
# Bank card as OV-chipcard

A user-centered strategy for successful adoption of the contactless EMV bank card in Dutch public transport

## Design report, September 2016

Expertise Centre for E-ticketing in Public Transport

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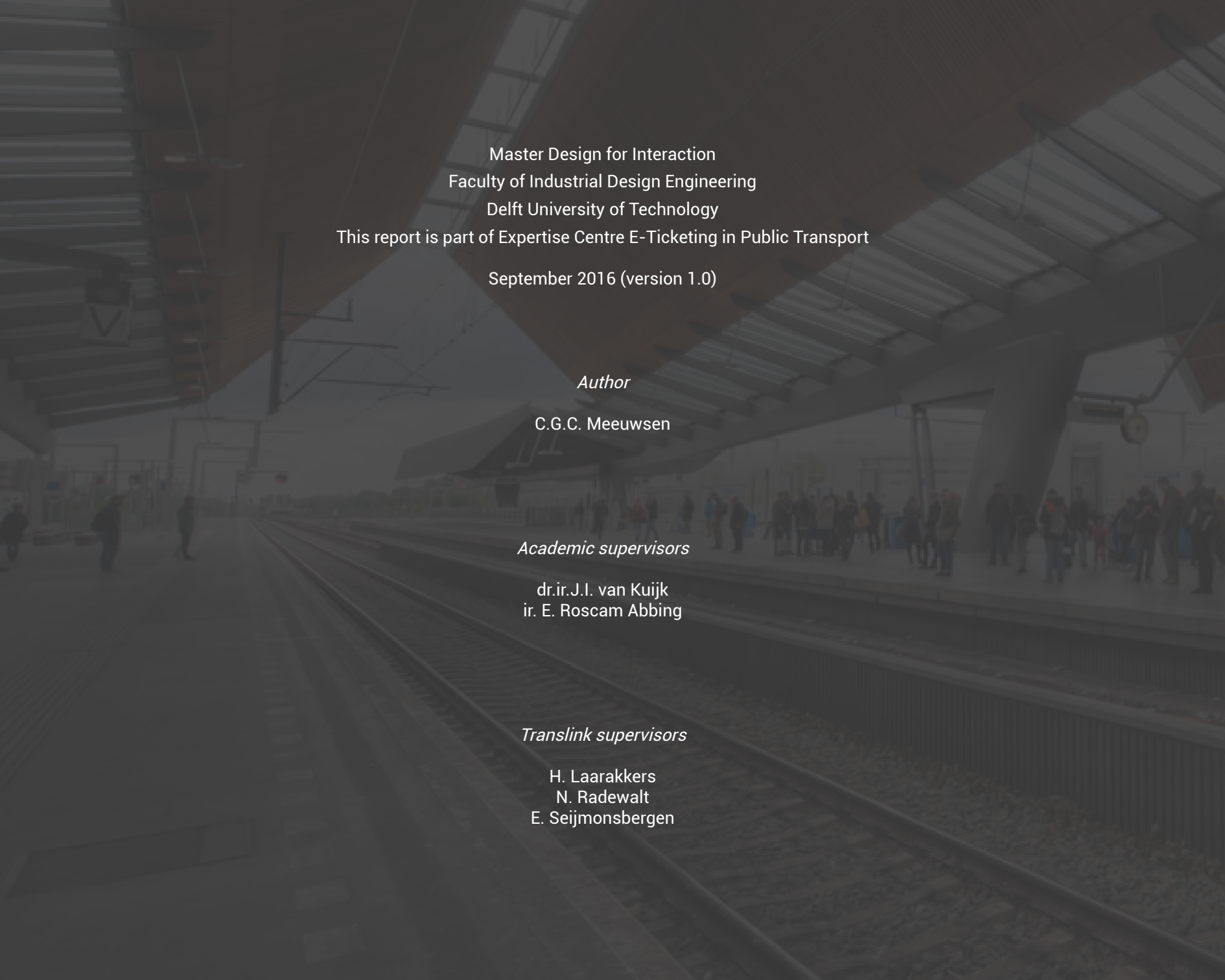

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# LIST OF ABBREVIATIONS

CBO = Central Back Office

CiCo = Check-in, Check-out

CJM = Customer journey mapping

EMV = Europay, Mastercard, Visa

EMV-c = EMV contactless

EMV-pt = EMV contactless within public transport

NOVB = National Openbaar Vervoer Beraad

OV = Openbaar Vervoer (Dutch public transportation system)

OVCP = OV-chipcard

PIN = Personal Identification Number

PTO = Public Transport Operator

SUS = System Usability Scale

TCO= Total Cost of Ownership

TfL = Transport for London

TLS = Trans Link Systems

X-CEPT = Expertise Centre for E-Ticketing in Public Transport

# EXECUTIVE SUMMARY


### Background & Relevance

The OV-chipcard has been widely accepted within the Netherlands as method for payment in pubic transport. However the smartcard does not lower the barrier of use for everyone and research shows that infrequent and international travellers often still have trouble purchasing and using it. To deal with this problem the Nationaal Openbaar Vervoer Beraad (NOVB) created a future vision document in which they state the want to enhance the travel experience and increase traveller satisfaction within in the Netherlands by implementing the contactless EMV bank card in Dutch public transport (EMV-pt). Because experience with the OV-chipcard has shown the importance of dealing with a new development through a user-centered and integral approach, the main focus for this project is the perspective of the user. If done right, the implementation of the contactless bank card in public transport could increase the simplicity of the Dutch public transportation system by giving travellers an extra way of travelling.

### Project Setup & Approach

This project is a collaboration between the TU-Delft Expertise Centre or E-ticketing in Public Transport and Translink. The main focus during the project was the perspective of the user and thus a user-centered approach has been taken. Although the emphasis during this project was on user-centered design solutions, other aspects were also taken into account during the project. Throughout the project user demand and wishes served as starting point and the technological feasibility and business viability acted as frame in which the eventual design should fit.

### Process

The project consisted of two phases, an analysis phase and a design phase. In the analysis phase research has been performed in various contexts that have EMV-pt implemented. By taking a closer look at the public transport system of London, Chicago and the Czech Republic, it became apparent that there are still many pitfalls when it comes to implementing EMV-pt. Issues concerning consistency, service personnel knowledge and the experience of insufficient control could be found within these countries. The results of this research made is possible to form threats and guidelines for the implementation of the contactless bank card in Dutch public Transport as well as create a model showing which factors influence the acceptance of EMV-pt.

In the design phase the results of the analysis research has been used to see what is needed to make the adoption of EMV-pt in the Netherlands successful. Within the scope of the first years of EMV-pt implementation, several user groups could be defined and mapped out in a customer journey. Using the customer journey to identify opportunities for improvement, various touchpoint ideas were generated in order to enhance the user-friendliness of EMV-pt. By evaluating these ideas with users and stakeholders the wants and needs of all parties involved could be identified in order to create an EMV-pt service concept that was acceptable to all of them. This service has been prototyped and tested in its entirety with the user groups in order to refine the concept.

## Design: A Service Design for EMV Contactless in Dutch Public Transport

The service design for EMV-pt aims to give travellers an easy way of accessing public transport using their contactless bank card. By making it possible to directly travel from one's bank account, EMV-pt allows travellers to use public transport without having to top up or pay for a ticket or travelcard in advance. Within this service concept several aspects form the foundation of this design. These aspects can be described with the following keywords: uncomplicated, transparent and empathic.

Uncomplicated: When using the contactless bank card the aim is to make sure its use it perceived and experienced as simple. Features that are connected to this aspect are the ability to be able to travel with EMV-pt without activating or registering the bank card prior to use. Unlike the OVCP the bank card does not make use of a deposit and has a stretched contactless spending limit of 50 euro in order to make it possible for users to travel without worrying too much about reaching their contactless spending limit. The entire service is promoted as a service given by public transport as a whole that is supported by the banks, making it clear for people where to look for help in case problems occur.

Transparent: Seeing as EMV-pt makes it possible to travel using the money of the traveller's bank account, it is essential to be honest and open in order for people to trust the new technology. Because EMV-pt is not like any other public transport ticket and certainly does not work the same way in the back office, information will be made available to the travellers of the exact way EMV-pt works.

Empathic: Because the bank card is a personal and valuable object to many travellers, it is important that the card is also treated as such. The service gives travellers the option to deactivate EMV-pt if they do not want to use it, which can be either done by deactivating the contactless feature at one's bank or by specifically deactivating EMV-pt at the OV-betalen website. When used for the first time, the banks will also notify people when the card is used in order to make them aware of both the existence of EMV-pt as well as potential misuse. Although a spending limit hinders the use of the contactless bank card in public transport, it is nevertheless added to the service in order for people to feel comfortable when using EMV-pt.

The service itself also consist out of various touchpoint that the user encounters when using EMV-pt. The following touchpoints have been designed in order to enhance the traveller experience when travelling with the contactless bank card in Dutch public transport.

Journey Phase

PRE-TRAVEL EXPERIENCE

TRAVEL EXPERIENCE

Journey Steps

Orientation | Preparation | Check-in | Station


Bank information Letter


Ticket options poster


CiCo feedback and compatiblity logo

**Compatibility Logo** – A logo showing where EMV-pt is implemented and where not in order to protect users from accidently trying to use the contactless bank card with PTOs that do not support it.

**Ticket Options** – An overview of payment options for Dutch public transport to make sure travellers can more easily distinguish they different options they have.

**OV-Betalen Website** – A platform that provides travellers with information concerning their contactless bank card in order to make sure EMV-pt travellers can receive an overview of the travellers made with the contactless bank card.

**Information Letter** – A letter from the bank to their customers showing the bank supports EMV-pt in order for travellers to feel more comfortable using the contactless bank card with public transport.

**Overview from Statements** – An overview shown on bank statements in order to give travellers the ability to see how what the EMV-pt costs consist of.

**CiCo Feedback at Validators** – Adjusted validators that are able to give travellers check in and check out feedback to avoid confusion during travelling.

TRAVEL EXPERIENCE

POST-TRAVEL EXPERIENCE

Travelling | Interchange | Check-out | Verification | Reflection


Vehicle information screens

Overview in bank statements

OV-betalen website

**Information Folders** – Information pamphlets providing travellers with information about the working principle of EMV-pt.

**Operator Compatibility** – Signs showing where it possible to use EMV-pt in order to make sure travellers do not attempt to use their contactless bank card with an operator that is not EMV-pt ready.

**Information at Vehicle Screens** – Screens within vehicles of the PTOs will show EMV-pt information to make travellers more conscious of the new technology and to give them information concerning its working principle.

When looking at the adoption strategy for EMV-pt, it is important to create the right foundation from the start in order for people to still accept EMV-pt later on because the adoption rate in its first years also affects the adoption rate when the account-based back office is connected. Consistency during implementation is essential to heighten the adoption of EMV-pt and it is vital to communicate the right information about EMV-pt in order to avoid confusion. When done correctly, EMV-pt will be one step closer to reaching the following vision:

*Travellers will no longer have to concern themselves with different transporters and their tickets. Using their bank card they can go anywhere they want at any time. Their bank card will no longer be just a tool to access their bank account but will become a key that opens up their world.*

# Contents


# 1

# 1 INTRODUCTION: CONTACTLESS EMV BANK CARD IN DUTCH PUBLIC TRANSPORT

This graduation project focuses on improving the Dutch public transportation system by creating a strategy for the successful adoption of contactless EMV bank cards (EMV-c) as a new method of payment in public transport. The project is a collaboration between Expertise Centre for E-ticketing in Public Transport (X-CEPT) of the faculty of Industrial Design Engineering at the TU Delft and Translink.

This report describes the steps that need to be taken to make the adoption of EMV contactless bank cards in public transport (EMV-pt) a success. The project focusses on the first two years of the implementation of EMV-pt in the Netherlands. Throughout the project multiple design solutions were created and evaluated with both users and stakeholders. The findings of these evaluation sessions helped to combine several design solutions into one proposed service design and strategy that aims to enhance the adoption of EMV-pt within the Netherlands. The service design itself is visualized in a customer journey with its respective touchpoints designs and shows the effects it will have on the future experience of the EMV-pt user.

This chapter gives a brief description of the project as a whole, the design brief and the approach that has been taken throughout the project.

## 1.1 Project Background

When the OV-chipcard (OVCP) was implemented nationwide in 2012, it was possible tot travel throughout the entire Dutch public transportation system (OV) with only one card. Instead of buying separate tickets, travellers were now able to check in and out during their journey with a money charged OVCP. But even though the OVCP has been widely accepted within the Netherlands as method for payment in public transport, it does not lower the barrier of use for everyone. Research of Joppien, Niermeijer and Niks (2013) for example showed that infrequent or international travellers still have trouble purchasing and using the OVCP.

In order to deal with this problem, the National Openbaar Vervoer Beraad (NOVB), a council created by the government consisting of public transportation companies, local governments and consumer organisations, created a future vision document (NOVB, 2014) in which the NOVB states it wants to enhance the travel experience and increase traveller satisfaction within the Netherlands. Within this vision the NOVB states that it wants to change the way travellers can pay for their public transportation services by introducing several new payment technologies. One of these new technologies the NOVB wants to introduce in 2018 is contactless EMV bank cards (figure 1). Inspired by London where this system is already up and running and managed by Transport for London (TfL), the NOVB wants to implement a similar system in the Netherlands. Using the contactless bank card travellers would no longer have to put money on an OV-

chipcard but instead can instantly use public transportation which removes the travel fee directly from the travellers' bank account.

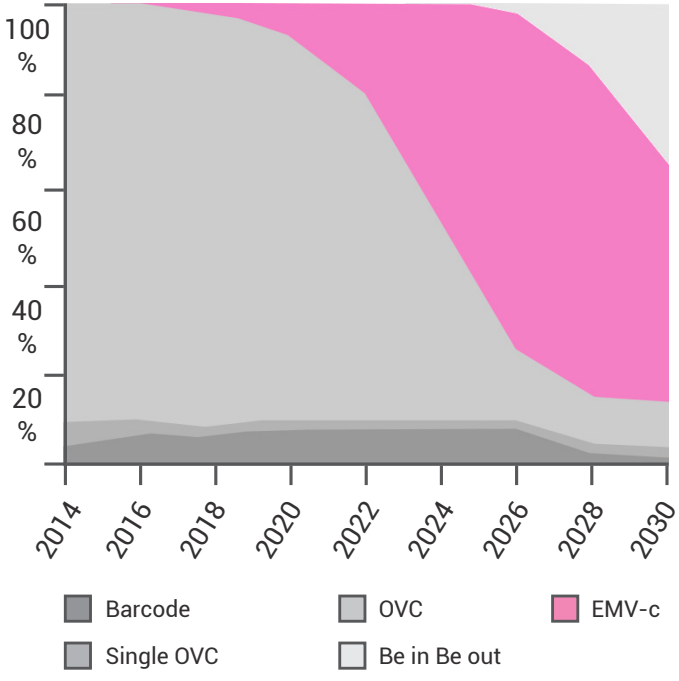



Figure 1. NOVB vision development OV payment methods

At the same time Trans Link Systems (TLS) better known as Translink, the company that developed the system behind the OVCP, wants to play a part in the implementation of this new innovation. Translink is responsible for the back office of the OVCP and thus has a central role within the public transportation system of the Netherlands. It wants to keep this position by adding EMV-c as one of the products in their service and thereby also fulfilling a central role in all EMV-c related payments in public transport. Another reason Translink wants to be part of this implementation is because they want to improve their service towards the travellers by adding a more approachable way of paying for public transport. Finally the introduction of EMV-pt also gives Translink the opportunity to set up a smart central back office which can be more suitable for handling transactions of possible future payment developments.

## 1.2 Problem Statement

Experience with the introduction of the original OV-chipcard has shown that it is important to deal with new developments through a user-centered and integral approach. The commission Meijdam (2011) noticed that the OVCP was developed mostly from the technology and business perspective and that human and societal perspective received less attention. Additionally the stakeholders involved in the OV-chipcard (governments, transport operators, system developers and travellers) also often have conflicting requirements, which can be hard to align. For EMV-pt each of the stakeholders looking from their own perspective could pose the same problem and could result in a product service system that does not meet the users needs and would discourage people from using EMV-c in the Dutch public transport.

Apart from looking too much from one's own view there is also a danger in blindly copying the already working system in London. Currently stakeholders seem to view London's integration of the bankcard with the Oystercard as a 'best practice', that shows that EMV-pt works. However, the fact

that the context of London is not the same as the one in the Netherlands in terms of size (not nationwide) and complexity (less stakeholders) but still expecting a product of one system to function just as well in the other could prove to be a problem.

## 1.3 Relevance

Public transport fulfills an important role in the Netherlands and is a service that should be available to everyone and as such it is also the responsibility of a public university like the TU Delft to use its expertise to improve it. The Dutch Government values the effect public transport has on area accessibility, impact on livability, participation of citizens in society, and the support for economic activity (CPB & KiM, 2009) The introduction of EMV-c in the Dutch public transportation system could be a benefit to both the transporters as well as the travellers. As the NOVB states in their vision, the aim of this new form of payment is to help with the following goals:

- Increase the amount of travelers in public transportation
- More convenience for travelers
- Increase of market growth by strengthening positioning of the transporters
- Decrease of total cost of ownership (TCO)

A good implementation of EMV-c within public transportation could increase the simplicity of the Dutch public transportation system by giving travellers, both national and international, an extra way of traveling using something they already have; their bankcard.

## 1.4 Design Brief

The goal of this project is to design a strategy which will enable the successful adoption of EMV-pt in the Netherlands. This strategy should include various steps that need to be taken to achieve this adoption and should encompass a service design based on the customer journey of the possible users. This service design would include several touchpoint design solutions for potential problem areas for EMV-pt in the Netherlands based on the previous research (Meeuwsen, 2016) and new user insights.

The outcomes of this project will contribute to a larger objective which has been separated into two parts. First of all the vision, which represents the ideal future outcome. And second of all the mission, which is the more concrete target leading to the proposed vision.

*Vision*
Travellers will no longer have to concern themselves with different transporters and their tickets. Using their bank card they can go anywhere they want at any time. Their bank card will no longer be just a tool to access their bank account but will become a key that opens up their world.

*Mission*
To enhance the user-friendliness and accessibility of the Dutch public transportation system through a user-centered implementation of EMV-contactless as a new method of payment.

### 1.4.1 Aim

Design multiple solutions for the potential problem areas which travellers will experience when using EMV-pt in the Dutch public transportation system. Test and iterate the design solutions and create a service and strategy that will help in achieving the goal to make the adoption of EMV-pt in the Netherlands a success.

### 1.4.2 Research Questions

• Which types of travellers will make use of EMV-pt in the Netherlands?
• What are the problem areas the potential travellers will face when using EMV-pt in the Netherlands?
• Which solutions can be found to tackle the problem areas that the travellers will encounter?
• What human, business, technological and societal aspects are relevant for the EMV-pt service design?

## 1.5 Approach

In this project the main focus will be the perspective of the user and thus a user-centered approach will be taken. Since all the parties involved in EMV-pt have one aspect in common in the form of the traveller that will use EMV-pt, it is essential to have the user segment as a central pillar throughout the implementation of EMV-pt. In order to make sure the user is accurately represented within EMV-pt, it is important to design for this innovation keeping the user perspective in mind to avoid the earlier described problem.

Although the emphasis during this project is on user-centered design solutions, other aspects will also be taken into account during this project. As stated by van Kuijk (2015), a good product/service is the results of the integration of the needs of the people, the possibilities of technology, the requirements for business success and the needs of society (figure 2). In order to achieve this integration, discussions with stakeholders are held throughout the project to determine the effect proposed design solutions would have on the other aspects and to see whether the designed service and strategy are realistic. Thus within this project user demands and wishes will serve as starting point and the technological and business feasibility will act as frame in which the eventual design should fit.

The research that is performed in this project is mostly based on qualitative methods to support this user-centered approach. As Kvale (1983) states, qualitative research better enables the collection of rich data that makes it possible to get a better understanding of the wants and needs of the user.

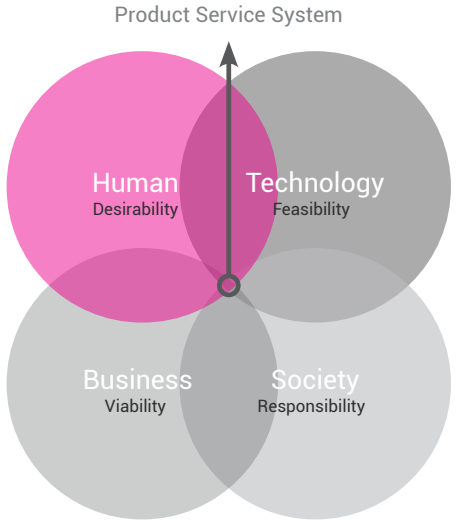



Figure 2. Innovation Model by Van Kuijk (2015), adapted from the human-centred design model by IDEO (2009).

## 1.6 Project Setup

The graduation project is part of the Expertise Centre for E-ticketing in Public Transport (X-CEPT) of the faculty of Industrial Design Engineering at Delft University of Technology. X-CEPT focusses on improving the user-friendliness of paying for public transportation in the Netherlands through user-centered design projects. This project is a collaboration between X-CEPT and Translink and is regarded as a graduation internship. However during the project the intention is to make EMV-pt in the Netherlands as user-friendly as possible without being influenced too much by the company and its goals.

The project consists of two phases; an analysis phase and a design phase (figure 3). The first phase is documented in the analysis report 'Bank card as OV-chipcard' (Meeuwsen, 2016) and gives an overview of insights, threats and guidelines for the adoption of EMV contactless bank cards in public transport and is based on a study performed abroad at countries that have EMV-pt implemented. A summary of the results found in this analysis can be found in chapter 2.

The second phase, which is documented in this report, takes a closer look at what is needed to make the adoption of EMV-pt in the Netherlands successful and uses the results of the analysis report as a starting point. Where the first phase was more aimed at getting insights for EMV-pt in general, this phase is focusses at what it means to implement EMV-pt in the Netherlands and how this can be done properly.

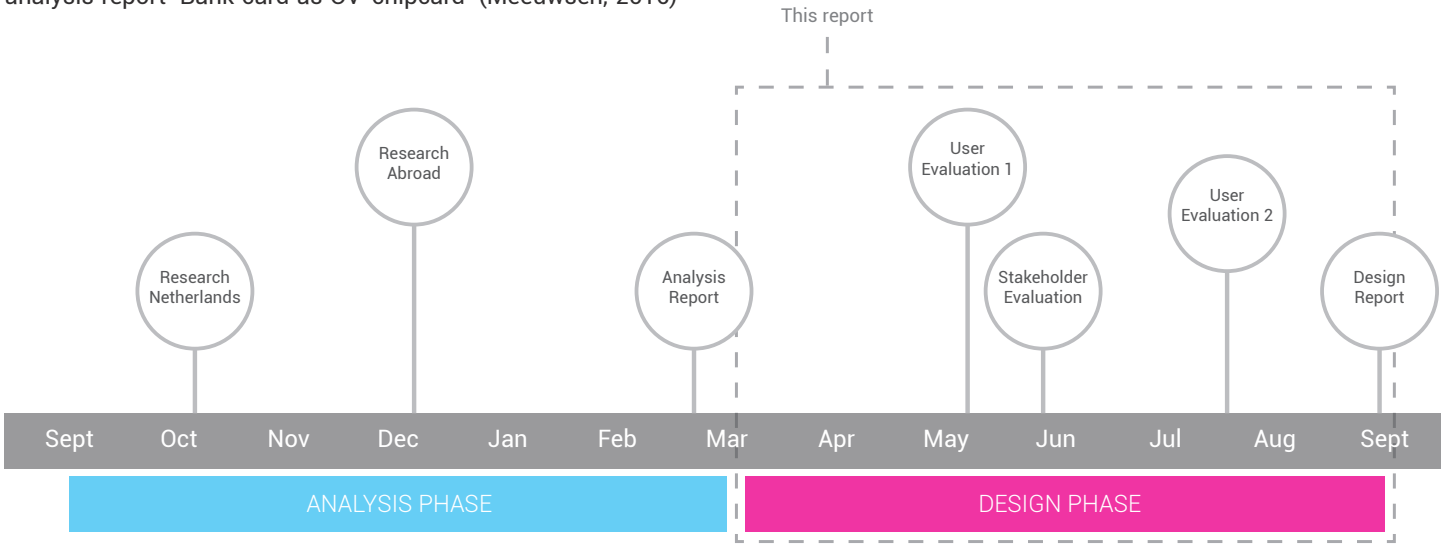
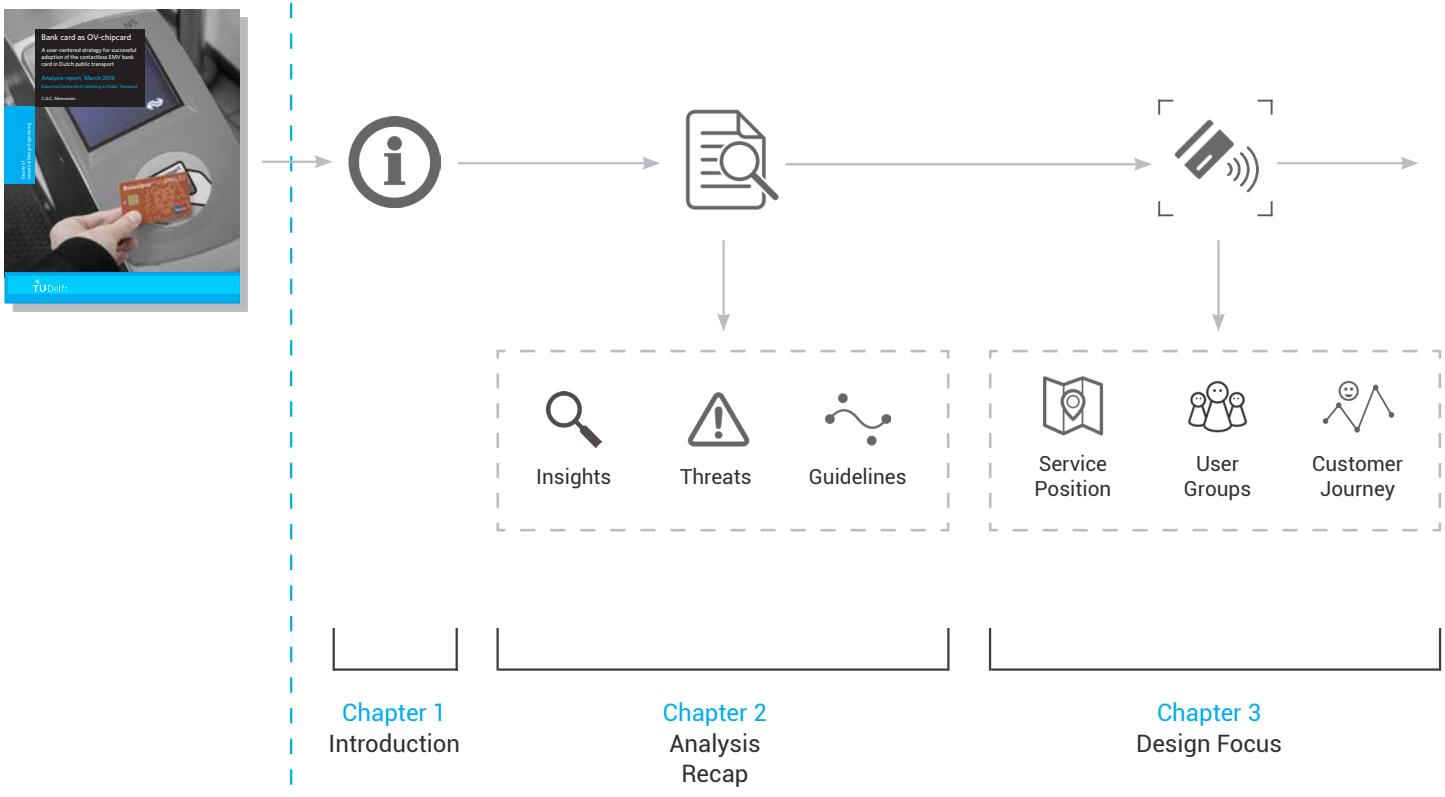


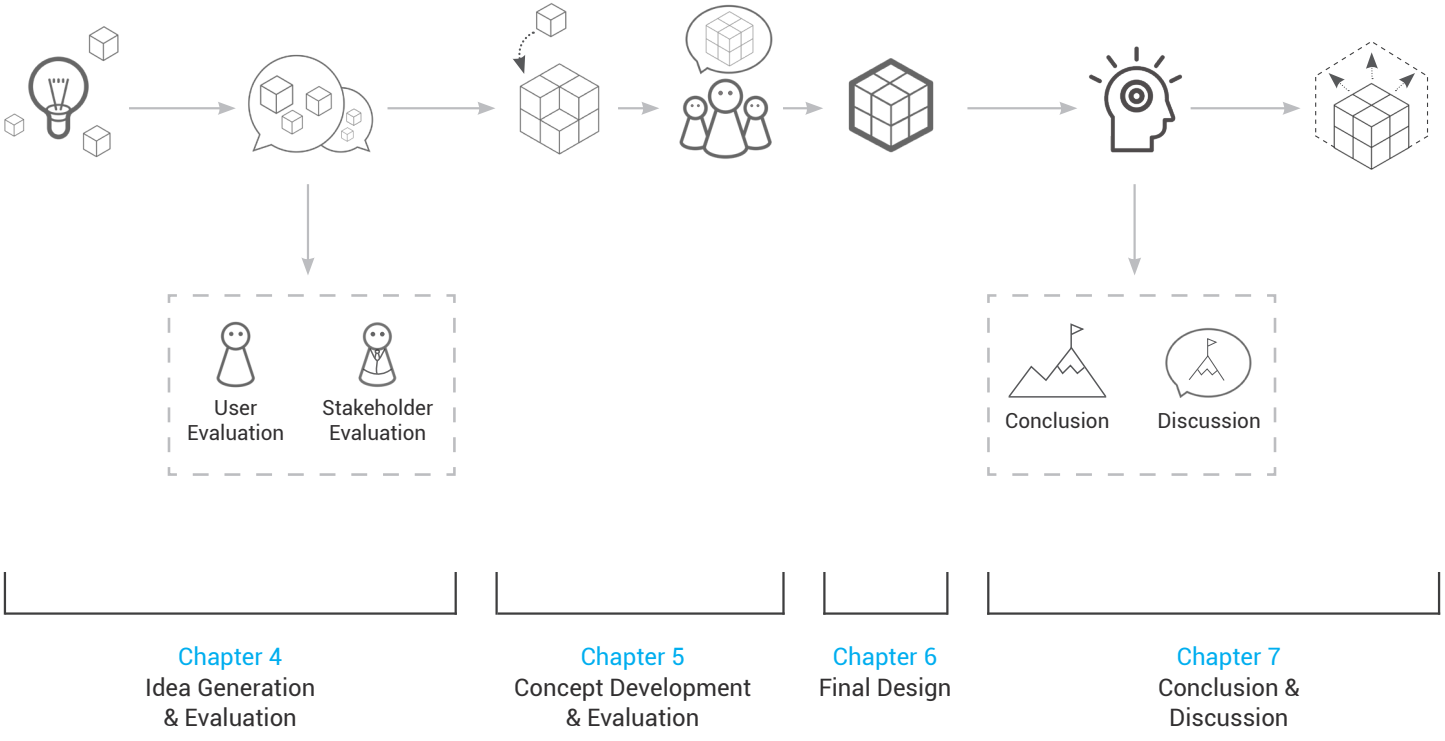

Figure 3. Timeline of project and the different phases

## 1.7 Process and Reading Guide

This report consists of eight chapters and starts out with an introduction to the entire project and this report. The second chapter of the report is a recap of the insights, threats and guidelines found in the analysis report. The third chapter describes the focus of this project and the way EMV-pt will be positioned in the Netherlands. In this chapter the potential



EMV-pt users are defined as well as the journey these users will make and how this is experienced. Using the domain specified in chapter 3, ideas were generated and evaluated with users and stakeholders. The ideas that were created as well as the results of these evaluation sessions can be found in chapter 4. The fifth chapter describes the service design concept that has been created based on the results of the previous chapter. This concept is developed and tested with the potential EMV-pt users and the results of this test can also be found in chapter 5. The feedback gathered in the final user evaluation were used to make adjustments to the service design concept and resulted in the final design which can be found in chapter 6. The conclusion and discussion of the project are described in chapter 7 and recommendations for EMV-pt in the Netherlands can be found in this chapter as well.




# 2

# 2 ANALYSIS RECAP

In order to get a better idea what it means to implement the contactless bank card as carrier within public transport, a study was performed abroad in the Czech Republic, Chicago and London to identify user issues and to see how people react to using EMV-pt. Apart from this analysis, a literature study and desk research were also conducted to see what information is already available on similar topics. The study itself and a detailed report of the results can be found in the analysis report 'Bank card as OV-chipcard' (Meeuwsen, 2016).

This chapter provides an overview of the results that have been found in the study performed abroad as well as the research that has been performed in the Netherlands. These results are separated into insights found in the contexts studied, threats and guidelines for the implementation for EMV-pt in the Netherlands.

## 2.1 Insights Research Netherlands

Looking at the context of the Netherlands and the current working model for EMV-pt (figure 4) showed that there are many existing restrictions and barriers one has to deal with and that the position of EMV-pt in relation to other future developments in public transport is crucial for a successful implementation. The current system is very dependent on the fact that the OV-chipcard stores a lot of information, something the bank card might not be able to do, which could form a problem. Other issues could be found concerning the payment limit the contactless bank cards have and the inability to enter a PIN while travelling. Another important service issue that could be identified is the fact that when EMV-pt will implemented it will experience stages in which travellers cannot use their bank card as carrier in every part of the Netherlands. EMV-pt in the Dutch transportation system is also going to be a product of a complex cooperation amongst stakeholders and unity is needed in design and service to avoid confusion amongst travellers. The research also showed that even though several issues have been identified because the EMV-pt model currently considered for the Netherlands is based on the already working London model, there is still a big emphasis on technology and business issues and user issues are relatively unknown or highly connected to the existing OV-chipcard.

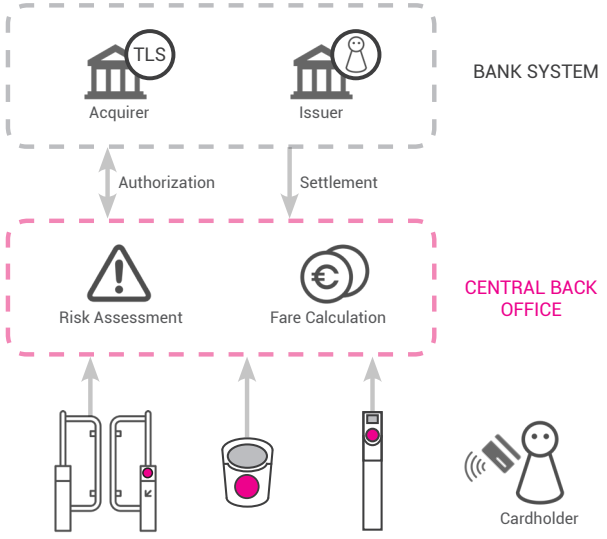



Figure 4. Proposed transaction model EMV-pt

## 2.2 Insights Research Abroad

The research abroad showed that there are various pitfalls when it comes to implementing EMV-pt and that studying these contexts can help in avoiding them. The insights that have been discovered could be separated for each country and several general insights were found that are apparent in all the three contexts.

**Czech Republic**
Results in the Czech Republic made it clear that there is little consistency in the way contactless readers work and the rules banks maintain when it comes to using contactless. It also showed that it is difficult for users to rely on their previous experience to make contactless transactions. Next to that the context also revealed that language still plays an important role when using EMV-c and that contactless readers often rely a lot on text to explain use (figure 5).

**Chicago**
In Chicago the results showed that a complex implementation of EMV-pt can really lead to a poor adoption, especially combined with an unreliable service and added costs compared to other forms of payment. The context also showed that the contactless bank card requires its own information and promotion in order for travellers to get familiar with the technology.

**London**
Research in London made it visible that there is a big group of incidental travelers that make use of the contactless bank


Figure 5. Steps for EMV-c displayed in Czech

"My second trip using Ventra and I was charged double. I called and got a message telling me that I should expect a hold time of 17 minutes. Who are these clowns and what led them to think this was ready to release?"

-Chicago transit user-

"But at the same time, it depends how much of a rush you are in. Because it (contactless bank card) can be extremely helpful compared to the Oyster card"

-London transit user-

card. The study also made clear that there is a large gap of information and feedback at the validators causing confusion and doubt (figure 6). Next to that many users indicated that it is hard to find EMV-pt specific information and are often expected to connect rules of the local travelcard, Oystercard, to the bank card. The adoption in London was relatively successful and the way they implemented it was paired with a lot of promotion and an emphasis on equality between the Oystercard and the contactless bank card.

**General Insights**

Some issues were visible in all three countries and made it possible to form insights that affect the implementation of EMV-c/pt regardless of the different contexts. An example of one of these general insights is the need for control when using the contactless bank card, both in spending as well as in knowing how much is being debited. Another insight that is present in all contexts is the importance of costs when selecting to use the contactless bank card as method of payment for public transport. The study also displayed that users have a lot of expectations and make many assumptions because EMV-pt is a combination of two different worlds, public transport and banks. The positioning of the bank card next to other methods of payment in public transport also plays and essential part in the adoption of EMV-pt as well as the complexity of the service as a whole. All three context also show that there is a lot of inconsistency in information, feedback and design (figure 7). Next to inconsistency, service personnel knowledge leaves much to be desired in order to accurately help travellers with using the contactless bank card.


Figure 6. Reader pole that cannot give CiCo status


Figure 7. Differences in information sign of reader

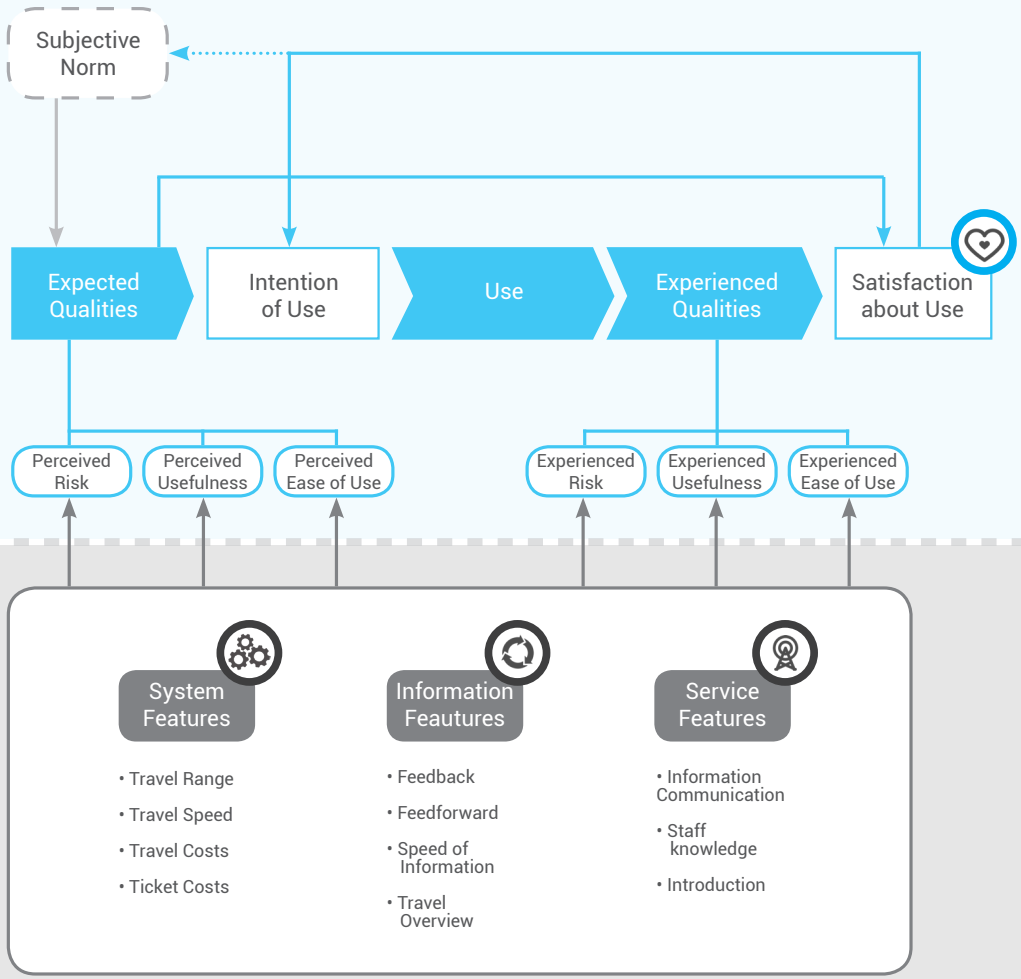



Figure 8. EMV-pt acceptance model with factors found in research

**Factors Influencing the Adoption of EMV-pt**

The discovered insights could help with identifying the factors that influence the adoption of EMV contactless in public transport. By combining the insights with various models concerning technology acceptance like the TAM (Venkatesh & Bala, 2008) and the IS Success Model (DeLone & McLean, 2003) found in the literature study, a new model for the adoption of EMV-pt could be made. This model, which can be seen in figure 8, shows how the expected and experienced qualities of a system can be influenced and how this will lead to satisfaction of use for EMV-pt. By making design decisions within the various features of the system, these two qualities can be affected. The research abroad helped to identify the features that can be influenced in order to get a better grip on the adoption probability of EMV-pt.

## 2.3 Threats

The findings of the analysis led to an overview of threats to successful adoption of EMV-pt in the Netherlands. One of these threats the Dutch system could experience if no intervention takes place is the absence of proper feedback at validator poles. If the current poles are not supported with a more real time connection, validators will be unable to provide travellers with their check-in and check-out status (CiCo) and travel costs (figure 9). The current working model for EMV-pt in the Netherlands will also make it hard for travellers to know what is happening when their bank card cannot be checked in due to a reached contactless limit (figure 10). Another problem that could occur is that travellers would have trouble finding the right party for help when something goes wrong during the use of their contactless bank card in public transport. Due to the complex nature of the relationship between the various Dutch public transport operators (PTO) and service providers, travellers are often not aware of the roles each party plays. The multitude of PTOs also makes it difficult to immediately update all the equipment to handle the EMV contactless bank card. Because the beginning of a new concession period is a natural moment for PTO to change their equipment, a situation could arise in which travellers can only use the bank card in parts of the Netherlands.


Figure 9. Validator pole without CiCo and price information


Figure 10. Gate showing check in not possible due to reached limit

## 2.4 Guidelines

Using the identified insights and threats, several guidelines (figure X) were formed that will help with the successful adoption of EMV-pt in the Netherlands. One of these guidelines is to keep EMV-pt simple in order to make it comprehensible for travellers to use. Due to the complex nature of EMV-pt, the primary focus should be on just entering the Dutch public transport instead of immediately adding many products and features to the bank card. Another guideline is to make sure the threat of validators giving limited feedback is resolved. Since checking in and out is an important aspect of the Dutch public transport system, information about one's CiCo status needs to be known to the traveller. Research abroad also showed that service personnel lacks EMV-pt knowledge and the ability to handle EMV-pt related problems. For the Netherlands this will also be the case if personnel is not specifically trained in order to know more than just the fact that the bank card is a new method of payment in public transport. When implementing EMV-pt, the focus should initially be on the infrequent traveller. The accessible characteristics of the bank card combined with the fact that travellers would not have to get very connected with a transport operator makes it a very suitable for this group. If EMV-pt should be implemented, it is also important to create an operational organisation that will help users when experiencing problems with EMV-pt. This organisation should be positioned in such a way that it is logical for users and easy to find. In order for travellers to get a clear idea how EMV-pt works it is essential to communicate information about the contactless bank card in one clear format throughout the different PTOs and banks. And last, since the bank card makes is possible to directly spend money for travelling from your bank account, it is vital to make sure the users feel in control. Even though contactless transactions sacrifice some control in favour of speed, added control is needed in order for users to feel comfortable using this technology in public transport.

## 2.5 Conclusion

The research done in the different contexts produced various insights for the implementation for EMV-pt. These results made it possible to form several threats and guidelines for the implementation of the contactless bank card in Dutch public transport. The findings of the analysis phase will be used to determine the problems areas and to create a customer journey for the potential users of EMV-pt in the Netherlands. The EMV-pt acceptance model will also be used throughout the design phase in order to generate solutions and ideas.


Victoria Station

# 3

# 3 DESIGN FOCUS: FROM INSIGHTS TO SCOPE

To know how much freedom exists within a project and with which limitations one has to deal with, it is important to create a clear framework in which to design. This chapter describes the focus of this project and the way the service for EMV-pt is going to be positioned. It will give a definition of the user groups that will be designed for based on motivational segmentation and show how these groups are displayed within the customer journey for EMV-pt in the Netherlands.

## 3.1 Positioning the Service

In order to narrow down the scope of the project and to clearly look at the part of the EMV-pt implementation that is backed by the most data, the focus for this design phase needed to be decided.

Part of the implementation of the contactless EMV bank card is going to be hand in hand with the account-based central back office (Albricht et al., 2015). This smart back office will have an open architectural system that would be easily expendable and capable of handling future payment tokens without reducing the travel information that can be supplied. The products and services that are now stored on the OVCP would be transported to the central back office (CBO) in order to make it possible to use these features even on carriers that have a lack of available memory space for OV information.

In this project the scope of the adoption will be limited to the moment the contactless bank card is implemented without the account-based back office connected to it. This will mean the focus is on the initial phase, the first two years of implementation, of the contactless bank card where the account-based back office is absent and thus the bank card cannot be combined with travel products as is the case with the personal OVCP (figure 11). The reason for this focus is

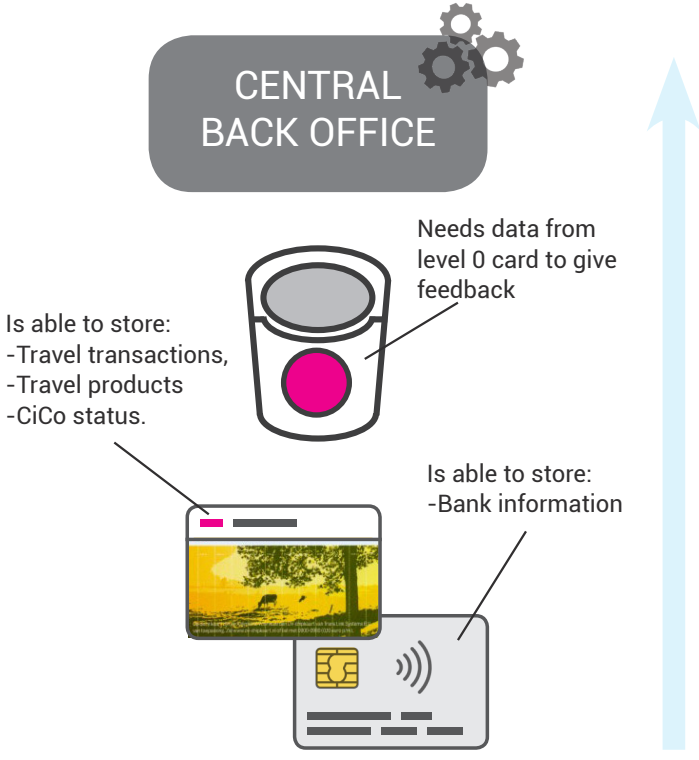



Figure 11. Service position EMV-pt

because the implementation of the account-based back office will change the landscape of public transport payment options due to the transition from smart payment equipment such as the OVCP to tokens that are not capable of storing a lot of information. This will make it more difficult to use the results from the analysis research to predict what is needed since this research has been performed in environments that use smart payment equipment. Furthermore the implementation of the account-based back office will probably need its own adoption strategy in order to make the various payment methods work together in harmony.

## 3.2 Defining User Groups

From the results of the analysis (Meeuwsen, 2015), three different types of travellers could be discovered that will use EMV-pt based on the scope defined in the previous subchapter (figure 12). These types are travellers that will use the new technology and are based on the usage scenario of the implementation of the contactless bank card without the account-based CBO. The types of travellers are as following: the emergency user (pink), the replacement user (blue) and the first time user (grey).

**Emergency User**
This type of traveller will use the contactless bank card occasionally because he/she normally uses a personal OV-chipcard with products loaded on it. The emergency user is very experienced with Dutch public transport and makes use of it several times a week. The bank card gives these travellers a back up to always be able to enter public transport. This could be the case when their OVCP is experiencing an error or when there is insufficient money on their card. Another added value for this traveller group is the fact that the bank card can be used beside the OVCP, giving the travellers more flexibility to bring someone along if they do not have an OV-chipcard. Travellers within this group are for example daily commuters that user their OVCP to go to work or students that have a government supplied travel free product.

**Replacement User**
This type of traveller will make a complete switch to the bank card for personal use. He/she is relatively experienced with public transport and normally uses an anonymous OV-chipcard or paper tickets (possibly next to their business travelcard). The bank card will make it possible for replacement users to purchase a public transport ticket without investing a lot of money in the form of transit money and card deposit. Examples of travellers within this group are infrequent travellers that only use public transport now and then, but also business card travellers that make use of an anonymous OVCP to travel in their free time.

**First Time User**
This type of travellers is inexperienced with Dutch public transport and will make use of the contactless bank card to avoid the entry barrier and the hassle of committing to the OV system. The bank card provides them with an easy way to buy the most basic ticket without having to spend time on ticket machines. Travellers within this group are for example tourists or car drivers that rarely or never use Dutch public transport.

Apart from the travelers that will make use of the contactless bank card, it is also important to remember that there is a large group of people for whom the bank card is not a favorable option. Although most of the design of the service will be created based on the viewpoint of the travellers that will use it, since the bank card will be part of public transport one cannot dismiss the opinions of the non users. This means that when

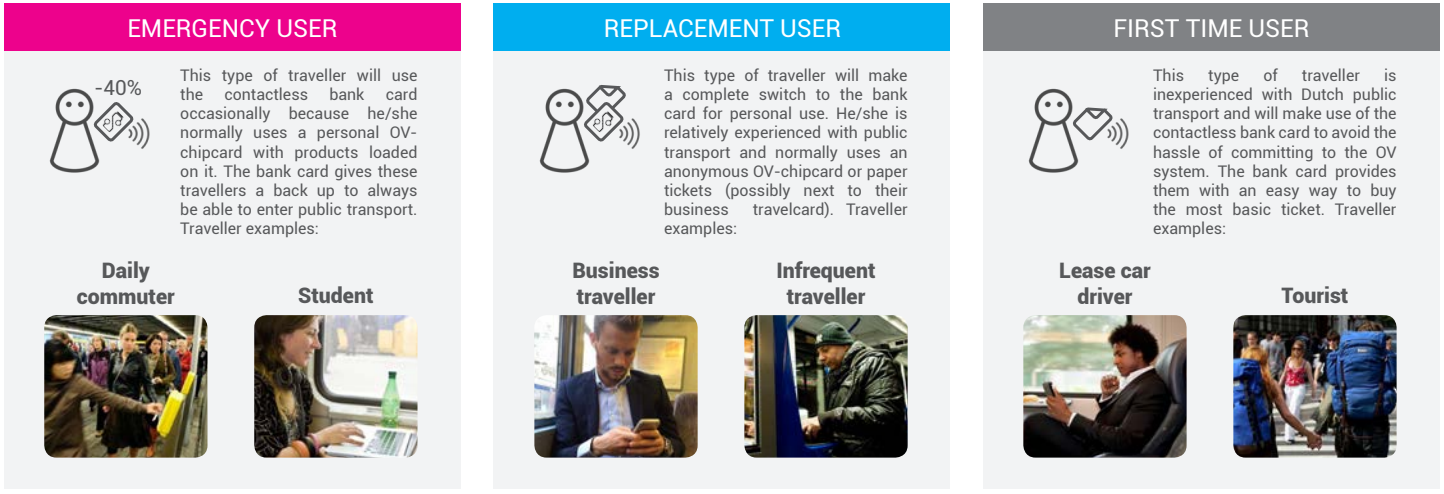



Figure 12. EMV-pt user groups

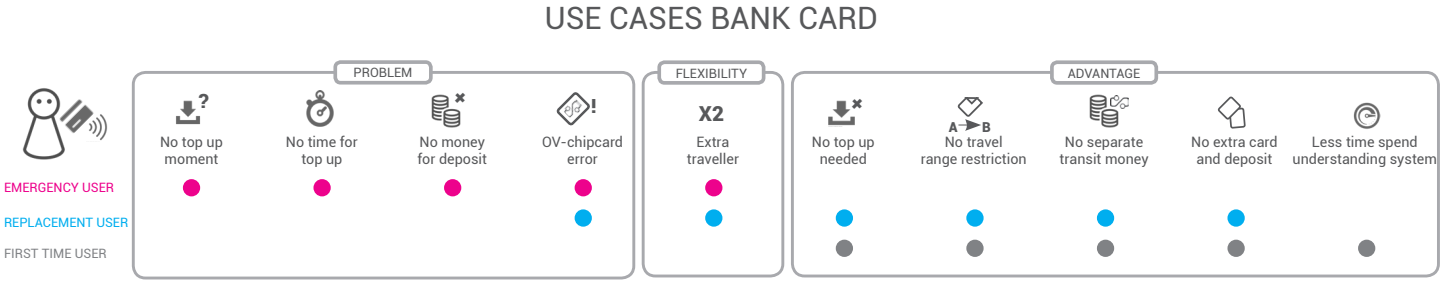



Figure 13. Motivational segmentation of user groups

designing a service concept for EMV-pt, certain demands and wishes of the group that is not going to use the bank card needs to be kept in mind.

The usage scenario for these types of travellers can be seen in figure 13. The colours indicate which use cases apply to which type of traveller. The use cases have been separated into three categories that have been defined based on the research performed in the analysis report. These categories are: problem, flexibility and advantage. The emergency category describes use cases in which the bank card will be used to deal with an unexpected situation concerning the OV-chipcard. The flexibility category consists of one use case which shows the flexible nature of the bank card to be able to easily take an extra traveller. And last the advantage category are the use cases that happen when travellers are motivated to use the bank card due to its advantages compared to other methods of payment.

## 3.3 Defining the Customer Journey

In order to see what the effect of the current working model for EMV-pt in the Netherlands will be on the different user groups, a customer journey (figure 14) has been created in order to identify opportunities for improvement for the various groups (Roscam Abbing, 2010). The customer journey also gives an overview of the various positive points EMV-pt brings, making it possible to get a better idea of the total effect the implementation will have. This journey has been created based on the current working model for EMV-pt described in the analysis report and depicts a journey where there have been made no changes to this model.

Within the customer journey itself, the goals and expectations these travellers have during travel can be seen in the top two rows followed by the touchpoints they encounter. The experiences they will have and how this affects each type of traveller can be seen in the bottom part of the customer journey. The three colours show how each traveller type is affected differently by the touchpoints and the numbers (1-5) indicate the areas of interest.

1 - As can be seen in the customer journey map, both the emergency users as well as the first time users experience a gap of information in the orientation phase of their travel. For first time users this gap is caused by their lack of experience with the Dutch public transport system, making it hard for them to find the correct information concerning EMV-pt. The emergency user is however well experienced with Dutch public transportation system but is in this case introduced to the contactless bank card in the hypothetical situation where their OV-chipcard encounters an error. He/she therefor has a limited time to absorb the needed information to travel with the bank card and as such starts out with a negative experience.

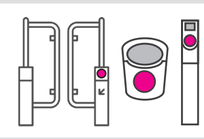
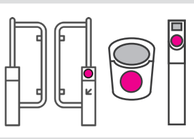
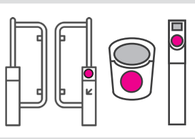
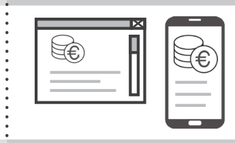
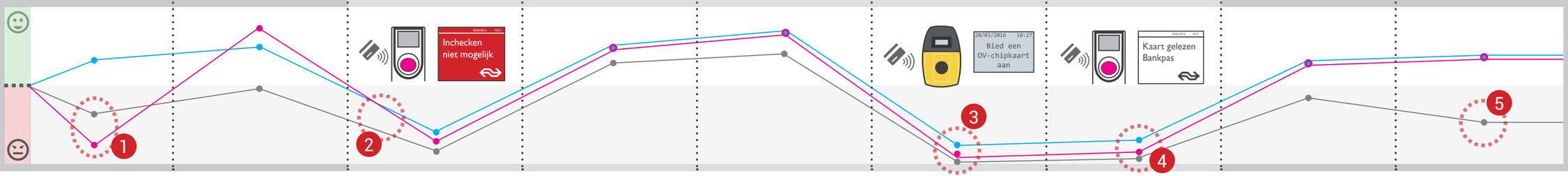
2- For all three user groups the moment of check-in is a stressful phase in which many different things can go wrong. When the contactless limit has been reached travelers could be confronted with an error screen giving them only the notification that they cannot enter the system. Because the system now also supports multiple cards, users could also be encountered with card clash in which two separate cards are scanned during travel. Apart from these errors the users also deal with previous experiences concerning the system and, as Polaine et al. state (2013), when these experiences are not met could result in feeling a lack of quality.

3 – A similar negative moment for users is the interchange phase in which travellers have to switch from one PTO to another. Apart from being subjected to the same problems as in

PRE-TRAVEL EXPERIENCE

TRAVEL EXPERIENCE

POST-TRAVEL EXPERIENCE

| | Orientation | Preparation | Check-in | Station | Travelling | Interchange | Check-out | Verification | Reflection |
|---|---|---|---|---|---|---|---|---|---|
| GOALS | Checking where it is possible to use the contactless bankcard in public transport and seeing how much it costs | Selecting a fast and easy route to the final destination | Check-in to enter public transportation vehicle | Finding the right platform, purchasing items for the journey and relax before the journey starts | Seamless travelling from A to B | Finding the platform of the connecting vehicle and getting there on time | Checking out and exiting the station or vehicle | Checking statements to see whether journey has been correctly debited. | Solving problems that occured during the journey and give feedback on experienced service |
| EXPECTATIONS | The PTOs website, sevice personal and information signs will provide me with all the information for my travel | PTO service personnel, the PTO website and the station will give me an overview of all the travel information | Since I do not have to top up my bank card, checking in will be easy and will be similar to checking in with the OV-chipcard | The station provides information on delays and basic travel information. The station has shops | The journey will be comfortable and the destination will be reached on time | Transfer. Continuing travel will be possible (check-in) | Check-out will be possible and location of check-out will be clear. Machines will give feedback about the journey and its costs | My bank statements will show me which trips have been made and will give a clear and accurate overview | It is clear where the complaint can be made and the problems can be instantly solved |
| TOUCHPOINTS |  |  |  |  |  |  |  |  |  |
| EXPERIENCE | -No information concerning contactless compatibility<br>-No information concerning costs of journey | -No information concerning travel range of contactless bank card in public transport<br>-Queuing up is not needed | -Card clash<br>-Limited CiCo feedback<br>-Denied check-in<br>-Forgetting to check-in | -Station and platform provide little travel when checked in<br>-No idea if contactless limit has been reached | -Giving bank card to train conductor can be uncomfortable<br>-Uncertainty of status bank card when using the train | -Uncertainty travel costs<br>-Denied check-in<br>-Card clash<br>-Unable to travel further<br>-Limited CiCo feedback<br>-Forgetting to check-in and out | -Uncertainty travel costs<br>-Card clash<br>-Limited CiCo feedback<br>-Exiting through wrong barrier<br>-Forgetting to check-out | -Statements arrive late<br>-Foreign bank card fees<br>-Difficult to distinguish travel statements from other statements | -Not clear which organisation has to be contacted<br>-Problem can not be solved at the moment the mistake is made |
| EMOTIONAL CURVES |  | | | | | | | | |

● = EMERGENCY USER ● = REPLACEMENT USER ● = FIRST TIME USER

Figure 14. Customer journey of EMV-pt for the three user types types

the check-in & check-out phase, travellers could now also deal with inconsistency in bank card compatibility amongst PTOs. Combined with the existing problems the current OV-chipcard system is already experiencing (e.g. forgetting to check-out, multiple PTO validators) makes it a very difficult situation for the user groups.

4 – The check-out phase is another moment in the customer journey which affects all the user groups in a negative way. For the first time user, the already existing problems combined with the limited CiCo feedback makes it hard to see whether their journey went right or not. For the emergency and replacement users this point in the journey can be very confusion due to its differences with the journey of the OV-chipcard. The limited feedback given by the validators when using the contactless bank card not only complicates their journey, but also clashes with the experiences they have of using public transport with the OVCP.

5- Having little experience with the public transportation system in the Netherlands, the reflection phase could pose a problem for the first time user group due to insufficient knowledge about the way the PTOs and their services work.

## 3.4 Conclusion

Defining the scope of this project helps to get a better grip on the service and the problems that could arise. Since the early stages of EMV-pt will have a large impact on the adoption of the service, it is important to have a strategy that can cover this part of the implementation. When looking at the moment EMV-pt is implemented without the account-based central back office, data from the research abroad can also be used to enhance the service for the Netherlands.

By examining the motivations to use the contactless bank card in public transport, user groups could be determined for whom EMV-pt has value in its early stages. The first is the emergency user who would use the contactless bank card as a backup option seeing as he/she normally uses a personal OVCP. The second user group is that of the replacement users. These users would make a complete switch from using the anonymous OV-chipcard to the bank card. The first time users are the last group and would make use of the contactless bank card to be able quickly make use of Dutch public transport.

Using these groups, customer journeys could be formed that helped in identifying the positive points and problems that will emerge should the current working model for EMV-pt stay unaltered. This showed that there are five areas of interest that need designing for in order to improve the EMV-pt experience for the user groups. The areas are mostly located at the beginning and end of one's journey and are also present the moment a travellers needs to use validators and gates. The problems discovered will help in creating ideas that can improve the EMV-pt service.

HTM tram used for a EMV-pt pilot


ONLINE REGISTRATION
CONTACTLESS STATEMENTS
REMINDER ON PAPER TICKETS
OV APPLICATION
GENERAL TICKET OPTIONS
INFO AT MACHINE

# 4

# 4 IDEA GENERATION & EVALUATION

By looking at the different user groups and the journeys they experience, areas of interest could be found that need designing for in order to make the adoption of EMV-pt in the Netherlands successful. In this chapter the ideas addressing these areas of interest are shown. These ideas have been tested with users representing the various user groups, as well as with representatives of the stakeholders. The way this test has been performed and the results it yielded are also described in this chapter.

## 4.1 Generating Touchpoint Ideas

Because the journeys of the different users show that there are various trouble areas in the total experience of their travel, solutions need to be found in order to tackle these dissatisfiers. The analysis performed abroad also showed that the acceptance of EMV-pt is influenced by several factors that can change the perceived and experienced qualities of the system. Using the areas of interest and service features found in the acceptance model, several topics could be found that needed designing for which can be seen in figure 15.

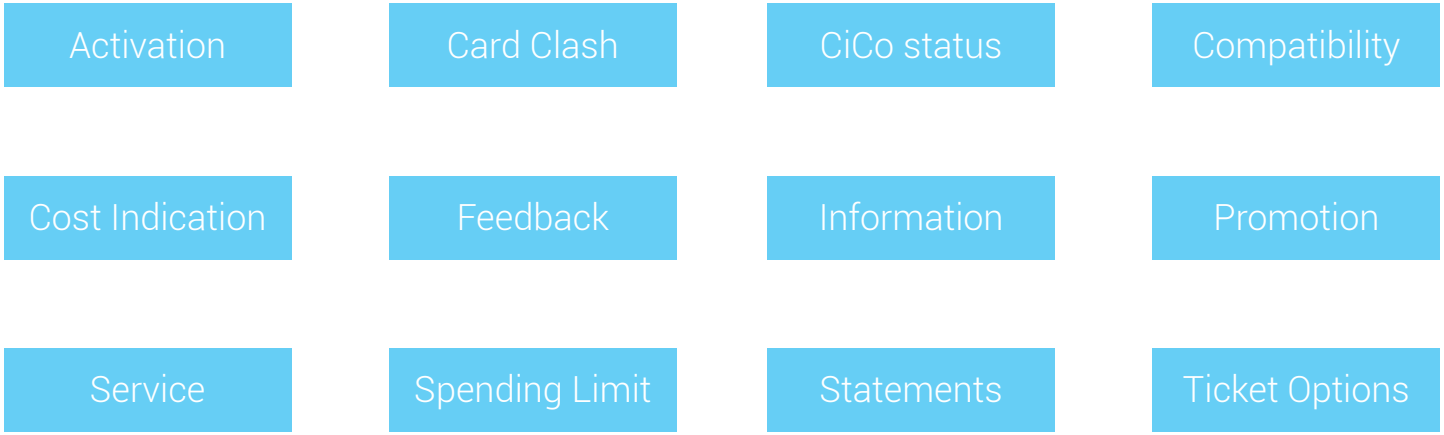



Figure 15. Idea generation topics

Using these topics various ideas were created that could potentially improve the EMV-pt service (figure 16). By brainstorming and sketching both individually as with fellow designers these ideas have been formed. The topics were used in order to make sure every dissatisfiers was tackled, but several ideas also cover multiple topics seeing as some ideas are more detailed than others. The ideas themselves consist out of a descriptive title, a picture with a potential visualisation of this idea and a small description explaining the essence of the idea.


Figure 16. Idea Generation Sketches

### 4.1.1 Idea Examples

In total 32 of these ideas have been created and visualised. The ideas themselves are relatively indefinite and should not be confused with fully worked out concepts. In the case of the idea 'Register on Validator' (figure 17), the way this can be implemented can vary a lot but the important element of the idea is the fact whether registration should take place at that moment. The ideas also served as discussion stimulator and thus some ideas stretched the boundaries of feasibility in order to see how users and stakeholders would react.

Similar to the previous idea, 'Online Registration' (figure 18) is another example of an idea within the 'activation' topic. This idea focusses on the ability to register the contactless bank card online and thus making it suitable for Dutch public transport. Whether this means that the bank card needs to be registered on the OVCP website, a bank website or a totally different website is still left unclear in order to extract this information out of users during the evaluation.

REGISTER ON VALIDATOR

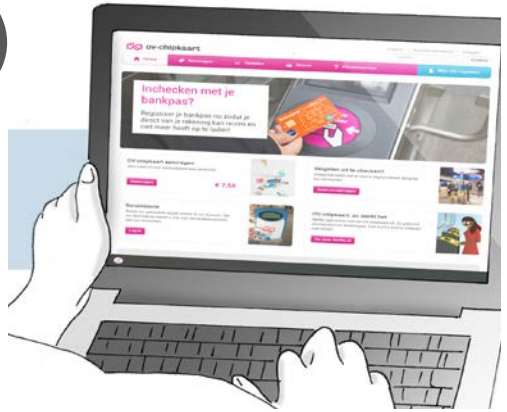
IDEA 27


The bank card can be registered with public transport by placing the card on the validator for a longer time (in order to connect to the bank). This would only have to be done once.

Figure 17. Idea Example 'Register on Validator'

ONLINE REGISTRATION

IDEA 23




Before you can use the contactless bank card, one has to first register the card online.

Figure 18. Idea Example 'Online Registration'

An example of an idea that covers two topics, 'feedback' and 'CiCo status' can be seen in figure 19. In the idea 'Check-in Push Message' bank clients are given a message when they checked in with their contactless bank card by their bank themselves. This would ensure the travellers would know whether they have checked in or not even when a validator cannot give that information. This idea helps with giving direct feedback at that moment as well as informing the user of his/her CiCo status.

In the topic 'cost indication' ideas are created that will help people with understanding how much they have to pay for a ticket in order to make a journey. The idea 'Ticket Costs' (figure 20) is an example of a touchpoint regarding the cost indication topic and would help travellers with getting a better idea how much a journey costs by showing them the prices of several frequently made journeys from their current station.

## CHECK-IN PUSH MESSAGE

IDEA 22


When checking in with your bank card, the bank sends you a push message to your phone saying you have checked in.

Figure 19. Idea Example 'Check-in Push Message'

## TICKET COSTS

IDEA 4


Sign would show the costs of some of the travels to places that are most visisted within the station to give a better indication of how much one's travel costs.

Figure 20. Idea Example 'Ticket Costs'

## 4.2 User Evaluation

Various touchpoint ideas have been created to improve the adoption of the contactless bank card in the Dutch public transportation system. In order to see how travellers react to the proposed implementation of EMV-pt, as described in chapter 5 of 'Bank card as OV-chipcard' (Meeuwsen, 2016), and to see whether these ideas match with their needs and wants, a user study was conducted.

### 4.2.1 Aim

The intention of this research was not to fully test a finalized concept with the actual users, but rather to see what is needed for users to successfully adopt the contactless bankcard in Dutch public transport. By jointly thinking about the implementation and the proposed ideas, feedback could be collected that could help shape these ideas and unite them into a complete service for EMV-pt that is tailored to the user's needs.

### 4.2.2 Research Questions

• What are the wants and needs of the participants when it comes to the use of EMV-pt?
• How do the participants react to the current working model for EMV-pt?
• Which ideas match with the wishes of the participants and which do not?
• What participant concerns or idea properties cause these ideas to (mis)match with the wishes of the participants?

### 4.2.3 Method

Qualitative research helps to understand the wants and needs of the participants and was thus used in this research. The test itself consisted out of four parts:

1) Current OV experience
2) Vision on EMV-pt
3) Opinion of current working model
4) Feedback on Ideas

For this study a group of four participants were first guided through a fictional map of a train station in order to get them to relive the experiences they have when using public transport. This part served as icebreaker to get the participants to feel more comfortable, but also served as outlet in which the participants could share the stories that were already on their mind. This part also helped in verifying the travel habits of the different user groups. In the second part the participants were asked to explain what their ideal version of the EMV-pt service in Dutch public transport would look like. After they did this they were shown how the current working model for EMV-pt and were asked to give feedback. In the final part of the test the participants were shown various card depicting the ideas. The participants rated each card (from – to +++) and explained why they gave it a certain score. The set-up can be seen in figure 21. The entire session was recorded and photographed as well as noted down.

Figure 21. User evaluation set-up

For this study 12 participants were recruited ranging in age from 27 to 58 years old (table 1). For this study the participants were separated in three groups based on their travel behaviour and their assumed use of the contactless bank card. These groups are: the emergency, the replacement and the first time user type. All participants are neutral or positive towards Dutch public transport or the implementation of a new technology because the research is focused on improving the current EMV-pt working model and the ideas through co-creation rather than just testing it. For the full research setup see appendix A.

| User Group Type | Gender | Age | Primary Transport | Frequency of use public transport |
|---|---|---|---|---|
| Emergency 1 | Male | 27 | Train, bus, tram | Daily |
| Emergency 2 | Male | 50 | Train | 4 times per week |
| Emergency 3 | Female | 38 | Train | 4 times per week |
| Emergency 4 | Female | 58 | Train | 3/4 times per week |
| Replacement 1 | Male | 57 | Bus, bicycle | 2/3 times per week |
| Replacement 2 | Male | 42 | Car | 2 times per week |
| Replacement 3 | Female | 55 | Car, Train | 2 times per month |
| Replacement 4 | Female | 35 | Motorcycle, bus | Once per week |
| First Time 1 | Male | 55 | Car | 2/3 times per year |
| First Time 2 | Male | 47 | Car | 6 times per year |
| First Time 3 | Female | 41 | Car | 3 times per year |
| First Time 4 | Female | 58 | Car | Never |

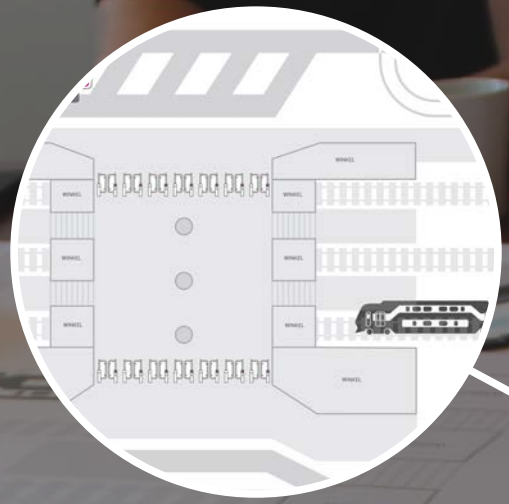
Table 1. List of participants for first user evaluation

### 4.2.4 Stimuli

Multiple images were used to help participants in envisioning their journey and to help them to imagine a world where the contactless bank card could be used in public transport (figure 22). A paper A0 map of a fictional station was used to guide the participants through all the stages of the journey in order to see what their experience was in each stage. The map also acted as scribbling-pad to make sure the participants were able to also write down ideas or suggestions that they had during the session. In the third part of the test, in which the participants were asked about the current working model for EMV-pt, pictures of scenarios were used. These pictures displayed public transport equipment with corresponding display messages, should the working model be implemented as it is right now. For the final part of the test stimuli was used to present various ideas. The ideas that were created were converted into a set of cards stating the name of the idea and a small description. The back of the cards could be used for writing down their feedback on the idea. A larger illustration of the A0 map and the complete set of cards can be found in appendix B and C.

### 4.2.5 Results

The results for this evaluation session are separated for the different phases of the study. For the results of the first phase the experiences of the participants with the current Dutch public transportation system are shown. In the results of the second phase the way the participants see their ideal version of EMV-pt is described and in the results of the third phase their reaction to the current working model for EMV-pt in the Netherlands. The results of the idea evaluation show how the participants rated the ideas and in what way the ideas and their properties match with the wishes of the participants.



Map of a fictional train station to guide participants through each step of their public transport journey. Also useful as scribbling-pad.


Cards depicting various ideas. The front side of the card shows the title of the idea, a description and a potential visualisation of the idea. The backside provides the participants with room for comments.


Pictures visualising the implementation of the current working model for EMV-pt in the Netherlands and the effect it has on the Dutch public transportation system.

Figure 22. User evaluation set-up

**Current OV experience**

When looking at the current experiences the various groups have with Dutch public transport, many differences can be found in the user groups although all groups indicated that they have trouble with the overcrowded and delayed trains. The emergency group stated that they find it irritating when people are not quiet within the silence compartments or when fellow travellers display asocial behaviour. The group also expressed that they are annoyed by the lack of information that is given to them when problems occur and public transport does not operate as it normally does. They also said that they find it troublesome that there is a delay in the travel information that is displayed on websites and applications, especially when they are not sure whether the CiCo went correctly.

"You have 6 hours to make sure you're checked out, so it would be nice if I could quickly see if everything went right or not."

-Male, age 50, Participant Emergency User Group-

For the replacement user group one of the things they described as nuisance when using public transport was the deposit amount one has to pay when using the OVCP. The group explained that they think the deposit is both high and that is also causes the OVCP to be full of transit money that they cannot access. Next to the deposit, other aspects that the group specified as being troublesome were the travel costs that could vary for the same journey and the problem of forgetting to check out. The group also stated that they often forget the amount of credit they still have left on their OV-chipcard. One replacement user participant also stated that she does not like the fact that the OVCP is only suitable for one traveller and does not allow her to take a friend along.

"I have to put a lot of money on the card although I am probably not going to use the card for 2 or 3 months. And I don't feel like doing that, so in the end I buy an e-ticket."

–Female, age 55, Participant Replacement User Group-

"The OV-chipcard is also not very social. When a friend is with me and we decide to take the bus, I cannot just take her along using my OV-chipcard."

–Female, age 35, Participant Replacement User Group-

Results of the session with the first time users show that a lot of the participants still have trouble with checking in and out while changing from one transport operator to another. Adding to this problem, the group also specified that they would like to see more validator gates as this forces them to check in or out. The group also explains that they often have trouble finding their OVCP because they do not use it that often. Many of the first time users also find the actions one has to perform in order to use the OVCP difficult and not always clear. They say this is also the case when one has to claim money. The first time users also noted that they think the addition of the silence compartments is a nice improvement to public transport and

that they are also happy with the information screens in the vehicles. Because the participants in the first time user group do not make use of the OVCP that often, the group expressed feeling a bit stressed throughout their journey because they have to constantly remember to not forget to check out. Many participants of this group also indicated that they do not like it when a station does not have an information booth to help them in case of an emergency.

"I am very happy the paper ticket machine is still there and that you don't have to invest time in figuring out how the OV-chipcard works. Especially if you're only travelling a few times per year."

–Female, age 41, Participant First Time User Group-

**Vision on EMV-pt**

When asking the groups how think EMV-pt would work in the Netherlands and what would be ideal, all of the participants stated that they would like the contactless bank card to work similar to the OV-chipcard. Both the replacement users as well as the first time users also explained that they would like to see a more waterproof system when it comes to checking in and out, especially when they are going to use their bank card. The placement of validator gates was often mentioned by the participants along with this comment. All participants groups also stated they think there will be a lot of privacy issues and are worried that EMV-pt will mean companies are better able to track where they are going and what they are doing. Next to fear of privacy loss, in every group participants indicated that they would also feel a little unsafe using the bank card in public transport when it is very crowded due to the threat of being robbed.

"I really like to use the contactless bank card, but I deactivated it anyway. It is just too easy for someone to stand next to me with one of those devices in their pocket, especially in public transport."

-Female, age 38, Participant Emergency User Group-

The emergency user group participants thought the bank card would be a real nice alternative for tourists in order to bypass the complexity of the OVCP. Several participants of this group also explained that they think the bank card will just contain an OV-chip and will therefor be able to do the same as the OV-chipcard. However if it did work like this, the participants said it would have little value to them compared the automatic top up function that is currently available for the OVCP. This group also noted that they think it is going to be hard to combine the contactless bank card with travel products that are now stored on one's OVCP. It was also noted by the group that they would like it if the bank card can also be used even though there is no money one's bank account. Two participants also declared that they would be a little scared of putting everything on one card as it would make losing the bank card all the more of a problem.

"I have to admit that I do feel that the more I connect to one thing, the more I will lose when I lose the card."

-Female, age 38, Participant Emergency User Group-

Looking at the replacement user group shows that they would like to have more flexibility when using the bank card. It was declared by the participants of this group that they would like the bank card to be able to serve as ticket for multiple people making it easier for friends to travel together. Because the bank card would result in less cards in one's wallet, the group also saw potential in an easy way of getting in and out with enhanced scanners detecting your contactless bank card without having to use the card. The group also said that the more the bank card will be used contactless, the bigger the risk will be of people forgetting their PIN. Many of the participants in the replacement user group also would find it convenient if an application was going to be connected to the bank card in order to keep track of their journey and the things that they are doing with the card. It was also stated by the group that they would like to use contactless on their smartphone, but they do explain that the think that making mobile contactless payments could be more risky than using the contactless bank card.

"If I would use the bank card, I would only have one card in my pocket. Now I have like three cards so if I use my wallet with one of those gates it scans them all. But when I will only use the bank card and the scanners would be upgraded in such a way that when I get out they immediately make sure I am checked out, I don't have to do a thing."

-Male, age 42, Participant Replacement User Group-

The first time user group participants stated that they see the contactless bank card as an easy and simple way of paying for Dutch public transport. However the group also explained that they would like to have control over their card by supplying it with a separate compartment for public transport expenses. The group also declared they want to be able to turn EMV-pt on and off themselves. Much like the replacement user participants, this group also specified that they would like to see an application connected to the contactless bank card in order to provide extra information.

"The big advantage that I see now is that your are taking away all the hurdles. No longer do you have to buy a ticket or print something out. It can be really convenient."

-Female, age 41, Participant First Time User Group-

**Opinion of current working model**

When looking at the current working model for EMV-pt, there are some problems that most participants had the same opinion about. Almost all the participants said that using a deposit with contactless bank card transactions, similar to the OVCP deposit, would be cumbersome and some participants state that this would be a reason for them to switch to paper tickets. The participants also declared that they think it is unacceptable if the validators are not capable of showing CiCo information and are unable to give travellers information about their journey price. When it comes to the statements shown on one's bank account, all participants indicated that they want to be able to see what they have spend, but that a complete overview does not have to be visible on the bank statement itself.

User Evaluation Session

"It would be like if you would sit at a terrace and the waiter would come up and ask for your bank card. You would settle the bill but you would have no idea what you've paid for your drinks."

-Female, age 38, Participant Emergency User Group-

For the emergency user group the fact that the implementation of EMV-pt would not be nationwide the day it is released is something they can understand, but the group indicated that they would only accept the implementation if it is per PTO instead of per region. However the group also noted that they would not use the bank card during this period seeing as this would require them to bring two cards in order to travel. When it comes to problems that arise while using the contactless bank card in public transport, the group explained they would most likely first go to the transport operator with whom they are travelling before contacting the bank.

"It is already unclear right now, so if I would just see 'bank card has been read' then I would have no idea what is happening."

-Male, age 27, Participant Emergency User Group-

The replacement user group participants explained they would like to be able to set their own limit and have control over how much they can spend using their contactless bank card. When it comes to the reduced travel range during the implementation the group said they would be willing to use it as long as the nationwide implementation does not take too long. The group did declare that until that time they would probably mostly make use of the OVCP. The participants of this group also specified that they would go to a PTO when they have a problem with EMV-pt, but expect the banks to also be able to handle the problem.

"I would go to the transport operators when I have a problem, but I do think they should have some sort of direct connection with various banks."

-Male, age 42, Participant Replacement User Group-

For the first time user group, some participants did explain that they would be able to accept the deposit if it was possible to make a separate OV compartment within the bank card. When looking at the contactless spending limit the group stated that they would like to have this limit and are willing perform an extra action in order to lift the spending block. The first time user participants also indicated that they do not like it when EMV-pt is not implemented nationwide immediately but said they would get used to it. However they did note that they hate it that there are so many differences in all the public transport operators while they only just want to use one thing. When looking at potential problems that could occur and the party they would approach, the group stated that they would contact the bank.

"Being able to spend up until 50 euros is fine, but if you want to travel some more using the contactless bank card, then you just have to go somewhere and give permission."

-Male, age 47, Participant First Time User Group-

**Evaluation of Ideas**

The test showed that there are quite some similarities between the user groups, the view they have on EMV-pt and the ideas that they like. All of the groups for example stated that they did not want the bank card to be forced upon them by the PTOs and banks. Ideas concerning the active promotion of the bank card, like the handing out of information cards, were described as unwanted. The groups also stated that providing regular paper tickets with the notification that the bank card can be used to save money, feels like they are being cheated and they think the message is displayed too late seeing as the money has already been spend. Special services connected to the bank card are accepted as long as the service could only be implemented on the bank card and not on other carriers (e.g. OV-miles just for people travelling with the bank card). It was also explained by the participants that just having a card less in their wallet is not enough for them to completely switch to the bank card.

One recurring aspect that the groups liked in the ideas was the feeling of being in control. Idea cards giving features of improving the feeling of being in charge were often rated high. Even though the user groups have a different viewpoint on the amount of control they want to have, all the groups stated that they want to be able to (de)activate EMV-pt for their bank card and want to have control in the contactless spending limit used for EMV-pt.

"Just like you can turn world coverage on or off, I would like to turn OV coverage on or off." [Concerning the (de)activation of EMV-pt]

–Male, age 55, Participant First Time User Group-

The groups also declared that they do not want to see every travel made with a PTO appear on a separate statement, but want a combined statement for all their travels they made in one day. They did however express that there should be a possibility to see more detailed information about their journey. Whether this detailed information is provided through a link or displayed within the statements did not matter to the groups, as long as there is an easy way of obtaining a travel overview.

"I think it is okay if they just show one total amount, as long as there is an overview next to it."
[Concerning the statements when using the bank card in public transport]

–Male, age 27, Participant Emergency User Group-

All the groups were also in favour of an application being connected to the bank card to provide more information, but at the same time also revealed that they would not like to have many more different applications on their phone. It was also stated by the groups that the application could help with giving personal advice about one's journey and inform them of the

costs of a journey. When it comes to problems and finding the right service company for help, almost all participants indicated that they would first go to the PTO with which they travelled and would then look for help at their bank. However the participants did declare that they would turn to their bank when something happens to their bank card itself.

Apart from the similarities the user groups have, there were also a lot of aspects on which they had a different opinion. For the emergency user group the service would be suitable when it does not provide too much information since they are already very used to Dutch public transport. They also stated that they would use the bank card, but only in emergency situations due to fear of damaging or losing the card when used too much. For this group the bank card would become a more useful carrier according to them when it has more options and products just like the personal OVCP and when they have a lot control over the way it works.

The replacement user group expressed that they want EMV-pt to be simple and easy. Just like the emergency group they do not want too much information to be displayed, but the reason they want this is connected to the fact that they want it to be straightforward and uncomplicated and feel that an overload of information goes against this principle.

"I would like it if you can see it at the stations, because then I can also decide if I will travel with my OV-chipcard or if I will use the bank card." [Concerning showing the ticket options per operator]

–Female, age 35, Participant Replacement User Group-

The group also stated that they would like to have a better overview of the various travel products they can use in public transport.

The group of first time users showed that they would like to have more information available to them and liked the ideas that made this possible. Since they have little experience with public transport, they have the feeling insufficient information is provided to them to be able to correctly use the OV. This group also exclaimed that they had trouble identifying how much a journey would costs since it you only see it at the end of your journey. They also pointed out that they miss consistency within public transport and the way it works and that they experience a lack of feedback from the validators. This group also indicated that EMV-pt should be basic and comparable to the OVCP in terms of travel range and working principle.

"In the past you would just buy a ticket and settle the bill, but now you just do 'bleep'. So basically you don't know what you are paying and what they take off your account."

–Male, age 47, Participant First Time User group-

An overview of the way the various groups rated the ideas can be seen in table 2. In this table the ideas are shown together with the rating of the various user groups. The dots represent the likability of an idea, while an empty field means the idea is disliked by the group. An overview of all the results can be found in appendix D.

●●● = High like ● = Low like

●● = Medium like ○ = Dislike

| Design Idea | Emergency User | Replacement User | First Time User |
|---|---|---|---|
| 1. Compatibility Logo | ●●● | ●●● | |
| 2. Ticket Options PTO | | ●●● | |
| 3. Contactless Statements | ●●● | | ●●● |
| 4. Ticket Costs | | | ●●● |
| 5. Ticket Options General | | ●●● | |
| 6. OV-Miles | ●●● | | |
| 7. ATM Information | | | |
| 8. App Displays Limit | ●●● | ● | ●●● |
| 9. Information Pole | | ●●● | ●●● |
| 10. Activating EMV-pt | ●●● | ●●● | ●●● |
| 11. Variable Limit | ●●● | ●●● | ●●● |
| 12. Information Folder | ●●● | ●● | ●●● |
| 13. Vehicle Information | | | ● |
| 14. Info at Ticket Machine | ●●● | | ●●● |
| 15. Bank Card Case | ●●● | ● | |
| 16. OV Application | ●●● | ●●● | ●●● |
| 17. Combined Statements | ●●● | ●● | |
| 18. Separated Statements | | | |
| 19. Help Number Card | ●● | | |
| 20. No Contactless Limit | | | |
| 21. Compatibility Screens | | ● | |
| 22. Push Message | | | ●●● |
| 23. Online Registration | ●●● | ●●● | ●●● |
| 24. Error Guidance | ●●● | ●●● | ●●● |
| 25. Information Cards | | | ● |
| 26. Screen Information | ●●● | ●● | ● |
| 27. Register on Validator | | ● | |
| 28. Reminder on Ticket | ● | ●● | ● |
| 29. Weekly Capping | ●●● | ●● | ●●● |
| 30. Fingerprint Verification | | | |
| 31. Info from the Start | ●●● | | |
| 32. Register at Ticketmachine | ●● | ● | ● |

Table 2. Rating of the design ideas by the three user groups

### 4.2.6 Conclusion & Discussion

The evaluation sessions with the various user groups showed that there are several points on which the groups have common ground. When it comes to their travel behavior now, all the participants indicated that they have trouble with crowded and delayed trains. For the vision on EMV-pt, the groups stated that they would like EMV-pt to work similar to the OVCP and would feel saver if the current public transport system would be made more user friendly by implementing gates everywhere. The participants also expressed their concerns for EMV-pt seeing as the data could be exchanged between public transport operators and the banks causing them to feel a loss of privacy. When looking at the current model for EMV-pt the participants displayed a disliking for both the deposit as well as the lack of check in and check out feedback supplied by he validators. The groups showed a strong liking for ideas giving them more control over the way EMV-pt works. All the groups also expressed a disliking for combined EMV-pt statements on their bank account and would not like it if EMV-pt is forced upon while it is being promoted. The user groups are also in favour of an application connected to EMV-pt, though most participants indicated that they make little use of applications now except for planning their journey. When dealing with a problem, the groups stated that they first would go to a PTO instead of the bank, unless something is wrong with their bank card.

The sessions also displayed that there are many different viewpoints involved for EMV-pt. The user tests showed that even though EMV-pt can have value for many people, the way the different types of travellers want to see the service can vary a lot. When looking at their current travel behavior, the emergency group participants described many problems concerning the lack of and delay in information provision by PTOs. For the replacement users the biggest complaints are

pointed at the deposit one has to pay and the varying travel costs. The first timer users expressed still having trouble with checking in and out and switching from one PTO to another. For this group the steps one has to take to use the OVCP is also described as confusing. Looking at various groups and their vision on EMV-pt showed that the emergency users would like to see a bank card that can contain discount products otherwise they would see little value in using it. The group does see a lot of potential for EMV-pt as it can help tourists use Dutch public transport more easily. For the replacement users EMV-pt could become a way to be more flexible while travelling, making it possible to serve as payment option for multiple travellers. This group would also like to see EMV-pt connected to an application to make it possible to track one's journey. The first time users described their ideal version of EMV-pt as an easy and quick way of paying for public transport. When it comes to the current working model and the concerns of the groups, the emergency user participants stated they would like to see the implementation per PTO instead of per region but until it is nationwide would not use the bank card. Both the replacement as well as the first time users were concerned with the lack of control in the current model. Looking at the ideas the emergency user group explained they like the ideas that give them more control and provides them with more options. Ideas that were disliked by this group were often in the form of touchpoints giving extra information, seeing as the group is already very knowledgeable about Dutch public transport. The ideas that were rated best by the replacement users were connected to making EMV-pt simple and uncomplicated. For the first time users the ideas that were rated best were the ones that provided the traveller with more information concerning the working principle of both EMV-pt as well as the Dutch public transport system as a whole.

The differences in these user types need to be taken into account when designing the service in order to create an EMV-pt service in the Netherlands that is acceptable for all potential users. At the same time the similarities the user groups have can help create a foundation for the service and the values that should be connected to it.

**Limitations**

Even though the user evaluations gave precious insights in the want and needs of the various user groups concerning EMV-pt, there are some limitations to the evaluation session that might have influenced the results. Because the user evaluations session took place with three groups, personal revelations might not see the light of day when a participant feels uncomfortable sharing experiences in the user group. A second disadvantage of using a group instead of individuals is that fact that some outspoken participants could have dominated parts of the discussion causing other participants to feel less inclined to voice their opinion. Another downside when using groups for evaluation session is that individuals do not express their own definitive individual view but are speaking in a specific context within a specific culture, making it difficult to clearly identify an individual message as stated by Gibbs (1997).

The focus of this evaluation session was also to further develop the proposed ideas and to see what is needed for users to successfully adopt EMV-pt. For this reason participants were recruited with a neutral or positive stance towards Dutch public transport and as such cannot truly represent their corresponding user group. However the participants do give an indication of what is needed and could help with generating targeted questions for future research (Mack, 2016).


ERROR GUIDANCE
NO CONTACTLESS LIMIT
ACTIVATING EMV-PT
INFO FROM THE START
REGISTER AT TICKET MACHINE
SEPARATED STATEMENTS
When using the bank card in public transport, each journey is displayed as separate statement on your bank statements list.
Before the contactless bank card can be used with public transport, the user must register the card at a ticket vending machine at the station.

Idea cards

## 4.3 Stakeholder Evaluation

To see whether the created ideas are viable in terms of business and also technologically feasible, a test was conducted with stakeholders to gather this information. This test also served to see what the wants and needs of the different stakeholders are in order to be able to take them into account when designing the EMV-pt service concept.

### 4.3.1 Aim

The aim of this research is to verify the feasibility and viability of the created ideas and to see how they connect to the wants and needs of the stakeholders.

### 4.3.2 Research Questions

• Which ideas are feasible according to the stakeholders and why (not)?
• Which ideas match with the wishes of the stakeholders and which do not?
• What stakeholder concerns or idea properties cause these ideas to (mis)match with the wishes of the stakeholders?

### 4.3.3 Method

For this test various representatives of both the banks as well as the transport operators were interviewed. Using a set of idea cards that were also used in the user feedback sessions, the participants were asked to explain what they liked and did not like about the ideas from their company's perspective. They were then asked if it would be possible to implement the idea and what the consequences would be when doing so. Both the opinion of the company as well as the possibility of implementation were noted down on the backside of the cards. In this test representatives of Translink, NS, RET, HTM, ABN AMRO and ING were asked for feedback. During the session notes were taken.

### 4.3.4 Results

The banks indicated they want to keep a neutral stance towards EMV-pt and would not like to push their customers too much into using it. Similar to how they deal with other companies, the banks do not want to influence the way their customers spend money and on which companies. Although they acknowledge the fact that adding the feature of using the bank card in public transport is something special, they would like to keep a neutral position in this process (their distance as much as possible). The focus of the banks is more on showing to their customers that they can use this new feature, and thus increasing the value of the bank card, instead of taking the lead in actively promoting and informing them. However some banks explicitly indicate that supporting their customers is needed and, as long as it does not interfere with their products (e.g. making separate changes in their application for public transport), is something they would like to do. This non interference policy also counts for ideas concerning the contactless spending limit and the activation of EMV-pt. Although such options would be feasible, it can not be directly connected to public transport as this would steer their customers in using their bank card in a certain way. In the case of ABN AMRO, who offer their customers to activate and de-activate the contactless feature, it would also be hard to connect the (de)activation of the contactless bank card to public transport, since the company does not provide the option to switch the contactless feature on or off.

For the PTOs and Translink it is a different story and they would like to take the lead in promoting the contactless bank card as carrier. Important aspects for the PTOs are the amount of information they provide to travellers and location information.

All PTOs state that they want to avoid giving information about the way EMV-pt works in their vehicles to maintain a calm atmosphere. However they are willing to provide information on the onboard screens, especially before and during implementation. In general the PTOs want to avoid information overload around the stations and vehicles and would like to steer the travellers using the bank card to a website or application for information. When it comes to pushing customers to use the bank card the opinions of the transit companies also differ. For the city and regional transport operators an important source of income is the paper tickets they sell and the margin that is on those tickets. Although these operators want to improve their service by adding the bank card, a switch to EMV-pt will mean that the revenue from the contactless ticket, the paper version of the OVCP, would reduce whilst the cost of operations is not necessarily reduced. This calls for careful balancing the cost of various channels and how this fits in the overall business model. Translink expressed that they want to guide people into using the bank card, in such a way that this does not affect the OVCP in a negative way, making sure travelers can choose the payment option of their choice. In terms of the contactless spending limit, the city and regional transport operators are more or less indifferent seeing as their travellers would probably never reach this limit. The NS however states that the limit is a problem for them and would make travelling more difficult, seeing as their tickets could more easily reach this limit. All the PTOs do understand that the removal of a limit could increase the sense of insecurity among the travellers, however they state that this removal does make travelling less complicated and is thus favourable. Concerning the activation of EMV-pt, the PTOs state that they want the travellers to able to use public transport by default in order to keep the easy access nature of the bank card. When it comes to giving CiCo feedback, all the parties agree that it is necessary to give the travellers the information they need. However for NS the costs of implementing a network of connecting level 1 equipment can be very expensive and thus the NS would like to look at an alternative to solve this problem.

> "We are not going to force people into using the bank card in a certain way, much like we would not tell people to for example go shop at the Albert Heijn. The bank stays neutral."
>
> -A Representative of one of the Banks-

> "We do have a margin on our tickets, but you can always promote it (concerning the 'reminder on paper tickets' idea)."
>
> -A Representative of one of the Local Transport Operators-

### 4.3.5 Conclusion & Discussion

Feedback sessions with the stakeholders showed that there are still some different mindsets concerning the way the EMV-pt service should work and what are important aspects to deal with. Especially the NS deals with a lot of different problems which are almost non existent for the local operators. The test also displayed the different mindset between the banks and the PTOs when it comes to taking the lead in promoting the new technology and the way it is connected to the companies. The

banks also deals with the complex situation of wanting to be sort of impartial towards EMV-pt for their customers in order to not influence their spending behavior. Apart from the way the stakeholders want the EMV-pt service to be, they also deal with various technical difficulties making the implementation of several ideas either very expensive or very complex.

**Limitations**

The stakeholder evaluation has been performed with several PTOs and banks that are directly connected to the project. However when EMV-pt will be implemented, many more parties will be involved that all have their own concerns and wishes for EMV-pt. In order to accurately know what each party would want for EMV-pt, extra research would need to be performed. The representatives of the companies also had the tendency to switch between discussing the ideas from a user's perspective and from their company's perspective due to the fact that the representatives where often responsible for customer satisfaction within their company.

## 4.4 Conclusion

Based on the problem areas found in the customer journey and the factors of the EMV-pt acceptance model, several topics were defined for which ideas have been generated. These ideas have been evaluated with both users and stakeholders in order to see whether the ideas are both desirable as well as feasible and viable. The evaluation sessions with the user groups showed that the participants want a lot of control when using their contactless bank card in public transport and are concerned about their privacy. The participants also indicated they would go to the PTOs for help and support and said that they would not like it if the bank card is forced upon them. Although the session with the user groups showed that the groups have similar interests, the way the groups want EMV-pt to be implemented can vary greatly. Where the replacement and first time users expressed a liking for the contactless bank card being an easy way to use public transport, the emergency user group would only find the contactless bank card interesting when it is able to contain the same products their personal OV-chipcards have right now. The type of information the different user groups wanted is also dissimilar seeing as the groups have different amount of experience with public transport. In order to create a service for the contactless bank card in Dutch public transport that is acceptable for all of the user groups, they differences and similarities need to be taken into account when designing. The stakeholder evaluation sessions also showed that the various parties involved still have some different opinions about the way EMV-pt should be implemented and what aspects are important to deal with. It also became apparent that the public transport companies and the banks have a dissimilar mindset concerning their involvement in the EMV-pt service.

When looking at both sessions and the expressed opinions, various similarities can be found. Both the participants as well as the stakeholders were in favour of connecting an application to EMV-p in order to support the contactless bank card. For the participants this application was seen as a way of providing them with more information of the journeys that they have made with their bank card. However the participants also stated that rarely use applications connected to public transport except when planning a journey. For the stakeholders the application is seen as a good platform to provide the travellers with information about EMV-pt and could serve as a tool to supply travellers with more feedback while they are travelling. Ideas concerning the supply of information were also appreciated by both the participants as well as the stakeholders, were both mostly agreed that supplying a lot of information both on

stations as well as in vehicles concerning the working principle of EMV-pt is important. The evaluation sessions also showed that there are quite some issues on which the stakeholders and participants differ. Where the user groups for example expressed a strong liking for added control and security, the stakeholders would like to remove features that give these feelings in order to make the EMV-pt service more apprehensible. The same goes for the feedback given by validators, as this is seen by the participants as something essential in order to correctly use public transport. However the added costs of connecting validators in order to supply this information is seen by the stakeholders as too expensive, although they understand the need of the users. Many participants also indicated that they would like to see more EMV-pt related features on the bank website or application, however the banks state they want to keep a neutral position towards EMV-pt and would rather not make specific changes in their services just for EMV-pt. In order to make the adoption of EMV-pt successful something must be done to satisfy the wants and needs of all these parties, without making the service unacceptable for any of them.


# 5

# 5 CONCEPT DEVELOPMENT & EVALUATION

Using the results of the user and stakeholder evaluation of the touchpoint ideas, a service design concept could be created for EMV-pt in the Netherlands. This service design focusses on the implementation of EMV-pt up until the moment an account-based back office is created to support the contactless bank card. This service and its touchpoint concepts have been tested with users to see whether they matched with their wants and needs and to see how the usability of the system is perceived. In this chapter the service concept for EMV-pt is described as well as the user evaluation that has been performed to test this concept. The results of the user evaluation can be found at the end of the chapter.

## 5.1 Service Concept for EMV-pt

The service concept consists out of various touchpoint concepts that work together in different phases of the traveller's journey. The focus of this service is to provide travellers with an easy way in using their contactless bank card and would give people that are less used to public transport or that have limited time, a simple way to quickly make use of Dutch public transport. The service therefor concentrates on being uncomplicated to use without to many add-ons (e.g. applications) required to make it work. Because a big part of the user groups consists out of travellers that do not frequently make use of public transport, commitment to a PTO is avoided as much as possible to make sure travellers do not first have to spend a lot of time activating EMV-pt and connecting themselves to a service that they might not use that often. The service itself is mostly presented by the PTOs and Translink whereas the banks act in the background showing their support and providing information and help where possible. Much like the OVCP, the contactless bank card as payment method is presented as a solution by all the public transport companies and thus the working principle, the information that is given and the promotion are consistent across the various PTOs. However because the bank card is not actually an OVCP, the service design is also created in such a way that both travellers and service personnel will be aware of the differences. Because the bank card is a personal and valuable item in the eyes of most travellers, transparency and sensitivity are other important aspects of the design which are implemented in both the way the system interacts with the user as well as the way information is given.

### 5.1.1 EMV-pt Touchpoints Concepts

The touchpoints within the service are created with the three user group types in mind and as such the touchpoints these users encounter can vary due to the differences in their journey as can be seen in figure 23. These journeys, which only show one of the many potential user scenarios, show a scenario in which the user would most likely be confronted with EMV-pt and is based on the customer journey of the user groups as described in chapter 3.3. Although all the touchpoints can be used by travellers and many are encountered by all the user groups during their journey, there are still some differences in the journey of the various user groups. For the emergency user this would mean a journey in which they would start out without the bank card, but due to unforeseen circumstances are unable to continue travelling using their OVCP. The bank card in their journey comes as a back up option and can help them to be able to still immediately make use of public transport. The touchpoints within the service of these users are most likely visible to them when this disturbance in their journey occurs

and as such these users will first notice the possibility of using the contactless bank card at stations or stops. During travelling this user will try to use the bank card like they would use the OVCP. At the end of his/her travel, the emergency user looks back on the journey that has been made on the public transport website in order to see what has been spend in order to verify the journey or to claim back money. For the replacement user EMV-pt will come more announced giving them the time to make the switch from their anonymous OVCP to the contactless bank card. The first touch point this user encounters is at home when they receive a letter from their banks telling them they can use their contactless bank card in public transport. Using the information provided by the letter this user will look up all the necessary information concerning the bank card online before they start using EMV-pt. Being somewhat used to public transport and the way it works, this travellers will use the contactless bank card like they would use the OVCP. People of the first time user group first encounter the contactless

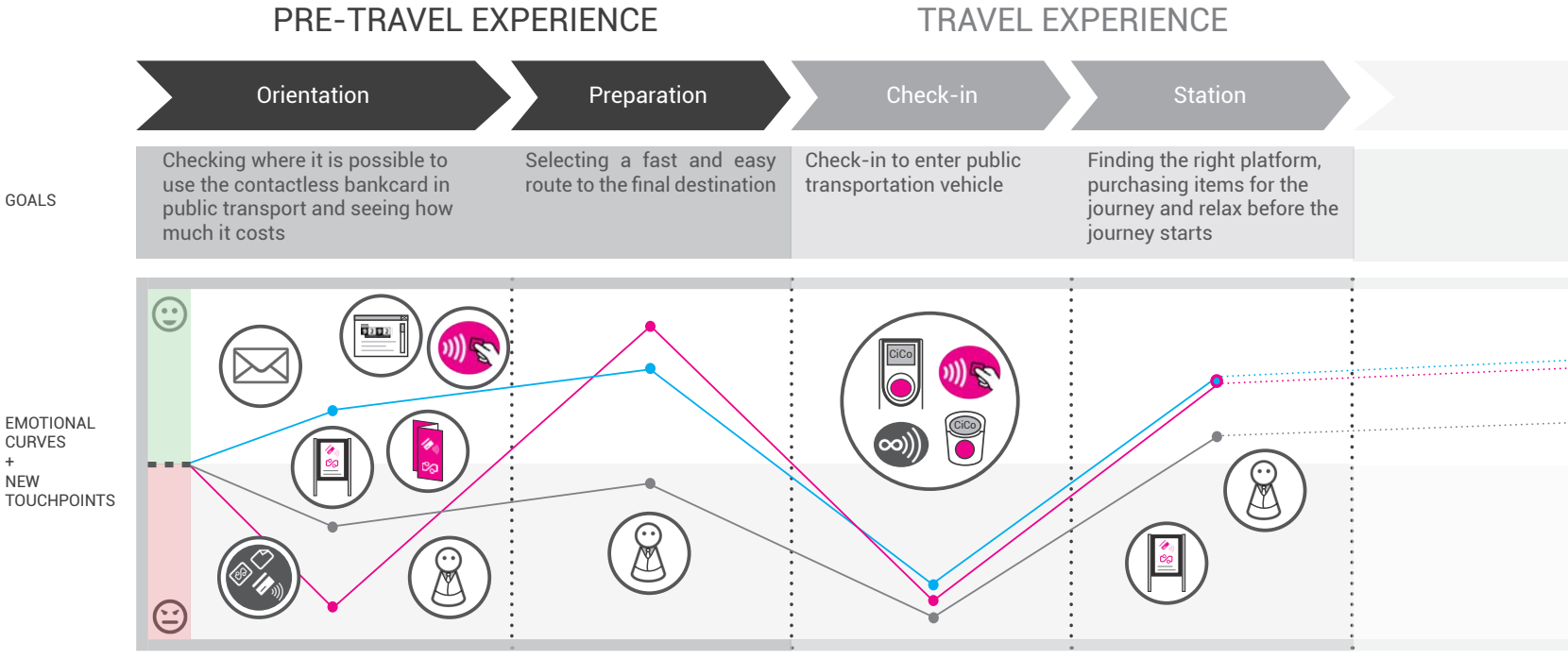
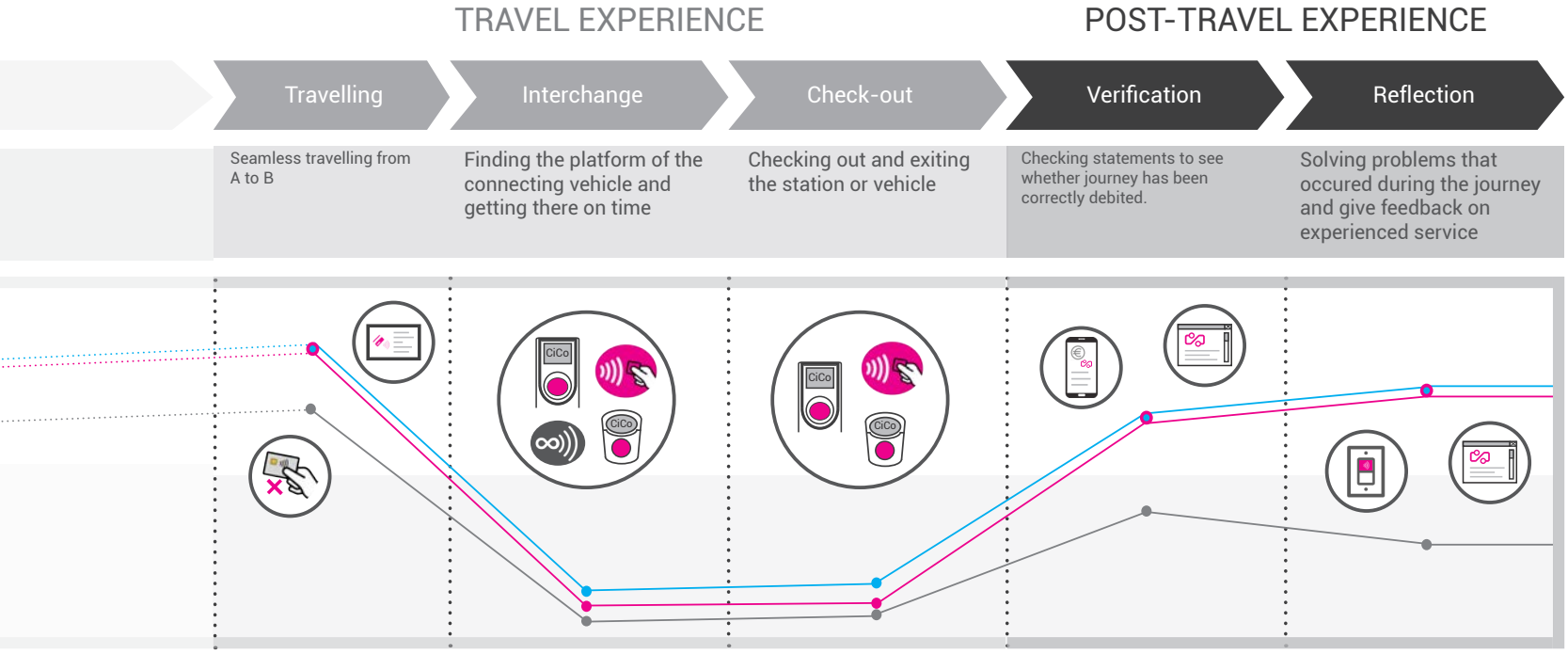



Figure 23. Location of touchpoint concepts within EMV-pt journey

bank card as payment option when selecting a ticket for public transport. They are made aware of the new technology and the benefits it brings at stations and stops. For this group the use of the bank card will come as a deliberate switch from another payment option or will be chosen when first using Dutch public transport. Seeing as this user is less accustomed with public transport, this user would be more likely to request information concerning the bank card at service points.

The service design touchpoint concepts are split into four categories: general, at home, at stations and in vehicles. Each touchpoint has a small description of its properties and a reason of implementation. Because each touchpoint concept affects the acceptance of the contactless bank card in Dutch public transport, its position in the EMV-pt acceptance model is also shown.



# GENERAL

**1. COMPATIBILITY LOGO**
Validators and information signs will show a new logo which shows operators are compatible with the contactless bankcard as carrier within their system.

**2. TICKET OPTIONS**
Information signs and websites will clearly display the various ticket options available for their service.

**3. ON/OFF EMV-PT**
Travellers are able to turn the function of EMV-pt in public transport on or off.

**4. NO LIMIT**
When travelling with the contactless bank card in public transport, users cannot reach their contactless spending limit.

| | | Description | Reason |
|---|---|---|---|
| 1 |  | A new logo will be used to show travellers were they can use the contactless bank card as carrier. This logo will be displayed on validators and signs. | Because EMV-pt will not be implemented country wide from the start, it is important to show travellers where they can use it. [Experienced Usefulness, Experienced Ease of Use] |
| 2 |  | Public transport operators will give a clear overview of the various carriers that can be used within the OV. Both on their websites as well as the information signs, tickets options are shown with their corresponding characteristics. | Since the amount of public transport carriers will continue to expend, it is necessary to give users an overview of the available tickets. This will also help infrequent users to get started more easily. [Perceived Usefulness, Experienced Ease of Use] |
| 3 |  | Users are able to turn the option of using their contactless bank card in public transport on or off. By simply changing a settings, travellers can decide whether their bank card will be compatible with public transport. | Giving travellers control over the way their bank card works heightens the feeling of control and safety. This will also give people who do not want to use EMV-pt the option to remove it. [Perceived Risk, Experienced Risk, Experienced Ease of Use] |
| 4 |  | While travelling, users will not be able to reach their contactless spending limit. This would mean that travellers would not have to fill in their PIN to get the bank card to work again. | Since the bank card does not work the same in OV as it would in a store, the limit would only hinder the travellers in their journey, making EMV-pt more difficult. [Perceived Risk, Experienced Risk, Experienced Ease of Use] |

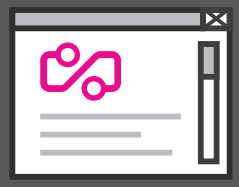
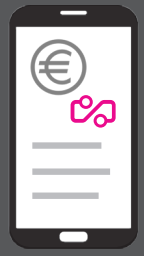
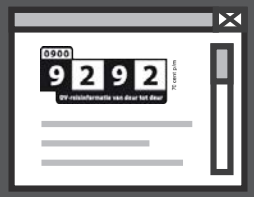
# AT HOME

**5. OV-Betalen Website**
There will be an OV-betalen website that offers information about the working principle of EMV-pt and provides travellers with a travel overview of their journey.

**6. Information Letter**
Banks will sends their customers a letter giving information about the new function of their bankcard and shows where to find information.

**7. Overview from Statements**
Though a link between the bank statements and the travel overview, EMV-pt users can obtain information about their journey.

**8. Website information**
Public transport websites and 9292OV provides travellers with information about whether the contactless bank card can be used in public transport and where to find information.

| | | Description | Reason |
|---|---|---|---|
| 5 |  | As future platform for the various carriers, the OV-Betalen website will be the first step towards the account based back office. Travellers can access their bank card travel information with and without registering. It will provide both information on the bank card as well as the OVCP. | Showing the travels one has made, gives people a sense of control over their expenses. It also gives users a means to make a printout of their statements. [Experienced Risk, Experienced Ease of Use, Experienced Usefulness] |
| 6 |  | When EMV-pt is implemented, the banks will send their customers a letter giving information. The letter does not imply one should use this, but shows that the option is available and where to find more information. | The communication channel through the banks can be very helpful to reach people that do not make use of public transport. It also makes sure people are not surprised by the new feature. [Experienced Risk, Perceived Usefulness] |
| 7 |  | Acting as a sort of receipt, travel overview of the contactless bank card can be found by looking at the description of the bank statement. Because access to ones statements requires to fill in personal information, this link can also make it easier to see the overview without filling in these details. | By putting the link within the bank statements, the connection to information becomes more direct. The connection to OV information can also make sure people would more easily contact the PTOs for questions. [Experienced Ease of Use, Experienced Usefulness] |
| 8 |  | Travellers will see if the bank card is available as carrier on the websites of the different operators, but also on websites giving travel information by showing the contactless bank card icon next to the journey. | By showing the contactless bank card logo next to journeys, people become accustomed to looking at the logo and searching for compatible operators and journeys. [Experienced Risk, Experienced Ease of Use] |


# AT STATIONS & STOPS

**9. CiCo feedback at Validators**
Validators at stops and stations will be able to tell the traveller whether he checked in or out.

**10. EMV-pt knowledge Service Personnel**
Service personnel will know exactly how EMV-pt works and is able to help the travellers using the bank card.

**11. Information Folders**
Folders at stations will give travellers all the information concerning EMV-pt and the way it works.

**12.Operator Compatibility**
Operators will show on signs that they are compatible with EMV-pt and that the bank card is a valid carrier within their system.

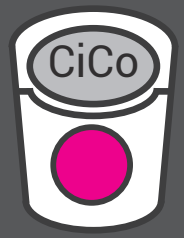
| | | Description | Reason |
|---|---|---|---|
| 9 |  | Validator poles and gates will give CiCo feedback to travellers when using the bank card. This means these level 1 devices are able to store a certain amount of information and are able to connect with each other. | Since checking in and out is a fundamental element in correctly using Dutch public transport, this information cannot be withheld from users. Implementing CiCo information will also help future token carriers to supply information. [Experienced Risk, Experienced Ease of Use] |
| 10 |  | Apart from knowing that EMV-pt exists, service personnel has the knowledge to help travellers when using the bank card. Whether it is about the way it works or how to deal with errors, personnel will always know what to do. | In order to correctly help travellers when they experience problems and to give users a sense of safety and security, personnel needs the knowledge to help. Personnel will be able to avoid confusion and thus ensure people who experience problems will not immediately stop using EMV-pt. [Experienced Risk] |
| 11 |  | Service shops and tourists information centers will have folders with information about EMV-pt. The folders will show how the new technology works and shows were travellers can find more information. | Since EMV-pt has a lot of value for infrequent travellers, who have little knowledge of the OV, it is important to provide these travellers with enough information. [Experienced Risk, Perceived Usefulness] |
| 12 |  | Various information signs provided by the PTOs will show that they are compatible with the new EMV-pt technology. | By reminding travellers which transport operators are compatible with EMV-pt, travellers will get a better idea which operators use the new technology and which do not. [Experienced Risk, Perceived Usefulness] |


# IN VEHICLES

**13. CiCo feedback within Vehicle**
Validators within the vehicles will give travellers CiCo feedback.

**14. Proper handling Bank card**
Banks will sends their customers a letter giving information about the new function of their bankcard and shows where to find information.

**15. Information in Vehicle Screens**
Screens in vehicles will give information about the contactless bank card in public transport.

| | | Description | Reason |
|---|---|---|---|
| 13 |  | Validators on vehicles will give CiCo feedback to travellers when using the bank card. This means these level 1 devices are able to store a certain amount of information and are able to connect with each other. | As with the validators on stations, checking in and out is a fundamental element in correctly using Dutch public transport, this information cannot be withheld from users. Implementing CiCo information will also help future token carriers to supply information. [Experienced Risk, Experienced Ease of Use] |
| 14 |  | Service personnel is aware of the personal nature of the bank card and will make sure . This means that service personnel is familiar with the privacy issues and conductors will not just grab the bank card without permission of the owner. | Since the bank card is a very personal object, service personnel will take proper care when handling your bank card and will make sure travellers feel safe and in control at all times. [Experienced Risk] |
| 15 |  | Information screens in vehicles will inform travellers about the contactless bank card as carrier within public transport. It will also show travellers how it works and where they can find more information. | The moment travellers enter a public transport vehicle they start a relative easy part of their entire journey. Because travellers use this moment to focus on other things and to relax, it provides the perfect opportunity to inform them about the bank card and to show them where to find information. [Perceived Usefulness] |

## 5.2 Concept Evaluation: Testing the Service Concept with Users

By combining various touchpoint ideas, a service design concept has been created. To see how users would react to this design and to see whether the design actually matches with their wants and needs, a user study has been conducted.

### 5.2.1 Aim

The goal of this study was to test the service in its entirety in order to accurately see how users would react to the proposed service design concept for EMV-pt in the Netherlands.

### 5.2.2 Research Questions

• Does the proposed service design concept for EMV-pt match with the needs and wants of the target group and why?
• Do the specific touchpoint concepts within the service concept match with the needs and wants of the target group and why?
• How usable does the target group perceive the proposed service design concept for EMV-pt in the Netherlands?

### 5.2.3 Method

The evaluation consisted of four parts in which both qualitative and quantitative methods were used to understand the wants and needs of the user as well as get an indication of the usability of the proposed service concept. The four parts of the study were as following:

1) Current OV experience
2) Opinion of EMV-pt service design concept shown in video
3) Feedback on non visible ideas of service design concept
4) Rating the service design concept

Figure 24. Set-up of second user evaluation

At the beginning of the test, the participant was asked a series of questions concerning his/her public transport experience in order to stimulate a critical attitude. After answering, the participant was asked to view three interactive videos of the service design concept for EMV-pt. Within this video the participants were showed the concept as it is implemented within Dutch public transport. The videos showed the service design concept in various travel scenarios matching with the three different user types as described in chapter 3.2. The participant first watched the video that matches with his/her public transport travel behavior. After the video the participant was asked to give his/her opinion of the service and in a series of questions was asked to give feedback on the various touchpoint concepts showed within the video and separately at the end. This process was the continued for the other two videos which were randomized in sequence. After the videos

the participant was presented with several touchpoint ideas that were not visible in the video and asked to evaluate these ideas. In the last part of the test, the participant was asked to rate the service according to the System Usability Scale or SUS (Brooke, 1996) and was asked to explain why he/she rated the service as such. The set-up can be seen in figure 24. The entire session was recorded, filmed and photographed as well as noted down.

In total 12 participants were recruited for this study ranging in age from 26 to 57 years old (table 3). The participants were selected and separated in three groups based on their travel behavior and their assumed use of the contactless bank card. These groups were: the 'emergency', the 'replacement' and the 'first time user' type as described in chapter 3.2. For the full research setup see appendix E.

| User Group Type | Gender | Age | Primary Transport | Frequency of use public transport |
|---|---|---|---|---|
| Emergency 1 | Female | 30 | Train | 4 times per week |
| Emergency 2 | Female | 54 | Train | 3 times per week |
| Emergency 3 | Male | 33 | Train | 5 times per week |
| Emergency 4 | Female | 37 | Train, Bicycle | 5 times per week |
| Replacement 1 | Female | 57 | Bicycle | 2 times per month |
| Replacement 2 | Female | 26 | Public Transp. | 5 times per week |
| Replacement 3 | Male | 27 | Motorcycle | 2 times per month |
| Replacement 4 | Female | 48 | Train, Tram, Car | Once per week |
| First Time 1 | Female | 54 | Car | once per two weeks |
| First Time 2 | Female | 41 | Car, Train | once per two weeks |
| First Time 3 | Male | 25 | Car | once per two weeks |
| First Time 4 | Male | 38 | Car | 1/2 times per month |

Table 3. List of participants for second user evaluation

### 5.2.4 Stimuli

For this research three videos will be used to test the concept in various scenarios. These videos are interactive and give the participants the option to interact with certain parts of the concept at the end of the video (figure 25). These interactive concepts include the OV-betalen website and the display of bank statements on a smartphone out of which one is directly connected to public transport (ING application) and one is not (SNS application). The videos are filmed in a first person perspective to give participants the feeling that they are experiencing the service themselves instead of someone else. During the video several touchpoint concepts are shown within

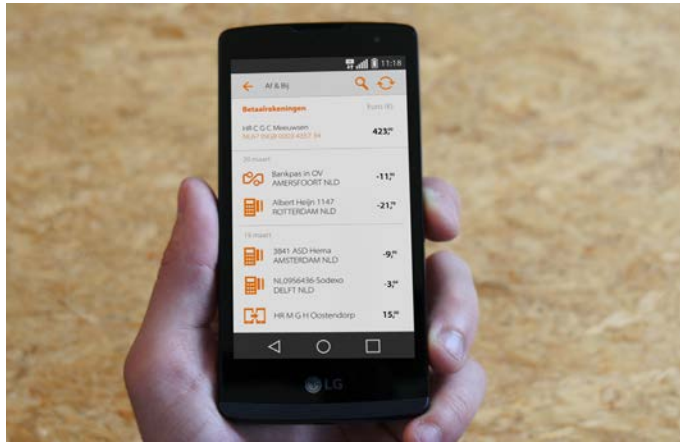


Figure 25. Interactive part of the service design within the video

their actual context. The touchpoint concepts displayed in the video are all edited in such a way that they blend in with the environment and do not stand out too much in terms of realism (figure 26). As stated before, the three videos depict possible scenarios for the three user groups for EMV-pt. They show scenarios of use and display the situation in which the user is introduced to EMV-pt in the Netherlands. Apart from the videos, several images will be used depicting touchpoint ideas that are not visible within the videos. These images will be printed and supported with a small description.

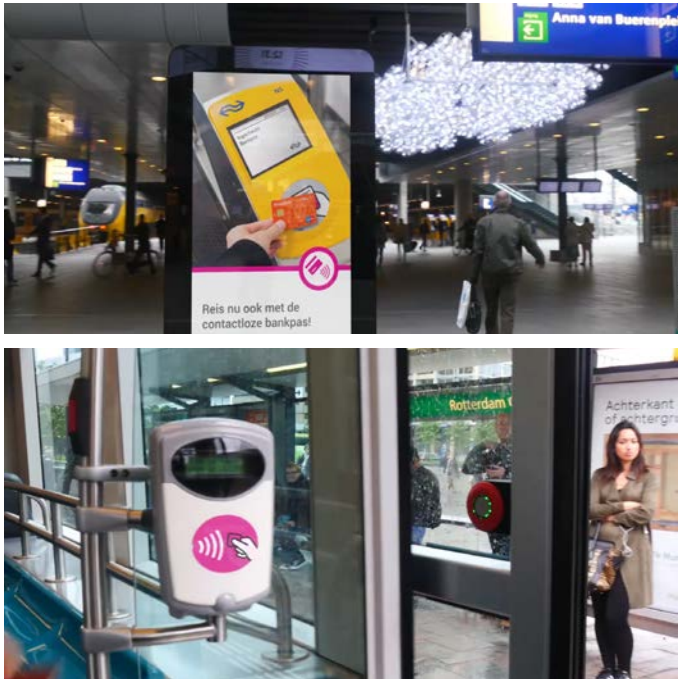



Figure 26. Touchpoint concept visualisations for user test video

### 5.2.5 Results

The results for this study are separated for the service concept as a whole, its touchpoints concepts and the SUS score. The first shows the results of the reaction of the participants on the service in its entirety after seeing the video and the second that of the discussion of the separate touchpoint concepts. The results of the SUS score show the way the participants rate the usability of the entire service. An overview of the resuts can be found in Appendix F and G.

**EMV-pt Service Concept**

If we look at the service concept in its entirety we can see a mostly positive attitude towards the EMV-pt implementation. When seeing the movie for the first time most participants reply that they perceive the service concept for EMV-pt as convenient and that it looks easy. Many participants do state that they worry about the privacy aspect of the bank card and would not always feel comfortable using a card that is so valuable to them

> "At Rotterdam Centraal station, an open environment with security, that felt safe. But in a tram and then also near an exit. While getting in and out you're standing near the exit with your bank card and if I were a pickpocket...it just makes me a little uncomfortable."
>
> -Male, age 33, Participant Emergency User Group [1-3]-

in such a blatant way.

Various participants also indicated that they did not expect to be able to use the contactless bank card immediately and assumed it could only be used when registered beforehand. Especially the emergency situation shown in the video where

the bank card acts as backup was stated by many participants as a familiar situation and something that really showed the worth of the contactless bank card.

"That thing that we discussed, that contactless makes you pay for your lunch faster. I don't see the advantage in something like that. But in this case I do see the advantage. I really think this will help make contactless more popular."

–Male, age 33, Participant Emergency User Group [1-3]-

The magenta colour used throughout the touchpoint concepts was not always understood by the participants as being the colour for Dutch public transport in general. Several participants answered that they do not connect the colour to public transport either because it is not clearly visible on the OV-chipcards or because the transport operators use different colours. A lot of participants also stated that they were pleased to see that there where so many communication channels giving information about EMV-pt and the way it works.

"I think my (OV-chip) card is blue. I would not go so far as to say that I view pink as the OV colour."

–Female, age 57, Participant Replacement User Group [2-1]-

Apart from most participants of the emergency user group, it was declared by many replacement and first time user group participants that they would like to use the contactless bank card in public transport. In the end 7 out of 12 participants said they would be willing to use EMV-pt and pointed out that this was due to the advantage of either not having an extra card in their wallet or because it saves them the trouble of topping up. The participants indicated that the main reason for not wanting to use the contactless bank card in public transport is due to the inability to use discount products while travelling. For three emergency user participants this absence of discount products gave the bank card little value compared to the OVCP, though they would be willing to use it if it did have this feature. Though privacy issues were often addressed, often in the form of the bank keeping track of your movement, it was almost never expressed as being a reason not to use EMV-pt at all. One emergency user participant described that the contactless feature on the bank card was of little value to him before, but after seeing the video described he would be more inclined to use it. It was also pointed out by first time user that the bank card could be more helpful for the elderly, seeing as it required less steps to use compared to the OVCP. Because the bank card does not require a deposit like the OVCP, one first time user said she had trouble knowing how much money would be deducted from her when she fails to check out.

"I can imagine that the OV-chipcard for people aged 60 or 70, that they are not really tempted to start using it. And then this would be a nice alternative, more user friendly."

–Female, age 41, Participant First Time User Group [3-2]-

**Touchpoints - General**

## Compatibility Logo

When looking at the new logo, the opinions of the participants was very different though many indicated that they did not notice a change in the logo when looking at the video for the first time (figure 27). The participants stated that the colour magenta added to the suggestion that it was just the same logo as the one before and made it hard to distinguish the new logo from the old. Several participants also explained that they did not found the logo very clear because it is not a bank card itself. The contactless signal on its own was also experienced by some of the participants as confusing due to it being relevant for both the OVCP as well as the bank card. Many participants did declare that they would easily get used to a new logo as long as there is a information campaign making people aware of the new logo. When it comes to the gradual implementation of the contactless bank card many participants explain that they still remember the implementation of the OVCP and that they can understand that this is something similar. However several participants did state that this would mean they would wait with using the contactless bank card until nationwide implementation was complete, seeing as they did not want to use two separate cards for public transport.

After watching the video of the logo for a second time, the participants representing the emergency users and the replacement stated that the logo is a clear and they recognize the logo as the contactless payment symbol that can be found in stores and on their bank card.

## Ticket Options

Most participants did state that they like that the sign with tickets options is there, even though they are not inclined to


Figure 27. Compatibility logo touchpoint concept

> "It is a clear logo for indicating that you have to hold a card against it, but whether this card is a bank card or OV-chipcard or whatever is not clear to me."
>
> –Male, age 25, Participant First Time User Group [3-3]-

use it themselves, as they think it can really help elderly people and tourists. Various participants also indicated that they think they would probably not notice the sign while they are travelling. Several participants also pointed out that they would like to see part of the sign in English in order for the sign to be of more use to tourists.

The emergency user group participants indicated that they would not make use of the ticket option signs because they already know which payment options are available to them. Several first time user group participants declared that they like the information on the sign, but also often look up the same information in advance before arriving at the station. One participant also stated that he would like to see more use of photos on this sign seeing as this would make it more clear for him that the bank card can be used with a validator (figure 28).

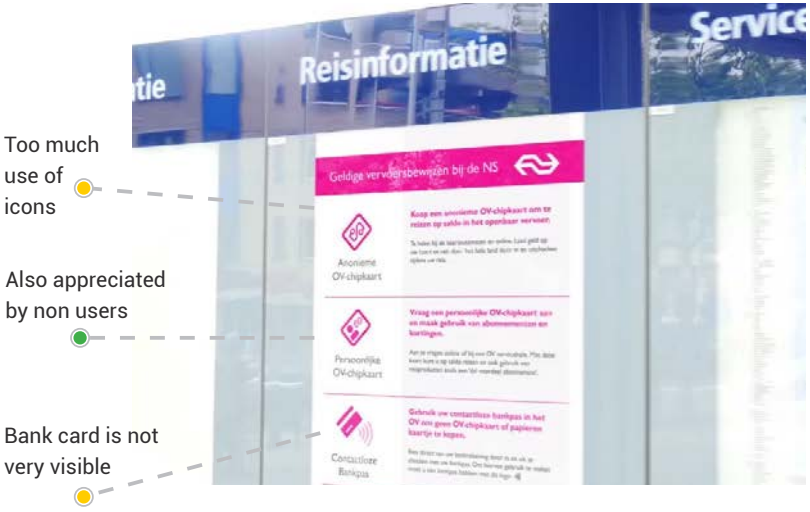



Figure 28. Ticket options touchpoint concept

"It's already an unfortunate message when you see that your OV-chipcard has insufficient credit. In many cases this would mean you would miss your train and you could clearly see that feel good moment: Oh I can check-in with my bank card as well. That's just ideal."

–Male, age 27, Participant Replacement User Group [2-3]-

### ON/OFF EMV-PT

Results of the evaluation on the (de)activation of EMV-pt showed that almost all participants want to have the option of switching EMV-pt on or off. They way this function should be integrated however differed amongst the participants, but most indicated that they would like to at least have the option to deactivate EMV-pt if they do not want to use it. Some participants explain that they would like the (de)activation to be connected to contactless in general, but most want to be able to separatly (de)activate EMV-c and EMV-pt.

Many of the emergency and first time user participants state that they would like to be able to use the bank card immediately and that deactivation should be possible in case the card gets stolen or lost.

"I would like to have some kind of control, doesn't really matter if I have to activate or deactivate it, but there has to be something."

–Male, age 38, Participant First Time User Group [3-4]-

### No Limit

For the contactless spending limit for EMV-pt the opinions are quite diverse, although eight out of twelve participants indicate that the absence of a contactless spending limit would give them an insecure feeling. Of these participants many have also said that the absence of this limit would be a reason for them to not use the contactless bank card in public transport. Several of these participants also suggested removing the 25 euro limit to only keep the cumulative contactless spending limit of 50 euro or making the contactless spending limit higher in order to make sure the bank card can be used for more expensive journeys. Another suggestion that was made by these participants was to make the limit more personal and to give the traveller the option of setting the contactless spending limit. The participants in favour of removing the spending limit, mostly within the emergency user group, often state that the removal of the limit would help in making EMV-pt more user friendly and think it is very logical for it to be not present in EMV-pt.

"I think not having a spending limit is quite convenient, otherwise you have to keep doing that verifying stuff."

-Female, age 41, Participant First Time User Group [3-2]-

"If it would not be possible to set a limit then I would consider using my OV-chipcard. An infinite contactless spending limit would definitely be a deal breaker."

–Male, age 34, Participant First Time User Group [3-4]-

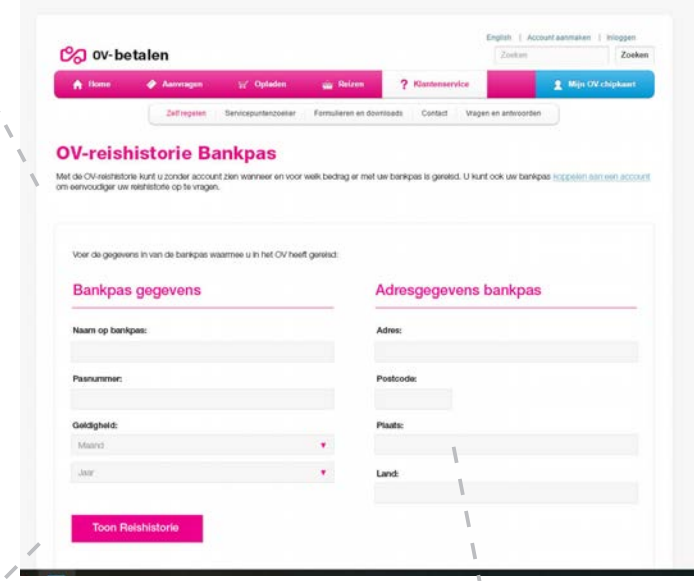
**Touchpoints – At Home**

### OV-betalen Website

Many participants expressed a liking to the fact that it is possible to retrieve one's travel information both by registering as well as by filling in the bank card details (figure 29). Though many participants make use of public transportation websites like '9292OV' or 'NS reisplanner', most participants said they would only make use of a website like OV-betalen when they have to claim money from a company or when they have experienced a problem. A lot of participants also stated that they dislike having so many accounts with passwords and think there are already too many websites connected to Dutch public transport. When filling in their bank details, participants explained that they would like to see a 'remember option' within the website to make sure they do not have to fill in all the details every time they would like to see their travel information without registering. It was also declared by some participants that would like to have this information within an application.

Out of all the participants, the emergency user group showed to be most interested in the concept and all participants of that group would be willing to use the OV-betalen website. Half of the replacement and first time user group participants declared that they would not make use of such a website because they prefer to do things offline or because the website does not help them with planning a journey. It was stated by one replacement user participant, before seeing the website concept within the video, that he would like to see everything integrated within the current OV-chipkaart website instead of having so many different public transport websites. One emergency user also stated that, even though he would like to make use of the website, did not like just handing over his bank data to just anyone.

Account not needed




Use of existing website

Many details that need to be filled in

"It is connected to your bank account number and with all the talk of hackers and people that can access your data, I just get this feeling like: Better be careful with the data I release and hand over in order to see my travel history."

–Male, age 33, Participant Emergency User Group [1-3]-

"All those accounts drive me completely insane. If I have to create an account somewhere then I am out, unless I really have to. But if I have a choice I would rather do it without an account."

–Male, age 25, Participant First Time User Group [3-3]-

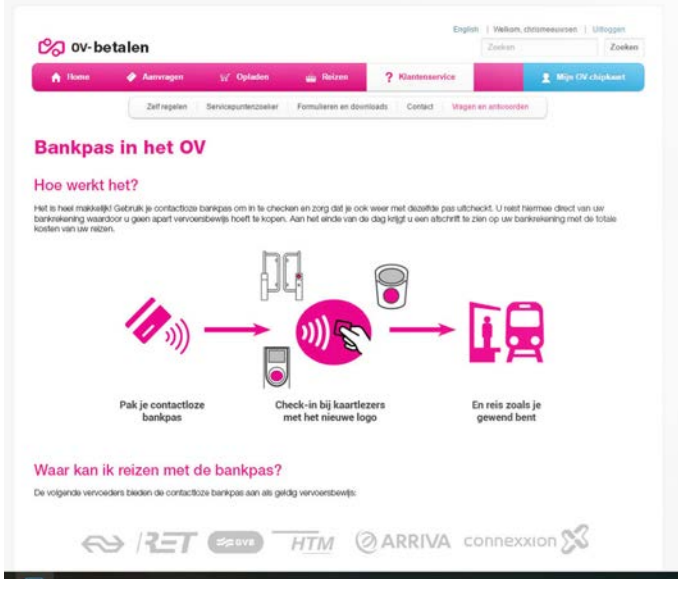



Figure 29. OV-betalen website touchpoint concept

### Information Letter

When it comes to the letter from one's bank showing information about EMV-pt, many participants indicate that they think it is very nice that the bank informs their clients this way (figure 30). Apart from the information the letter contains, the participants explain that is also helps for them in trusting the new technology. Since the bank would show that it supports this new use of the bank card, they state that it gives them more assurance in using the contactless bank card in public transport. All the participants also say that they always read the letter provided to them by their bank and that they will most likely read the information concerning EMV-pt as well.


Figure 30. Information letter touchpoint concept

"Well I would like it if my bank agrees with this as well and says something like: From now on we are going to travel this way in public transport. Then at least you know it is coming from your bank and not from others."

–Female, age 37, Participant Emergency User Group [1-4]-

### Overview from Statements

For the concepts connected to the overview of public transport statements, all participants indicated that they would prefer to see the costs of the travels that they made with the contactless bank card combined into one bank statement (figure 31). Participants however also explained that they would like to have the option of seeing what this statement entails in order to have the possibility of seeing whether the costs have been correctly debited. The link to the OV-betalen is often described by participants as being sufficient to facilitate this need of information, but many participants declared that they would like to have a quick overview as could be seen in the ING application. As to the link itself most participants display a liking for the direct link provided by the ING application as they say it increases the convenience of the bank application. However some participants did state that the added information that needs to be filled in for the SNS application does give an increased sense of security and gives them less the feeling that the bank can track your every movement (figure 32). Although both bank statement display scenarios are highly appreciated by the participants, they did express that they do not see it necessarily as the bank's responsibility to provide this information.

"You would not mind if the bank application takes you to the website? No not at all, I prefer being lazy over tired. And everyone with me I guess. I would really like it if you can just press a button and immediately see everything."

–Female, age 48, Participant Replacement User Group [2-4]-

When seeing the two bank statement scenarios several participants of the replacement and first time user groups

also indicated they saw an added benefit to the use of the contactless bank card when it comes to claiming back their travel money. Three participants of these groups explained that they normally have problems claiming back money due to it being difficult for them to make a travel overview with the anonymous and paper OV-chipcard, resulting in them collecting the paper tickets and receipts. Emergency user participants also stated that the combination of public transport travels with the bank statements could help them with better deciding which discount product is more suitable for them as it gives them a better overview of the money they are spending on public transport.

"The fact that you can see your expenses on your bank statements is a very positive thing. I am already always trying to see whether the discount card is beneficial for me or not. And to do that I had to see how many times I was topping up which was very tedious. So I can imagine this makes it way easier."

–Male, age 33, Participant Emergency User Group [1-3]-

"I now always submit the amount of kilometers have travelled because I have an anonymous card which means I only have receipts of 20 euro. So you mean the receipts of topping up? Yes, because where you are going is of course not being registered."

–Female, age 26, Participant Replacement User Group [2-2]-

One replacement user participant made a similar remark, as he sees the OV bank statements as a helpful way to know how much he is spending per day on public transport. This participant and a first time user participant also remarked that they would like to be able to make a separation between business and private

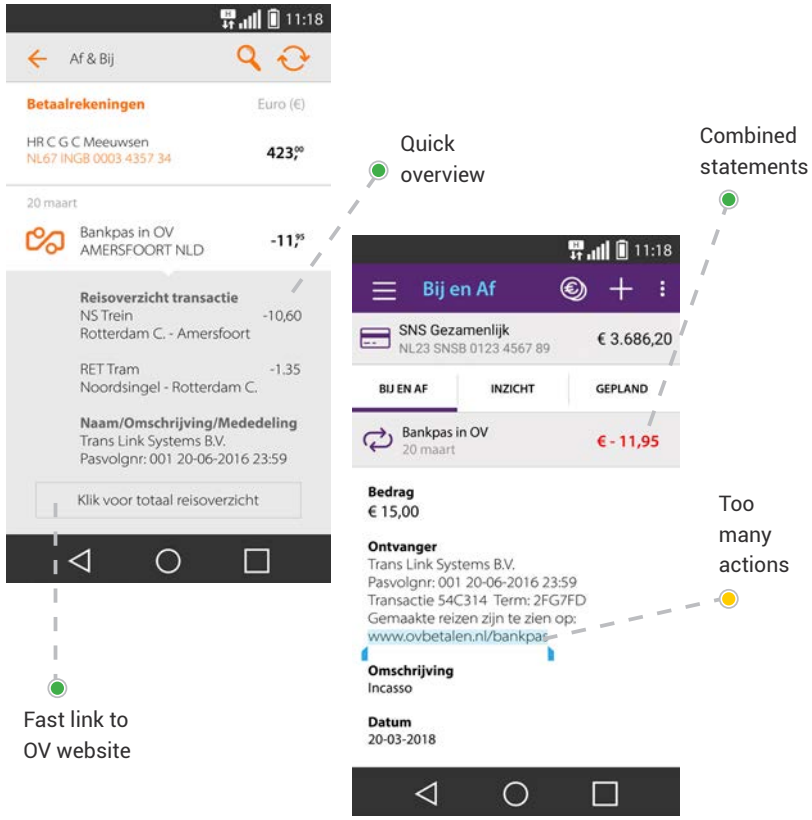



Figure 31. Overview from statements touchpoint concept

travels on their bank statements. Although several participants said they assumed the bank application correctly logs out when using the link to OV-betalen, one emergency user participant did express that she would like to receive a message from the application saying that she is leaving the bank application and is automatically logged out.

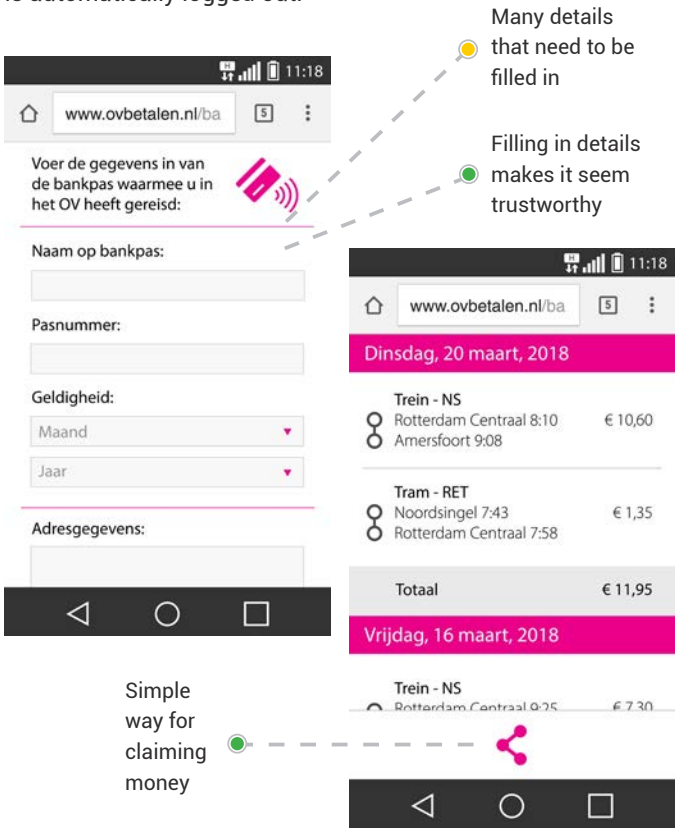



Figure 32. Overview from statements touchpoint concept

**Touchpoints – At Stations & Stops**

CiCo Feedback at Validators

When looking at the feedback the validators give concerning CiCo status and travel fee information, almost all participants indicate that they use both types of feedback during their travel. Several participants explain that they use the CiCo feedback as a check to see whether they correctly used the system in order to avoid the penalty for forgetting to check in or out. The participants also declare that the travel fee information helps with both knowing how much they are spending as well as check to see whether the correct amount of money is written off. It was also indicated by many participants that they use the sounds the validator makes next to the screen information when they are either in a hurry or when they are unable to correctly read the validator screen. Various participants also said that they would rather not have the validator saying that a 'bank card' has checked in due to privacy issues and because they think it is obvious which card you are using in public transport (figure 33).

> "Sometimes I can see with what card my predecessor has checked in. When it is like a business card or student card or whatever, this is no problem. But I can imagine if it displays bank card that someone might think: oh the card that he just swiped past that thing is a bank card and it is now in his right pocket."
>
> –Male, age 33, Participant Emergency User Group [1-3]-

One replacement user group participant stated that even though she makes use of the travel fee information, she could

get used to a validator displaying less information than when using an OVCP in time. She did add however that the first time she would use the bank card it would really confuse her since she is expecting the validator to give her the information she is used to when traveling with the OVCP. One emergency user participant also stated that she wants to use the travel fee information since it is information that is displayed at that moment and that she does not want to validate the travel fee afterwards. A replacement user participant also pointed out that she would like to see the travel fee because the prices for the same journey can vary a lot and she is never really sure what she has to pay.

"You have something valuable in your hands and on top of that it is also going to be more vague on what you spend? I would like to be reassured one way or another and I don't want things to become even more mysterious by this new development."

–Male, age 33, Participant Emergency User Group [1-3]-

"I would find it a bit annoying, because you immediately want to check whether the correct fee has been written off. Because I would not check this afterwards at all."

–Female, age 30, Participant Emergency User Group [1-1]-


Figure 33. CiCo feedback at validators touchpoint concept

### Information Folders

In case of the information folders, all participants stated that they think it is good that it is there and would like to see the folder at more places than just the service shop. Many participants also indicated that they would not like it if folders would be handed out to them, as they do not want the new payment option forced upon them.

> "When you just told me about the bank card in public transport I was like: Hey, that is interesting. So yes I would grab one (folder). It's just that you must not hand them out, at least to me, because then I have the tendency to say: No I don't want it."
>
> –Female, age 41, Participant First Time User Group [3-2]-

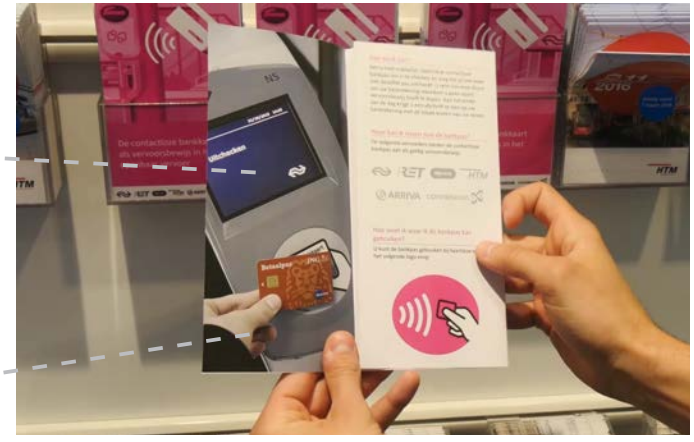



Figure 34. Information folder touchpoint concept

Participants of the emergency and replacement user groups mostly noted that they would not make use of such a folder (figure 34). But the participants in these groups did state that they would appreciate it when information was spread in this manner, for the same reason that they are in favour for the ticket options sign, since it helps people that are less knowledgeable about Dutch public transport. Half of the participants of the firs time user group declared that they would probably not make use of these folders, however they explain this could change if the existence of the folder is communicated really clear.

### Operator Compatibility

Regarding the poster showing operator compatibility all the participants indicated that they think the poster is very clear regarding its message and that it would trigger them to look at it. Several participants said that the use of the photo in the poster showing a bank card on a validator made it very understandable what the poster was about. Various participants also stated that they often look at the information posters to discover new things in public transport (figure 35).

> "When you see the same bank card as you are using you think: Hey let's check this out, what is this? And in the back of your head you already know, but when you read the message, the message that is displayed below, you think wow that is convenient."
>
> –Male, age 27, Participant Replacement User Group [2-3]-

One first time user participant expressed that the poster did not really work for him, giving him the feeling of it being to good to

be true. The participant though that there has to be a catch in the form of registering beforehand and did not get the feeling you could immediately use the bank card in public transport. Another participant of the emergency user group described that she would expect a mail or letter explaining this new feature before she would see this poster. One participant also explained that the use of the same bank card as he possessed helped in getting him interested in the message of the poster.


Figure 35. Operator compatibility touchpoint concept

## Information at Ticket Machine

The sticker displaying the possibility of travelling with the contactless bank card in public transport is seen by all participants as a convenient concept. A lot of participants also indicate that they appreciate the location of the message because many have experience with the situation of waiting in line to top up their OV-chipcard or get a ticket (figure 36).

> "I don't travel a lot with public transport so I constantly need to top up my card. And waiting in line to top it up is one of the most annoying things there is."
>
> –Male, age 25, Participant First Time User Group [3-3]-

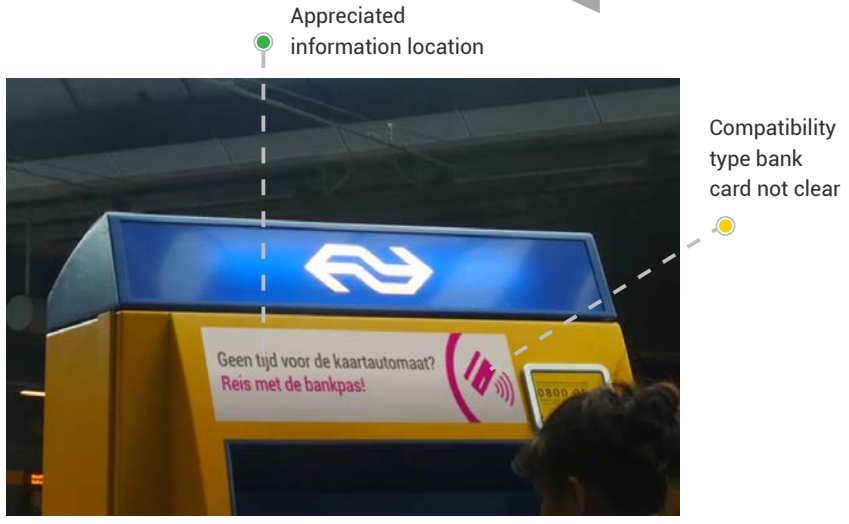



Figure 36. Information at ticket machine touchpoint concept

One replacement user participant declared that he would like to see more colour variation on the message and would prefer the use of photos to indicate it is possible to use the contactless bank card. He also explained that he would like the message to be similar to the compatibility posters seen in the video as it immediately shows what it is about and what card is compatible. Another replacement user participant stated that although the sticker would trigger her to use the bank card, it is not specifically displayed which bank card would work with public transport which could result in travelling without a valid ticket. It was also stated by one first time user participant that EMV-pt could really help him seeing as he constantly needed to top up his OVCP card when travelling because he only tops up to the minimum amount needed for travelling.

> "Only now I don't now if my bank card is compatible or not right? Even if you read this and decide not to buy a ticket, it could be that your bank card is not suitable. And then you can't travel."
>
> –Female, age 48, Participant Replacement User Group [2-4]-

**Touchpoints – In Vehicles**

### Information at Vehicle Screens

When it comes to the information screens located in the vehicles, many participants stated that they look at the screens and that they would like to see information concerning EMV-pt displayed on them. Several participants did explain that the EMV-pt information is fine as long as it does not interfere with the regular travel information that is shown. Although they are always reading the vehicle screens, some participants did specify that they would only look at the non-travel information screens when the are bored and admitted that they often ignore the advertisements (figure 37).

> "I assume that when this launches there will be a sort of nationwide campaign in which they keep explaining how it works. And the screen is a sort of confirmation of that. But if it is only displayed on the screen, I don't know if I would notice."
>
> –Female, age 54, Participant Emergency User Group [1-2]-


Figure 37. Information at vehicle screens touchpoint concept

Half of the replacement user group participants said that they do not look at the screens or only when they are travelling to an unfamiliar location. One emergency user participant stated that just displaying the EMV-pt information on the screens is not enough and needs to be supported by a nationwide campaign. In one of the videos the participants were shown a video where the screen only shows the fact that the bank card can be used with that operator, to which one first time user participant replied that this is less desirable. The participant explained that the added information of the compatible logo and the fact that travel information can be seen without registering made the screens appeal more to him.

> "When I am in the train I would sooner grab my phone to see what it is and how it works." –Female, age 26, Participant First Time User Group [3-2]-

**System Usability Scale**

The SUS showed that the participants gave the usability of the EMV-pt service design an average score of 82,08 as can be seen in figure 38. When looking at the SUS adjective-anchored Likert scale of Bangor et al. (2009) this score would translate itself to a usability rating of 'good' (>71,4) to almost 'excellent' (>85.5). Of the different groups, the replacement users rated the usability of the EMV-pt service design the highest with a score of 88.75 followed by the first time user group with a score of 85. The emergency user group participants rated the service design concept considerably lower with an average SUS score of 72.5. The SUS box-plot of the various groups can be seen in figure 39.

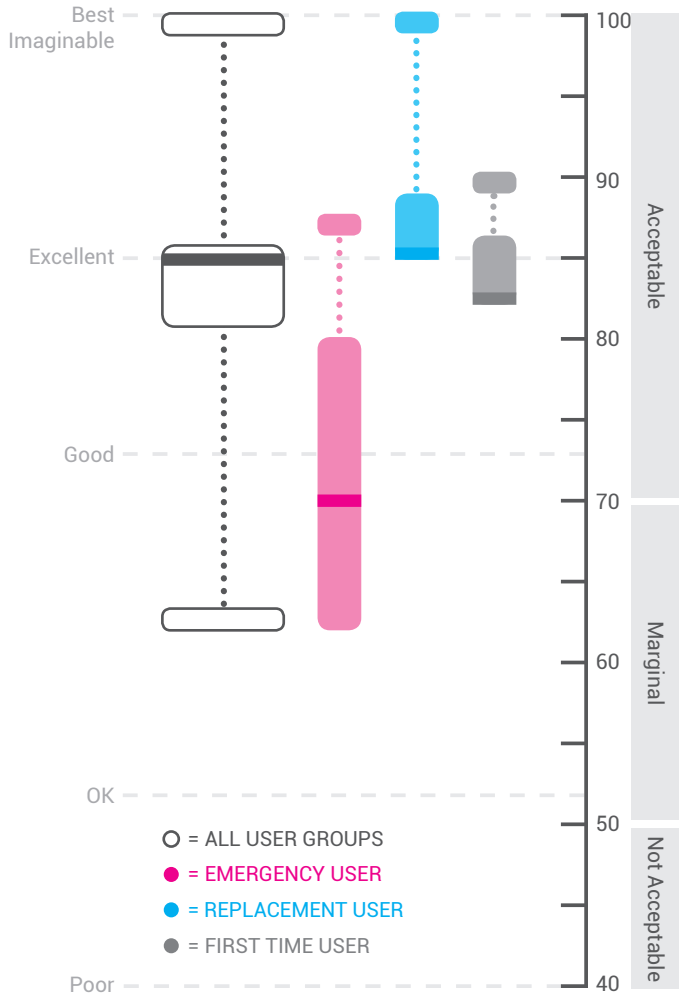



Figure 38. SUS score for EMV-pt service concept

The questions that were rated best concerned the ability to be able to use the system without service personnel (4,83) and the ease of use of the system (4.5), while the lowest rated questions concerned the frequency of use (3.83), the confidence to use service (3,75) and integration of the various products within the service (3,67). When looking at the separate questions within the SUS, interesting differences could be found amongst the various user groups. The question concerning the frequency of use of the service was rated very low (2.5 out of 5) by the emergency users, often stating that the service has little value for them as long as the bank card is not capable of containing discount products. One question concerning the confidence to

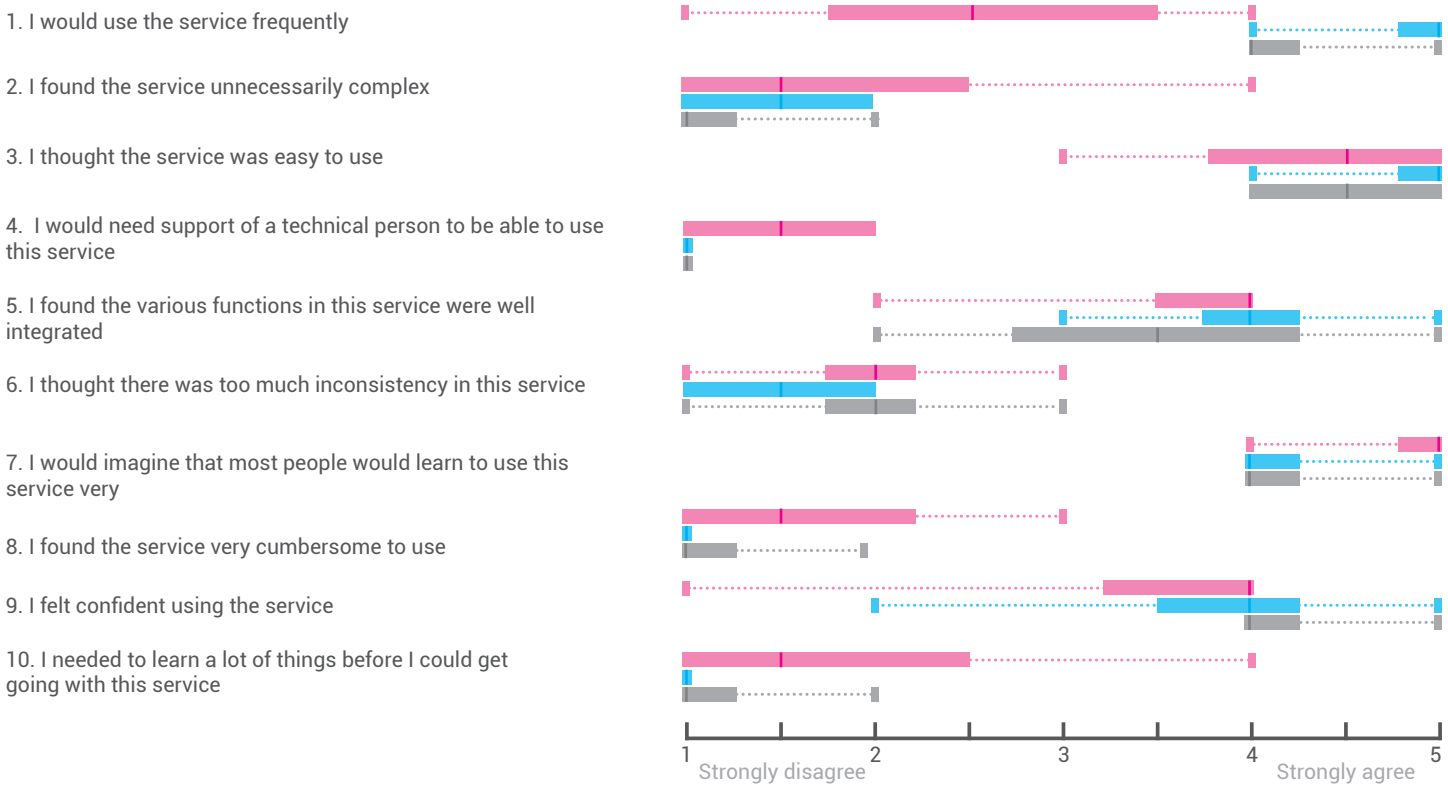



Figure 39. Rating of SUS questions by user groups

use the system was rated significantly higher by the first time user group (4.25 compared to 3.25 and 3.75). An overview of the SUS scores can be found in appendix G.

### 5.2.6 Conclusion & Discussion

The evaluation session showed that support of the banks is really desired by the participants in order for EMV-pt to come across as a trustworthy technology. The bank card is seen by many participants as a personal and valuable item and thus they are reluctant to just use it on whatever comes across their paths. The banks must do more than just give their approval and must fully support EMV-pt in order for the new technology to be accepted. The results of the session also showed that the participants would like to see more transparency within the system and want to have a better understanding of the working principle of EMV-pt. Although the current design does offer information concerning the way the contactless bank card is used within public transport, it offers little information concerning the system itself and why everything works as it does. It is also often stated by participants that they think EMV-pt works in a certain way, often linked in a negative way to how their privacy is influenced, although that is actually not the case. Not addressing this problem would cause EMV-pt to inherit problems that are not actually there and thus for the redesign this information gap needs to be filled in order for users to adopt EMV-pt. The removal of the contactless limit was expressed by many participants as something unsettling. Although the participants understand that the removal of the limit could add to the usability of EMV-pt, they would not feel reassured if the limit is removed in its entirety and would rather have a high limit that cannot be reached than nothing at all. Almost all participants also explained that they would not mind if their information is shared between the banks and the PTOs since they say they have nothing to hide, but could imagine someone else being bothered by this occurrence. However whether this truly not applies to the participants or that this is a way of voicing their own opinion is not entirely clear. Because the contactless bank card is added as an payment option in a already existing system, it will always be compared to the OV-chipcard which the participants also showed. Features that the OVCP has and EMV-pt does not will result in the latter being seen as a lesser technology. During the session features that were addressed that had this problem include but were not limited to the CiCo status, travel cost indication and discount products capability. Although users will eventually get used to certain changes, not being able to get the contactless bank card to be able to perform as well as the OVCP can really damage the adoption of EMV-pt.

Several ideas aimed more at first time users (e.g. information folders, ticket options) were often described by participants as something they would not quickly use. However most participants indicated that they like the fact that these touchpoint concepts are present seeing as they could help for example tourists. For EMV-pt not every touchpoint concept might immediately seem useful to the majority of travellers, but apparently these touchpoints can also give a boost to the likability of the service as it shows it takes the all kinds of travellers into account. Although the idea of the compatibility logo was designed with the account-based back office in mind, making it more suitable for future payment tokens, the ambiguity of the logo has been described by many participants as unclear. The logo needs to be redesigned in order to make it clear to people that both the OVCP as well as the contactless bank card are compatible with a validator and where this is not the case. Several ideas shown to the participants made use of icons in order to describe certain types of tickets. The participants however indicated that they have a strong liking

for photos as this both shows what the information is about and better triggers their interest. The icons also made it hard to tell which bank card was suitable for EV-pt according to the participants.

The evaluations sessions also show that the participants see a lot of advantages to the bank card next to the benefit of having a card less in your wallet and paying for public transport directly from one's bank account. These advantages range from an improved way of claiming back money to avoiding the deposit and transit money. Although the scenario of using the bank card was more aimed at the emergency user participants, many participants of the first time and replacement user group explained that they are familiar with that situation and clearly see the benefit of the contactless bank card as back up as well. Many participants claimed that they would be willing to try EMV-pt and are willing to take some of the inconveniences that the implementation causes for granted if the bank card is truly more useful to them. EMV-pt was also seen by some as a reason to start using the contactless bank card in general. However for many participants the lack of being able to add products to the bank card and the fact that the bank card is not implemented nationwide immediately is seen as cumbersome.

The SUS displayed that the participants are overall quite satisfied with the usability of the service design concept, rating the usability of the service between good and excellent. The integration of the various functions of the system however was rated lower by all participants. The SUS also showed that although EMV-pt could help the emergency users, as long as it cannot offer the same benefits as their personal OVCP the willingness to use EMV-pt is not that high.

**Limitations**

During the evaluations sessions participants were shown various videos of journeys that were filmed from a first person perspective in order to create the feeling they are using EMV-pt themselves. However during the videos actions where performed by a male actor which could cause participants to not fully emerge themselves in the experience seeing as it is not them that is performing the actions. The video also showed two concepts concerning the way statements in one's bank application are displayed and the sequence in which the participants saw these concepts was randomized. However because these concepts both deal with the same problem but in a different way, the opinion of the participants might be influenced depending on which concept they saw first.

The evaluation sessions took place at the faculty of Industrial Design Engineering within a mirror room. Using a mirror room could however result in making the participants feel nervous doing the session or inclined to give positively biased responses (Keepitusable, 2016). The latter could also be stimulated by the fact that the presented work is part of the thesis of a student, making participants perhaps more willing to positively rate the shown work.

For this evaluation sessions various participants where recruited corresponding with the defined user groups. However for this research participants representing the tourists within the first time user group where absent and should be included in further research to have more accurate data of the needs and wants of this user group. Another participants group that was missing for this study was the non user which is also important to analyse since EMV-pt will be part of public transport.

## 5.3 Conclusion

Using the results of the stakeholder and user evaluations of the ideas, a service design concept was created for EMV-pt. This service focusses on giving travellers and easy and uncomplicated way to pay for public transport using their contactless bank card. Other important aspects of the service are transparency and sensitivity in handling and informing travellers about EMV-pt. The service is positioned in such a way that it is mostly seen as part of the PTOs and Translink while the banks offer their support. In an evaluation session with participants representing the three user groups, the service concept has been tested and rated on its usability. The session showed that participants are positively minded towards the innovation, but would like to see several changes made to the concept to improve the amount of control the travellers have while using EMV-pt. The session also showed that the participants often compare the contactless bank card with the OVCP and expect the bank card to be able to function just as well. The participants also saw many advantages to the bank card and are willing to try it out when it is implemented. Using the results of the session the service concept can be redesigned in order to better match with the wants and needs of the user.

# 6

# 6 FINAL DESIGN: SERVICE DESIGN FOR EMV CONTACTLESS IN DUTCH PUBLIC TRANSPORT

By making use of the results of the user evaluation described in the previous chapter, a redesign could be made of the EMV-pt service design concept in order to improve the design. In this chapter the final design for the service design concept for EMV-pt is shown as well as the touchpoints and implementation strategy that are connected to it.

## 6.1 Service Design

The service design for EMV-pt aims to give travellers an easy way of accessing public transport using their contactless bank card. By making it possible to directly travel from one's bank account, EMV-pt allows travellers to use public transport without having to top up or pay for a ticket or travelcard in advance. Within this service concept several aspects form the foundation of this design. These aspects can be described with the following keywords: uncomplicated, transparent and emphatic.

**Uncomplicated**: When using the contactless bank card the aim is to make sure its use it perceived and experienced as simple. Features that are connected to this aspect are the ability to be able to travel with EMV-pt without activating or registering the bank card prior to use. Unlike the OVCP the bank card does not make use of a deposit and has a stretched contactless spending limit of 50 euro in order to make it possible for users to travel without worrying too much about reaching their contactless spending limit. Information that is provided try to explain the basic working principle of EMV-pt without going into details immediately in order make sure travellers are able to quickly the payment option. Since the bank card cannot hold any products, users are only able to get a full price second class ticket using EMV-pt. Travel expenses of one day are shown in one statement to give travellers a better overview of their expenses while travelling with EMV-pt. The entire service is promoted as a service given by public transport as a whole that is supported by the banks, making it clear for people where to look for help in case problems occur.

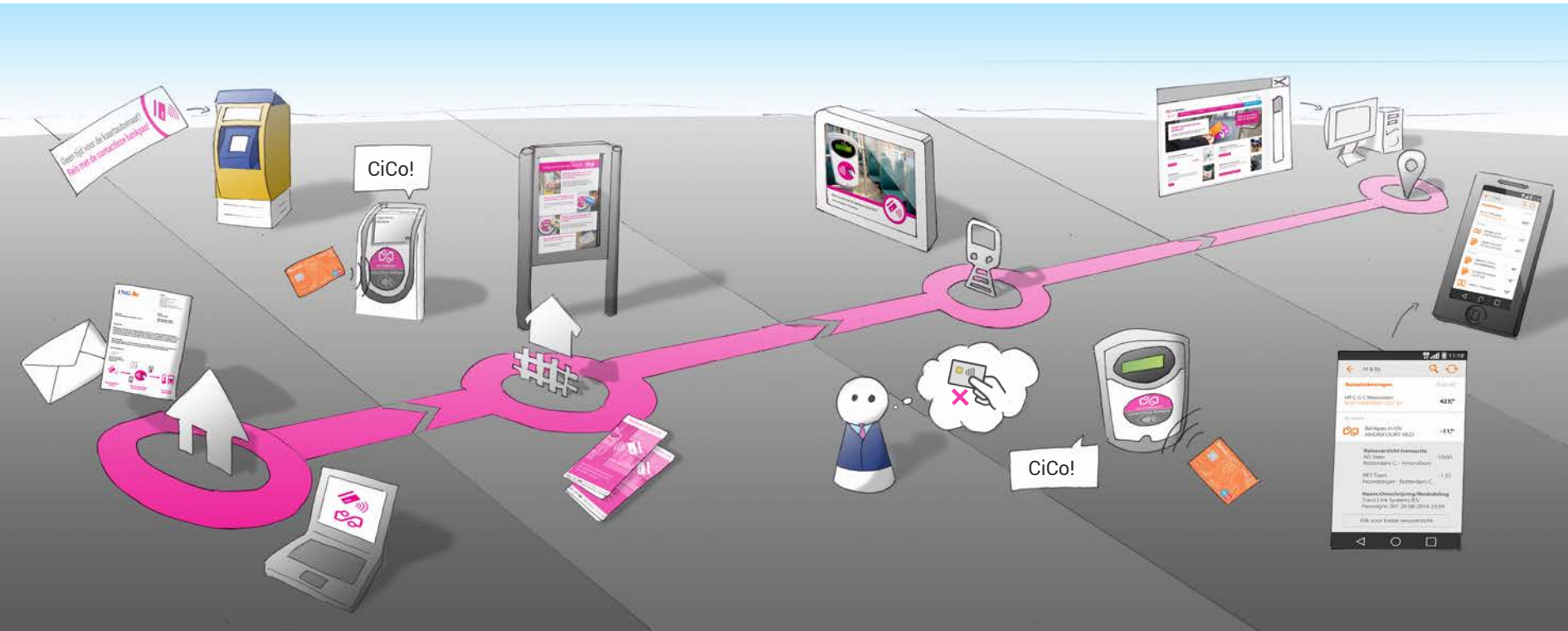
**Transparent**: Another aspect that is prominent in the service design is transparency. Seeing as EMV-pt makes it possible to travel using the money of the traveller's bank account, it is essential to be honest and open in order for people to trust the new technology. Because EMV-pt is not like any other public transport ticket and certainly does not work the same way in the back office, information will be made available to the travellers of the exact way EMV-pt works. Although this type of information will not be shown on the signs and poster at stations at stops, clear links will be always be provided to show where to find more information.

**Emphatic**: Because the bank card is a personal and valuable object to many travellers, it is important that the card is also treated as such. The service gives travellers the option to deactivate EMV-pt if they do not want to use it, which can be either done by deactivating the contactless feature at one's bank or by specifically deactivating EMV-pt at the OV-betalen website. When used for the first time, the banks will also notify

people when the card is used in order to make them aware of both the existence of EMV-pt as well as potential misuse. Although a spending limit hinders the use of the contactless bank card in public transport, it is nevertheless added to the service in order for people to feel comfortable when using EMV-pt. During travel service personnel will also treat people travelling with the bank card with care and will not just grab a bank card out of a travellers hand in order to scan it or inquire about personal bank information.

## 6.2 Touchpoint Designs

A service is only good as the combined strengths of the various touchpoints out of which it consists. The location of the touchpoints and their position within the customer journey can be seen in figure 40. In this customer journey the old touchpoints as well as the new are shown along with the goals and expectations the travellers have. The logos of the new touchpoints located in the emotional curve of the CJM correspond with the touchpoint concept described later on. In this subchapter the touchpoints that the travellers will encounter are also described and shown. Within the description the problem which the touchpoint tackles is explained as well as the way the touchpoint works and how it is designed. The position of the touchpoint on the customer journey is also shown as well as the factors it contributes to the EMV-pt acceptance model.



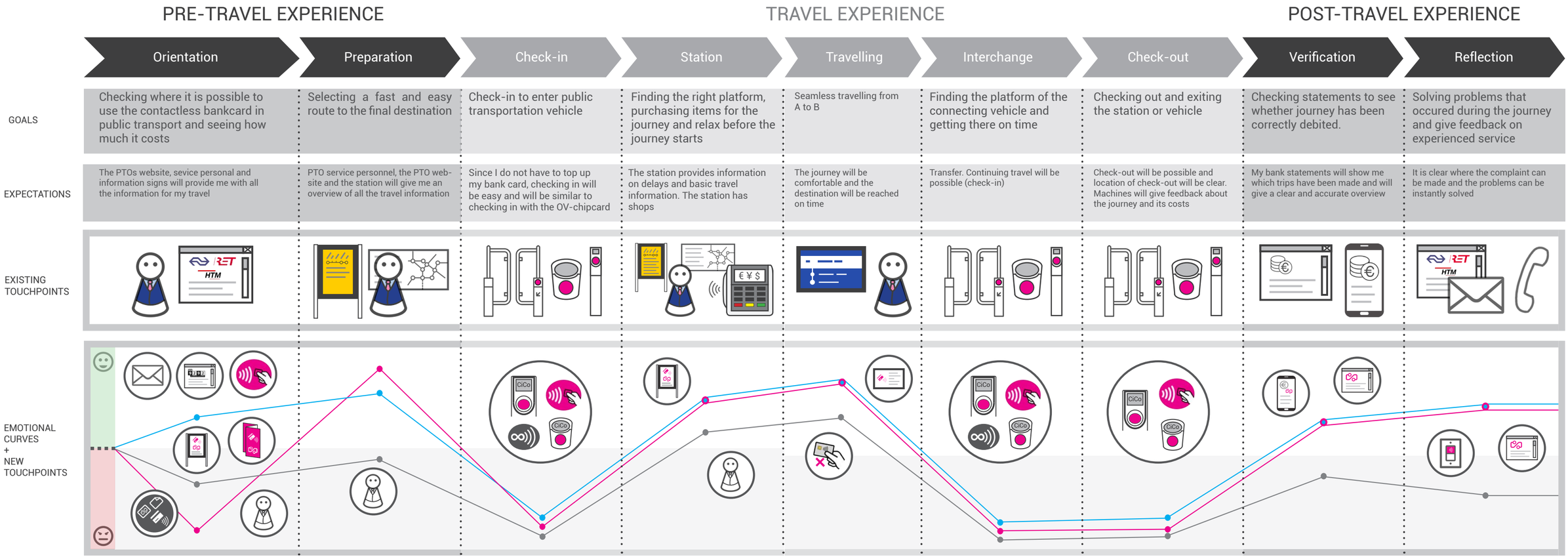
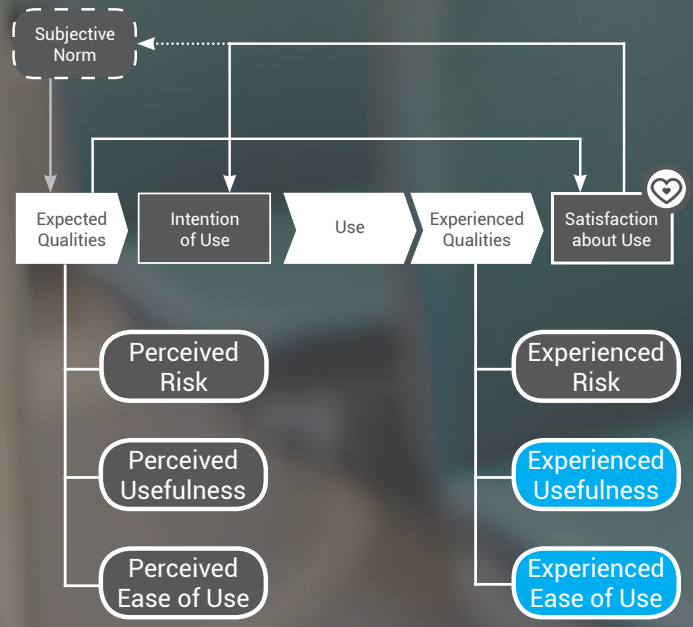



Figure 40. Location of touchpoint concepts within EMV-pt journey


Touchpont is used during:


Contribution to EMV-pt acceptance model



**Compatibility Logo**

When EMV-pt will be implemented in the Netherlands, it will not be directly supported by all operators at once. Because the Netherlands deals with many concessions which do not all end at the same time, not each PTO can change its equipment to be EMV-c ready immediately. Nationwide implementation could only be reached after several years of the launch of EMV-pt and even then it is not certain whether EMV-pt will be accepted by each transport operator. Not being able to use the contactless bank card everywhere could result in travellers getting confused where they could use their bank card and where not. It could also lead to travellers getting stranded at stations or stops without being able to continue their journey. Therefor it is important to notify travellers where they can and cannot make use of the contactless bank card as carrier in public transport.

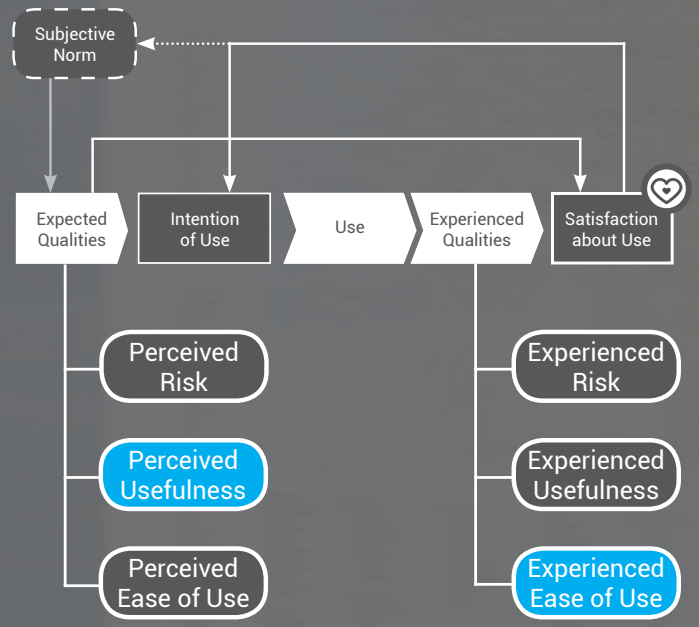
By providing the validator poles and gates with a new logo printed on stickers showing where EMV-pt is implemented and where not, users will protected from accidently using the contactless bank card with public transport operators that do not support it. Next to the validation equipment, websites and signs will also be outfitted with this logo in order for people to quickly link the logo with using the contactless bank card in pubic transport.

The compatibility logo is separated into two parts (figure 41), where the top side shows it is also still possible to use the OV-chipcard, and the bottom side shows it is compatible with the contactless bank card. The logo used for the contactless bank card is the general contactless bank card logo as is being used by the banks and shops. Although this logo is officially used to indicate contactless smart cards as can be seen in the analysis report (Meeuwsen, 2016), the fact that it is now mostly used for payment terminals makes it very recognizable for users as being a place where the contactless bank card works. Another reason this logo has been chosen is to minimize the amount of inconsistencies that are currently present within both the bank as well as the transit by using a well known logo to create a standard instead of making a separate EMV-pt logo for the bank card. The colour in the grey used in the bottom of the logo is being used to highlight the differences between the new logo for EMV-pt compared to the old one, making it easier to separate from the existing stickers which will continue to be used non EMV-pt ready equipment. Both the name of the OV-chipcard as well as the bank card have been put on the logo to further explain the compatible carriers.


Figure 41. Compatability logo design


Touchpont is used during:


Contribution to EMV-pt acceptance model



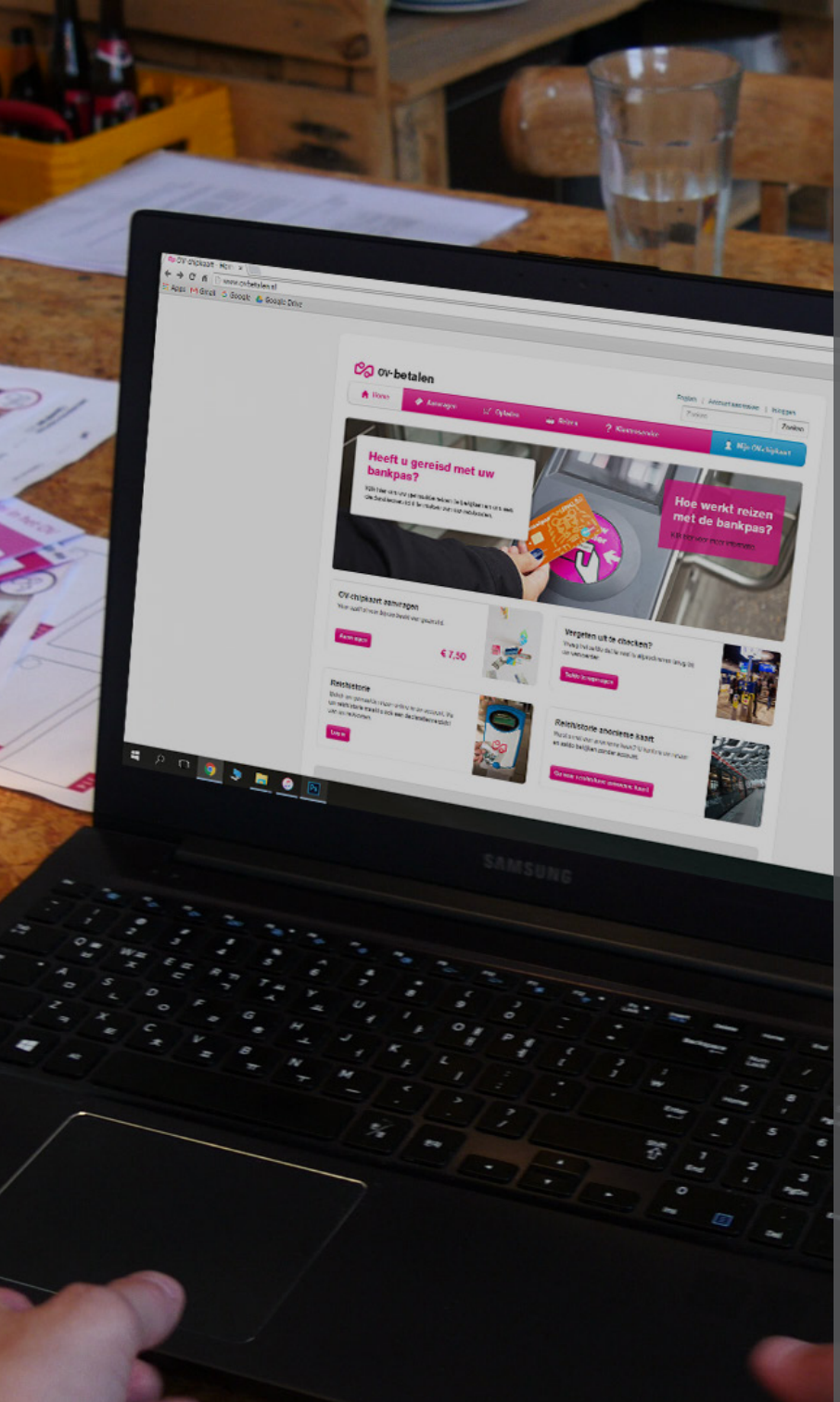
**Ticket Options**

When EMV-pt will be implemented as new carrier for public transport is added to the existing tickets. For many travellers the amount of payment options could come across as confusing and it could be harder to select the right payment option. Next to given a overload of tickets, it could also become increasingly difficult to distinguish one payment option from another.

In order to make sure travellers know what carriers are available to them an overview of all possible ways to pay for public transport are shown (figure 42). This information is given both at stations and stops in the form of posters and signs, but also on the websites of the various public transport operators. Next to supporting travellers choosing the right ticket for them, it can also help travellers that are in need such as the emergency users, to quickly see what other payment possibilities there are for using public transport.

The information concerning the tickets will show the travellers where they can travel with each payment option. It also shows where each type of ticket can be obtained and what the special characteristics of each card are. In case of the bank card, the information signs show how to recognize a contactless bank card that can be used with public transport and explains that when using the bank card the travellers pays directly from one's bank account. The information will be displayed showing photos of the carriers in order to make identifying the ticket easier for travellers. The magenta colour will also be used in the signs to indicate that this information applies to the entire public transport service.


Figure 42. Overview of payment options for public transport

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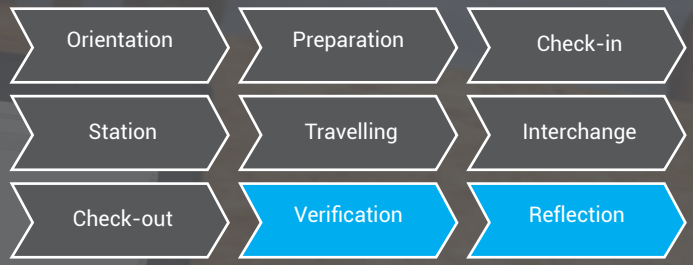


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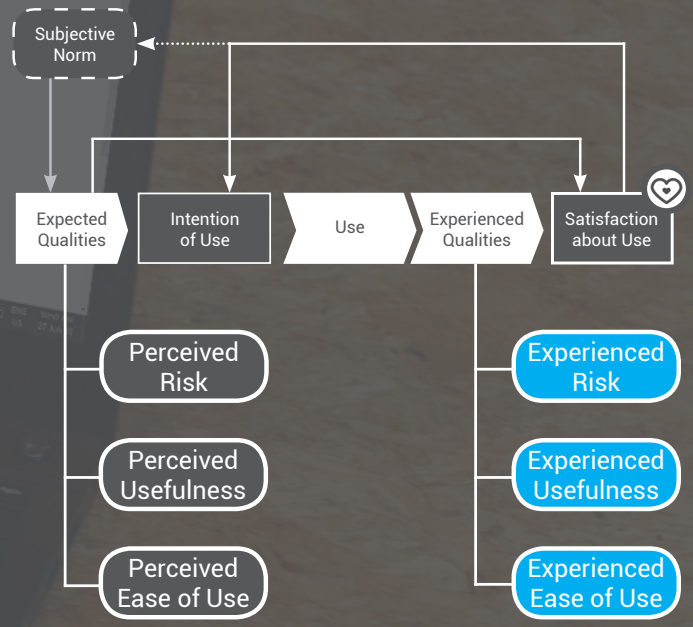


**OV-Betalen Website**

The moment EMV-pt becomes reality in the Netherlands, travellers need to know how it works. Information needs to be present both in the physical world in the form of stations and stops as well as in the digital world in the form the internet. Furthermore it needs to be possible for people to know where they have travelled with their bank card in order to get the feeling that they are in control. Without an overview of their travels, travellers would only receive a bank statement showing the costs of the travel. In order for travellers to know what they did with their bank card and to be able to make an expenses overview a touchpoint is needed that can supply these needs.

The OV-Betalen website is an upgrade of the current OV-chipkaart website and is able to provide travellers with information about the contactless bank card in public transport. The website also shows people an overview of their journeys when they have travelled with the contactless bank card and makes it possible to make an expenses overview just like is possible with the OV-chipcard.

The website itself has been altered little in order to stay familiar with its current users. The name of the website is changed in order to be more future proof since only more payment options will be added. When wanting to retrieve EMV-pt travel information travellers have the option of either making an account or to request an overview without registering. When making an account the user will undergo the same steps that they would otherwise follow when making an account with the OVCP. When the user decides not to register, he/she is required to fill in extra information concerning the bank card in order to verify that the user is the owner of the bank card (figure 43). Once this has been done, the option is made available to store parts of this information to avoid the situation where users have to keep filling in long forms.

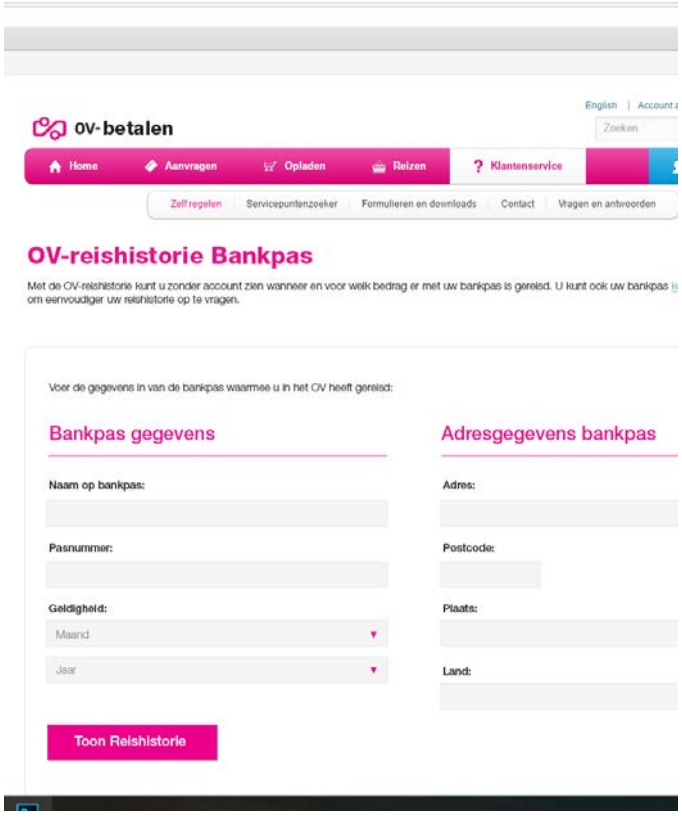
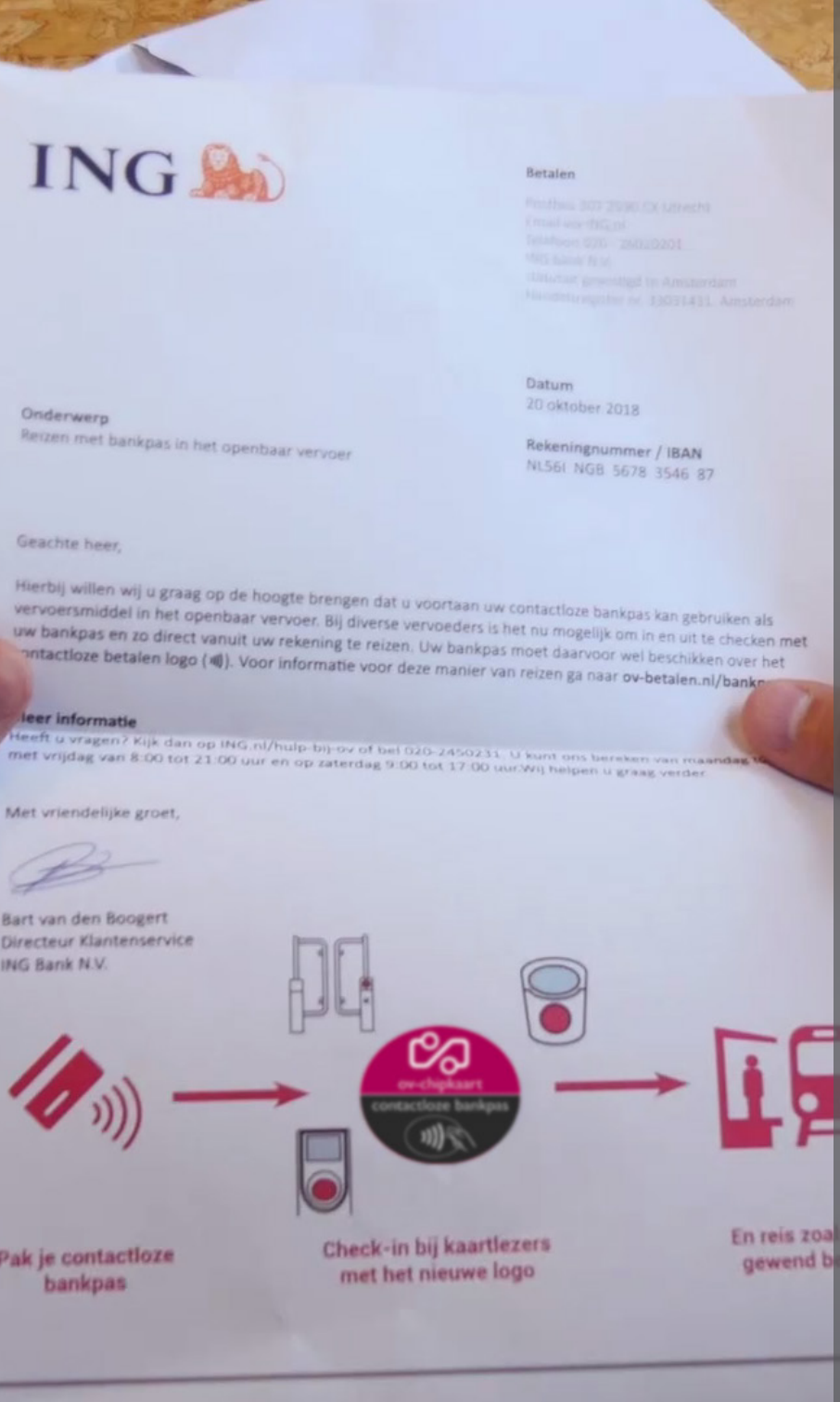



Figure 43. Bank card journey history screen of OV-betalen website

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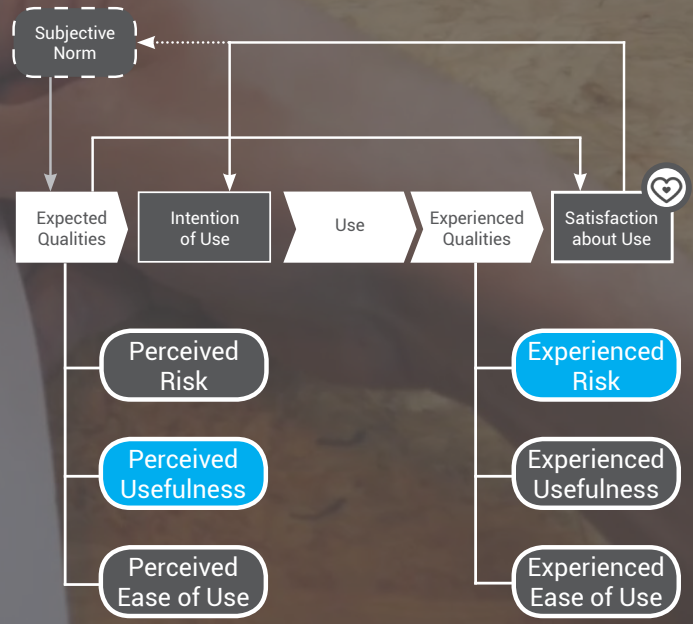


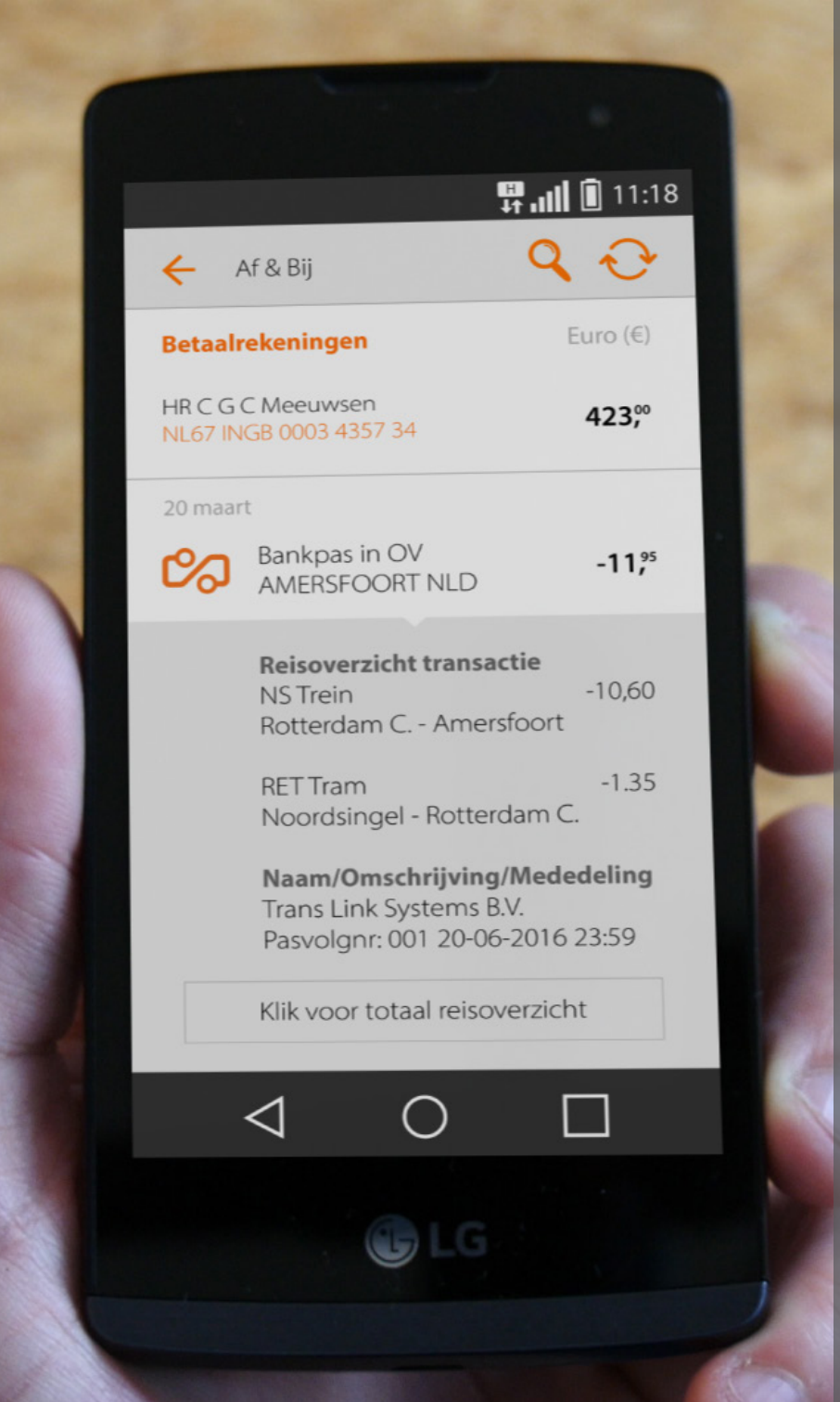
**Information Letter**

If EMV-pt becomes reality, the situation will arise where many bank card are all of a sudden able to be scanned by validator equipment of various PTOs. If travellers are not informed of this change in their contactless bank card, there is a possibility of travellers accidently using their bank card without wanting to. Information needs to be provided to bank card holders so they know that their bank card could be compatible with pubic transport. Apart from the existence of EMV-pt, bank card holders also need to know how it exactly works and where they can find more information.

In order to provide this information, banks will send their customers a letter at the launch of EMV-pt, stating that it is now possible to use their bank card with public transport. The letter will also contain information about the working principle of EMV-pt.

In the letter a basic instruction of the working principle of EMV-pt is given and a link to the OV-betalen website is shown (figure 44). Information on the letter is displayed in the same style as all the public transportation information concerning EMV-pt, making the link to public transport more clear and guiding people to the PTOs for more information. The letter will also help with reassuring travellers, seeing as it shows that the bank supports the new technology and is willing to lend its services to make EMV-pt possible.


Figure 44. Displayed information of working principle EMV-pt on information letter

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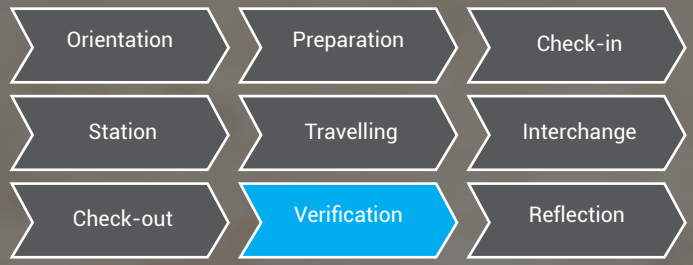
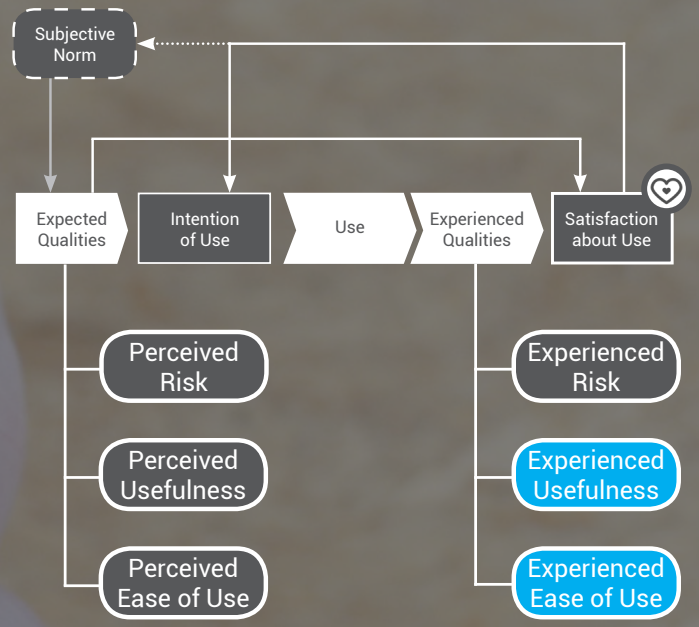



Contribution to EMV-pt acceptance model



**Overview from Statements**

Since EMV-pt will make it possible to travel with public transport by directly paying from one's bank account, statements will appear that will show how much money has been spend on public transport. Without further explanation, travellers would not know if the money that has been written off is done so correctly and would have no idea what the EMV-pt costs consist of.

In order to make sure travellers can receive this overview, the banks will make it possible to show how these costs are built up. Both on their respective website as well as on their application, the banks will provide EMV-pt users with the ability to see an expenses overview for EMV-pt. Banks connected to Dutch public transport will be able to show exactly how they statements built up and what journeys contribute to its total costs. Foreign banks or banks that are not connected to Dutch public transport will be able to see where extra information can be found.

In the sample case of the ING application, the bank is able to provide an expenses overview within the application itself. By clicking on the statement, a textbox unfolds showing what travels have been made for that statement. Within this textbox there is also a direct link to the OV-betalen website making it possible to see even further in one's travel history and to be able to make an expenses overview. Because in this case the bank has a cooperation relationship with the transit world, it is possible to see one's travel history without entering any further bank details since the user is already logged in his/her bank account. For banks that are not connected (in this case SNS) the statement contain a link to the OV-betalen website (figure 45). By copy pasting this link the user will arrive at the OV-betalen website in which he/she has to fill in her bank details in order to show that she is the owner of that particular bank card. When filled in the website will offer to memorize parts of the information and will redirect the user to his/her travel overview.

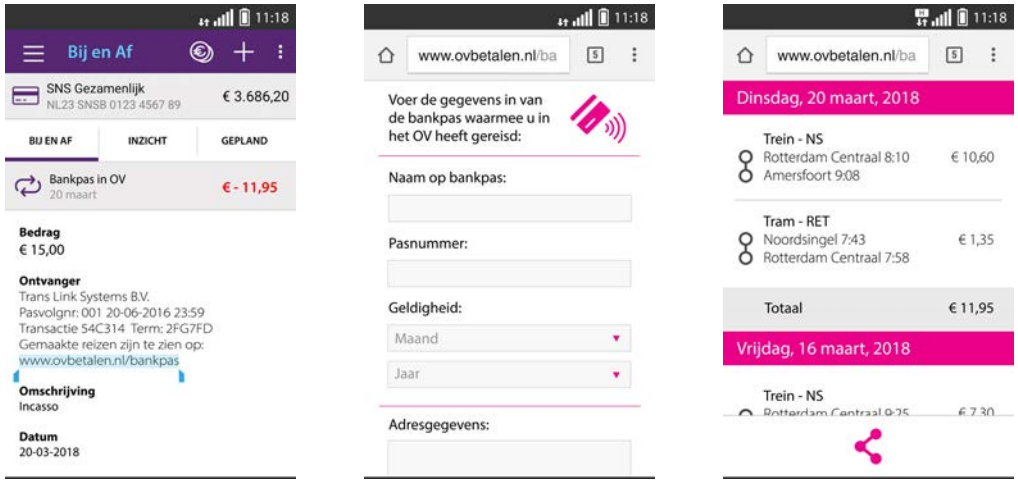



Figure 45. SNS application screens and link to OV-betalen website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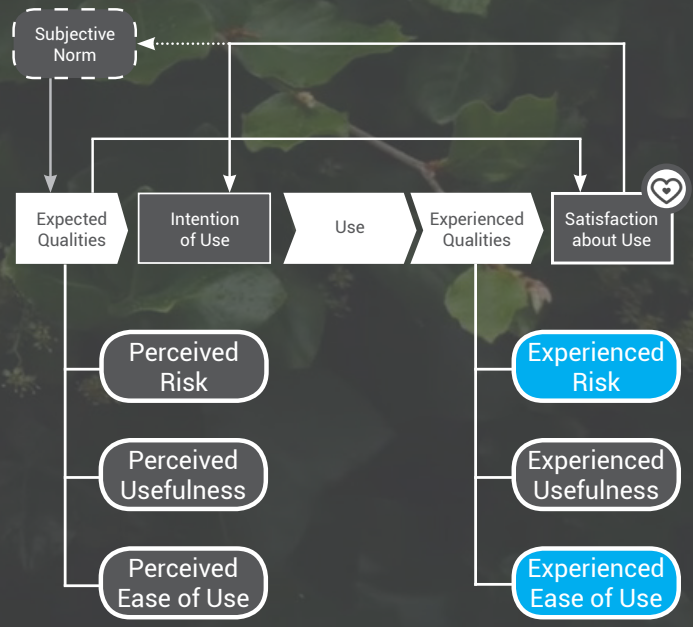
Contribution to EMV-pt acceptance model




**CiCo Feedback at Validators**

Since travel information is stored on the OV-chipcard and not on the bank card, the implementation of EMV-pt would mean that validators are unable to show travellers journey information when using the contactless bank card. Since the bank card is not able to store the same information as the OVCP, validators would not be able to show the CiCo status of the bank card as well as give the corresponding sound when checking in and out. This could result in travellers not knowing whether checking in and out went right or wrong since they receive no visual and audio feedback. It could also lead to travellers not being aware that it is needed to check out since the validator does not indicate that it works with a CiCo system. Since checking in and out is a fundamental element in correctly using Dutch public transport, something must be done to provide travellers with this important information.

In order to tackle this information gap adjustments need to be made to the validator equipment to make it possible to let them communicate with each other. This would make sure CiCo status can be given to any token without them having to be smart cards capable of storing public transportation information.

By connecting the level 1 devices information can be exchanged in order for the devices to communicate whether a bank card has already checked in or not. When the validators are connected, validator at station and in vehicles will be able to show travellers their CiCo status, both displayed on the screen as well as communicated through audio feedback (figure 46).

If a traveller uses the bank card for the first time, an email notification will also be send to the card holder informing him/her that the contactless bank card has been used. This way people that did not intent to use the card, are still aware of the existence of EMV-pt or potential misuse and are able to swiftly deal with the consequences. The type of card is also shown on the validators in order to make sure people know with what kind of card they are checking in and out.


Figure 46. CiCo fedback at validator gate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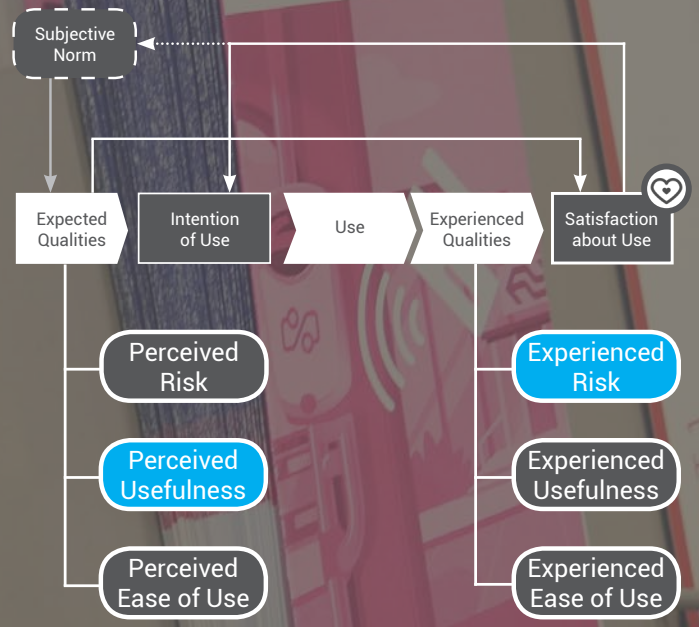
Contribution to EMV-pt acceptance model



**Information Folders**

Because the working principle for EMV-pt needs to be explained to travellers before they can make use of the payment option, information needs to be communicated to the travellers. Next to digital communications platforms such as websites, it must also be possible for travellers to gather the necessary EMV-pt information at stations.

In order to cope with this need for physical information, public transport operators will provide travellers with information folders regarding EMV-pt. The folders will show how the new technology works and where travellers can find more information.

The folders themselves will explain how the contactless bank card can be used in public transport and which bank cards are compatible (figure 47). It will give information about which public transport operators have EMV-pt ready equipment and it will also give the traveller an overview of the characteristics of the contactless bank card as carrier in public transport. Information about the safety of the bank card will also be displayed as well as a link to the OV-betalen website where more information can be found. The folders would also be available in multiple languages to support international travellers.


Figure 47. Folder information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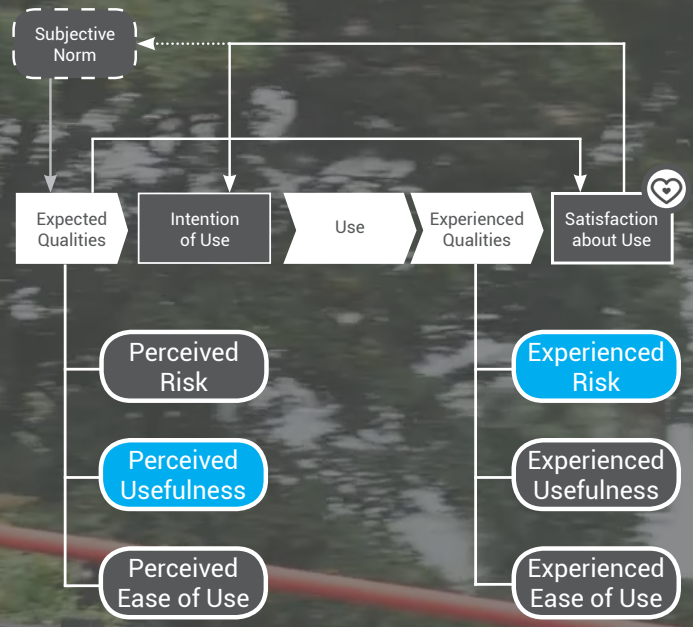
Contribution to EMV-pt acceptance model



**Operator Compatibility**

As been stated before, seeing as the implementation of EMV-pt will not immediately be available, not all PTOs will be EMV-pt ready at launch of the new technology. It is therefor important to show travellers where they can use the contactless bank card as valid carrier in public transport in order to avoid confusion.

Public transport operators will provide travellers with signs showing that it is possible to use the contactless bank card as carrier for their services. By reminding the travelers which transport operators are compatible with the new technology, travelers will get a better idea which operators use EMV-pt and which do not.

Signs and Posters will show images of the bank card being used with the validators of a specific PTO. By showing photos of EMV-pt, travellers are triggered to use the contactless bank card themselves. The photos also help to illustrate the simplicity of using the bank card as it shows that it works just like the OVCP. Information concerning the compatibility is also shown at ticket machines in order to make travellers aware of the benefits of using the bank card compared to buying a paper ticket (figure 48).

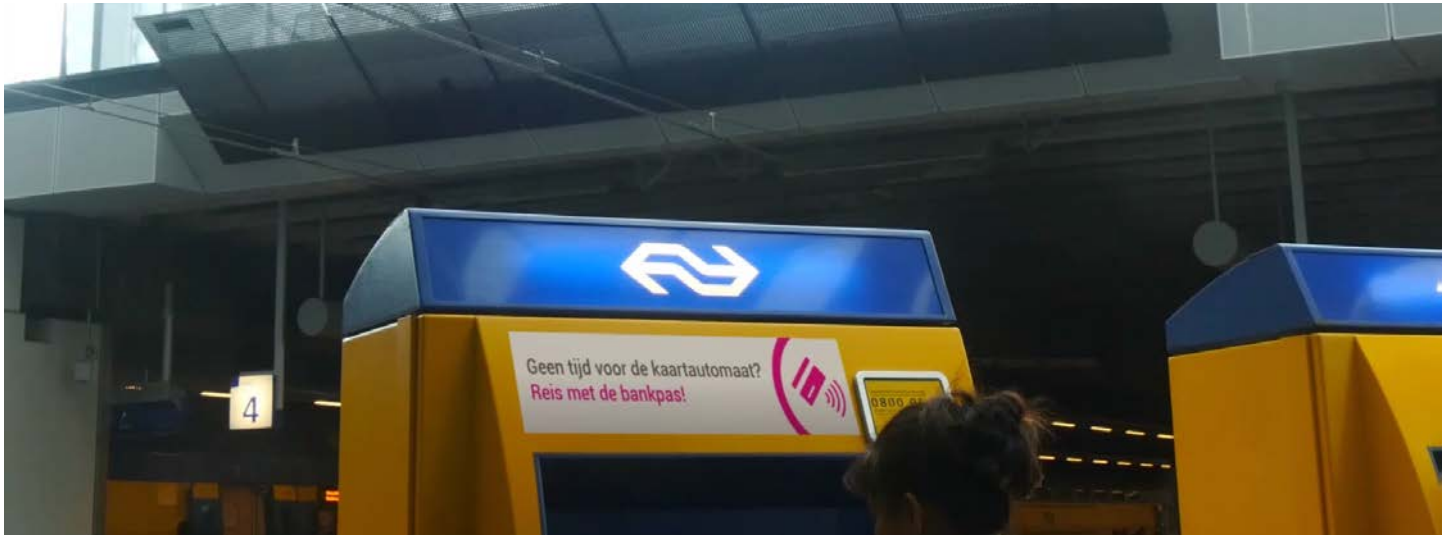
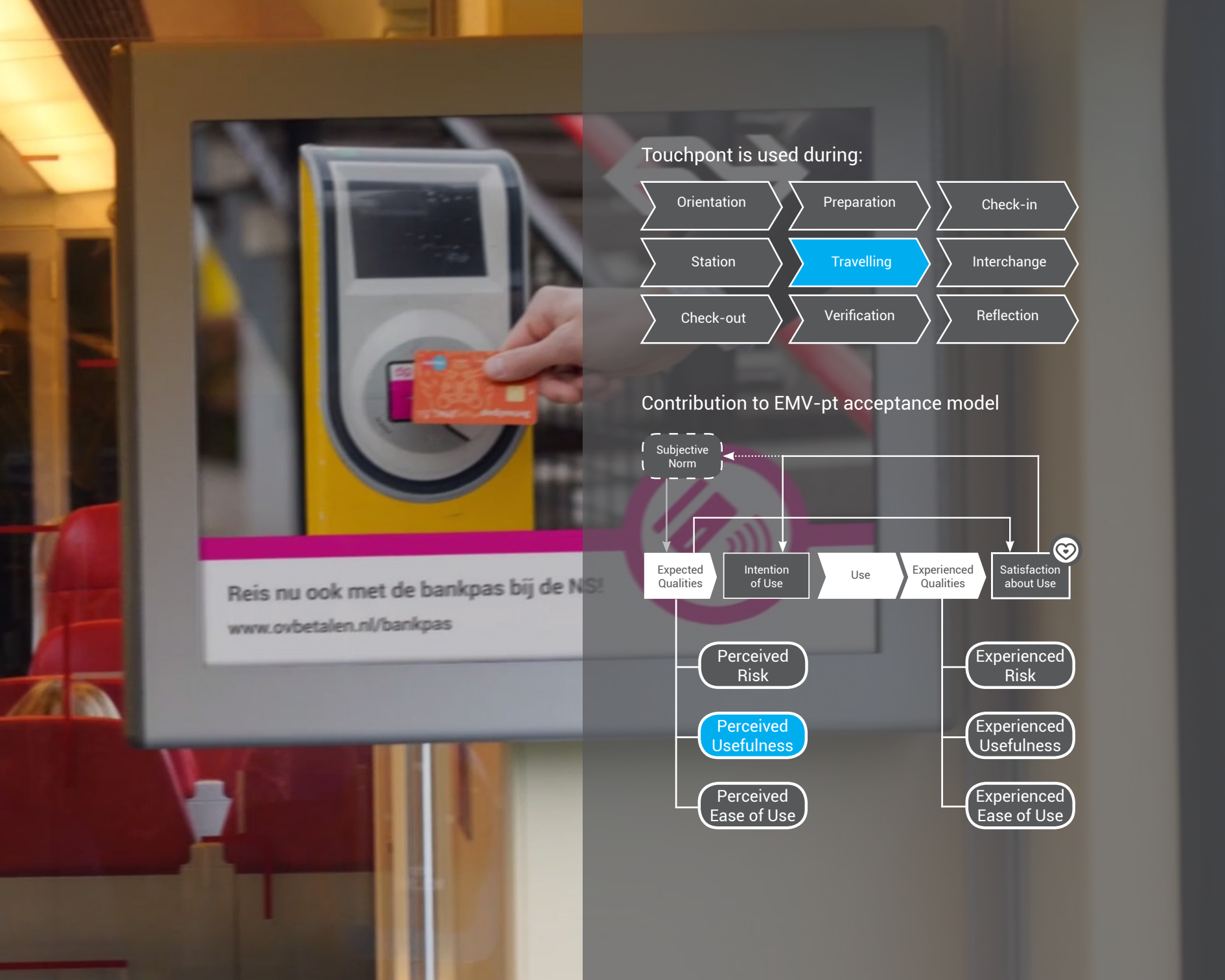



Figure 48. Operator compatbility information on ticket machine




Touchpont is used during:




Contribution to EMV-pt acceptance model

**Information in Vehicle Screens**

Seeing as EMV-pt is going to be a new payment option in public transport, travellers need to be made aware of the new technology before they can consider using it.

To make people conscious of EMV-pt and to already give them information concerning its working principle, PTOs will show various EMV-pt information on the screens in their vehicles.

The moment travellers enter a public transport vehicle they start a relative easy part of their entire journey. Because travellers use this moment to focus on other things and to relax, it provides the perfect opportunity to inform them about the bank card and to show them where to find information. The information provided by the screens serve both as commercial as well as information communicator. The screens will show it is possible to use EMV-pt with that specific operator, but will also the travellers how to use the bank card, what bank is needed and where the card can be used (figure 49). Apart from the way it works the screens also show where the traveller can find more information. The screens would be shown in between travel information screens and would be displayed in such a way that it does not feel forced upon the travellers or interferes too much with the information they want to see.


Figure 49. Information shown on vehicle screens

## 6.3 Implementation Strategy for EMV-pt

Since the adoption of EMV-pt in its first years also affects the adoption when the account-based back office is connected, mistakes made in this phase heavily influence the adoption later on. When EMV-pt is going to be rolled out, it is essential to make sure that it is not just a minimal viable product but is able to compete on at least the same level as the OVCP if it is to stand a chance of being used in the future.

During the implementation of EMV-pt it is also important for both the PTOs and Translink as well as the banks to be consistent with the way they display information. Since EMV-pt already involves the merger of two different worlds, unity is needed when communicating the new technology in order to make it look like a coherent whole to gain the trust of the users. The parties involved must also watch out with promoting EMV-pt nationwide when it is not implemented everywhere and should only do so if the contactless bank card can be used with each and every public transport operator. Although the title of project is somewhat misleading, the bank card should also not be presented as being the same as the OV-chipcard. Although many of the actions performed by the traveller are similar, the two cards differ greatly in working principle. In order to make sure people do not confuse the two cards it is therefor essential to not compare the two when explaining how EMV-pt works.

When promoting the contactless bank card users must be given a chance to get familiar with the new technology, especially because using such a valuable item in public transport can be seen as a big hurdle. Making it possible for people to use the contactless bank card free of charge for one day could get them to try the bank card and start trusting the system. A similar strategy has also been deployed in London, where this seemed to have worked well.

If EMV-pt is correctly implemented it can also serve as communication tool for the banks to even further promote the contactless bank card itself. Although the contactless bank card provides public transport with another way of paying for one's travel, it also works the other way around seeing as EMV-pt could give more value to the contactless bank card.


EMV-pt pilot in HTM vehicle


# 7

# 7 CONCLUSION & DISCUSSION

In this chapter the results and the corresponding conclusions of this project are discussed as well as the limitations of this project and the research that has been done. A closer look will also be taken at the design brief in order to see if the formulated goal has been reached. The vision and mission that were created for this project are also reviewed to see whether the outcome of this project contributed to these objectives. Next to the design brief, the innovation model (van Kuijk, 2015) described in the approach has been addressed in order to look at the various aspects of this model and to see how the service design contributes to them.

## 7.1 Conclusion

The goal of this project was to design a user-centered strategy which will enable the successful adoption of EMV-pt in the Netherlands. This strategy would include the steps needed to achieve this adoption and would encompass a service design with corresponding touchpoint designs. In order to reach this goal research was performed in the  Netherlands as well as abroad in London, Chicago and the Czech Republic. The results of the researches led to various insights, threats and guidelines for the implementation of EMV-pt in the Netherlands. Using a model created in a literature research, it was also possible to create an EMV-pt implementation model showing the factors that influence its acceptance.

The finding of this analysis led to the second phase of the project which involved the design of the EMV-pt service for the Netherlands. In this phase a scope was defined in order to have a clear focus while designing. For this project it was decided to look at the situation where the account-based central back office does not yet exist and EMV-pt is in its first stages of being implemented. Using this scope several user groups could be defined based on motivational segmentation for EMV-pt. These groups include: the emergency users, the replacement users and the first time users. Apart from the three user groups it was also found that the non users play an important role since EMV-pt is going to be part of public transport. With the three user groups a customer journey was created of the EMV-pt working model described in the analysis in order to identify opportunities for improvement. This showed that there are five problem areas within the journey of these groups that need designing for in order to enhance the user-friendliness of EMV-pt.

Using the user groups and the information the customer journey provided as well as the acceptance model for EMV-pt, several topics could be found that needed designing for. Based on these topics ideas were generated and evaluated with users and stakeholders. The evaluation sessions showed that there are many different viewpoints involved for EMV-pt. The user tests displayed that even though EMV-pt can have value for many people, the way the different types of travellers want to see the service can vary a lot. The differences in these user types need to be taken into account when designing the service in order to create an EMV-pt service in the Netherlands that is acceptable for all potential users. At the same time the similarities the user groups have can help create a foundation for the service and the values that should be connected to it. Evaluation sessions with the stakeholders showed that there are still some different mindsets concerning the way the EMV-pt service should work and what are important aspects to deal with. Apart from the way

the stakeholders want the EMV-pt service to be, they also deal with various technical difficulties making the implementation of several ideas either very expensive or very complex. Both evaluation sessions showed that there are quite some issues on which the stakeholders and users differ. In order to make the adoption of EMV-pt successful something must be done to satisfy the wants and needs of all these parties, without making the service unacceptable for any of them.

By using the results of both evaluations, several touchpoint ideas were selected and combined in one service design concept. The service design concept focusses on giving travellers an easy and uncomplicated way of paying for pubic transport and aims to be transparent to its users. The design consists out of various touchpoints providing users support in using EMV-pt along their journey. The design in its entirety was evaluated with the three user groups. This showed that the design is positively received but that there needs to be added control before travellers feel comfortable using it. The participants also often compared the contactless bank card with the OVCP and indicated that they would not be very satisfied if EMV-pt cannot reach the same level of user friendliness as the OV-chipcard. During these session it also became apparent that the participants see many advantages to the bank card and it often excited much enthusiasm amongst the participants.

The results of the second user evaluations helped create a final design for EMV-pt. This design is characterized by three keywords describing the main values of the service: uncomplicated, transparent and empathic. The service is uncomplicated as it tries to make sure travellers perceive and experience EMV-pt as a simple to use payment option. The design is transparent as it aims at telling travellers how EMV-pt works without holding something back. Finally the service is empathic as it recognises the bank card as a personal and valuable object and deals with that in a proper way. The final service design for EMV-pt needs to be tested and developed further before it can be implemented in the Netherlands. However when this is done and EMV-pt is implemented successfully, it will be one step closer to reaching the vision stated at the beginning of the report:

Travellers will no longer have to concern themselves with different transporters and their tickets. Using their bank card they can go anywhere they want at any time. Their bank card will no longer be just a tool to access their bank account but will become a key that opens up their world.

## 7.2 Discussion

The human, technological, business and societal aspects of the project and the way connected service influences these aspects is described in this subchapter as well as the limitation to the project.

**Human Aspect**

As the human aspect has been the central pillar throughout the project, this aspect has been addresses numerous times. User-centered has always been the emphasis during both the research as well as the design phase. The evaluation sessions with the users showed that there is definitely interest in EMV-pt and many users indicated that they are willing to use the contactless bank card in public transport.

**Technological Aspect**

When looking at the technological aspect for EMV-pt, the service design is definitely feasible. Most technology used within the design already exists and touchpoint concepts often focus on tweaking existing platforms in order to display

new information. The link between bank applications and the OV betalen website would require extensive communication between the two parties involved, but going from one protected environment to another is not something new. The linkage of the validator equipment does require a fast network that makes it possible for the equipment to know where travellers have previously checked in or out, but apart from the fact that this could be expensive it is not impossible to provide this equipment with travel information.

**Business Aspect**
Implementing EMV-pt could increase the amount of travelers in public transport. As has been stated by the NOVB, the implementation of EMV-pt can also help in strengthening the positioning of the transporters and decrease total cost of ownership. However the implementation also brings with it a lot of costs for both public transport as well as the banks. The proposed service design for EMV-pt requires the PTOs and Translink to heavily invest in validator equipment that is able to communicate with each other to provide travellers with CiCo information. However this equipment is also needed for other token based payment options in the future when the account-based central back office will be created.

**Societal Aspect**
Public transport is a service that is available to everyone and as such the societal aspect plays an important part when designing for this industry. The implementation of the bank card has the potential to make public transport more accessible to infrequent travellers. The new technology could help convince travellers, that would otherwise use the car or other means of transport, to turn to public transport for their journeys. Apart from the benefits EMV-pt brings, the societal aspect has also been used in terms of looking at everyone when designing. Even though the main focus during the project was on the user groups of EMV-pt, during the project the non users has also been taken into account for the design of the service.

**Limitations**
For the research in this project a qualitative approach has been taken in both during analysis and the design phase. This type of research has been chosen because the focus throughout the project was centered around the user. As has been stated by Kvale (1983), this type of research better enables the collection of rich data that makes it possible to get a better understanding of the want and needs of the user and of the actions that they are displaying. However this type of research is vulnerable to interview bias, leading questions and skewed interpretation (Kvale 1994).

## 7.3 Recommendations

In this subchapter several recommendations are formed which can help with the implementation of EMV-pt in the Netherlands as well as with the development of the EMV-pt service design proposition. These recommendations also look beyond the scope that has been set for this project and take a look at what can be done to even further improve EMV-pt in the future.

**Develop and evaluate the separate touchpoints**
Although the proposed service for EMV-pt contains several worked out touchpoints designs, the touchpoints that have been created are still on a very conceptual level. This means that the touchpoint require further development and testing in order for them to be ready to implement. However the described touchpoints can be used as starting point and give a rough indication what is needed and how users would react to them.

The situation changes with the account-based central back office

When the account-based CBO is going to be implemented, it is important to know how the environment will change and what this means for the various payment options. The shift from having a valid ticket to having a valid account with a ticket connected to it can be a big change and as such it is essential to research the effects this change will have on EMV-pt and the other payment options. It might also be interesting to look at the cooperation between different payment options, seeing as they are all connected to one payment account, to look for ways to remove the problem of card clash.

**Look beyond the Netherlands**

The contactless bank card can become more valuable than just a payment option that reduces the amount of cards that you carry around in your wallet. Because EMV is becoming a worldwide standard, EMV-pt could become the payment option that connects different public transportation systems throughout Europe or the rest of the world. The new technology could support international travellers with border crossing as it could help with many of the problems addressed in the report of Mak and van Lieshout (2016). Although EMV-pt definitely has to potential to improve the user friendliness of Dutch public transport, it also has the power to improve the user friendliness of public transport in general.

**Do not forget the international travellers**

Research showed that EMV-pt can have a significant impact on the user friendliness of public transport for first time users. Within this user group the international travellers play a big part. Although the proposed service design has not been tested with these travellers, it is important to further research the demands and wishes of the international travellers in order to . More information concerning the wishes of the international travellers can be found in the report 'OV-betalen for international travellers' (Lehr, 2016) and can, together with this report, serve as starting point for further research on this user group.

**Consistency is key**

As has also been described within the adoption strategy, consistency is important for EMV-pt to work and be understood by travellers. Because EMV-pt concerns many different stakeholders, it is essential to create standards in order to avoid for travellers to keep having to learn new symbols, logos and working principles. The more consistent the service is, the easier it is for travellers to understand.

**Keep the user-centered mindset**

This project has been brought to life because there was a need for a user-centered approach in dealing with the implementation of EMV-pt. Although this project is now at an end, it does not mean the user-centered mindset has to end with it. In order to make the adoption of EMV-pt successful and for it to be experienced by travellers as user-friendly, it is important to keep the human aspect as central pillar throughout the implementation. This means not only designing for the users, but also involving the users to get a good overview of what their wants and needs are.


Proef in ov met bankpas om in te checken
Kaart hier
ov-chipkaart
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Vervoerbedrijven willen laten betalen met sma
Gepubliceerd: 18-09-15 08:45
Laatste update: 18-09-15 10:10
Vervoerders willen proeven gaan hou
mogelijk wordt om in plaats van met ee
contactloos te betalen met een smartph
bankpas.
Dat staat in een vrijdag gepubliceerde to
van het Natione
Innovatie graag, voor d
vier ov-chipkaartkwel
Inchecken. Reizigers kunnen snel verbete-ringen en innovaties rond de ov-chipkaart verwachten, nu chipkaartbeheerder TLS een coöperatie van alle vervoerders wordt.
Vanzelf je geld terug bij vergeten checkout
reiziger zou dus graag een 'vervoerderonafhankelijke' vertragingsregeling zien.
3 Oeverloos in- en uitchecken
Reizigers moeten opnieuw inchecken als ze gedurende het traject overstappen op een andere vervoerder. Een doorn in het oog, want daar kan ongewild van alles bij misgaan. Zo kon een treinreiziger niet uitchecken op station Abcoude vanwege een storing bij de ov-paaltjes. Ze
Galaxy S6
€ 29,-
Studentmobiel
VUELTA DAG TE LA
VOOR TOM DUMOU
PAGINA 20
DÉ GRATIS KRANT VAN NEDERLAND
maandag 14 september 20
metro
VANDAAG OP METRONIEUWS.NL: STAD ALABAMA
Snel betere ov-chip voor reiziger
WAT GEEF JIJ EE
Knuffe
een te
openbaar vervoer. Reizigers kunnen snel
verbeteringen en innovaties rond de ov-chipkaart
verwachten, nu chipkaartbeheerder TLS een
coöperatie van alle vervoerders wordt. PAGINA 3

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# FIGURE REFERENCES

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# APPENDICES

The appendices are located in a separate report:


A digital version of the appendices can be obtained at the project website or at the following link:

http://tinyurl.com/DesignAppendices

# COLOPHON

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