedicated app for their smartphone. Charging the account can be done through the internet, although charging with a smartphone is considered easier. But it shows that MNO’s are not necessary to enable proximity mobile payments. A transaction with Minitix will cost 0.05 euro, independent of the payment channel of choice (SMS, social network or NFC). The costs will be charged to the merchant, which also have to pay an access fee of 180 euro, in order to be allowed to handle Minitix payments (Minitix, 2012b). Minitix is gaining popularity, perhaps due to the focusing on different markets with specific products.

The services that are based on the Minitix wallet aim for a very specific markets (closed communities), where contactless payments provide the solution to a certain need. Although the market penetration of Minitix services is limited, it can be considered as the second largest success in the Netherlands with regards to contactless payments, after the OV Chip Card.

2.6.4. NFC projects overview

So far we have seen several examples, with the most important conclusion that the success of NFC mobile payments in the Netherlands is still rather limited. At the end of 2009, Minitix had 150,000 users, but recent figures (and figures on the number of transactions) are not available. This chapter has analysed several project and services, with small to moderate success, a summary is given in Table 9. The OV Chip Card is not represented, since in-store payments are not yet possible with this contactless card.

Table 9 Overview of the NFC related mobile payment services in the Netherlands

<table>
<thead>
<tr>
<th>Product</th>
<th>Leading organization</th>
<th>Access fee to the network</th>
<th>Transaction costs</th>
<th>Peer 2 peer?</th>
<th>Payment channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1000, Rabobank, Logica pilot</td>
<td>Joint venture</td>
<td>Free</td>
<td>Same as debit card</td>
<td>No</td>
<td>NFC phone</td>
</tr>
<tr>
<td>Payter</td>
<td>Independent organization</td>
<td>2,50 euro/month for consumers</td>
<td>0.70 euro each time a consumer adds money to the account</td>
<td>No</td>
<td>NFC phone</td>
</tr>
<tr>
<td>Minitix</td>
<td>Bank</td>
<td>180 euro for merchants (excluding hardware) / free for consumers</td>
<td>0.05 euro per transaction for merchants, free for consumers (Minitix, 2012b)</td>
<td>Yes</td>
<td>Multichannel (SMS, NFC and online through social network)</td>
</tr>
</tbody>
</table>

The overview leads to several insights, but which can be taken into account during the interviews. These are:

- New organizations, where previous trust relationships are not yet established with the clients, seem to struggle to find new users, from both sides of the market (Tylee, 2008).
- Peer to peer payments seem to be a feature that can contribute to the adoption and success of NFC mobile payment services.
- Although reports indicate that most consumers are willing to pay for mobile payment services, the Dutch pilots indicate otherwise. This could be due to local habits.
- Adapting mobile payment services to specific market needs could increase the acceptance.
- Telecom operators have a limited role in the developments so far.
- Benefits seem to be larger for the merchants, their willingness to pay is larger in that case.
2.7. **Domain conclusion**

This chapter has given an extensive overview of mobile payments, the enabling technology and the organizational aspects of NFC mobile payments services. What have we really seen and learned so far?

In terms of technology and payment behaviour, it seems to be feasible to introduce NFC mobile payments in the Dutch market. The consumers are familiar with digital payments, especially debit card payments are popular. Consumers seem to be willing to try new technologies if they experience benefits from it. The payment infrastructure is well-developed in the Dutch market, making investments to enable NFC mobile payments limited. Previous pilots had positive outcomes, but they were all on a limited scale and the consumers only had to make small or no personal investments. In chapter 2.5 it was concluded that consumers are satisfied with NFC technology once they get the chance to use it, but it seems unlikely that they will pay for it, as was concluded from the chapter on Payter (chapter 2.6.2).

We also know that several platforms are competing, which are either created in the Netherlands or will be pushed in the market from abroad. Platform leaders are very different, since some solutions are bank-centric (Minitix), others are centred around the card schemes (payWave/Paypass) or the last class is formed by the collaborative projects (TRAVIK). Designs also vary, since some solutions are created from the phone (so NFC functionality is built in the phone), while other solutions can be seen as an extension of the installed base of RFID smart cards, like the OV Chip Card.

Chapter 2.5.8 explained the current trends in the Dutch markets and the organizational structures belonging to these trends. When looking at the previous services, chapter 2.6.4 explained how the transaction costs were arranged and which type of organization was in charge. The different collaboration structures have revealed variables that seem to be of influence on how the service is provided and the strategic position of the platform owner seem to have an influence on the success of the service. From the analysis of the several cases so far, the design variables for an NFC mobile payment service, seem to be:

- Carrying device (smart card / NFC smartphone)
- Platform owner (bank / MNO / public transport / other)
- Strategy for diffusion
- Focus (niche markets / universal solution)
- National or international standard
- Access fee to the network (consumer pays / merchant pays / both)
- Usage fee of the network (monthly payments / free / other)
- Peer to peer functionality (yes / no)

The theories describing the variables deduced in this chapter will be analysed in chapter 3, in order to understand the concepts that describe the questions and variables posed here.
3. Concepts

Chapter 2 has revealed some of the design variables that seem to be of influence on the organizational aspects of an NFC mobile payment service. The variables that have been derived from an historical analysis of pilots and project and from the stakeholder analysis, have been listed in chapter 2. This chapter will elaborate on the theoretical background of these variables, since this knowledge is required in order to determine the theoretical framework for interviews with industry experts. Only when the theoretical concepts are thoroughly described, a research model can be created and the individual influence of each concept on the problem central in this research can be tested.

Chapter 3.1 focuses on business model theory, the STOF model more specifically. The STOF framework is chosen since it describes how organizations that need to work together in an ecosystem can define their business models on an individual level and on a network level. Since the domain description has indicated battles between different technologies, different platforms and strategies, different literature streams will be consulted in order to define a research model for the interviews. The concepts derived in chapter 3.2 to 3.7 will be grouped as concepts from platform theories, with references coming from three literature streams. Chapter 3.2 analyses multi-sided markets and the possible solutions to overcome the problems arising when dealing with this type of markets. Chapter 3.3 zooms in on network externalities, an effect that is very relevant in for multi-sided markets. For these two chapters references from industrial economics and strategic management will be used. Then, in chapter 3.4, 3.5 and 3.6 platform characteristics will be assessed. The chapters will analyse platform competition (competition between platforms), platform openness (strategic choices of the platform owner) and platform leadership (competition within a platform). These chapters will mainly be based on literature from economic research and from strategic management. Chapter 3.7 analyses whether lock-in effects are relevant for the adoption of a new payment method, in order to assess whether the stakeholders can utilize these effects to create a more loyal client base. Chapter 3.8 sums up the lessons learned, in order to assess which concepts need to be taken into account in the theoretical framework for the interviews.

In this report the term Near Field Communication ecosystem has been mentioned several times, but the theoretical background for ecosystems is not given yet. There are two common definitions of an ecosystem, both posed by Moore. The definitions are “an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world” (Moore, 1996) and “an extended system of mutually supportive organizations; communities of customers, suppliers, lead producers, and other stakeholders, financing, trade associations, standard bodies, labor unions, governmental and quasigovernmental institutions, and other interested parties. These communities come together in a partially intentional, highly self-organizing, and even somewhat accidental manner” (Moore, 1998). The definitions above are applicable to the NFC ecosystem, since many companies from different sectors come together to provide a service, which is enabled through technological developments in other fields, like RFID and mobile phone technology.

3.1. Business models for service platforms

Traditionally, business processes were often described with the value chain approach, mainly due to the books and articles of Michael Porter around 1985. Later however, the value chain approach received negative feedback from two perspectives. The external focus has been criticized by (Barney, 1991), who came up with the Resource based view, which is more internally focused. The other point of critique came from the network-oriented approaches (Tapscott, Lowi, & Ticoll, 2000). These new approaches also took into account the horizontal aspects of corporate processes, so the processes between companies operating in a network (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008). The criticism from different directions led to the development of new conceptualizations of business processes, with the new definitions ‘value net’ and ‘business web’ as a consequence. Value nets can be distinguished according to several characteristics, which determine the advantage over traditional businesses (Petrovic & Kittl, 2003). They are:

- **Customer-aligned**
  - Customers can play an active role, so they are no passive recipients of the output of the value chain. They provide key information on their preferences and demands. Customers trigger the sourcing, building and delivery of the required product or service.
• **Collaborative, systemic, and information-based**
  o The companies within the value net need to engage suppliers, customers and perhaps even competitors in a network of value-creating relationships. Tasks are divided according to the specialties of each actor in the value net. The flow of information and the intelligent use of this are at the heart of the value net.

• **Agile and scalable**
  o Due to intelligent use of client data, the value net is able to respond quickly to changes in the market. The production and distribution process are flexible and process time is reduced.

The value net for NFC mobile payments in the Netherlands should be having the characteristics mentioned above, since this defines the attractiveness and viability of the services. The value net of proximity mobile payments will be presented as a service platform. Service platforms are platforms that provide an infrastructure to enable the development, deployment and delivery of services to businesses and consumers (Nikayin, 2012). The networks that create the infrastructure for an ICT-based platform have to consist of three types of participants (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008):

• **Structural or Tier-1 partners**
  o These partners provide the assets, either tangible or intangible, to the value web on an equity or non-equity basis. The assets are essential and non-substitutable. The partners of this group play a direct and core role in the value web, both in determining the intended customer value and in creating the business model.

• **Contributing or Tier-2 partners**
  o This group of partners provides the goods and/or services to meet the requirements of the service offered, in order to meet the requirements specific to the value web. They play no role however in determining the intended customer value and in creating the business model. The assets they bring to the value web can be substituted.

• **Support or Tier-3 partners**
  o This group of partners provides generic goods and services, without which the value web would not be viable. These services and goods could otherwise be used in connection with a wide variety of business models and intended customer value.

This research is scoped around the structural partners, since they are the most important stakeholders in the development of the NFC mobile payment ecosystem. With the definitions of business processes, value nets and the potential roles within these networks assessed, we can now focus on business models for these networks.

Business models for networks of companies, as is the case with the NFC ecosystem, are more complex than those for single companies. Not only do the individual companies within the network have to be profitable, the network of companies also has to compete with other networks. For the definition of a business model, the definition of Bouwman et al. (2008) is chosen as the most complete and relevant to this research: “a business model is a blueprint for a service to be delivered, describing the service definition and the intended value for the target group, the sources of revenue, and providing an architecture for the service delivery, including a description of the resources required, and the organizational and financial arrangements between the involved business actors, including a description of their roles and the division of costs and revenues over the business actors.” (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008). Business models for networks of companies are often described according to four elements (Haaker, Faber, & Bouwman, 2004):

• **Service design**
  o Which service is offered? What is the added value? At which market segment is the service targeted?

• **Technology design**
  o What is the fundamental design of the technical system and what is the technical architecture needed by the firms in the value network to deliver the service required?

• **Organization design**
  o Which actors are needed to deliver the service, and in what configuration? What role does each actor play? How does the network create value for the end-users?

• **Finance Design**
  o How does the value network intend to capture monetary value from the service offering? How are risks, investments and revenues divided over the different actors in the value network?
These four components of a business model create a conceptual framework on which each business model can be analysed. This framework, given in Figure 7, is called the STOF model due to the first letter of each domain. All domains are interconnected, as can be seen in the model. The STOF framework is used for networked companies in several branches, so it has a large usability for several markets.

Figure 7 STOF business model domains (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008)

Each domain as displayed in the framework, is broken down into several concepts. Several articles, like the one from Faber et al. (2003), give all concepts belonging to the four elements. These different concepts are given in Table 10. Since the focus of this research is on the organizational aspects of the business model for NFC mobile payments, the concepts belonging to the organization domain are given in Figure 8.

Table 10 Concepts per domain of the business models for networks of companies (Faber, Ballon, Bouwman, Haaker, Rietkerk, & Steen, 2003)

<table>
<thead>
<tr>
<th>Service design</th>
<th>Organization design</th>
<th>Technology design</th>
<th>Finance design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intended value</td>
<td>Actors</td>
<td>Technical architecture</td>
<td>Financial arrangements</td>
</tr>
<tr>
<td>Delivered value</td>
<td>Value network</td>
<td>Backbone infrastructure</td>
<td>Tariff structure</td>
</tr>
<tr>
<td>Expected value</td>
<td>Interactions and relations</td>
<td>Access networks</td>
<td>Revenues</td>
</tr>
<tr>
<td>Perceived value</td>
<td>Strategy and goals</td>
<td>Service platforms</td>
<td>Investments and costs</td>
</tr>
<tr>
<td>Customer or end-user</td>
<td>Organisational arrangements</td>
<td>Devices</td>
<td>Risks</td>
</tr>
<tr>
<td>Context</td>
<td>Value activities</td>
<td>Applications</td>
<td>Performance indicators</td>
</tr>
<tr>
<td>Tariff and Effort</td>
<td>Resources and capabilities</td>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>Bundling of services</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 8 Descriptive model of the organization domain (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008)
As can be seen in Figure 8, the concepts belonging to the organization domain are already modelled by Bouwman et al. (2008). In chapter 4 the theoretical framework will be created, partly based on the concepts given in Figure 8, in order to assess which concepts influence the feasibility of NFC mobile payments in the Dutch market. So, the STOF framework for business models forms the first group of concepts that could influence success in the market, the other concepts will come from the concepts belonging to platform theory. These concepts will be assessed in the next chapters.

3.2. Multi-sided markets

As indicated before, ecosystems consist of many different stakeholder groups which are all involved in offering one service or product. In the case of proximity mobile payments in the Netherlands, the stakeholder groups are given in chapter 2.5. In order to make mobile payments possible, consumers need a mobile phone, retailers need a point of sale which can process this type of payments and mobile phone producers need to produce mobile phones that are NFC enabled. They will only do this however if the expected market for this product is large enough. So NFC mobile payment services suffer from the so-called ‘chicken-and-egg-problem’, since consumers wait for enough functionality of NFC phones and retailers wait until enough consumers have an NFC enabled phone.

With multi-sided (often called two-sided, since more traditional markets consist of buyers and sellers only) markets the role of a platform is essential, since it brings together the distinct groups and allows them to interact. A market is two-sided if “the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount; in other words, the price structure matters, and platforms must design it so as to bring both sides on board” (Rochet & Tirole, 2004). So the distribution of prices for the different sides of the market affects the market participation and the overall volume of demand (Roson, 2005), due to differences in the price elasticity of demand. With multi-sided markets there is a difference between two types of fees: the membership charges and the usage charges. We can also distinguish membership externalities and usage externalities (Rochet & Tirole, 2004). This is represented in Figure 9, where A stands for the ‘membership charge’, a for the ‘usage charge’, B for ‘buyer’ and S for ‘seller’.

![Figure 9 Visualization of the difference between costs and externalities for membership and usage (Rochet & Tirole, 2004)](image)

Multi-sided and two-sided markets are widespread. They are found in the game-console industry, the credit card industry and with mobile phones, to name a few examples. The membership fee is often the purchase price of the device, like a game console or a mobile phone. The usage charges consist of the charges you have once you are ‘on board’, so when you buy video games for the game console or when you make calls with your mobile phone. Many business models are constructed for low membership fees (for instance: selling game consoles below cost price) in order to get as many people as possible ‘on board’. This large group of users then attracts many game producers and makes the console more attractive for online gaming. The owner of the platform can then earn money on the games they sell or by demanding a monthly fee for online gaming possibilities.

This theory is mainly of interest for the competition between platforms, since platforms suffer from these externalities (Rochet & Tirole, 2003). Many cases have been researched by Rochet and Tirole, with the conclusion that many if not most markets with network externalities are two-sided. Later this definition was expanded to multi-sided markets, in case more organizations were involved with the platform. According to (Rochet & Tirole, 2003) price allocation in this type of markets is affected by six variables:

- Platform governance
- End-users cost of multi-homing
- Platform differentiation
Platforms ability to use volume-based pricing
The presence of same-side externalities
Platform compatibility

Multi-homing is another element that belongs to multi-sided markets. This is the case when consumers adopt multiple platforms and use them side by side (Rochet & Tirole, 2004). For instance, some merchants accept both Visa and Mastercard credit cards, in order to serve all their consumers. This is represented in Figure 10. Multi-homing puts a downward price pressure on the seller, since the consumer can adopt the platform that results in the lowest fees. Within multi-homing steering is possible, either by consumers (all adopt one platform to force sellers to adopt the same) or by sellers (only accept one platform, in order to force consumers into the required behaviour). NFC platforms can reduce the need for multi-homing, when cleverly designed. If the payment platform on which the proximity mobile payments are based accepts different card systems, only one point of sale is required for the merchant. There are already designs where the NFC phone can emulate the functions of a credit card from either Visa or Mastercard.

Figure 10 Multi-homing when adopted by the seller side of the market (Rochet & Tirole, 2004)

Knowledge on multisided market characteristics is essential in defining the design and pricing strategy for mobile payment services. A recent research by PwC revealed that consumers are willing to pay up to 5 euro (£4.20) per month for more convenience with their mobile phones (PwC, 2011b), but the example of Payter, as explained in chapter 2.6.2, gives the impression that Dutch consumers are less likely to accept a service if they have to pay for it. Pricing of the mobile payment services will be crucial in order to get the service accepted by a large base of consumers, so pricing will also be considered in the interviews.

Multi-homing theory is applicable to payment systems and needs to be taken into account for proximity mobile payments as well. Several mobile payment designs already have this characteristic embedded, since consumers can link several types of credit cards to their mobile wallet account. This is the case with the MiniTix service, the Visa mobile payment services and the proposed Apple iWallet application for smartphones.

From this literature streams, three elements will be taken into account with the research model. Multi-sided market effects will be split into membership externalities, usage externalities and the possibility for multi-homing. These three elements seem to reflect the differences between several contactless payment services, as was seen in chapter 2.

### 3.3. Network externalities

As indicated in the previous chapter, the value of mobile payment services depends on the number of other users and on the number of points of sale, since these variables define the usability of the NFC functionality of the phone. This effect is known from many other areas, like with mobile phones, faxes, computers etc. These effects are called network externalities, which can be divided into direct and indirect network externalities (Katz & Shapiro, 1985).

Direct network externalities occur when the utility of a good increases with the number of units sold (Rohlfs, 1974). The consequence of this effect is that the demand of consumers not only depends on the value attributed by the consumer to the product, but also on the number of users. In the case of a mobile phone, a mobile phone becomes more attractive when you can call others on their mobile phone as well. This effect was first noticed with the development of the telecom infrastructure in the USA, following the invention of the telephone of Graham Bell in 1876 (Rallet, 2011). To stay with the multi-sided market theory, direct network externalities come from actors on the same side of the market. Consumers experience an advantage if more other consumers use the service. Negative externalities are also possible, for instance when too many people use the same computer network, causing the download speed to decrease for each user.
Indirect network externalities occur when the demand for a good or service depends on the supply of complementary goods or services. The number of complementary goods or services that come with the product, can increase the attractiveness to consumers. When taking the example of the Apple iPhone, the App Store can be seen as a complementary service which makes the phone more attractive. With multi-sided market theory, indirect network externalities come from actors on ‘the other side’ of the market.

Once the adoption of a product or technology has started, these network externalities provide benefits to both new and existing users (Dew & Read, 2007):

- Reduced price as a result of standardization, economies of scale, competition and producer incentives
- Lower uncertainty regarding availability of upgrades and future versions of the products
- The provision of informal support, content and information sharing by a group of users
- Higher quality products
- A market for complementary goods and scale and competition in the market
- Lower uncertainty of future complementary goods and services

Another aspect that needs to be taken into account, learnt from the literature stream of network externalities, is the problem of coordination of innovations when technologies are not compatible. If this is the case, incompatible products are at a substantial disadvantage (Farrell & Saloner, 1985), caused by inefficient inertia. This cannot be entirely solved by communication amongst firms, meaning that innovations can be inefficient when compatibility is not taken into account. This view has later been complemented by (McIntyre & Subramaniam, 2009), which concluded that “strategy could play a critical role maximizing a firm’s potential for success in networked industries”. This is relevant for NFC mobile payments, in the domain description it became clear that the contactless payment cards by Visa and Mastercard require a small adaptation of the payment terminals. This increases compatibility with previous investments from the merchant and consumer, making the chance of success for innovations larger. These benefits are not present for the OV Chip Card, since NFC readers are not installed in store yet and the payment scheme is different than and incompatible with the Mastercard scheme (Maestro).

Network externalities can both increase the product adoption and the network value of the product. It is safe to assume that network externalities are very relevant for the adoption of NFC mobile payment technology, so this concept will be taken into account during the interviews. The perceived value of NFC enabled smartphones will be higher when they can be used at more locations to make payments, to use couponing or to use the phone to get access (for instance at a cinema). Also, when proximity mobile payments can also be made to other consumers (peer-to-peer payments), the direct network externalities will increase even further. This relationship was already assumed in chapter 2, where the previous pilots or services that also provided the possibility to make P2P payments seemed more successful. If the platform is capable of matching demand from all sides of the market, the value of the platform will increase.

During the interviews, the strategies aiming for the utilization of network effects will be investigated. In the analysis, the answers will be analysed with regards to direct and indirect externalities, as well as compatibility with products that already have a large installed base.

### 3.4. Platform competition

In earlier chapters, it became clear that multiple solutions can be found for implementing NFC payments in society. Although the ISO standards have been set, it is very uncertain which organization will be in charge of the leading platform. Platforms can already be distinguished, like Minitix, international card schemes, the OV Chip Card and many more. Competition between platforms has been described in literature, since it occurs in many markets and interesting cases can be found in history. The important concepts regarding this competition are given here, in order to assess the relevant concepts that need to be taken into account with the interviews.

The competition between platforms is described in literature on industrial economies. Where “old industrial economies were driven by economies of scale, the new information economy is driven by economics of networks” (Shapiro & Varian, 1999). An important concept with this new economy is positive feedback, which means that the strong get stronger and the weak get weaker. This implies, in the limit, that there will be only one platform or technology that dominates the market. However, as already identified in chapter 2, legislation
on a national and European level prevents monopolies to take the whole market in the digital era. Competition has to occur in the domain of service provisioning.

Often, multi-sided markets can be characterized as a ‘winner-takes-all’ market, for several reasons. This effect is mainly found when (Cusumano, 2010):

- Network effects (direct or indirect) are very strong
- There is little room to distinguish among different platforms (few niches)
- The costs for adopting multiple platforms are high or when this is difficult, so multi-homing is not possible or not efficient.

This effect has been seen in the VHS-Betamax battle, with operating systems for computers, the market for web browsers and in many other cases. The phenomenon is caused by a cycle of economies of scale on the supply side and the resulting network effects on the demand side (Rallet, 2011). From the previous chapter it can be concluded that the first condition is met with NFC payment platforms (complementary services and other users make the service more attractive), but the other two are not clear. Just like with current payment mechanisms, multiple platforms can coexist (for instance Visa and Mastercard) and multi-homing is possible. With mobile phones however, multi-homing is not very likely, due to rather high membership and usage costs.

When looking at platform competition, not all factors affecting success are within control of the firm. As discussed by (Schilling, 1998), “even though path dependency of a technology enables idiosyncratic events to have powerful effects, their effects impact technology selection in an ordered way”. This means that several factors that define the success of technology are still in control of the firm. As concluded by (Schilling, 1998): “a firm that has greater understanding of the forces driving technology selection, and that effectively manipulates them to its favour, should have a competitive advantage in technology markets.” The same researcher later added that, although idiosyncratic events play an important role in the success of a technology, the acceptance of a technology can be modelled and predicted (Schilling, 2002). So the success of platforms has a large dependence on timing and strategic choices during the implementation phase.

In the competition between platforms the critical mass is an essential point. The critical mass is defined as the point where enough individuals have adopted an innovation so that the innovation’s further rate of adoption becomes self-sustaining (Rogers, 2001). This results in the typical S-shaped adoption graphs, where adoption is often slow at the starts, then gains momentum and increases fast, and ends with saturation when the largest part of the market is provided with the technology. The adoption rate then decreases. Once the critical mass has been achieved, network externalities become even more important and help the technology to diffuse quickly into society.

Platform competition is potentially a major cause for delay in the adoption of a technology. As indicated before, network externalities reduce the uncertainty for future updates, versions and complementary services (Dew & Read, 2007). When multiple standards are entering the market and a clear winner cannot be decided yet, uncertainty for investments (especially the membership investments) is high. Not only for the consumers, but also for developers, producers of complementary goods and others. On the supply side of the platform, organisations can form alliances in order to reduce the risk of ‘choosing the wrong standard’, with the goal to accelerate adoption (Tsoutson & Stamboulis, 2005). This was already seen before, with the introduction of the NFC forum, where many corporations work together on providing compatible NFC services (NFC Forum, 2012). This collaboration should ensure the interconnectivity between several platforms, to make at least the technology compatible. They seem to be rather successful in doing so, since most NFC platforms proposed are either (or both) Mifare (based on NXP technology) and Felica (based on the Sony technology as used in Japanese public transport) compliant.

Platform competition has to be in the research model, in order to assess with the stakeholders how they optimize their strategies to optimize their network value and how they aim to become the dominant standard.
3.5. Platform openness

NFC payment services can be identified as platforms, where different platforms are competing. In other words, the consumer will use one service under which the other services and technical details will be grouped. An important design choice for NFC mobile payment services, which partly defines the platform owner, is the location of the secure element. This can be placed in the mobile phone (embedded), on the SIM card of the phone or on a micro-SD. The design defines which organizations owns the secure element, making the secure element an important asset. The owner of a platform has more power in defining the service characteristics. A platform can be called ‘open’ when (Eisenmann, Parker, & Alstyne, 2009):

- No restrictions on participation in its development, commercialization and use
- Any restrictions, for example to pay licensing fees, are reasonable and non-discriminatory, so they are applied uniformly to all potential platform participants

The openness of a platform depends on whether the participation and control is unrestricted. Openness can be defined on four levels (Eisenmann, Parker, & Alstyne, 2009):

- For the demand-side user, so the end-user
- For the supply-side user, so the application developer
- For the platform provider
- For the platform sponsor levels

In the case of NFC mobile payments these levels can also be distinguished. The end-users are the consumers, the application developers can be either payment service providers (PSP’s) or other developers of payment applications. The platform provider is either the owner of the operating system of the phone, the owner of the SIM card (so the MNO) or the scheme provider (for instance Visa or Mastercard). The platform sponsor level, so the highest level of the platform, consists of the designers of the platform and/or the owner of the intellectual property regarding the platform. The article of Eisenmann et al. (2009) gives some examples to represent these levels, as can be seen in Table 11.

Table 11 Comparison of openness by role in platform-mediated networks (Eisenmann, Parker, & Alstyne, 2009)

<table>
<thead>
<tr>
<th>Role</th>
<th>Linux</th>
<th>Windows</th>
<th>Macintosh</th>
<th>iPhone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand-side user (end user)</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>Supply-side user (Application developer)</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Closed</td>
</tr>
<tr>
<td>Platform provider (hardware/OS Bundle)</td>
<td>Open</td>
<td>Open</td>
<td>Closed</td>
<td>Closed</td>
</tr>
<tr>
<td>Platform sponsor (design and IP rights owner)</td>
<td>Open</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
</tr>
</tbody>
</table>

The openness of the platform on which NFC mobile payments will be based, will be partly responsible for the success of this technology. Different groups of consumers tend to have their preferences in terms of openness, as can also be seen in the Android and Apple operating systems for mobile phones. A large group of consumers is satisfied with a ‘open but not open’ platform like the iOS system of Apple, while other consumers prefer to have more possibilities to adapt the operating system to their preferences.

The competition of standards, often referred to as ‘standards battle’ in literature, often occurs between the platform sponsors, so the owners of the intellectual property of the platform. They have the largest benefits from making their platform the dominant one, especially when network externalities are strong. When this is the case, the result is often a ‘winner-takes-all’ market, as indicated before. Even the providers of open platforms sometimes tend to close the platform once the market share is secured, in order to have the largest benefits (Nikayin, 2012). Not only can they earn money through licensing, but also through regulating the complementary products and services, through banning or licensing.

So, reducing the openness of a platform tends to increase benefits for the owner of the platform. When looking at the opposite strategy, so to make platforms more open instead of closing them, several trends have been found in literature. An open platform stimulates both the adoption and innovation of the services and goods, but it also intensifies competition and it reduces the incentives for investments. The incentives are reduced because the ownership of an open platform can hardly be transferred into competitive or financial advantage (Church & Gandal, 2005).
Literature on platform openness is relevant for an NFC mobile payment platform, because of the effect of openness on adoption and economical benefits for the platforms owner. There seems to be a trade-off between quick adoption and incentives for both suppliers and other complementary service providers. This difficult characteristic of multi-sided markets has to be taken into account, in order to assess which type of openness is required in order to provide an NFC mobile payment platform with the largest chance on success in the Dutch market. So also this concept has to be taken into account in the theoretical framework, in order to be tested during the interviews.

3.6. Platform leadership

So far we have seen that platforms play an important role in overcoming the problems of two-sided markets, that they can compete with each other and that most platforms experience network externalities. In many cases these externalities result in a ‘winner-takes-all’ market. But who plays the key role in creating, evolving and managing the platform?

A platform leader is often a company or an organization that provides the foundation of the platform, on which other companies build their products and offer their service (Nikayin, 2012). If we look at the leadership role within a platform the owner of the platform, as described in chapter 3.5, often takes this dominant position. The main role of the leader is to ensure the growth of the network, in terms of value, installed base or another appropriate variable. This needs to be done by facilitating other companies, in order to ensure the continuous innovation of the platform. It also needs to control critical components and interfaces existing on the platform, in order to ensure the security and availability of the platform. So, next to ensuring growth and progress of the platform, monitoring of the activities is also an important role of the platform leader.

Platform leadership can be described according to four levers (Gawer & Cusumano, 2002):

- Scope of the firm
- Product technology
- Relationship with external complementors
- Internal organization

Each platform leader, like Apple with their operating system or Facebook with their social networking platform, can be described according to these four levers. Very interesting differences between the leaders can be found, as written by Gawer and Cusumano (2002). The leadership profile for NFC payments is not decided yet, but this is also an indicator that needs to be taken into account in the interview phase of this research. What type of firm should be the leader, what should be the scope, how does the organization need to be internally managed?

This concept is very relevant for the choice whether NFC mobile payments will be enabled through a secure element placed on the SIM-card of a smartphone, through an embedded secure element or through a secure element placed on a micro-SD card. Not only does it define the level of comfort and portability a consumer will experience, it is mainly a struggle of ownership and therefore a struggle of which company ‘owns’ the client.

3.7. Lock-in effects

Consumers that use a certain platform have the risk of experiencing lock-in effects, which cause them to stick to the platform and not looking for other (perhaps better) solutions. This is caused by the transaction costs that are often involved when changing a platform. A common example here is the game-console market. Once consumers buy a console, they start buying complementary goods, like controllers and games, and start to game online with gamers around the world. When a new console comes to the market, this group will not only take into account the technical characteristics, but also whether all the complementary goods he/she bought can still be used. If not, the transaction costs to switch to another brand of console will be much higher than only the costs of the new console.

There can be two types of switching costs that lock-in consumers to a platform (Church & Gandal, 2005). The first type occurs when two networks are incompatible and the previous investments in a platform are sunk costs. When this is the case, switching to another platform also results in costs from both hard- and software. The second type of switching costs come from the network externalities. When a consumer decides to switch to
another platform, the installed base of this new platform can be much smaller. The network value is therefore lower for the new technology than for the incumbent.

The design of the NFC mobile payment functionality could have a large effect on the lock-in consumers experience. When the NFC functionality is built in the SIM-card as provided by the MNO, the mobile phone will not serve as their digital wallet, but the chip that is rather easily transferable to other phones. This means that a consumer can have the perception that it will be difficult to change the MNO, while changing of the phone can be rather easy. When the NFC functionality is built in a smartphone, a consumer will experience difficulties when the phone is stolen or when it needs to be replaced. In that case the consumer does not only give up the knowledge of the functionalities, but also the digital wallet functionalities. So, the design defines whether the consumer will experience lock-in effects from the MNO or from the smartphone producer. Due to this effect both MNO’s and mobile phone producers have large incentives to become the provider of NFC functionalities.

3.8. Chapter conclusion

Two groups of concepts have been identified in this chapter. In chapter 3.1 the organizational domain of the STOF model (Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008) resulted in seven concepts that define which actors are needed to deliver the service, the role of each actor and the value of networks. These concepts are expected to influence the strategic feasibility of an NFC mobile payment service in the Netherlands, so this group of concepts will be discussed with industry experts.

The second group of concepts comes from theories related to platforms and the effects related to platforms. The origins of these concepts come from different literature streams, with the three most important being economic research, strategy management and industrial economics. In chapter 3.2 and 3.3 the effects of multi-sided markets and network externalities have been assessed according to their relevant literature. Chapters 3.4 to 3.7 have assessed the characteristics of platforms, how they can be designed and how they can be structured to get people ‘on board’. This showed that the technical value only described part of the attractiveness of a service, the number of other users and the number of complementary services potentially has a large effect on whether people adopt the new technology or not. Even though the concepts in the second group of the research model stem from different literature streams, the researcher prefers to group them under platform concepts for comprehensiveness.

These two groups of concepts form the theoretical framework for the interview, as will be explained into more detail in chapter 4.1. During the interviews the effect of the concepts, derived in chapter 2 and analysed in chapter 3, can be determined.
4. Methodology

The previous chapters resulted in two groups of concepts that may influence the strategic feasibility of NFC mobile payments in the Dutch market. In order to test these concepts, interviews will be performed with key stakeholders that have a role in the development of an NFC mobile payment ecosystem. This chapter describes the steps that have been taken before, during and after the interviews.

Chapter 4.1 explains the conceptual framework that will be tested during the interviews. This framework has been developed according to the questions coming from chapter 2 and 3. Chapter 4.2 explains the selection of subjects. Chapter 4.3 explains when the interviews have been performed, how the interviews were organized and how the data was processed. With this information the background of the results, which will be analysed in chapter 5, can be assessed.

4.1. Research model

The previous chapters have revealed the complexity of NFC mobile payment ecosystems and the economical theories that describe why successfully introducing NFC mobile payments is difficult. Based on the literature review, a small number of concepts seems to be relevant in the success of a platform. The assumed relationship between the concepts and the success of NFC mobile payments in the Netherlands is given in Figure 11.

![Figure 11 Conceptual model derived from the literature review](image)

During this research process a loose research design has been applied in order to grasp as much complexity of the problem as possible. Due to this methodology, it is very likely that the model posed here will be different after the interviews. By testing the concepts that are derived from literature with business experts, a conclusion can be drawn on whether these concepts are sufficient to describe the strategic feasibility of NFC mobile payments. The questions on the topic list used, as given in chapter 4.3, are directly linked to the individual concepts of Figure 11.

4.2. Selection of participants

An overview of the stakeholders of NFC mobile payments in the Netherlands is given in chapter 2 already. Another representation is given in Figure 12. From these groups of stakeholders several people have been approached for participation, either through personal connections, through connections of the host organization or through searches on social media (Linkedin). The job title of interest was ‘business development manager’ or ‘strategy manager’, especially when related to ‘cards’, ‘payments’ or ‘mobile’. The response rate on requests for interviews was very high, only two people that have been contacted did not reply to the request. All other subjects who received an interview request, did participate in this research.

After the first interviews snowballing effects also occurred, where the researcher was recommended to contact other experts. Due to the early stage of the NFC mobile payment ecosystem, experienced consultants have also
been interviewed. Many of the actors involved in the development of NFC mobile services, are advised or supported by a consultant specialized in this technology. Since these consultants have a good overview of the market, their opinions should also be taken into account. These consultants were working at other organizations than the host organization of the researcher.

Figure 12 The six stakeholder groups as indicated earlier in chapter 2.

In order to collect sufficient data to test the influence of the concepts on the strategic feasibility of NFC mobile payments, from different angles and from the different stakeholder groups, data has been collected in several ways. The researcher has performed fourteen personal interviews and two interviews over the phone. He has also attended one business conference with market representatives and a scientific two-day conference at Delft University of Technology. The distribution of subjects, according to the stakeholder groups from Figure 12, is given in Table 12. The number of interviews has been a result of the saturation principle that has been applied in the research process.

Table 12 Division of subjects who participated in the interviews.

<table>
<thead>
<tr>
<th>Stakeholder group</th>
<th>Number of participants</th>
<th>Members of TRAVIK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks / cards</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>MNO</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>PSP</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Public transport</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Merchants</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Consultants</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

As can be seen in Table 12, the consumer group is not represented in the interviews. Due to the focus on strategic motivations for organizations to be active in the NFC mobile payment market, the consumer group is not in scope for defining the strategic behaviour of organizations.

Half of the subjects is (directly) involved in the TRAVIK consortium, since the organizations in this joint venture represent a large part of the market in terms of volume and consumers reached. One of the subjects was a member of the Sixpack project office (the project as being developed by the TRAVIK member), so he could explain the motivations for the joint venture. Since he has a background at one of the banks, he has been qualified in the ‘banks’ stakeholder group. From the six other subjects that have been classified in the ‘banking’ group, four worked directly for a bank, one worked for a leading card scheme in the Netherlands and the last one worked at the organization in charge of payment traffic in the Netherlands, on a governance level. At one bank two subjects have been interviewed, due to their different roles in the organization. This explains why there are seven members of TRAVIK instead of six. Two subjects have been selected from an organization classified as a payment service provider (PSP), one focusing on SMS payments and SMS services, the other on online payments through a payment platform. The subject classified in the ‘public transport’ group worked at the organization owning the payment scheme which consumers know as the OV Chip Card, the card currently used by all public transport organizations in the Netherlands. The last stakeholder group was formed by the merchants. Since there are many merchants and retailers in the Netherlands, the researcher has decided to request an interview at the organization that aims to make payment methods more efficient for the merchants.
They negotiate, often on behalf of the merchants, to get low transaction costs and efficient payment methods. The organization has representatives from the banking sector and the retail sector.

The last group of participants to this research was formed by two consultants outside the host company. One subject works for a specialized consulting firm in the field of payments and contactless innovation. The other subject works at the organization that has performed an NFC pilot in the Netherlands before, the largest at the time. This company has now evolved into a consulting firm and a supplier of hardware to enable contactless payments. In the overview of results, the consultant group is not mentioned as a separate group. Due to their knowledge on the different stakeholder groups, their answers have been combined with the answers of the stakeholders within the group.

The last sources of information were two conferences. The first was a business conference (Contactless and mobile payments platform 2012), held in Nieuwegein (the Netherlands) at the 24th of May 2012. Attendants were mainly representatives from the financial sector, the MNO’s, public transport organizations and consulting firms. This conference was a good opportunity to discuss some of the preliminary conclusions with experts in the field. The second conference, International Conference on Mobile Business 2012 (ICMB 2012), was held at the 21st and 22nd of July 2012 in the Delft, the Netherlands. This two day event consisted of round table discussions, paper presentations and workshops, with some of the researchers referred to in this report attended as well.

4.3. **Structure of the interviews**

The concepts of the research model will be tested with each subject, in order to get their view on the questions derived. But, in order to enable other concepts to rise during these interview, a semi-structured interview protocol has been chosen. By doing that, the researcher aimed to grasp as much of the complexity as possible. During each interview, lasting 60 to 90 minutes, a topic list has been used. This topic list was a guideline during the talks, the order of the questions varied in order to make the interviews as natural as possible and to get deeper into the answers of the subjects. Two interviews were held over the phone, due to time constraints, but the fourteen others took place at the working environment of the subjects, so the office they worked at. It could be either their personal office, a meeting room or a quiet place in the office canteen. By going to the offices, the researcher hoped to have richer information due to non-verbal communication. The first interview took place at the 1st of May 2012, the last interview took place at the 7th of June 2012.

The topic list consisted of the following points:

1. Welcome / opening / explanation of research / request for recording of the interview
2. STOF-model questions
   a. What is your role in the development of NFC mobile payments?
   b. What value and resources does your company bring to an NFC mobile payment ecosystem?
   c. Are you developing NFC activities from a growth or a defence strategy?
   d. If you are collaborating, which organizations would you choose?
3. Platform theory questions
   a. How do you plan to overcome the ‘chicken-and-egg’ problem?
   b. Does success come from small, targeted projects where consumers are forced to adopt by their peers or leaders? Or should there be one universal solution?
   c. Who should be the platform owner? What type of organization?
   d. Do you expect the secure element to be placed on the SIM, to be embedded in a smartphone or to be placed on a micro-SD? Why?
   e. Which platform has the largest potential? Travik / OV Chip / other?
   f. Will NFC payments only be possible when they are compatible with the payPass/payWave debit and credit card platform?
   g. Would you estimate the effect of peer-to-peer payments to be of large influence on market success?
   h. Who should pay for the additional costs that come from NFC mobile payments?
4. Did you miss elements in the discussion so far? If so, which one?
5. Conclusion / wrap-up
The topic list has not been shared with the subjects before the interviews. Most interviews were recorded, after asking the subjects for approval. One subject did not approve the recording. During each interview notes were made, after each interview a short summary was made. Later the recorded tapes were listened again in order to check whether certain elements had been missed in the first round of making notes, resulting in more complete transcripts. The process of data analysis is explained in the next chapter.

4.4. Data analysis methods

As indicated before, each interview has been written down in large detail, with the help of notes and audio recordings made of the interview. The first round of analysis was done directly after the interviews, where the notes made during the interview were combined with the key findings. In the second round of coding, the notes were extended while listening to the audio recording. This resulted in extensive notes of each interview of about four pages per interview. The sixteen interviews performed resulted in approximately 50 pages of transcript. In a third round, the most important elements of each interview have been highlighted in the document, in order to prepare coding in later stages.

With the notes of each interview, where the most important elements were highlighted in order to match elements of the interview to the concepts of the research model, the tables in chapter 5 were created. By going through each interview for a fourth time, and combining the answers per stakeholder group, coding was done and the tables were created. Quotes have been used to support several conflicts that were raised during the data analysis. Coding was preferred however, due to agreements that have made with the subjects. Since most subjects know each other in a professional way, quotes could result in linking quotes to one of the subjects. Therefore the public version of this thesis will not have quotes embedded.

With the codified answers of the subjects, as given in the tables of chapter 5, differences between and within stakeholder groups have been assessed. Three levels of comparison have been used, in order to find the most feasible solution of NFC mobile payments for the Dutch market:

- The first level of comparison was between TRAVIK and non-TRAVIK members, in order to assess differences between the five stakeholder groups that have been interviewed. By doing that, a comparison could be made between the stakeholder groups that develop the Trusted Service Manager (TSM) and the stakeholders that have no direct influence in these developments.
- The second level of comparison was between the banks and the mobile network operators, the two stakeholder groups within TRAVIK. This is done in order to assess where conflicts have occurred or could potentially occur in the future, with the development of the TSM. Typical differences between the business models of banks and MNO’s are likely to get noticed here.
- The last level of analysis is done within two largest stakeholder groups in this research. So the differences between the three different banks, as well as the differences between the three MNO’s. This last type of analysis is done to assess which conflicts are present between the organizations that operate in the same market with a similar business model.

By following this approach, the researcher aimed to find key elements of conflict within and between the different stakeholder groups. With this insight, the strategic feasibility can be assessed and an advice can be given to the practitioners in the market. The second goal, to assess the influence of individual strategies of stakeholders on the ecosystem as a whole can also be reached by following this approach.
5. Results

As indicated in the introduction of this chapter, the research model has been formulated based on the domain description and the conceptual chapter. This research model consists of two elements, with concepts from the STOF business model framework as the first group and platform related concepts as the second. In order to make the analysis clear, this division will be followed with the outcomes of the interviews. Chapter 5.3 will assess the impact of the results, as presented in chapter 5.1 and 5.2, on existing relationships between different stakeholder groups.

5.1. STOF business model concepts

Based on the literature review and the domain description, seven concepts from the STOF business model framework have been identified as relevant in defining the strategic feasibility of NFC mobile payments in the Dutch market, as can be seen in Figure 13. In order to assess the importance of each concept for the different stakeholder groups, the answers will be grouped for the stakeholders belonging to the TRAVIK consortium and organizations that are outside this group.

Within the subjects involved in the TRAVIK consortium, there was consensus about the chosen organizational model, where banks and MNO’s collaborate to deliver their service. The main goal of TRAVIK is to create the infrastructure to get payment applications to a mobile phone over the air. Service providers can use this infrastructure at a certain fee, they can ‘rent’ a certain area of the Secure Element, as placed at the SIM-card or embedded in the smartphone.

The TRAVIK members create a Trusted Service Manager (TSM) that handles the distribution of banking (and later loyalty) cards to mobile phones, as well as the infrastructure required. The TSM will be the link between the issuer of the Secure Element or the SIM and service providers. The shareholder of TRAVIK are represented in Figure 14. The three banks combined have a market share of 90% in the retail banking market, the two MNO’s in TRAVIK have approximately 60% market share in the network operator market (TRAVIK, 2012). The third MNO in the Netherlands, T-Mobile, will not be a shareholder of the TSM since they stepped out of the consortium in 2011 (Webwereld, 2011).

The value network, which involves consumers and external service providers, has been announced in one of the presentations given by the TRAVIK core team, and could also be derived during the interviews. This network is represented in Figure 15.
The TSM will buy parts of the Secure Element, as placed on the SIM of the MNO, and then sell or rent this to organizations that want to deliver services with the use of this Secure Element. Service providers can be banks, MNO’s, public transport or even organizations like Google and Paypal. The goal of TRAVIK is to have an open infrastructure, in order to get a high adoption rate and a large payment volume, but also since European anti-collusion legislation requires this. Competition is required in the domain of service provision, no organizations should be excluded. The core assets of the TSM are the Secure Element, they will own the ‘bridge’ to this element of the SIM and can deliver applications to the SIM. For other actors in the ecosystem the TSM can provide convenience, since they have to deliver their product to the TSM, after which the TSM securely delivers the product to the client of choice.

In the interviews, it became clear that the two groups of shareholders bring in their own resources and their own value. Their business models traditionally differ, as well as their activities. This shows in their behaviour and perspectives. The answers provided during the interviews by the TRAVIK members are given in Table 13.

Table 13 Conceptual division of answers for the subjects working for banks or MNO’s. Concepts from the STOF business model theory.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Banks</th>
<th>Mobile Network Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model of choice (actors involved)</strong></td>
<td>Collaborative model (banks and mobile network operators)</td>
<td>Collaborative model (banks and mobile network operators)</td>
</tr>
<tr>
<td><strong>Value provided to the network</strong></td>
<td>• Security, relationships with merchants, network of acceptance points (points of sale), efficiency, financial resources.</td>
<td>• SIM cards, link between phone manufacturers and consumers, mobile network, financial resources.</td>
</tr>
<tr>
<td><strong>Value activities</strong></td>
<td>• To adapt IT systems in order to distribute banking cards ‘over the air’.</td>
<td>• To distribute cards over the network</td>
</tr>
<tr>
<td></td>
<td>• To provide security.</td>
<td>• To rent out the SIM-space.</td>
</tr>
<tr>
<td><strong>Interactions and relations</strong></td>
<td>Weekly meetings with TRAVIK core team</td>
<td>Weekly meetings with TRAVIK core team.</td>
</tr>
<tr>
<td><strong>Strategy and goals</strong></td>
<td>• Both defensive and offensive (“what if we don’t”).</td>
<td>• Both defensive and offensive (“what if we don’t”).</td>
</tr>
<tr>
<td></td>
<td>• “Role as service provider is more important than the role as shareholder of the TSM.”</td>
<td>• “Role as service provider is more important than the role as shareholder of the TSM.”</td>
</tr>
<tr>
<td></td>
<td>• “TRAVIK is a vehicle required to deliver the services we want.”</td>
<td>• “TRAVIK is a potentially new ‘lifeline’, which can result in revenue growth.”</td>
</tr>
<tr>
<td></td>
<td>• Universal solution (all phones, all banks, all networks). Preference to support any phone, any network and any Secure Element.</td>
<td>• Universal solution (all phones, all banks, all networks). Preference to use the SIM-based Secure Element initially.</td>
</tr>
<tr>
<td></td>
<td>• Goal to remain the platform for financial services for their clients.</td>
<td>• Services focus on both C2B and B2B market, depending on the strategy of the MNO.</td>
</tr>
<tr>
<td></td>
<td>• Other goals: cash reduction and finding a suitable replacement of Chipknip.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Services focus on C2B market.</td>
<td></td>
</tr>
<tr>
<td><strong>Organizational arrangements</strong></td>
<td>Banks will develop the two-sided market at the merchants side (NFC readers at the point of sale). The TSM will be operated according to a costplus-model.</td>
<td>MNO’s will develop the two-sided markets on the consumer side (Secure Elements, NFC enabled phones). The TSM will be operated according to a costplus-model.</td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td>Banking functionality, trust, security, money.</td>
<td>Mobile phones, SIM cards, consumers, data network.</td>
</tr>
</tbody>
</table>

Many of the responses within the same stakeholder group were similar. Banks and MNO’s have a fundamental difference in their business model and this shows in the table above. However, the value activities are complementing and the resources from both stakeholder groups are required for the TRAVIK infrastructure to have a large acceptance in the market from the start. Within both stakeholder groups involved in the TRAVIK consortium, conflicts have been found, when assessing the concepts mentioned in Table 13.
The largest conflict within the MNO stakeholder group is found in the decision of one of the MNO’s to stop activities with regards to TRAVIK. The given reason was that the business case was not interesting any more. Within the MNO that stepped out, there is a different view on when the investments need to be earned back. Also, during the process of discussion on the feasibility within TRAVIK, new insights occurred on the number of services that require the secure element. Many loyalty applications don’t need a secure element, so it will be unlikely that merchants will pay for using the secure element. The lower expected revenues of the TSM could have caused the MNO to stop with TRAVIK. Long-term support from the board with such an insecure investment is difficult, also for other stakeholders. The TSM needs to be created, but the business case as a shareholder of the TSM is not very positive.

For the banks other conflicts were found. The most important example comes from a payment service offered by one of the banks, called Minitix. With this virtual wallet, consumers can pay with SMS or make payments in selected stores with an NFC sticker. The bank that owns this wallet, sees this as an intermediating step between the current EMV banking cards and NFC mobile payments, while the other banks prefer contactless banking cards with Paypass (or payWave) technology. This seems to block the collective decision of banks to introduce contactless banking cards. As indicated before, contactless debit cards could be an important step between the current banking cards and mobile payments, in order to develop the acquiring side of the market, so to give merchants incentives to install new readers at the point of sale. Introduction in the market will be more successful if the banks align their timing. The iDeal example is mentioned as a successful collaborative project of banks.

In the strategy to develop the merchant’ side of the market (so to get readers installed) and to get consumers familiar with contactless payments, three different strategies can be distinguished. Bank A and B would like to introduce contactless banking cards to the market, in line with delivering NFC mobile payment services. By doing this, they provide merchants with a larger incentive to replace their readers, since some subjects mentioned that it will take at least 5 years before 10% of all payments will be made by a phone, in a very optimistic estimation. However, bank C has developed its own service called Minitix, where consumers make payments with NFC stickers. If they would provide their consumers with contactless banking cards, the Minitix business would become obsolete.

Lastly, the TRAVIK board has expressed that benefits are estimated largest when consumers have ‘traditional’ banking cards as a reference. This would bring more value to NFC mobile payments, so their strategy is to skip the intermediating step. Another cause for this answer is that the TRAVIK board has no control on the introduction of contactless cards, this is a decision for the banks. So, there seems to be no agreement on how the transition from current banking cards to NFC mobile payments should be made, which is mainly a decision for the stakeholders in the banking group.

### Figure 16 Three different strategies for introducing NFC mobile payments in the Netherlands.

Although banks and mobile network operators are very important actors in the development of NFC mobile payments, there are more actors aiming to develop initiatives. When looking at the Netherlands only, the largest threats for TRAVIK are formed by two stakeholder groups. Payment service providers are growing in the virtual world (webshops and other e-commerce services) and have the ambition to deliver their services in the physical world. The trend seems to be that large actors in the physical world (banks) want to virtualize their services, while large organizations in the virtual world want to become active in the physical world. Another stakeholder group that should be taken into account for contactless payments, are the public transport organizations. Because of the large installed base of the OV Chip Card and a close concentration of stores where speed is very important, the OV Chip Card as a payment scheme can threaten the traditional banking cards in
terms of payment volume. The contactless payment card, as already used for payment of travels, will soon be adapted in order to support contactless payments in stores. At the moment of writing no decision was made on whether to use Minitix digital wallets or to use the payment scheme that is already used for public transport payments.

From these two stakeholder groups representatives have also been interviewed, in order to get their input on the concepts given in Figure 13. The answers, grouped according to the seven concepts, are given in Table 14.

Table 14 Conceptual division of answers for the subjects working for PSP’s or in public transport.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Payment Service Providers</th>
<th>Public transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model of choice (actors involved)</td>
<td>Innovator model</td>
<td>Bank – network (OV Chip Card is the network, banks or card schemes provide the payment application)</td>
</tr>
<tr>
<td>Value provided to the network</td>
<td>Value comes from additional services and reducing complexity for merchants.</td>
<td>Large installed base, specialized group of merchants (partly controlled by card owner), consumer group for who speed is important.</td>
</tr>
<tr>
<td>Value activities</td>
<td>Integrating loyalty and couponing, payment platform accepting all payment methods, security ‘in the cloud’. Business to business service provision.</td>
<td>Deliver additional services to the client. Providing speed and convenience. Business to consumers service provision.</td>
</tr>
<tr>
<td>Interactions and relations</td>
<td>Relations mainly with merchants.</td>
<td>Shops around the stations are controlled by the organization in charge of the trains, so strong relationship with both merchants and consumers.</td>
</tr>
<tr>
<td>Strategy and goals</td>
<td>Niche markets provide higher margins, merchant focused solutions are key.</td>
<td>Niche market, public transport users only. Goal to have 30% of all transactions at stations contactless in 2013.</td>
</tr>
<tr>
<td>Organizational arrangements</td>
<td>B2B, most of the clients are retailers. So they focus on the needs of merchants.</td>
<td>Partnership with merchants at the stations, partnership with card scheme. Uncertain whether Minitix or one of the large card scheme will provide the payment processing. Other organizations, like banks and MNO’s are not eager to partner with the OV Chip Card, due to the perception of security of this card.</td>
</tr>
<tr>
<td>Resources</td>
<td>Payment platform capable of handling any type of payment. Online/offline payment terminals. Large experience in e-commerce.</td>
<td>Financial investments to adapt readers in shops.</td>
</tr>
</tbody>
</table>

When the answers of Table 14 and Table 15 are compared, many differences are noted. The strategy of the non-TRAVIK service providers is different, since they start with the needs of merchants and develop solutions to their problems. They start with an experience or technology from a different market and use this knowledge or installed base for contactless payment provisioning. With the OV Chip Card an already existing contactless card, with a large installed base, will be the starting point. They focus on niche markets, enabling them to target their clients efficiently, to satisfy for other levels of security (for instance cloud-based) and to develop applications tailored for the problem that exists. Since they focus on niches and are developed from a need of merchants, the margins on each transaction are higher than for conventional payment methods, which are developed from the “anytime, anywhere, anyone” mindset.

For public transport organizations the problem is formulated as: “many travellers want to quickly buy coffee or any other good for their train, but their train is leaving in a few minutes. If there is a queue, they will not purchase, since then they will miss the train” (NS/eTSN, 2012). Since travellers already have a contactless card to pay for their travels, in the near future it will be possible to pay at the shops around the station as well. The revenue growth because of speed is likely to earn back the investments rather quickly. The benefit for this payment scheme is that the Dutch railways, partly owner of the OV Chip Card, also controls the shops around the stations, so the organization has less trouble to convince the merchants to install new readers. They can enforce a new payment method and benefit from the revenue increase as a consequence of the increased speed.
of transactions. However, based on responses of other stakeholders and the domain description, trust and the perception of security could be lower for the OV Chip Card than for conventional banking cards. As suggested by (Lu, Yang, Chau, & Cao, 2011), this can be a large factor that blocks the adoption of consumers. However, for low-value payments the security requirements are lower, as indicated by several stakeholders.

But, what do merchants think of all developments with regards to NFC mobile payments, and perhaps also from contactless payments? Due to the importance of merchants in the adoption of this technology, all subjects have mentioned their expectations about what merchants require. These assumptions have been tested with the payment organization of merchants. The results are given in Table 15.

Table 15 Conceptual division of answers for the subjects related to merchants, with concepts related to the STOF business model framework.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Merchants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model of choice (actors involved)</td>
<td>Collaborative, they want to serve many consumers once they adapt their payment terminals.</td>
</tr>
<tr>
<td>Value provided to the network</td>
<td>Merchant have just replaced their payment terminals. For many merchants NFC mobile payments will be 'just another payment mechanism', even more than already available. Complexity increases initially. For merchants, contactless payments with a banking card are similar to an NFC payment with a smartphone, due to backward compatibility. The value provided by merchants is that they are the ones needed to get the acceptance infrastructure developed.</td>
</tr>
<tr>
<td>Value activities</td>
<td>When merchants accept contactless payments, speed at the counter could go up. This could result in revenue growth, but only in stores where speed is important. Value will be added if merchants adapt their internal IT systems to provide their customers with individual offers, through couponing or loyalty schemes. However, several subjects have indicated that loyalty schemes are not really successful in the Netherlands, some expect that loyalty is used to “close a business case”</td>
</tr>
<tr>
<td>Interactions and relations</td>
<td>Relationships between merchant and consumer differ per merchant and type of business. Strong brands are expected to adopt NFC mobile payments services quickly, due to the loyalty and marketing options it provides them.</td>
</tr>
<tr>
<td>Strategy and goals</td>
<td>Most merchants only want to adopt a payment method if they can reach most if not all their clients. Therefore the TRAVIK approach is potentially very successful. Large retailers are very powerful in the discussions about transaction fees, resulting in very low costs that are charged on a transaction. This limits the opportunities for NFC and contactless payments, they cannot be more expensive. EMV cards are the standard now, transaction costs for this method will be the benchmark.</td>
</tr>
<tr>
<td>Organizational arrangements</td>
<td>With current EMV chips on banking cards, parts of the chip can also be rented, for loyalty for instance. This is not done now, in order to remain independent and to let the merchant remain in charge of their loyalty data.</td>
</tr>
<tr>
<td>Resources</td>
<td>Investments in new terminals, adaptation of IT systems in order to offer personalized marketing or loyalty schemes. Counter space.</td>
</tr>
</tbody>
</table>

When looking at the first group of concepts, it can already be noticed that several trends are emerging:

- TRAVIK is developing an infrastructure that will enable NFC mobile payments, which will enable a Trusted Service Manager (owned by the TRAVIK members) to send client data and applications to a mobile phone. This data is required to start making payments and will be stored on a Secure Element. This Secure Element will initially be placed on the SIM, due to standardization, but later other Secure Elements will also be supported.
  - Banks are investigating if and when they should introduce contactless cards to their consumers. The shared belief is that, if contactless cards will be introduced, all banks should do it at the same time. Just like with the EMV cards, only if it is a collective decision of banks merchants are willing to install a new reader. But between the three banks there is no consensus on the strategy on contactless cards, due to the payment engine developed by one of the banks (Minitix).
o From the three MNO's in the Netherlands, two are in the TRAVIK consortium. The MNO's expect benefits from renting out parts of the secure element to the TSM, but also from the services they can provide to their clients. So the MNO's that are within TRAVIK have two roles.

o The TRAVIK partners collaborate in the creation of the Trusted Service Manager and the infrastructure required to send applications to mobile phones. However, as soon as the infrastructure is active, they will be competing with their services.

- Public transport organizations are extending the functionality of their payment scheme, by adding functionality to one of their assets, the OV Chip Card. They focus on developing a solution for users of public transport, specifically targeted on stores in and around stations. Due to security issues in the early stage of the payment product, other stakeholder groups are not willing to collaborate. However, it is acknowledged by many subjects that public transport can have a key role in the adoption of NFC mobile payments.

- Payment service providers, with a large experience in e-commerce, are investigating methods to get into the ‘physical world’. Due to the payment platform they have, NFC payment solutions can quickly be offered, supporting any card scheme. For this type of organization, the openness of the NFC functionality will be essential in defining whether they can offer their services. They expect not to need a Secure Element, all they require is a protocol to make a connection between the point of sale and the phone. Security can be provided in the cloud, through their platform. They expressed their concern that TRAVIK will perhaps make their infrastructure too restricted for external organizations.

With the concepts from the STOF business model framework, the strengths of different actors have been assessed, as well as their (expected) role in the NFC mobile payments ecosystem. The characteristics of the service, the strategies for adoption and the competition between different card schemes could not be assessed with the concepts used so far. In the next chapter the theoretical concepts coming from economic research, from strategic management and from industrial economics will be assessed for each stakeholder group.

5.2. Platform related concepts

This chapter gives the results from the interviews, with regards to this group of concepts from the research model. Where the first group of concepts focused on business models and how collaboration within the joint venture should occur, this second group of concepts focuses on how the technology should be introduced in the market. The strategies to improve adoption, from the consumer and merchant side of the market, and the effects improving the perceived value will be assessed using the concepts mentioned in Figure 17. The division of answers will be grouped similarly to chapter 5.1. So first the concepts belonging to the subjects within the TRAVIK joint venture will be grouped in Table 16. Then the two other stakeholder groups that are likely to start offering NFC mobile payment services will be combined in Table 17. Finally, the responses of merchants during the interviews are listed and analysed in Table 18.

The most important concept that is mentioned by all subjects is ‘interoperability’. Payment mechanisms need to be accepted at many locations, there should not be competition between two different payment protocols. The Chipper/Chipknip example is mentioned by many subjects as an example of how it should not end. iDeal is mentioned of an example of how collaboration between Dutch stakeholders (banks in the case of iDeal) successfully solved a need in the market. As a result, the banks have been successful in blocking international parties (like Paypal) to become successful in the Dutch market. These comments returned in each interview and can be seen as boundary conditions that are kept in mind by all subjects.
Table 16 Conceptual division of answers for the subjects working for banks or MNO’s.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Banks</th>
<th>Mobile network operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-sided market effects</td>
<td>High membership costs for the bank, large investments required create TSM and to adapt IT systems to deliver payment applications ‘over the air’. Focus to increase membership externalities for their clients. Extra service provision attracts or keeps clients. Usage externalities not incorporated in the strategy, focus on complementary services for the clients of banks. Mobile payments will be “just” an extra payment channel, next to all banking cards, so they allow multi-homing for their clients.</td>
<td>Limited membership costs for the MNO, SIM cards will be slightly more expensive. Focus on membership externalities for their clients, additional service will attract new clients or keep the current ones. Usage externalities not directly important, focus on complementary service for smartphone users. Multi-homing unlikely to occur, most consumers will use one mobile phone for their NFC wallet.</td>
</tr>
<tr>
<td>Network externalities</td>
<td>Due to intercompatibility, leveraging on existing payment infrastructures is possible. The distribution of cards will change, payments will not change. To follow international standards is key, from cards schemes and / or from the European Payments Council (EPC) Focus on indirect externalities, so on C2B services. P2P payments not supported in the near future.</td>
<td>Limited adaptations required for the MNO’s, existing infrastructures are leveraged. International standards from GSMA are followed. Focus on indirect externalities, so on C2B services. P2P payments not supported in the near future.</td>
</tr>
<tr>
<td>Platform leadership</td>
<td>Banks want to remain the portal for all financial information for their clients. The trust they have from consumers should be transformed into insight for the consumers. This can only be done when banks ‘remain in control’ of transactions (which is the case with TRAVIK).</td>
<td>MNO’s prefer to deliver their own platform on which their clients can access other services. However, openness is required, consumers need to be able to choose. ‘walled gardens’ have not been successful in the past.</td>
</tr>
<tr>
<td>Platform competition</td>
<td>Preferably no platform leader, consumers should have the choice which MNO, which mobile phone and what location of the Secure Element they prefer. Banks want to offer their services to all consumers on all platforms. Interoperability is key, after that there can be multiple wallets or different TSM's. Banks mention the Chipper/Chipknip battle as a worst case scenario. iDeal as a very successful project.</td>
<td>Preference for locating the Secure Element on the phone, since this generates higher incomes than embedded SE’s. Revenue growth is expected from the new SIM’s with Secure Elements. Within TRAVIK, the MNO’s have had to agree on support for all types of secure elements in the future.</td>
</tr>
<tr>
<td>Platform openness (See Table 11 for reference)</td>
<td>Banks want to support all platforms, as long as they are as close to the consumer as possible. Demand-side user openness preferred, so the consumer can choose which functionality he/she needs and the TSM will send the wished application, over the air. But only after certification of the application, preferably done by the TSM.</td>
<td>Due to legislation and experiences from previous services, the MNO’s want to embrace all options. Then the TSM can generate income and the clients have the freedom to choose the service (wallet) of their preference. Previous experiences have shown that ‘walled gardens’ do not work</td>
</tr>
<tr>
<td>Lock-in effects</td>
<td>For banks the retail banking products are a ‘lifeline’. They don’t generate direct profits, but through cross-selling or additional service profits are made on the client relationship. By providing NFC mobile payment services before competitors do this, positions are consolidated.</td>
<td>When more elements of the life of consumers take place over the phone, the role of the MNO is growing, causing a lock-in of the clients.</td>
</tr>
</tbody>
</table>

Several elements of Table 16 indicate differences between the two stakeholder groups in TRAVIK. First of all, the secure element is very important for the MNO’s. If other organizations decide to offer NFC services to their consumers, and these services require a high level of security, they can rent part of the secure element, resulting in new revenue streams for the MNO. Banks have accepted that they will not get direct benefits from NFC mobile payments, but they expect that the level of service they offer to consumers and the reduction of cash will still make their business case. For banks, the largest investments come from their internal adaptations to get...
banking cards to consumers through the TSM. This has to be done over the air and rather quickly, much quicker than how cards are distributed at the moment. So for banks, the largest change will be in the value chain of cards distribution. Since traditional cards will also exist, they now have another channel that needs to be developed, resulting in higher operational costs. The handling of payments does not change from the current situation, the only difference is that initiation of a payment is done through a different protocol. The TSM uses the network of the MNO to get applications to the consumer. The network of the MNO is another infrastructure that is used for NFC mobile payments, but only to send banking cards or other secure applications to consumers (one-time event probably) and to send information, like receipts and wallet information to the smartphone of the consumer.

Table 17 Conceptual division of answers for the subjects working for payment service providers or in public transport. Concepts from platform theories.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Payment Service Providers</th>
<th>Public Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-sided market effects</td>
<td>PSP’s leverage on existing payment infrastructure and add value by reducing complexity. Membership externalities for consumers will be improved once multichannel retailing becomes common. This improves the buying experience. Usage externalities for consumers will improve, since they have more options to pay. PSP’s enable multi-homing for consumers and allow merchants to deliver one interface, one terminal.</td>
<td>So far this is the only market where contactless payments are really successful and accepted. Membership externalities for consumers are improved once contactless payments are offered from the OV Chipcard. Payments with OV Chip Card will also increase usage externalities for users.</td>
</tr>
<tr>
<td>Network externalities</td>
<td>Focus on indirect externalities, by providing B2B services they want to enable merchants to be more interesting for their clients. Direct externalities in the form of P2P payments not interesting in the short term, perhaps later.</td>
<td>Increased indirect externalities for consumers when functionality is added to the OV Chip Card. Direct externalities in the form of P2P payments are not supported.</td>
</tr>
<tr>
<td>Platform leadership</td>
<td>PSP’s focus on niche markets, since the margins are found in specialized service provision. No ambition to become a leader themselves, but they hope that the leader will be open enough to let others (like PSP’s) offer their services.</td>
<td>With regards to public transport payments, the investments of the OV Chip Card have been really high. Potential to become the platform leader for regular travellers.</td>
</tr>
<tr>
<td>Platform competition</td>
<td>PSP’s focus on niche markets. They expect that the new iPhone will define how NFC mobile payments will be processed. If the NFC functionalities are open for developers, they can start delivering their services. Openness is crucial.</td>
<td>No ambition to become the leading platform for NFC mobile payments on the short term. Will likely stay in their niche (contactless payments) on short term.</td>
</tr>
<tr>
<td>Platform openness (See Table 11 for reference)</td>
<td>Openness is important and a primary concern for the PSP’s. They want to develop services based on the payment platforms, they do not need the secure element necessarily. When the NFC functionalities of a phone are open for developers (through API’s), they can develop value added services that meet the needs of merchants. Preference for at least openness on the ‘application developer’ level.</td>
<td>Currently, the OV Chip Card uses an open standard. Other organizations can see the specifications, deliver products and sell them after approval. Openness currently is on the level of platform sponsor.</td>
</tr>
<tr>
<td>Lock-in effects</td>
<td>Merchants want to lock-in their clients by offering loyalty points. PSP’s can deliver services to help merchants do this.</td>
<td>No switching costs for consumers when payment functionality is added to the OV Chip Card.</td>
</tr>
</tbody>
</table>

The subjects in the stakeholder groups given above all mention the importance of merchants in the NFC ecosystem. They are the ones that need to install new readers, need to promote the use of NFC mobile payments and need to start delivering services in order to give the NFC ecosystem a higher network value and more usage externalities for the consumer. The concepts mentioned by the different subject and the merchant representative is given in Table 18.
Table 18 Conceptual division of answers for the subjects related to merchants, with concepts related to platform theories

<table>
<thead>
<tr>
<th>Concept</th>
<th>Merchants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multi-sided market effects</strong></td>
<td>Online and offline payments are getting closer and closer. Multichannel retailing is gaining popularity, due to positive experiences from e-commerce. So merchants want to offer consumers a uniform experience on their brand, whether it is online (at home or on the move) or in the store. The secure element can play a role in both types of payments. Membership externalities for merchants will be present, if they accept NFC mobile payments they can reach new clients and appear innovative. Usage externalities for merchants are expected from loyalty schemes, but mainly from increased speed at the counter. Multi-homing is possible with digital wallets.</td>
</tr>
<tr>
<td><strong>Network externalities</strong></td>
<td>Merchants form one side of the multi-sided market. This side needs to be developed, in order to enable the NFC ecosystem to grow. Direct externalities for merchants are expected if all merchants decide to adopt the same technological standards. Competition will then occur in the service domain, improving the negotiation position for merchants. Indirect externalities for merchants are expected from the installed base coming from either the OV Chip Card or from contactless banking cards once offered.</td>
</tr>
<tr>
<td><strong>Platform leadership</strong></td>
<td>Merchants want to accept scheme that are used by many consumers. It is likely that they will adopt once TRAVIK has launched. Due to the required investment costs, merchants are waiting until a viable solution comes up, that has the potential to be accepted by many consumers.</td>
</tr>
<tr>
<td><strong>Platform competition</strong></td>
<td>PSP’s can have an important role, since they offer many payment mechanisms in the online world. This experience from e-commerce, where a payment platform is offered to handle transactions, can be used for physical transactions as well. As mentioned before, the openness of the technology defines where PSP’s are enabled to deliver their services to merchants.</td>
</tr>
<tr>
<td><strong>Platform openness (See Table 11)</strong></td>
<td>The larger the openness of a platform, the more likely competition will occur. For merchants this competition is positive, since they are the ‘buyers’. Due to competition, costs are likely to remain low, just like with current payment mechanisms.</td>
</tr>
<tr>
<td><strong>Lock-in effects</strong></td>
<td>Lock-in is a threat for merchants. Now loyalty schemes are in hands of the merchants themselves. When loyalty schemes are handled through a wallet, they have to give up some of their client data. NFC mobile payments services also have many positive effects for merchants, since it enables innovative loyalty and marketing possibilities to offer. This can improve the relationship with clients and result in lock-in, for instance by loyalty points.</td>
</tr>
</tbody>
</table>

The subjects agreed that merchants take a very important position in the ecosystem, since they have to accept NFC mobile payments, either with contactless banking cards or with mobile phones. But, as all subjects also agreed on, delivering payments is not a proposition. Payment functionality is a ‘must have’ in the NFC ecosystem, but value will come from other services and features.

Therefore it is important to assess whether merchants are willing to deliver loyalty schemes or to provide additional services for their merchants, to provide a uniform shopping experience. Bringing online and offline payments together is the challenge for many merchants, lessons from e-commerce are very important. But here the difference between large retailers and small merchants is important. Large retailers have the funds to set up loyalty schemes, to provide customized marketing and to create an unique experience for their customers. For TRAVIK it will be important whether merchants would like to use the secure element to offer their services.

The merchants that are interested in payment innovations, are often the ones that don’t mind to have higher transaction costs. This can be seen in e-commerce for instance, where good payment mechanisms result in higher revenues for the merchants. The gains outweigh the higher transaction costs. This group of merchants is more likely to invest in the development of an application for smartphones, in order to merge their webshops and physical stores. Then, value can come from NFC. Also, merchants for which speed is important are the ones that are likely to invest in NFC terminals, since speed will result in higher revenues. The large group of small and medium sized merchants still accounts for a large part of the C2B transaction volume, so for the banks it is very important to get these merchants on board as well. Perhaps this group needs to be subsidized, since investments do not outweigh the extra income for them. Another method would be to focus on the large retailers in the next 5 years, until the payment terminal contracts of the smaller merchants end. Then, NFC
technology is likely to be more advanced, and the new terminal will then automatically be NFC enabled. This strategy has been confirmed by two of the subjects, belonging to TRAVIK.

5.3. The potential impact of NFC mobile payments on existing C2B relationships

The interviews performed have resulted in a better understanding of the market and the developments currently ongoing. However, not all of these insights gained has been visualised in the tables and the conceptual analysis in the previous two subchapters. An important element that is missing in the previous parts of this chapter is an analysis of the relationships between the several stakeholder groups and consumers. This subchapter focuses on the potential threats on the existing relationships. Based on the insights gained during the interviews, Figure 18 has been created.

Figure 18 Conceptual model of the trends in the markets of research. Arrows represent existing relationships in the physical world. Black arrows represent the existing relationships, the white arrows represent movements of the new entrants in the physical C2B payments market. The dotted circle represent the wallet that is envisioned for NFC mobile payments.

The relationship between the several stakeholder groups has been revealed during the interviews. The black arrows represent relationships as they are currently present. The white arrows present the movement of the payment service providers (with their experiences from e-commerce), social networks (Facebook for instance) and platforms (Google).

As can be seen in Figure 18, consumers now have relationships with merchants, with public transport organizations, with MNO’s and with banks. At the moment, these relationships are separated, each relationship is captured with a different card or a contract. Consumers have a relationship with several merchants. With the merchants they feel connected to, they could apply for a loyalty card, in order to get a discount and, in return, to give the merchant insight in their behaviour. Also, they choose the bank of their preference and the MNO that offers the best price for the phone they want. Or the one that offers the best and most reliable network. Public transport users now use their OV Chip Card for payments in bus, tram, metro or train. All these relationships are more or less separated, each relationship results in a different dataset and has a different level of commitment.

With NFC mobile payments, the smartphone of the consumer will initiate all financial activities (assuming that NFC mobile payments will be the only mechanism with which a consumer pays). The mobile wallet, an application on the smartphone where applications can be added, like banking cards and loyalty cards, will be the platform on which consumers can match their relationships with the other stakeholders. The goal is to improve consumer experience, since they don’t need to bring their normal wallet, the smartphone will take over all functions of the traditional wallet.
A smartphone is now more or less controlled by the MNO, since they typically offer smartphones with a postpaid contract. The SIM is owned by the MNO, so the secure element placed on a SIM as well. Several organizations have large interest in providing the wallet, since it will create valuable information on consumer behaviour. In this domain, banks and mobile network operators will compete, as well as many other organizations. The individual relationships currently existing then face the risk of becoming weaker, since the level of control for the business partners will decrease once a wallet stands between them and the consumer. The TSM has a potentially important role in delivering all these services to the consumer and in managing the applications placed on the secure element.

When looking closely at Figure 18, several other things become clear. The movements of stakeholders from the ‘virtual domain’ are threatening certain relationships:

- Payment service providers focus on the relationship between banks and merchants. By offering a layer between the merchant and several payment schemes, they provide the merchants with convenience and by doing that, they are able to add value. They want to become the partner for merchants, in order to handle all online and offline payments. The relationship between banks and merchants could be weakened because of this trend. Other payment service providers focus on the relationship between consumers and banks, Paypal for instance.
- Social networks try to form a ‘layer’ around the consumer, making their platform the layer that has to be passed by consumers to reach merchants (online for instance), or to pay for goods (Facebook credits). The value of the social network is decided by the number of participants on both sides of the platform, therefore the platform owners try to expand their reach. The mobile phone is the ideal device to move into the physical world.
- Platforms try to do the same, organizations like Google want to capture most movements of consumers, either online or offline, in order to create valuable data that can be used for marketing purposes.

Also in the ‘physical world’ certain trends are visible. The most important ones that have been learnt from the interviews are:

- When TRAVIK will become active, the banks remain in control of the debit accounts. Payments will be processed through Visa or Mastercard, as is similar to the current situation. The assumption that MNO’s threaten banks with respect to payment processing has not been confirmed in the Dutch market. In-store transactions will be handled similarly to current debit payments, there are no indications that mobile network operators would like to go into this market.
- Banks seem to prefer openness. Service provisioning and the reduction of cash are their primary goals. They need the infrastructure of TRAVIK (“TRAVIK is just a vehicle”) to be involved in NFC mobile payments and other banking services requiring a secure element. That is the main reason they are investing in the creation of a Trusted Service Manager.
- Amongst the three banks involved in TRAVIK, there seems to be a conflict on the strategy with regards to contactless banking cards. It seems to be very important to start offering contactless banking cards on a short term, in order to develop the merchants’ side of the market. With only NFC mobile payments the incentive for merchants to replace their readers is perhaps not large enough.
- On May the 24th (2012), the Dutch railway organization has announced that they will develop a payment scheme to use the OV Chip Card in shops around the stations. The contactless card will then also be enabled to make small payments, in a similar way as people already check-in for their travels. This can be considered as a threat to banks, since the installed base of these cards is very large already. Many consumers use it, if banks wait too long the OV Chip Card could replace a large part of the debit payment volume in and around the stations. The question is then which payment scheme will process the transactions, this is not known at the moment of writing. Minitix is mentioned as a potential partner.
- Mobile network operators only have a small role in Dutch payment traffic. Once NFC mobile payments will be possible, their role is growing. The first revenue stream will come from the secure element that can be rented out to the TSM. The second income stream is that they are likely to deliver a wallet service to their clients. MNO’s are the stakeholders that can promote NFC functionalities and can activate the market, because of the existing relationships with consumers.
In this chapter the outcomes of the interviews have been elaborately explained, while taking the conceptual model from Figure 11 as a guideline in structuring the answers. The sixteen subjects have been allocated to five stakeholder groups. These five groups have been grouped in three different categories. First the stakeholders involved in the TRAVIK joint venture, second the potential new entrants in the C2B payment market in stores. The third section focused on the needs of merchants and the experiences of the other stakeholders with the merchants. The main conclusions with regards to the conceptual model are given below.

After the main findings, a verdict can be made on the usability of the research model. After each interview the subjects were asked if any elements that they consider as important for the NFC mobile payment was missing in the discussion. None of the subjects has indicated that elements were missing in the discussion, therefore no concepts have been added. This indicates that the broad approach followed in the data collection phase, results in a complete picture of the Dutch NFC mobile payments ecosystem. This will be done in chapter 6.

The most important similarities between stakeholder groups, with regards to the stakeholder groups, are:

- Banks and Mobile Network Operators both prefer their role as service provider, none of the TRAVIK partners expected competitive advantage from ownership of the TSM. Although the two stakeholder groups are collaborating for the construction of a Trusted Service Manager, they will compete with their service offering to consumers.
- The business models for the TRAVIK partners, with regards to the concepts belonging to the organizational domain, are complementary. The partners have negotiated the division of value activities, resources and goals to achieve. However, they are both collaborative partners (in their role as shareholder) and competitive partners (in their role as service provider).
- Payment service providers seem to benefit from any development. Additional payment methods will increase the need for a reduction in complexity for merchants. However, the openness of the NFC infrastructure partly defines the role of PSP’s.
- All subjects expressed that consumers will decide, but their propositions are all aiming for C2B service provisioning. The services are all aiming to enable merchants to get higher revenues.
- Banks and merchants have the same goals, which is the reduction of cash. This goal can also be obtained with contactless cards, therefore networks that deliver contactless payment services (large card schemes, OV Chip Card and Minitix) have also been taken into account.

The most important conflicts between and within stakeholder groups are:

- From the three retail banks that have been interviewed, two prefer contactless payments with one of the large card schemes. These schemes already process debit card payments and have international compatibility. One bank however, does not see the need for contactless banking cards from one of the large schemes. They prefer to have other mechanisms, like NFC stickers, to be between the current banking cards and NFC mobile payments. The reason for this strategy is likely to come from their Minitix assets. The conflict results in a ‘missing link’ between the current EMV banking card and NFC mobile payments. Adoption from merchants is expected to be larger when contactless cards, interoperable with the technology of NFC mobile payments, will be distributed to all consumers as well.
- Originally, three mobile network operators were in the TRAVIK joint venture. One has stepped out however, since they do not expect benefits from the role as a shareholder of the Trusted Service Manager and the infrastructure to send payment applications to mobile phones. The conflict between the three MNO’s has the consequence that only 60% of the mobile phone users can be reached with the TRAVIK infrastructure. This reduces the attractiveness for merchants.
- As indicated before, the OV Chip Card has an ideal consumer base for contactless payments. They have a large installed base, they have a rather large control on the merchants and most clients are already used to making contactless payments. So, as a network they take a strong position. When looking at the business model concepts, the position of the OV Chip Card is less strong however. Due to the perception of security of the OV Chip Card, other stakeholders have expressed doubts whether to join a value network of this payment scheme. As a result, a competing value network is now emerging in the payments ecosystem.
6. Conclusions and discussion

In several phases, while using different research methods, this thesis has aimed to answers the following question:

“What is the strategic feasibility of NFC mobile payments in the Netherlands and how do strategies of individual organisations involved affect the NFC ecosystem as a whole?”

A definite answer on this question can, according to the insights gained in this research, not be given. This research has identified complexities with regards to network boundary specifications and problems with stakeholder management and stakeholder identification. The influence of both national and international influences makes the decision on inclusion and exclusion of stakeholders even more complex. The main findings on the practical questions and the additions to the existing literature are explained in this chapter.

6.1. Main findings

In the domain description, it was concluded that cash is still a dominant payment method for low-value payments in the Netherlands. However, it was also concluded that there are already several payment mechanisms in the market, with debit card payments taking a large part of the total payment volume. The current payment mechanisms benefit from economies of scale, with the result that not much value can be taken from the handling of payments in the Netherlands. Banks consider payments as a service for their clients, it does not generate direct income. NFC mobile payments or contactless payments could bring value in terms of speed and convenience for users. The technology also seems to be mature enough for market introduction.

Therefore it was concluded that the feasibility and success of NFC mobile payment services depend on the organizations that need to deliver services to their clients. For this purpose, business models frameworks were originally sufficient to describe the value activities of an organization. The problem with NFC mobile payment services is that they depend on many different stakeholder groups, making the business models of collaborations difficult, especially in a market where margins are very small. In order to describe the business models for organizations operating in a network, the STOF business model framework has been identified as the most complete for this market.

According to insights gained in the domain description, the researcher believed that business model frameworks cannot reflect the complexity that comes with mobile payment services. Therefore organizational aspects of the STOF business model framework have been combined with concepts that relate to platform characteristics. Concepts have been taken from strategic literature, from economic research and from industrial economics. This broad and explorative approach has been chosen with the purpose of grasping a large part of the complexity that comes from network service delivery.

From the organizational domain of the STOF business model framework, seven concepts have been tested with different stakeholder groups. Based on this framework, several conflicts have been found between and within stakeholder groups. Banks and Mobile Network Operators have, in the past years during negotiations within TRAVIK, optimized their business models for collaboration. Banks remain in control of the payment traffic while MNO’s deliver the network to send payment applications to mobile phones. TRAVIK will be the infrastructure, owned by the five membership organizations. Once the infrastructure has been created, the two stakeholder groups will compete on service delivery. So the stakeholder groups both collaborate and compete for delivering a similar service. However, in the scope chosen for this research (proximity mobile payments), the role of mobile network operators is very limited. When only looking at in-store payments, the role of the mobile network operators is to get mobile phones equipped with NFC-ready SIM cards and to distribute either payment applications or data to consumers.

The business models of Payment Service Providers and the OV Chip Card payment scheme have not been identified as a potential threat for in-store contactless payments, before taking platform related theories in consideration. Due to economies of scale and the efficiency of payments in the Netherlands, the value chain was expected not to allow new entrants. Also, other stakeholder groups were not willing to deliver payment services
based on the OV Chip Card, due to security reasons. The current EMV banking cards provide a higher level of security. Payment service providers provide a complementary role on service delivery, they reduce complexity for merchants, but are not likely to change the payment behaviour of consumers. The largest conflict found, as a result of the STOF business model framework, was the difference in strategies with regards to the introduction of NFC mobile payments. Two banks prefer to introduce contactless banking cards, so either the Paypass or payWave banking product. One bank however has its own payment engine called Minitix, which would become obsolete if contactless banking cards were introduced. Since the subjects from banks expressed that they prefer to offer contactless payments all together, this is a cause for delay. As a result, contactless payments have not been introduced in the Netherlands, it is not publicly known when and if this will be done.

With the second group of concepts, which were grouped as ‘platform related concepts’, new insights emerged. The installed base of the OV Chip Card, which has not been identified in the business model framework as promising, has been determined as a valuable asset. Also, the fact that the OV Chip Card is the only existing payment scheme in the Netherlands which uses contactless payments and is used by many people on a daily basis, was identified as very valuable. By increasing the indirect externalities of the OV Chip Card, the payment volume of this payment scheme is expected to grow. While the OV Chip Card is currently only used for public transport payments, it will soon become a competing platform for the traditional card schemes. If contactless banking cards would have been introduced already, the need for another payment scheme would not have been present. Since the OV Chip Card uses a different and incompatible technology than Paypass and payWave banking cards, this is considered as a threat for NFC mobile payments in the Netherlands, especially with the condition in mind that merchants in the Netherlands will only install one payment terminal. Timing can then be very important, if merchants can serve their clients with traditional banking cards and the OV Chip Card, the need for contactless banking cards will be rather small.

Contactless payments with banking cards or the OV Chip Card would not have been taken into consideration if only the STOF business model framework would have been applied. In chapter 3.4, (Shapiro & Varian, 1999) have indicated that the new information economy is driven by economics of networks, instead of economies of scale. In terms of economies of scale, the OV Chip Card cannot directly compete with existing payment methods. However, as a network, based on network externalities and critical mass, this payment scheme has large potential to become a dominant payment method for low-value payments around stations. Since all travellers in public transport have an OV Chip Card, and most of the merchants at station are controlled by one of the shareholders of the payment scheme, alignment of stakeholders is easier. When consumers accept to make payments with the OV Chip Card at stations, it is not unlikely that they will also demand readers at university canteens, vending machines, or other locations where speed is important and where transactions often have a low-value.

This does not mean however that NFC mobile payments in the Netherlands have no strategic feasibility. Both in terms of business models and in terms of the network value, the banks and international card schemes have a ‘better’ proposition. The technology is more secure, indirect externalities are much larger due to the existing installed base, and interoperability is guaranteed. The value network of the OV Chip Card has opportunities to expand due to the strategic behaviour of one bank. Based on the concepts from the research model, banks should not consider NFC mobile payments as a separate payment method, but they should offer it as a complementary service to their contactless banking cards. By doing that, they secure the position of the current payment schemes and prevent the OV Chip Card from becoming a payment method outside the public transport niche. With contactless banking cards, they will increase the chances of success for TRAVIK. Therefore, alignment between the three banks is required. By offering contactless payments on a short term, merchants are likely to adapt their readers for contactless payments with the large payment schemes, instead of with the OV Chip Card.

Based on the obtained results, banks have an important role in the payment market. They want to reduce the use of cash and to remain the platform for financial information for their clients. This last objective is one of the reasons the banks are investing in the TRAVIK infrastructure. This will provide them with the infrastructure to deliver the services they want to bring to their clients. Even though all subjects are convinced that “NFC mobile payments are the future”, this research suggests that contactless banking cards are an essential product in order to trigger merchants and consumers to change their payment behaviour. Most of the benefits that are attributed to NFC mobile payments (speed and convenience, leading to higher revenues for merchants), can also be obtained with contactless cards. Since banks are the actors to decide when this transition will occur, they have
the power to decide. As long as there are no contactless banking cards available, merchants with a need for contactless payments are 'forced' towards Minitix or the OV Chip Card soon. For this reason, the OV Chip Card has been identified as a competitive card scheme for the current payment methods and a potential threat for the adoption of contactless banking cards.

6.2. Contributions to theory

In this research, different research approaches have been applied, each fit for the stage of research. The largest contribution of this research comes from combining the STOF business model framework, which describes how firms optimize their individual and collective business model when operating in a network, with concepts coming from literature on strategic management, economics research and industrial economics. By following this approach conflicts have been found that would otherwise not have been taken into account. This research has explored the value of combining different literature streams in the assessment of the strategic feasibility of NFC mobile payments, and to determine individual strategies of stakeholders that operate in a network. The approach has been successful, but can be improved in future research.

Due to the complexity of the value network that have been assessed, the boundaries of the network are hard to identify. In this research the stakeholders that are important for mobile payments have been mentioned, but the NFC ecosystem is much broader. Since payments have been the service of interest during this research, other payment methods have been taken into account and have resulted in a large contribution to the final conclusion. The chosen boundary has a large impact on the outcome of the analysis. When other NFC related services would have been assessed, different stakeholder groups would have been identified. With defining the boundaries of a network, challenges are found at different levels. In the case of NFC mobile payments, many networks can be identified. Operating systems of smartphones can be identified as competing networks, as well as national banks and international card schemes. Choices made during this research have been explicitly mentioned, but the researcher is aware that other choices for the boundary conditions would have had resulted in different outcomes.

Many of the NFC mobile payment services are defined on an international scale, especially in terms of technological standards. However, agreements on a national level are also required. This research has indicated the relevant stakeholders in the Dutch market with the results presented in chapter 6.1. If international stakeholders would have been interviewed, the outcome could have been significantly different. Stakeholder management will be complex for value networks like the one central in this research.

The researcher strongly believes that the concepts that define platform competition and technology adoption should be incorporated in research models to assess the strategic feasibility of a service offered in a value network. By only looking at the business model on an organizational and a network level, as is done with the STOF business model framework, competing platforms and networks are not directly found. This leads to incomplete conclusions, as has been shown in this research. The research model that has been formulated can be applied to mobile payment services, payment products and mobile applications. The broad approach enables researchers to incorporate more complexity from the network into their analysis. As this research has shown, the competitive space can be in areas of the market where it was initially not expected.

For future research, the research model could be optimized in order to individually assess the role of each concept on the strategic feasibility. In that case, when theory development is the goal of research, the researcher recommends to specify the platform related concepts into more detail. The concepts mentioned in chapter 3, especially the concepts related to platforms, have been assessed in order to find the variables defining the concepts. As a second recommendation, the researcher recommends to research the willingness to adopt NFC mobile payments when contactless banking cards are not available. This research should not only focus on consumer behaviour, but also on the merchants.

6.3. Implications for research domain

With networks getting more complex, the definition of network boundaries becomes more difficult. With a focus on NFC mobile payments, one of the conclusions was that the value network around the OV Chip Card can be considered as a threat for banks and international card schemes. Therefore, it can also be a threat for NFC related payment services, due to the adoption of merchants. This conclusion was based on a conflict that has been identified in one stakeholder group (banks), which results in opportunities for other networks.
Banks and mobile network operators, the two stakeholder groups which are mentioned very often in research on mobile payments services, do have an important role in the Netherlands. The infrastructure that will be provided by TRAVIK can have an important role in the development of an NFC ecosystem. However, in the opinion of the researcher, a broader perspective is required in order to assess the feasibility of this new technology. Competition will not only be based on the business model applied, competition between networks on different levels is very relevant for this research domain. Therefore the approach followed here is recommended for other markets. The approach followed can be applied to mobile payments, payment services and mobile applications.

Competition between certain networks is identified on different levels. In the domain of payment schemes, competition seems to be between the traditional card schemes (Visa and Mastercard), the OV Chip Card and Minitix (to a smaller extent). However, since each subject has mentioned ‘interoperability’ as the core concepts, it is likely that the OV Chip Card can only form a threat as long as the banks do not align their strategies with regards to contactless banking cards. Once payWave and Paypass products are available in the Dutch market, with each consumer, the necessity for other contactless payment products is very limited. Banks can then optimize their internal processes in order to handle payments even more efficiently.

As indicated, boundary specifications of the value network is difficult. Therefore the researcher recommends a follow-up study where the international stakeholders will be embedded. By bringing mobile phone producers into scope, partnerships between card schemes and smartphone producers can also be assessed. This could result in very different outcomes than presented here.

6.4. **Implications for practitioners**

This research has indicated that the competition does not only occur between banks and Mobile Network Operators. Within the TRAVIK consortium, the roles of each individual actor has been specified and the value activities are complementing. Once the infrastructure is created, the organizations will compete in the service domain. However, due to the focus on proximity payments in this research, the role of mobile network operators has been rather small.

Based on the findings, the researcher would like to recommend the banks to align their goals and strategies with regards to the transition from traditional banking cards to NFC mobile payments. Based on the research here, contactless banking products as Paypass and payWave will be an important step in developing the market for NFC mobile payments. This reduces the need for other contactless payment services, like Minitix or the OV Chip Card. By getting the strategies with regards to banking cards innovation aligned, banks can protect the payment volume they are currently processing and give their products a boost, in order to reduce the use of cash.

Based on interoperability, which is expected and demanded from all subjects, the researcher expects that the international card schemes have the best position in the end. They benefit from network externalities, can provide both economies of scale and economies of networks, by partnering with either smartphone producers or mobile network operators. Banks are then forced in the role of client, but in the current payment market banks are already taking this role with traditional banking cards. All debit cards in the Netherlands are already Maestro products, an adaptation towards Paypass debit cards would be small for both merchants and consumers. Then consumers have the option to use their contactless features or not, since normal payments are still possible. Banks provide the clients, the trust and the infrastructure to send payment applications to the secure element. International card schemes can then provide security, critical mass and the required market penetration. However, banks decide when products of international card schemes are introduced in the market.

6.5. **Limitations**

From the beginning, this research focused on the Netherlands. For this reason, the current Dutch payment characteristics have been assessed and relevant stakeholders in the Dutch market have been interviewed. Many of the threats identified in literature, like Facebook with Facebook credits and Google with Google wallet, find their origin in the USA. They are likely to make the step towards the Dutch market with their products, since the Netherlands is part of their global strategy. These stakeholders have not been taken into account in the interviews, while their threat to the Dutch stakeholders could be rather relevant.
Another limitation is posed by the number of interviews. Although the saturation principle has been followed during the interview process, only one subject of each organization has been interviewed. This could create a bias in the answers per organization, since one employee cannot speak on behalf of the whole organization. This effect is estimated limited, since only project managers and business development managers involved with NFC mobile payments have been interviewed. The subjects were well-informed and had decision power. However, due to their professional activities, they are likely to be biased towards NFC related payment services.

Some of the subjects within TRAVIK knew each other and worked together on a regular basis. It would not be unthinkable that they discuss their participation in this research with each other, which could also generate a bias in their answers. The researcher did not get the impression this was the case, but it is not unlikely. The researcher has handled the information shared by the subjects in a very sensitive way, the outcomes of the interviews have not been shared with persons other than the readers of this report.

This research has been performed as a one-shot study. A longitudinal study was not possible, due to time restrictions. Each subject could only be interviewed once, so developments within the strategic behaviour could not be detected. The researcher has used the knowledge on this restriction by planning the interviews within one month. Developments in the market are rather quick, especially in markets outside the Netherlands, so the insights changed every week. By planning the interviews close to each other, the researcher had the goal to have equally informed subjects, since most subjects use the same knowledge sources.

The chosen approach, a qualitative study where grounded theory was leading the process of developing concepts, also has its limitations. The process of selective coding depended solely on the researcher, which could cause a bias. By using semi-structured interviews the researcher has allowed the subjects to bring new concepts to the research model. The subjects have indicated that the concepts of the research model reflected the challenges in the market, they did not bring in new concepts. The extensive analysis of the transcripts aimed to enrich the results as much as possible.

The final limitation posed by the research comes from the focus on NFC mobile payments only. By focusing on payments with NFC enabled phones, the value of NFC did not come forward in full detail. Many subjects mentioned that the value in the NFC ecosystem will not come from payments, additional services will make the technology attractive for consumers. Due to this focus, marketing organizations were not taken into account, while they are the ones strong in branding, loyalty schemes and other consumer focused services. However, since payments will be the first service that is offered by TRAVIK, an important part of the strategic considerations has been captured in this research.
7. Bibliography


Appendix A: Payments in the Netherlands

The graphs below are presented in order to support chapter 1.4, where the payments in the Netherlands are described in terms of their payment system, their payment volume and the payment values.

Figure 19 Number of payment transactions (in millions) for Chipknip per year in the Netherlands (Chipknip, 2012b)

Figure 20 Average transaction value per Chipknip transaction in the Netherlands (Chipknip, 2012b)
Figure 21 Number of payment transactions (in millions) with PIN in the Netherlands (Currence, 2012a)

Figure 22 Average amount of PIN transactions per month in the Netherlands, including growth percentage compared to the previous year (Currence, 2012a)
Appendix B: Payment processing details

Figure 23 Credit card payment processing (Credit Card Processing Blog, 2010)

Figure 24 Payment processing with a payment platform (GlobalCollect, 2012)