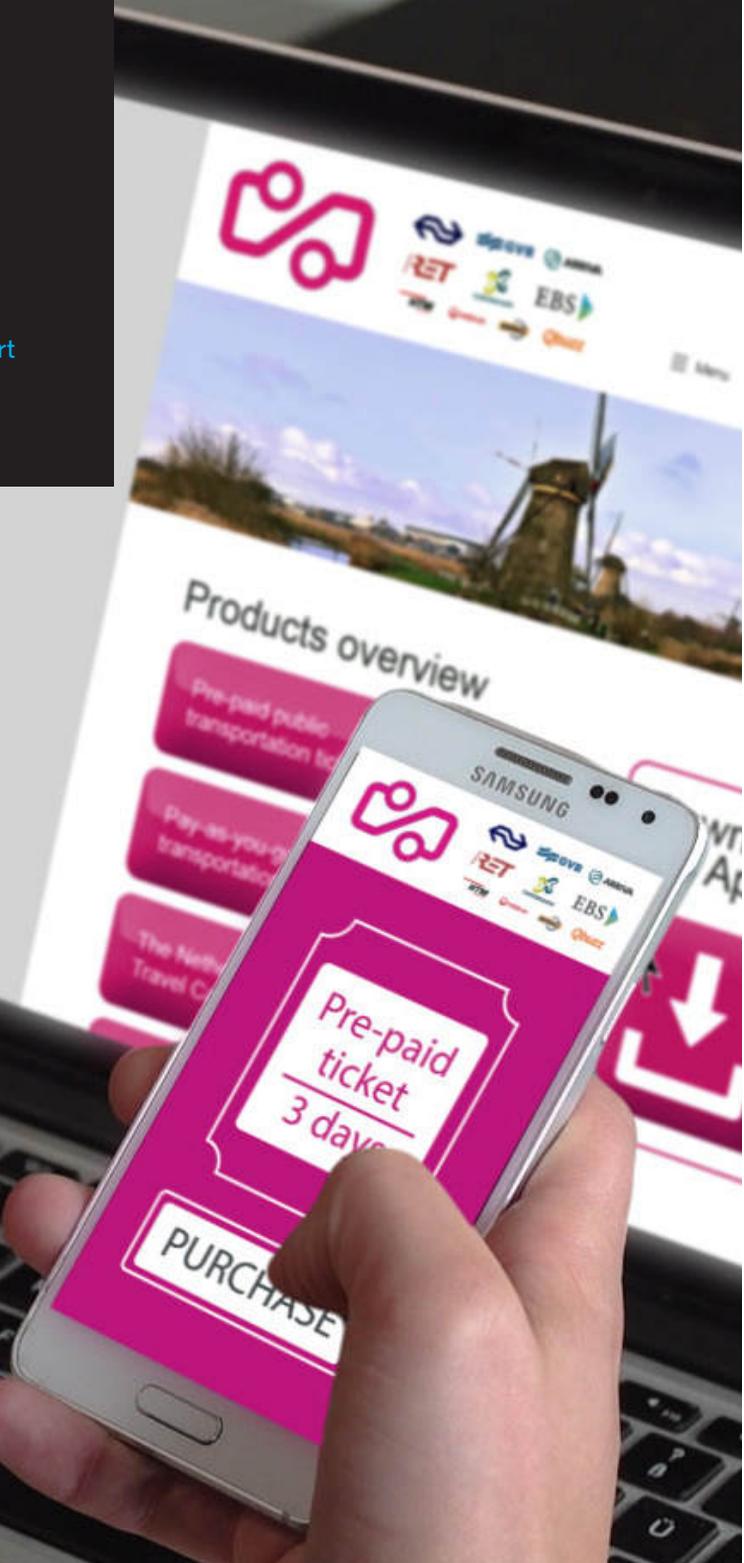


OV-betalen for international travellers

Design report, July 2016
Expertise Centre for E-Ticketing in Public Transport

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OV-betalen for international travellers arriving at an airport in the Netherlands

Design report
July 2016

Delft University of Technology

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Connexxion (bus transport operator to and from Schiphol airport and Amsterdam's surroundings)

GVB (Gemeentelijk Vervoerbedrijf, Amsterdam's municipal transport operator)

KLM (Koninklijke Luchtvaart Maatschappij N.V., in English Royal Dutch Airlines, the largest Dutch carrier airline)

NS (Nederlandse Spoorwegen, in English Dutch Railways, which is the primary Dutch rail transport operator)

RET (Rotterdamse Elektrische Tram, Rotterdam's municipal transport operator)

Schiphol Group (which operates Schiphol airport and Rotterdam - The Hague airport)

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List of Abbreviations

DOT	Din Offentlige Transport (Danish), in English <i>Your Public Transport</i>
EMV	Europay, MasterCard, and Visa - global standard for credit and debit payment cards based on chip card technology, named from the card schemes that originally developed it
GVB	Gemeentelijk Vervoerbedrijf (Dutch), in English <i>Municipal Transport Company</i> (in Amsterdam)
KLM	Koninklijke Luchtvaart Maatschappij N.V. (Dutch), in in English <i>Royal Dutch Airlines</i>
MTRCL	Mass Transit Railway Corporation Limited (in Hong Kong)
NBTC	Netherlands Board of Tourism & Conventions
NS	Nederlandse Spoorwegen (Dutch), in English <i>Dutch Railways</i>
OV	Openbaar Vervoer (Dutch), in English <i>public transportation</i>
PSS	Product service system
PTO	Public Transportation Operator
RET	Rotterdamse Elektrische Tram (Dutch), in English <i>Rotterdam's Electric Tram</i>
TfL	Transport for London (Transportation system in Greater London)
TLS	Trans Link Systems
TVM	Ticket vending machine

List of Definitions

Check-in & Check-out: When travellers validate their electronic payment card when entering (check-in) or exiting (check-out) the public transportations system, either on gates at stations or validation poles at stations or vehicles.

Concession: A concession as defined by the Oxford Dictionary is: "A thing that is granted, especially in response to demands." Or "The right to use land or other property for a specified purpose, granted by a government, company, or other controlling body." (Oxford dictionaries: concession, n.d.)

Customer Journey (Map): "The customer journey map is an oriented graph that describes the journey of a user by representing the different touchpoints that characterize his interaction with the service." (servicedesigntools.org, n.d.)

Feedforward: Feedforward is understood as the opposite of feedback: when the users receive information or cues that explain or hint what actions are coming next or on how to continue. (Norman, 2013, p.72)

Fidelity: "In product development, representations of the intended product are needed to enable specialists to learn about what they develop together. A variety of representations is deployed, ranging from textual documents like requirements, up to integrated prototypes. The difference between these representations is the fidelity: the degree to which a representation corresponds to the eventual real world product." (Stomppf and Smulders, 2014)

Frontend & Backend: The frontend of a product service system is the part that a user can see and interact with. The backend of a product service system is the part that the user cannot see. It includes the tools and infrastructure needed to deliver the part of the product service system that the user can see and interact with.

Interaction: "Bi-directional information exchange between users and equipment." (Source: ISO 9241-210:2010)

Journey & Trip: In this report a journey refers to the whole activity of travelling from A to B, while a trip refers to a segment within the journey. Thus, a journey can consist of multiple trips. For example, when going from Schiphol airport to Waterlooplein metro station in Amsterdam, the journey is Schiphol Airport to Waterlooplein and the trips within the journey are from Schiphol to Amsterdam Centraal (trip 1) and from Amsterdam Centraal to Waterlooplein (trip 2).

OV-betalen: Multiple forms of OV-chipcards exist and the sum of these ways of payment for public transportation in the Netherlands is labeled "OV-betalen". OV-betalen translated into English means public transportation payment.

OV-chipkaart/OV-chipcard: A smartcard the size of a credit card that enables public transportation users in The Netherlands to travel on all modes of public transport. In this report the OV-chipkaart refers to the plastic electronic card itself, while OV-betalen includes different forms of public transportation tickets and their respective travel products, see next definition.

Payment Border: The barrier that separates the paid and the unpaid areas in the station. Travellers will go through the closed payment border (if it is present in the station), the gates, when going from the station to the platforms or visa versa. In trams and buses (and also stations) there are validation poles to pay for public transportation.

Service Blueprint: "What is required is a system which will allow the structure of a service to be mapped in an objective and explicit manner while also capturing all the essential functions to which marketing applies." (Lynn Shostack, 1982)

Top-up: Adding balance or loading money to the electronic public transportation payment card.

Touchpoint: "Every contact point between the customer and the service provider." (Stickdorn, 2011) E.g. ticket vending machine

Travel Phases: The phases of public transportation usage are defined and broken down into steps that convey the possible stages travellers go through when using public transportation. During the research phase of this project four travel phases (pre-public transportation experience, pre-travel experience, travel experience, post-travel experience) were established. Each phase that consists of multiple steps travellers take when interacting with public transportation.

Travel product: Electronic (season) tickets that can be loaded on an electronic public transportation payment card.

Travellers/users: In this report usually the terms travellers and users describe international travellers arriving at an airport in the Netherlands, who use the public transportation system. In some cases the word will refer to all sorts of travellers, however in most cases it refers to international travellers. These are also referred to as foreign travellers.

User Experience: A "person's perceptions and responses that result from the use and/or anticipated use of a system, product or service." (Source: ISO 9241-210:2010)

Executive Summary

This study presents the development of a future vision and service proposition to improve the experience of international travellers when using public transportation in the Netherlands in a user-centred way. The focus is set on international travellers, who arrive at an airport in the Netherlands.

Relevance & Impact

Purchasing public transportation tickets in the Netherlands is a hurdle due to OV-betalen, which refers to different varieties of electronic payment in public transportation in the Netherlands. International travellers, who are most frequently first time users of the system, do not know how to acquire an OV-chipkaart (electronic public transportation ticket), which travel products to select and in general make more mistakes throughout their journey, because they do not have established routines like domestic travellers. This is a significant challenge to the Netherlands, as according to a study commissioned by NBTC Holland Marketing, "inbound tourism is a major growth industry within the Dutch economy". In this study the third main complaint of visitors to the Netherlands is the lack of user-friendliness of public transportation, and it is suggested to improve the smartcard and payment options for travellers (the first is regarding information provision for travellers in general and the second concerns too high prices for services). If the Dutch public transportation system provides a better service, not only the travellers will benefit from the improved service, but the Netherlands as a country can largely benefit from the travellers. Travellers would have a convenient access to the whole country (as most inbound tourists only travel to Amsterdam) meaning that tourism would spread in the Netherlands.

Project Set-up & Approach

In this project, the TU Delft cooperates with Connexion, GVB, KLM, NS, RET and Schiphol Group. The study's approach focuses on the human, societal, technological and business aspect of the product-service system. The project emphasizes the human aspect; therefore the desirability of the product-service-system and the users' needs and perspectives are prioritised. However, the expertise of the project partners is also fundamental during the process as it provides insight on the feasibility and viability of the proposed solutions.

Process

The project took place in two phases, a research phase and a design phase. The **research phase** consisted of qualitative field research, carried out in the Dutch OV-chipkaart system. Also, a benchmark was conducted in comparable electronic payment systems in London (Oyster card), Hong Kong (Octopus card) and Denmark (Rejsekort). The research phase showed that there are multiple types of international travellers that interact with the public transportation system differently depending on their travel purposes and preferences. Often the complexity of using and interacting with the system for international travellers is the consequence of multiple public transportation operators functioning within the same contexts and travel phases, but operating with different touchpoints and communicating differently, sometimes in respect to the same things. The research phase concluded with four improvement areas, which show that purchasing public transportation tickets as an international traveller means more than just buying a ticket. The improvement areas are: searching for information, wayfinding, know what to do (next) and payment.

The **design phase** consisted of an iterative process of ideation and evaluation by users and project partners. The ideation developed from the improvement areas. The evaluation results were taken into account to develop a future vision and service proposition. Finally, the future vision and service proposition was iterated based on the arguments provided by users and project partners to make the Dutch public transportation system more desirable, as well as feasible and viable.

Design: Future Vision & Service Proposition

Future Vision: *The Dutch public transportation is one system, ran by multiple operators, that cooperate in the backend to provide transparent and unified information to facilitate the usage of the system to its customers in the frontend, in areas, where they do not compete.*

Service Proposition: Improving information provision is essential to better the system and the experience of international travellers. Also, a homogenous array of tickets and payment methods available for all public transport operators will simplify the process of ticket section, purchase and usage for international travellers. To achieve this, the public transportation operators have to share certain touchpoints (such as a website, an app, the interface of ticket vending machines or staff), as well as to cooperate to homogenize ticket names and payment options. In order to improve the way information is provided and provide a harmonious array of ticket options and payment methods, the operators should share a platform to provide information and facilitate ticket purchase, see figure 1 on the next page. There are basic requirements that must be taken into account when developing the vision and service proposition:

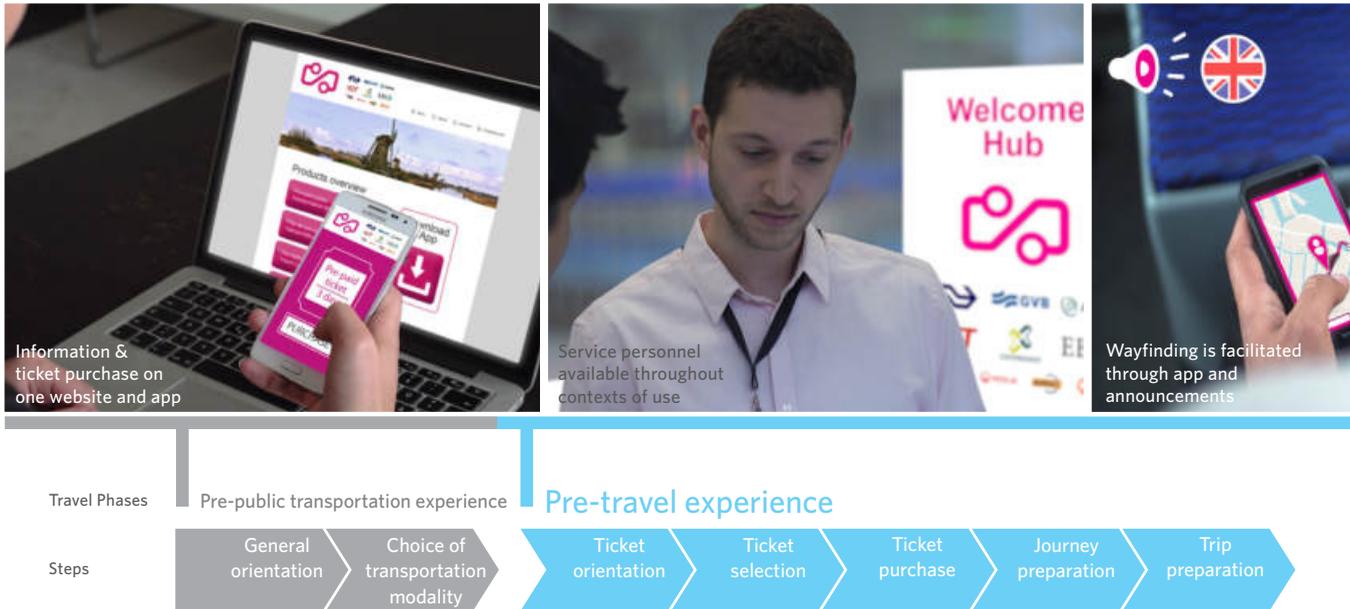
- **Accessibility of information:** Travellers should be able to access information about public transportation throughout travel phases (before, during and after usage), contexts of use and touchpoints.
- **Transparency of information:** Travellers should have an overview of the available possibilities within the public transportation system in terms of transportation modalities, time of travel and price to travel.
- **Clarity of information:** Travellers should be able to understand the information provided to them in the languages available, the terminology used and the design of the different touchpoints.

Overall, a more digitized system is proposed in which travellers purchase and pay tickets via the smartphone, given that there is wifi network throughout use contexts and travel phases. Alternatives and back-up options to the digital services are always available as well as a balance between self-service and service personnel.

Conclusions

The goal of this project was to develop user-centred solutions to improve international travellers' experience when selecting, paying and using their public transportation ticket(s) for their stay in the Netherlands. The proposed service is based on a platform for payment in public transport, shared by the public transportation operators. It is embodied by a more digitized system, which also offers alternatives and back-up options to the digital services and a balance between self-service and service personnel. Ultimately, the future vision and service proposition focus on the users' needs and are technologically feasible. Certain organizational

Executive Summary



changes must take place in order to make the proposition viable. The following recommendations establish stepping-stones towards improving the experience of international travellers when using the Dutch public transportation system:

- **Cooperation amongst PTOs:** It is imperative that operators work on the service of transportation as a unity, because they currently share a system, but do not always share their services in terms of providing information, assistance or tickets that build up the system.
- **Include all stakeholders in the process:** Further stakeholders, such as tourism organisations, airports and passenger airlines, can positively contribute when developing solutions to improve the experiences of international travellers. The stakeholders share contexts and in some cases the touchpoints that travellers use and interact with.
- **Have a user-centred mind-set:** Without travellers and their need of mobility, there would be no necessity of providing public transportation. The impact that the PSS design has on users is critical to provide a better service and also impacts the technological, business and societal aspect of the system.
- **Improve the accessibility of information throughout the system:** Public transportation is a service designed for everyone in society, hence it is crucial to optimize information accessibility for everyone: different types of travellers, throughout different travel phases, in different contexts of use, that interact with different touchpoints must be able to access information.
- **Unify information provision:** Unified information will avoid that confusing or misleading information is provided, as well as information overload. The information should be transparent and give enough

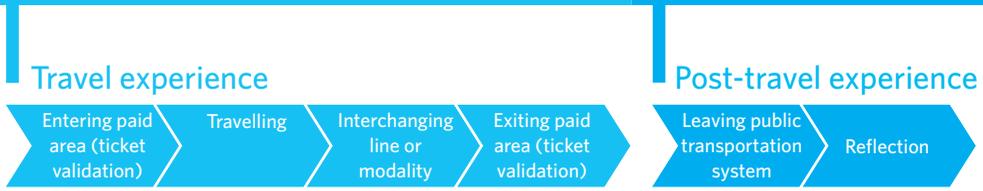


Figure 1. The images are examples of different interactions with the service through travel phases

knowledge to the travellers to make the best choices concerning their trip and their preferences. The PTOs and other stakeholders should facilitate the link for their shared platform to the users.

- **Simplify and unify ticketing & payment:** Although the Dutch public transportation system shares one payment system (the OV-chipkaart system), the individual PTOs have different product types and ticket names. Simplifying the ticket range, unifying the product range and providing a wide range of the same payment methods throughout the system can make ticket selection and acquisition better for international travellers.
- **Design and test the individual touchpoints, frontend and backend recommendations:** The service proposition in this study has only been designed in a conceptual level. The individual touchpoints, as well as the frontend and backend of this proposition must be designed thoroughly and tested before implementation.
- **Test the service proposition with travellers throughout the whole country - expand the scope:** The service proposition has only been evaluated by users in a limited scope of locations (in the Amsterdam area). To successfully implement the service proposition in the Netherlands, it is recommended to expand the scope of the service evaluation.

Guided by these recommendations, a more user-centred and user-friendly public transportation service can be developed. Improving the public transportation system will benefit the users, the PTOs and other stakeholders, as well as the travelling in the Netherlands as a whole.



Arrivals / Aankomst

MEXX

Sunweb
www.sunweb.nl

Schiphol Airport, travellers at the NS ticket vending machines

Introduction - 01

The graduation project “OV-betalen for international travellers” proposes a design-oriented approach and design solutions to the current problems regarding the way international travellers who arrive to the Netherlands at an airport, use public transportation. The project is part of the Expertise Centre for E-Ticketing in Public Transport (X-CEPT) at TU Delft’s faculty of Industrial Design Engineering. Through research-intensive design projects X-CEPT develops user-centred solutions for ticketing and payment in public transport, with a focus on the Dutch OV-chipkaart system.

In this project the TU Delft cooperates with Connexxion (bus transport company to and from Schiphol), GVB (Amsterdam municipal transport), KLM (largest Dutch carrier airline), NS (the primary Dutch rail transport operator), RET (Rotterdam’s municipal transport) and Schiphol Group (operates Schiphol and Rotterdam-The Hague airport).

This report presents the development of a future vision to improve the experience of international travellers when using public transportation in the Netherlands. The focus of this project lies on the process of ticket acquisition and usage. During an iterative process, multiple design solutions are designed; these are evaluated by project partners and by users. Based on the numerous findings, the future vision to improve the experience of OV-betalen for international travellers is proposed and visualized in a customer journey. The steps towards achieving this future vision are presented in short-term, mid-term and long-term developments.

01 - Introduction

1.1 Project Setup

This report is the second part of a larger project that consists of two main phases, a research phase and a design phase, as figure 2 shows.

- The first phase investigated the current situation of international travellers, arriving at an airport in the Netherlands and their usage of OV-betalen. The study also consisted of a benchmark study of similar systems in London, Hong Kong and Denmark. The Analysis report OV-betalen for international travellers arriving at an airport in the Netherlands holds all these findings (Lehr, 2016). These are summarized in this report in chapter 2.
- The second phase consists of designing solutions for the usage problems established in the first phase. The solutions are visualised in a customer journey with its respective touchpoints. These design proposals are evaluated by the project partners, tested with users and iterated into concepts and ideas for short-, mid- and long-term development of the OV-system.

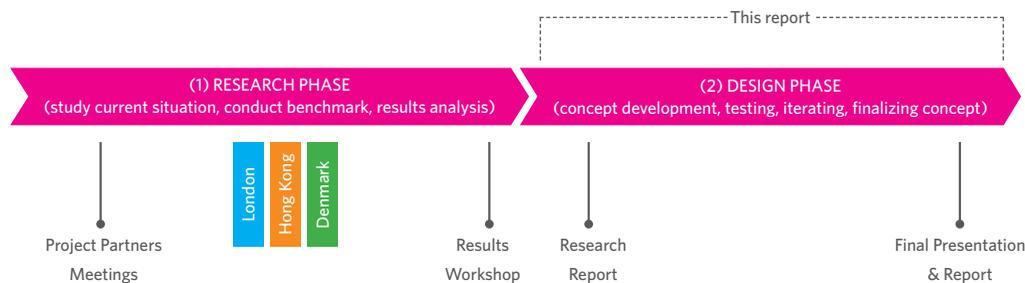


Figure 2. Project timeline

1.2 Relevance & Impact

Purchasing public transportation tickets in the Netherlands can be a hurdle. The system is called OV-betalen, which refers to different varieties of electronic payment in public transportation in the Netherlands. International travellers, who are most frequently first time users of the system, do not know how to acquire an OV-chipkaart, what travel products to select and in general make more mistakes throughout their journey, because they do not have established routines like domestic travellers (Joppien, Niermeijer, Niks, 2013).

My previous research shows that the usage and interaction of international travellers with OV-betalen can be improved specifically in four areas: searching for information (about the public transportation system and ticket options), wayfinding (during the usage of public transportation), providing the users with knowledge on what to do next and payment (for public transportation) (Lehr, 2016). See figure 3.

Improving the way international travellers use and interact with the public transportation system is a significant challenge to the Netherlands according to a study commissioned by NBTC Holland Marketing (2015). This study shows that the third main complaint of visitors to the Netherlands is the lack of user-friendliness of public transportation. Therefore, it is suggested to improve the smart card and payment options for travellers.



Figure 3. Improvement areas in the Dutch public transportation system in regards to international travellers

01 - Introduction

1.3 Design Brief

The goal of this project is to develop a future vision that focuses on the way international travellers arriving at a Dutch airport use and experience the public transportation system in order to improve the current situation that international travellers experience when using OV-betalen. The focus of the project is on ticket acquisition and usage. The vision should consider the whole customer journey of the international travellers from the moment they decide to travel to the Netherlands, to the moment when they return to their home country. As established in the research phase of the project, the process of purchasing a public transportation ticket includes the following improvement areas: searching for information, wayfinding, knowing what to do (next) and payment (Lehr 2016). This vision will be visualised in the form of a customer journey proposing respective touchpoints, and provide a service blueprint and the development requirements for short-, mid- and long-term.

1.3.1 Aim

Design multiple solutions for the current problems, which international travellers experience when using the public transportation system. Test and iterate the proposals into touchpoint concepts in the customer journey and establish requirements for short-, mid- and long-term developments to achieve this vision in the OV-system.

1.3.2 Research Questions

- How can the usage and interaction that international travellers have with the Dutch public transportation system be improved?
- What human, business, technological and societal aspects are relevant for the improvement of the Dutch public transportation system?
- What are the implications to improve the system in a short- (now - 2 years), mid- (2 - 5 years) and long-term (up to 5 - 7+ years)?

1.4 Approach

Overall, the focus of the project is user-centred, as the main focus lies on understanding and improving the product-service system to address the users' needs. To come to user-friendly solutions for the current problems which international travellers face when interacting with the Dutch public transportation, an integrated approach is employed. This means that the human aspect, the societal aspect, the technological and the business aspects are considered throughout the study. When improving the human aspect, the product-service system becomes more desirable. The societal aspect is considered, as public transportation should be accessible for anyone in society, including foreign travellers. Additionally, the business aspect of the development is crucial to develop viable solutions, as well as the technological aspect to develop feasible solutions (IDEO, 2009). Due to the nature of the project, the human aspect, namely creating user-centred design solutions, is studied in more depth than the other aspects. To achieve the integration between the human aspect and the other aspects, the study involves a multidisciplinary perspective evolving from the cooperation with the project partners and other stakeholders, who have the expertise to assess the impact of proposed solutions. Figure 4 illustrates the synergy created by these aspects (Van Kuijk, n.d.) and emphasises that the focus is given to the human aspect of the study.

Furthermore, the project is carried out in a qualitative manner and looks deeply into reasoning why certain behaviours and interactions with the system take place when used.

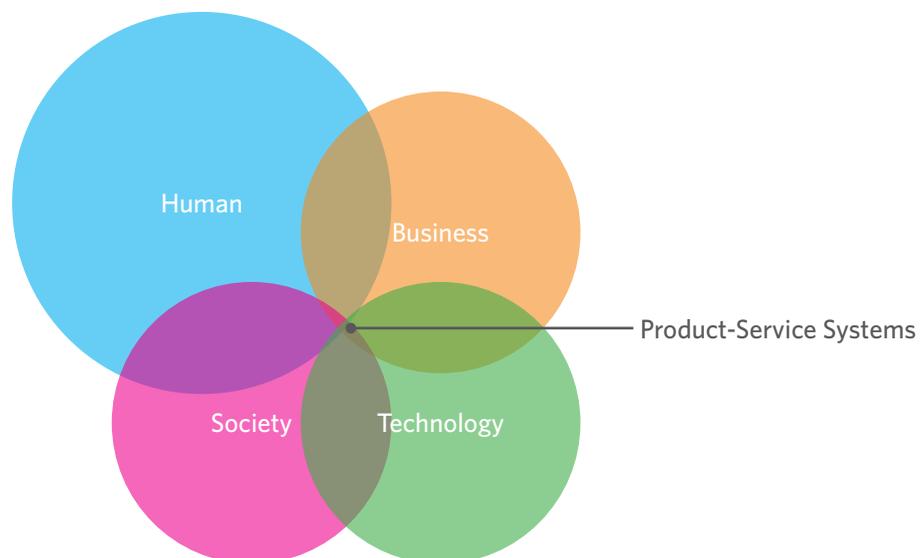


Figure 4. Social innovation model by Van Kuijk adapted from the human-centred design model by IDEO (2009)

01 - Introduction

1.5 Process

The design process is iterative, as it consists of alternating converging and diverging, in order to design the final vision, as figure 5 shows.

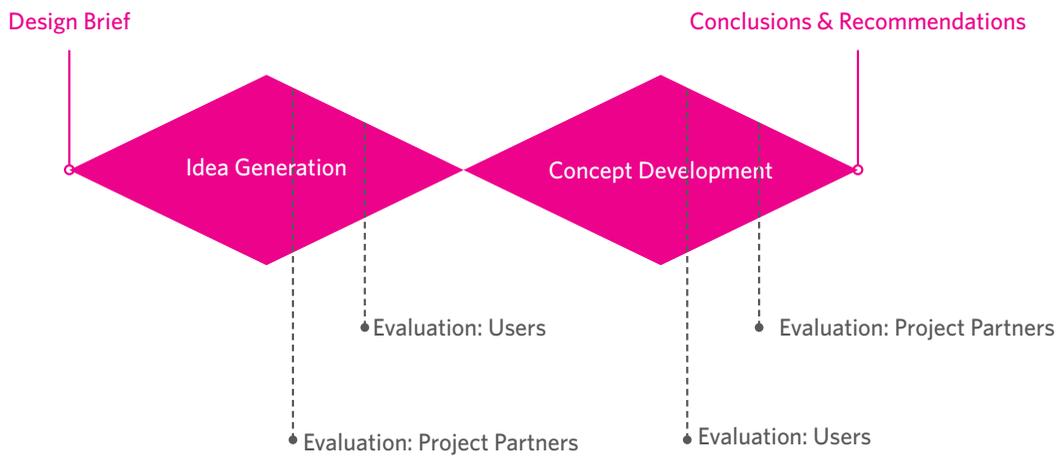


Figure 5. Iterative design process

Idea Generation

Idea Generation Parting from the **Design Brief**, the ideation phase consist of brainstorming and sketching, using individual, as well as group methods. After the initial idea development, multiple diverse ideas are visualised.

Evaluation: Project Partners

The ideas are proposed to the project partners. They evaluated the ideas. By doing that they provided arguments for the feasibility of these ideas in terms of technology and business. After this process some ideas are disregarded for the next phase due to their lack of potential or because they go beyond the project's scope.

Evaluation: Users

I visualised the selected ideas as individual concepts to test these with users. The focus of the user test is to understand why travellers would prefer certain options. The user test results provide the insight to decide on and specify the final design concept.

Concept Development

The final concept is developed using the project partners' and the users' evaluation. This concept is visualised in a high fidelity (definition on page 8) and specified in terms of the service blueprint and the short-, mid- and long-term developments required to achieve it.

Evaluation: Users

The visualisation is evaluated by users, to gain a final response to the proposed service system.

Evaluation: Project Partners

The visualisation is evaluated by the project partners in a workshop session in which all partners discuss the final concept together with the users' evaluation of the concept.

Conclusions & Recommendations

The feedback by users and project partners is synthesis and added to the final conclusions and recommendations.

The following chapter presents a summary of findings and conclusions from the research phase of the project, which are important to understand, in order to understand the idea generation and final vision for the OV-system in regards to international travellers.



Travellers searching for journey information at the Amsterdam Rijksmuseum stop

Research Results Summary - 02

2.1 Introduction

This chapter presents the main findings and conclusions from the research phase of the project. The research phase established the situation of international travellers arriving to an airport in the Netherlands, who use public transportation. In order to design for the current issues, which international travellers have with OV-betalen, it is essential to understand what it means to purchase public transportation tickets. To do this I used a mainly qualitative research approach to gather data: I carried out interviews with users and experts, made observations in the field, noted first hand experience was noted and studied documents. A benchmark study of similar systems in London, Hong Kong and Denmark complemented the research. Overall, different travellers have different travel goals and interact with the public transportation system at different places and through different touchpoints. This chapter briefly describes the main findings in terms of the aspects affecting travellers' usage and experience: Types of travellers, Travel phases and Touchpoint Problems in the Dutch public transportation system. Furthermore the main insights from the benchmark between the OV-system, the Oyster-card system (London), Octopus-system (Hong Kong) and Rejsekort (Denmark) are presented. Finally four themes that affect the purchase and usage of public transportation tickets are explained, as these provide room for improvement in the Dutch system and guidance during the development of solutions in the design phase. The four areas are: searching for information, wayfinding, knowing what to do (next) and payment.

02 - Research Results Summary

2.2 Main Findings

2.2.1 Types of Travellers

The initial research focused on the group of international travellers arriving at airports in the Netherlands. However, further categorisations are necessary to properly address the travellers' needs. Depending on characteristics that define the travellers' way of travelling, which influence their usage of the system, I identified four different types of international travellers after interviewing and observing travellers in the Netherlands, London, Hong Kong and Denmark.

- *Spontaneous travellers* usually use public transportation incidentally.
- *Efficient travellers* usually have a plan for their stay and select the best options in terms of tickets and activities or a combination of both.
- *Purpose travellers* have a specific destination and usually have to go to that destination and immediately travel back afterwards.
- *All-set travellers* are visiting friends and family, so they use public transportation, but are supplied with tickets and information by their hosts.

The variety of travellers shows that the different types of travellers have different needs when it comes to usage of OV-betalen and public transportation. In order to improve the system, all travellers' needs should be considered to address a larger range of users and provide a better service overall. For this study the traveller segmentation provides guidance to develop solutions for current problems, either specifically for one group of travellers or holistically for all types of travellers.

2.2.2 Travel Phases

There are four travel phases (*Pre-public transportation experience*, *Pre-travel experience*, *Travel experience*, *Post-travel experience*), which consist of multiple steps that travellers take when interacting with public transportation, see figure 6. Because travellers go through the steps using different touchpoints in different contexts, there is no right or best way to use and the experience the system. This happens because there are multiple parties who are responsible to provide the means to interact with public transportation in the different phases. The travel phases and steps show that purchasing a ticket actually cannot be treated as an individual action, but that the whole travel journey and experience of international travellers must be considered to create a seamless experience. In order to improve OV-betalen for international travellers, the diversity of use cases and the different combinations of touchpoints and locations should be incorporated into the solution.



Figure 6. Travel phases and steps

2.2.3 Touchpoint Problems in the Dutch public transportation system

Ticket vending machines and validators belong to the groups of technology-based self-service and are touchpoints that frequently cause the traveller to have problems. Companies should provide alternative solutions in case of a failure, to smoothen the effect these failures have on travellers; in the case of the public transportation system travellers seek help and advise from service personnel. Even though it is positive that personnel are available, often service personnel did not provide the appropriate guidance. This aspect has a large impact on the users' experience. It is not likely that customer tolerate a service failure twice, which has the consequence that customer acquire a negative perception of the service providers. There is a large amount of information provided in regards to the Dutch public transportation system online. Also there are many sources of information at different contexts. However, due to the large number of operators, the information provided causes travellers to lose overview and not know what option is best. This lack of overview is experienced both on digital sources as well as at the different contexts of use. In some cases the information is only provided in Dutch and not in English (or other languages). Hence, international travellers might be able to access the information source, but not the information itself as they then fail to understand it.

2.3 Benchmark Comparison

A comparison amongst the situations in the Netherlands, London, Hong Kong and Denmark has been made taking the Dutch system as the frame of reference. The insights provide guidance when developing solutions for current problems for international travellers' experience in the Dutch public transportation system. Figure 7 shows examples of the electronic payment cards in the respective systems.

General findings (in two or more of the countries)

- Many travellers have the perception that using an electronic payment card is only relevant as a local but not as a tourist.
- Many travellers prefer to talk to service personnel rather than looking for information themselves.
- The usage of smartphones, especially of Google (Maps) is broad and perceived as very useful.



Figure 7. Benchmark systems' card examples (from left to right): OV-chipkaart, the Netherlands; Oyster card, London; Octopus card, Hong Kong; Rejsekort, Denmark

02 - Research Results Summary

The most noticeable insights from the benchmark systems are:

The Netherlands - OV-chipkaart

- International travellers do not often buy the Anonymous OV-chipkaart.
- Especial day tickets and touristic tickets are popular tickets amongst international travellers - e.g. the *amsterdam* card is appreciated by tourists.
- International travellers have trouble not forgetting to check in and out at open payment borders.
- International travellers often do not understand or misunderstand the terminology of ticket names.
- Service personnel is often available and located at relevant locations (e.g. tram booths in Amsterdam, see figure 8). However, the personnel works for different operators. Hence, they are not trained to provide information about all companies.

London - Oyster card

- The Oyster card is sold as the best option for international travellers.
- The money on the card can be refunded.
- Service personnel is almost always available (see figure 9).
- Travellers appreciate the information provision in the tube, due to its high level of detail.
- The amount paid for a trip is not necessarily clear as it depends on several factors (daily capping, zones, peak hours, etc.).



Figure 8. Several of Amsterdam tram lines have as service booth in the vehicle to help (foreign) travellers during their trip



Figure 9. London Tottenham Court Station, service personnel are always available

Hong Kong - Octopus card

- Through information provision in all forms, travellers feel guided through their whole journey, even if they are completely unfamiliar with the system, as shown with the signage in figure 10.
- Information is always provided in both, Chinese and English.
- The Octopus card is not explicitly sold to international travellers, therefore international travellers do not necessarily purchase it.
- Travellers can refund the money on the card for a small fee.
- The connection between the airport and the city centre is perceived as extremely comfortable when using the Airport Express.

Denmark - Rejsekort

- The umbrella company DOT (Eng. Your Public Transportation) provides information about public transportation as one entity for all the different companies throughout multiple touchpoints. Figure 11 shows DOT ticket vending machines.
- Rejsekort is not intended for international travellers and a high fee must be paid (ca.80 Euros) to travel country-wide with it.
- There are special day and touristic tickets in the Copenhagen area.
- Information is often only provided in Danish. Thus, it is hard to understand for international travellers.



Figure 10. Hong Kong Station, a lot of signage to guide travellers and signage is always available in Chinese and in English



Figure 11. Copenhagen Central Station, DOT ticket vending machines with tickets for different transport modalities (train, bus, metro)

02 - Research Results Summary

2.4 Main Conclusions from the Research Phase: Improvement Areas

In general, the research on the current situation of international travellers arriving at an airport in the Netherlands, who use public transportation, shows that acquisition and usage of public transportation tickets means more than the moment when the traveller pays for the ticket and validates it. The process to purchase a ticket involves a large range of interactions with the system. Hence, four themes that affect the purchase and usage of public transportation tickets are defined. They are the most and/or most impactful.



Searching for information: Travellers are constantly searching for information related to their journey. Knowing where to find the information, understanding the information provided and having an overview of the options available (in terms of transportation in general, operators, routes and tickets) can impact the way travellers use OV-betalen positively.



Wayfinding: Spatial orientation is a recurring factor, affecting the seamlessness of travellers' journeys. A successful orientation allows for a more efficient travel experience, which is influenced by the clarity of signage and information provision. In several contexts, like at Schiphol airport, or during interchanges between modalities and/or operators, spatial orientation is problematic for travellers.



Knowing what to do (next) A further factor affecting the way travellers' interact with the system is that often they do not know what to (next). If they don't know what is expected from them to continue their journey, the journey is interrupted and therefore experienced as less seamless, which, for example, was encountered at open payment borders (definition page 9).



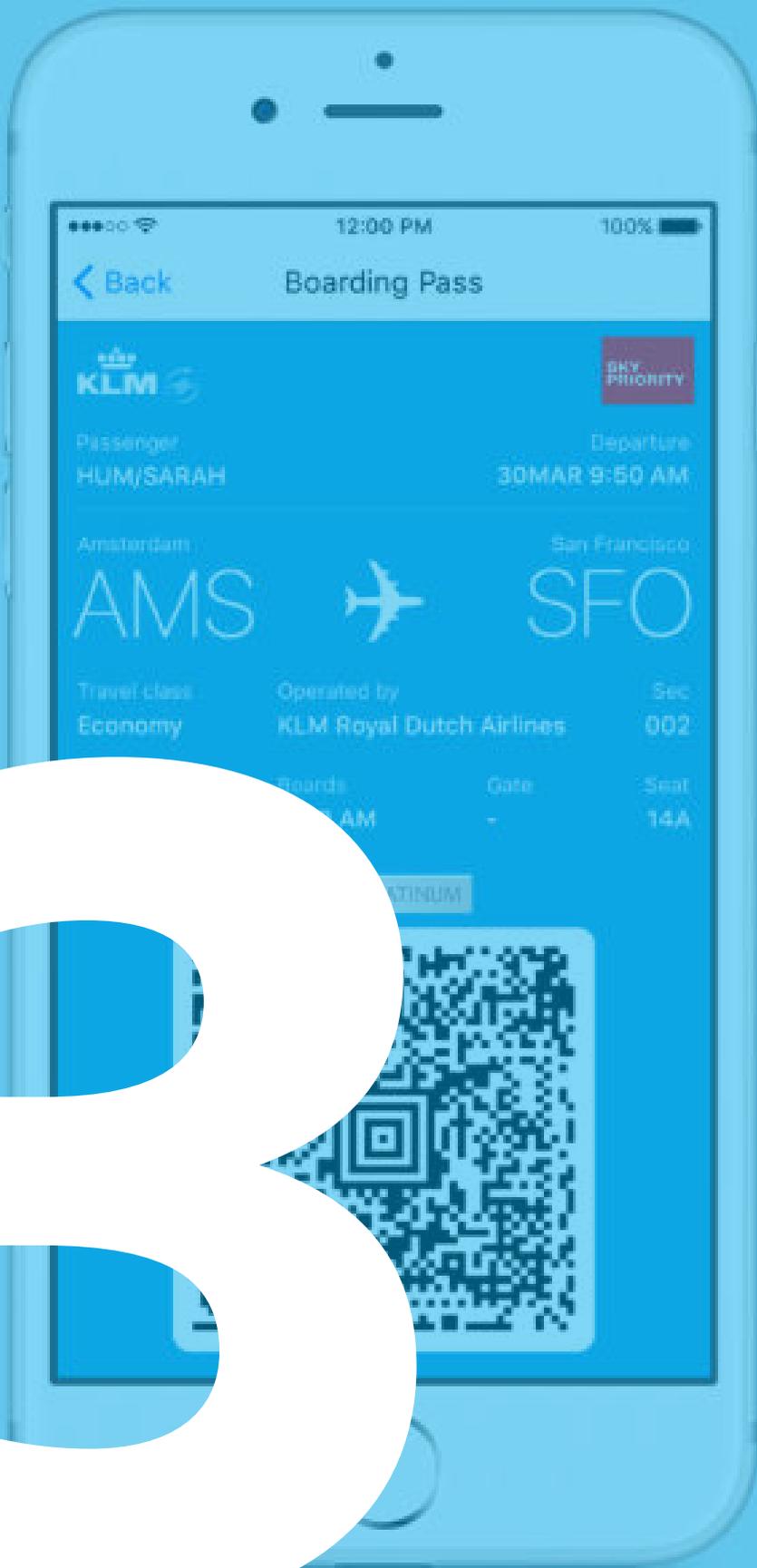
Payment: Being able to pay in the OV-betalen system is a major issue at ticket vending machines. Frequently problems related to payment (not being able to purchase a ticket with a bank card or with paper money) at the ticket vending machines were encountered, these problems start off the experience of travellers with the public transportation system negatively.

2.5 Conclusions

The four areas (searching for information, wayfinding, knowing what to [next] and payment) pose opportunities to improve the system and provide guidance during the design phase. Hence, they are used in the ideation phase presented in chapter 4. The following chapter describes current trends and developments in the field of mobility and transportation, which also are used to show the state of the art in the field of transportation and are used as inspiration during ideation.



Rotterdam Central Station: train and tourist information desk



12:00 PM 100%

Back Boarding Pass

KLM SKY PRIORITY

Passenger: HUM/SARAH Departure: 30 MAR 9:50 AM

Amsterdam AMS San Francisco SFO

Travel Class: Economy Operated by: KLM Royal Dutch Airlines Sec: 002

Boards: 11 AM Gate: - Seat: 14A

PLATINUM

QR Code

3

Current Trends & Developments in Transportation - 03

3.1 Introduction

This chapter presents a diversity of technologies and means, which are relevant to the goal of providing a more seamless experience to international travellers in the field of transportation.

A diversity of trends regarding the way (international) travellers' experience their travel journey, using cars, public transportation and air travel, are being developed and implemented worldwide. Automation, efficiency, sustainability and digitalization of systems are only a few of the many recurring key topics related to the future of transportation (Mobility and transport, European Commission, September 2015). While these themes address the overall vision for transportation, service providers are developing technologies and applications that make the usage and experience of individuals with the product-service systems of transportation tangible. The selected examples of technologies, products and services in this chapter are relevant because they apply to the Dutch air and ground transportation system or because they propose solutions in other similar contexts. These examples are not evaluated individually, but are combined and used to illustrate an overall picture of current developments in the field of transportation. The examples of current trends and developments together with approaches by operators in London, Hong Kong and Denmark (the benchmark systems, see chapter 7 of the Analysis report, 2016) provide guidance and inspiration to develop solutions for the Dutch system.

3.1.1 Aim

Provide an overview of current trends and developments in the transportation sector for public transportation and air travel in order to gain an understanding of current tendencies, which might be relevant to further research and implementation in the Dutch system.

3.1.2 Research Questions

- What current trends and developments to improve travellers' user experience exist in the public transportation sector?
- What current trends and developments to improve traveller's user experience exist in the air transportation sector?
- What are currently the most significant developments to improve (international) travellers' experience in the transportation sector?

3.1.3 Approach

Carry out an online research about current trends and developments to improve the experience of (international) travellers with public transportation and air travel, both in the Netherlands and worldwide. Talk to the project partners to gain further information about current technological developments in the field.

03 - Current Trends & Developments in Transportation

3.2 Current Trends and Development in Public Transportation

3.2.1 New forms of payment

As described in the research report, a vision on future payment for public transportation generated by a national public transportation deliberation group, the Nationaal Openbaar Vervoer Beraad (NOVB), provides an overview of relevant trends considered in the development of payment methods. These directly influence the purchase of tickets within the sector. In this chapter, four different payment methods are described, as they might influence user-centred solutions for the current problems international travellers experience when selecting, purchasing and using tickets for public transportation during their stay in the Netherlands. The payment methods are: EMV, Be-in Be-out, mobile payment and single check-in check-out (NOVB, 2014).

EMV



EMV is the abbreviation for Eurocard, Mastercard and Visa, which are the bank card payment options that embody the standard of contactless payment. Contactless payment allows bank card users to hold their card against a reader and pay without physical contact between the card and the reader. For payment in public transportation in the Netherlands, this would mean that, instead of using a ticket bought from the public transportation operators, the travellers could use their own bank card.

Mobile payment



Mobile payment refers to the use of smartphones to pay for public transportation, the same way current electronic tickets are used. The smartphones could be equipped with EMV-chips or SMART- OV (which uses NFC technology, a chip in the smartphone and an app) and would have to be validated at the readers to check-in and check-out. The banks or telecommunication companies would transfer the payment to the public transportation operators. The travellers could access their payment data on their smartphones. The opportunity to provide this service to international travellers has the benefit that they could pay for public transportation in the Netherlands in a more straightforward manner, without having to purchase the tickets at the ticket vending machines or at the counters. Additional benefits are that the information required to travel can be provided personally to the travellers, in their one language and through a single channel.

Be-in Be-out



Be-in Be-out (BIBO) is a concept of payment in public transportation in which travellers would not have to actively check-in or check-out of the system, but the system (or vehicle) would recognize and calculate the corresponding fares through location-based technology. The system could calculate this for example through smartphones, using GPS and beacons. One of the main benefits of this system would be that travellers would not forget to check-in and check-out. Nonetheless, one of the main concerns is the travellers' privacy.

Single check-in check-out



Single check-in check-out means that the traveller only has to check-in at the beginning of the travel and check-out at the end of the travel, which currently is not the case due to operator complexity: In the Netherlands multiple operators run public transportation, when travellers interchange lines ran by different operators, they must check out at the validators (gates and poles) from one operator and check-in again at the validators of the other operator. Single check-in and check-out would simplify the interaction with the system for all travellers, as it would prevent them from making mistakes when validating at the wrong operator. Additionally it would reduce the amount of validators at stations and platforms.

3.2.2 New travel products and services

Several products and applications worldwide are developed to make the usage of public transportation more accessible and seamless. The following examples showcase different ways that offer possibilities to do so, from changing/adding different types of tickets to smartphone applications and smart devices in cities.

Tourist ticket



In the Netherlands a tourist ticket (Holland Travel Ticket) will be available countrywide from spring 2016 on. The new tourist ticket, see figure 12, follows the Amsterdam Travel Ticket's (ATT) principle with the difference that it can be used countrywide. Due to the large range of tickets available, it often is hard for international travellers to select the most favourable ticket for their stay. Tourist tickets have proven to be successful and liked by international travellers suggesting the potential of such a travel product in the system. (nu.nl, April 2016, Lehr, March 2016)

Information and wayfinding: GoAbout Hub



GoAbout Hub is a 55 inch screen device with which travellers can find their travel information from door to door by searching their destination on a map, see figure 13. Multiple travel modalities can be selected (on foot, with public transportation, cycling from a station, with a taxi or a car). The purpose of this device is to simplify the complexity of mobility for travellers. (Hub.goabout.com, April 2016)

weCity App



The weCity app, developed in Amsterdam, recommends travellers travel tips based on GPS information and likes so that they can spend more time travelling and less time searching. The app bundles free wifi access around the city in order for travellers to be able to easily access it when getting from A to B to optimize their travel experience. It is already available on Apples operating system IOS 9.0 or later. (wecity.guide, April 2016; itunes.apple.com, June 2016)

03 - Current Trends & Developments in Transportation



Moovit: Your Local Transit App with Live Bus Schedules and Subway Maps

The Moovit app allows travellers to find the best routes to any place in the city and informs about delays and interruptions, see figure 14. Also the users of a location can update each other about eventualities. This app provides live feedback about public transportation as well as the means for travellers to actively communicate to fellow travellers about the current status. (moovitapp.com, April 2016)

3.3 Current Trends and Development in Air Travel

KLM Social Media & Apps



KLM has several different ways to communicate and interact with travellers on social media, as figure 15 shows. In early 2016 a KLM Facebook messenger service was launched, see figure 16. It offers the travellers the option to receive flight documentation, check-in notifications and all sorts of travel information. Furthermore, it provides the service of answering the travellers' questions (KLM messenger, April 2016). This is an example for a service going beyond functionality, as it not only informs the travellers, but provides a personalized service to them with live responses.



KLM Pay through social media

Comparable to booking a ticket on the phone, KLM customers can now book tickets via social media. The users can ask for the best fares for their travel dates as well as when they want to book the ticket. The KLM service sends them a link via a private Facebook or Twitter message and the users select their preferred method of payment (Kollau, February 2014).



Figure 12. Tourist Ticket: Holland Travel Ticket



Figure 13. GoAbout Hub: wayfinding and routing

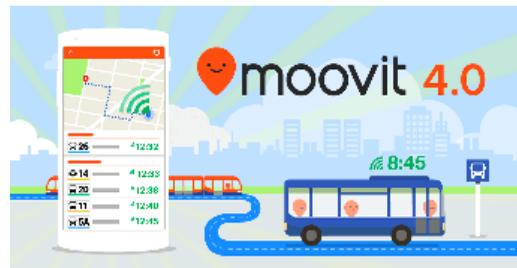


Figure 14. Moovit: Local Transit App



KLM Airport Robots (KLM Robot, Schiphol)

The passenger assistance robot “Spencer” was developed by KLM to help reduce the cost associated with passengers missing connecting flights. Spencer has completed several trials at Schiphol Airport and might be further developed to carry luggage and speak with passengers (Passenger terminal today, April 2016), figure 17. This robot improves wayfinding and therefore a more efficient and seamless travel.



Apps for airport navigation & wayfinding

The American Airlines app has a feature for wayfinding at some airports and according to The New York Times (April 2016) it is “a growing trend among airlines and airports to use smartphones along with other technologies to make the airport experience smoother and less stressful.” Customized passenger information together with airport directions provide guidance to the most efficient lanes at customs or immigration. The Amsterdam Schiphol Airport is introducing the technology as well, in order to provide travellers with a more seamless travel experience and improve the airport wayfinding (Levere, March 2016).



Pre-ordering food at airport and airlines via mobile apps

Apps make it possible for users to order things by simply using their phone and for services to efficiently be provided, as for example is the case with ordering an Uber ride. According to airtrends.com, the airport and flight industry have adapted to this, for example, Virgin America, Air New Zealand, Norwegian, Azul and Finnair “allow passengers to order meals, snacks and drinks via the IFE system in between regular meal services, while passengers on board leisure carrier TUI Netherlands can order drinks and duty free via their own smartphone.” (Kollau, January 2016).



Figure 15. KLM on multiple social media channels



Figure 16. KLM messenger with travel information



Figure 17. KLM robot Spencer for wayfinding at Schiphol airport

03 - Current Trends & Developments in Transportation

3.4 Conclusions

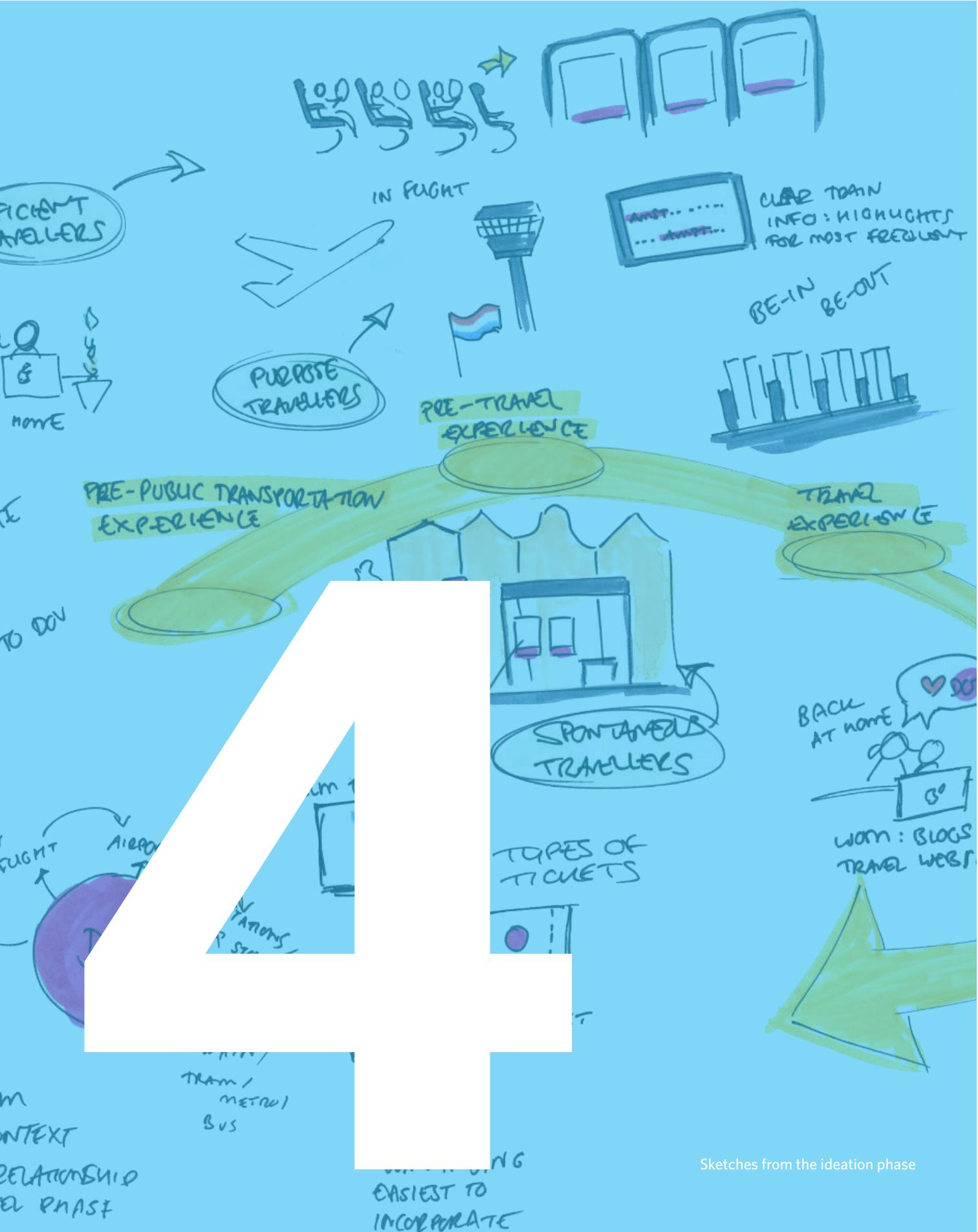
This chapter has presented a range of examples that embody solutions in air and ground transportation to improve the way travellers search for information, search for their way, are guided through systems and pay for the transportation services. Nowadays, passengers of air, but also of ground transportation, want to be connected and online all the time regardless of their location. During travel, being connected means having information and is even one of the moments, during which travellers seem to need the connectivity the most (airporttrends.com, April 2016). Wifi has become a commodity that is expected through different contexts for most travellers. The necessity of always having online access, for example, is embodied in the European Parliament's decision to abolish roaming charges (for downloading data, making calls or texting) within the European Union (Peachey, October 2015; Milligan, April 2016). Consequently, multiple solutions to provide a more seamless travel experience are smartphone related, as they pose the opportunity to provide personalized and live information. Moreover, technologies, such as beacons (airporttrends.com, April 2016), are providing ways to know passengers' locations in order to improve wayfinding, reduce cues and in general optimize the efficiency of travel. Combining big data, the Internet of Things (Marr, May 2015) and multiple technologies it is becoming easier to provide live information, which seems to be one of the biggest needs in the transportation sector, both from the users', but also from the providers' perspective.

During the research phase of the project, I studied travellers' needs and how these are addressed by operators in the Netherlands and in other places. I have developed my perception on the way public transportation can improve to provide a better user experience, by taking all the research insights into account and reviewing technologies, products and services that are currently being developed and provided to travellers. Overall, being connected at any context of use means having access to information. Having access to information allows users to use and interact with the public transportation system more independently, hence more efficiently and effortlessly. The more efficient and effortless the usage of the system is, the more seamless it becomes, as ultimately travellers' main goal is to merely go from A to B. The digitalization of the public transportation services can strongly influence the process of providing information and tools to travellers throughout their journey. Specifically the use of applications on the smartphones can contribute to the information provision and poses further benefits to the travellers including that the information is live and can constantly be updated. It is all in one place, it can be personalized to the traveller, for example, by providing it in their own language. For this to happen, travellers must be able to have network access at all times, which currently is still not the case, especially for international travellers, who must pay high prices to access a network. Furthermore, I also understand the necessity for alternatives and backup options to use and interact with the system, as it is not always possible for travellers to recur to digital means and in some cases travellers enjoy to have contact with people rather than technology-based self services, which affects their user experience.

The following chapter elaborates on the development of ideas to improve the situation of international travellers arriving at an airport in the Netherlands, who use public transportation. The ideas are inspired by the insights gained from the previous research in the Netherlands and with the benchmark systems in London, Hong Kong and Denmark, as well as by the insights gained from the current trends and developments presented in this chapter.



Leiden Station, traveller using her smartphone



Sketches from the ideation phase

Idea Generation & Evaluation - 04

4.1 Introduction

The previous chapter discussed several trends and provided examples of current developments to improve travellers' journeys related to their flight, at airports and with public transportation, as well relevant technologies to achieve more seamless travel. This chapter focuses on possible improvements for international travellers' experience within the Dutch travel context. As illustrated in figure 18, this chapter presents three stages of ideation: idea generation (chapter 4.2), idea evaluation by project partners (chapter 4.3) and idea evaluation by users (chapter 4.4).

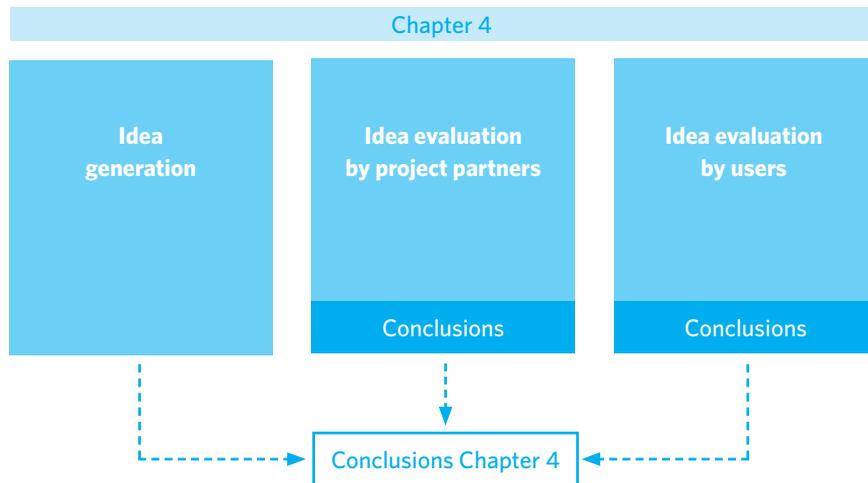


Figure 18. Chapter 4 structure

The first part of the chapter reports individual design ideas to improve international travellers' experience for transportation during their stay in the Netherlands and how they are conceived and visualised. The ideas both suggest improvements for the system as a whole, as well as for different touchpoints throughout the travel phases. The ideas illustrate a range of suggestions to improve the way travellers search for information, wayfinding or providing guidance to travellers, so that they know what to do and payment for public transportation. These ideas are visualised in a low fidelity - line sketches - (Stompff and Smulders, 2014) and are used as boundary objects (Carlile, 2002; Henze et al, 2013) to communicate possibilities with the project partners. The second part of the chapter presents the evaluation by the project partners as well as by NBTC Holland Marketing. Considering their input, it is then possible to narrow down the selection of ideas and test this selection with users, in the third part.

By synthesising these results it is possible to create a future vision of how public transportation, specifically, OV-betalen, could be for international travellers arriving at an airport in the Netherlands. The future vision and the final evaluation of the project partners and users are elaborated in chapter 5, the final iteration of the vision and service proposition are elaborated in chapter 6.

04 - Idea Generation & Evaluation

4.2 Idea Generation

4.2.1 Aim

Develop a variety of ideas to improve the workings of the public transportation system for international travellers, using the four determined improvement areas (searching for information, wayfinding, knowing what to do [next] and payment). Develop ideas within contexts and touchpoints throughout the international travellers' travel phases, which were established in the research phase (Lehr, 2016).

4.2.2 Design Challenges

- Which possibilities exist to improve international travellers experience with OV-betalen in the different areas (searching for information, wayfinding, knowing what to do [next] and payment), which require improvement?
- What possibilities exist to improve international travellers experience with OV-betalen
 - o considering the system as a whole?
 - o considering relevant contexts throughout their journey?
 - o considering relevant touchpoints throughout their journey?
- How do travellers' interact with the different touchpoints in different context throughout the system?

4.2.3 Method

The idea development is inspired by:

1. the existing situation in the Netherlands
2. the benchmark conducted in the research phase with London, Hong Kong and Denmark
3. current trends and developments in the field (see chapter 3)

Initially, brainstorming and sketching was employed to develop solutions for the customer journey as a whole, as well as for the four improvement areas (searching for information, wayfinding, knowing what to do (next) and payment). In order to do this, a grid that appoints specific touchpoints to the four improvement areas is used as guidance in order to develop ideas to solve the main issues for as many touchpoints as possible, see table 1. During the ideation phase it is key to develop multiple solutions for one problem/context/touchpoint in order to have a variety to select from. In several cases, ideas for one single thing that are radically different from each other are created in order to establish the arguments in favour and against the idea more concretely.

The brainstorming and sketching phase first took place individually and afterwards a creative method to visually brainstorm was applied with fellow designers to explore further possibilities, see appendix A.

Finally, I listed all the ideas and gave them an explanatory title that describes the essence of the idea. Considering the evaluation sessions with the project partners, the fidelity of the idea presentation was

Table 1. Relationship between touchpoints and improvement areas

<div style="text-align: right;">Themes</div> <div style="text-align: left;">Touchpoints</div>	 Searching for information	 Wayfinding	 Knowing what to do (next)	 Payment
 Validators: Gates & Poles	●	●	●	●
 Ticket vending machines	●	●	●	●
 Service Personnel	●	●	●	●
 Websites	●	●	●	●
 Apps/ Smartphone	●	●	●	●
 Signage/ Maps	●	●	●	●
 Information Posters	●	●	●	●
 Information Screens	●	●	●	●
 Audio Announcements	●	●	●	●
 Flight related touchpoints	●	●	●	●

● Touchpoint closely related to theme, hence opportunity for improvement

● Touchpoint not/less closely related to theme

● Opportunities to develop solutions for theme within flight

04 - Idea Generation & Evaluation

determined to be low, in order to demonstrate that the idea is not final yet and can be altered or completely left out. The ideas are visualised with digital line sketches, vectors and in some cases supported by photography. Figures 19 and 20 illustrate how the visualisation of ideas developed from hand sketches created during visual brainstorming to low fidelity visualisations. The hand sketches depicted on figure 19 show a range of drawings that address the travellers' journey as a whole (as showing with the yellow arrow that has multiple travel phases), as well tickets types or the way to select tickets for example by selecting the tickets on a map (top right corner). Also some drawings are dedicated to the way air travel can be linked with public transportation or providing a unified identity to the touchpoints. The idea visualisations

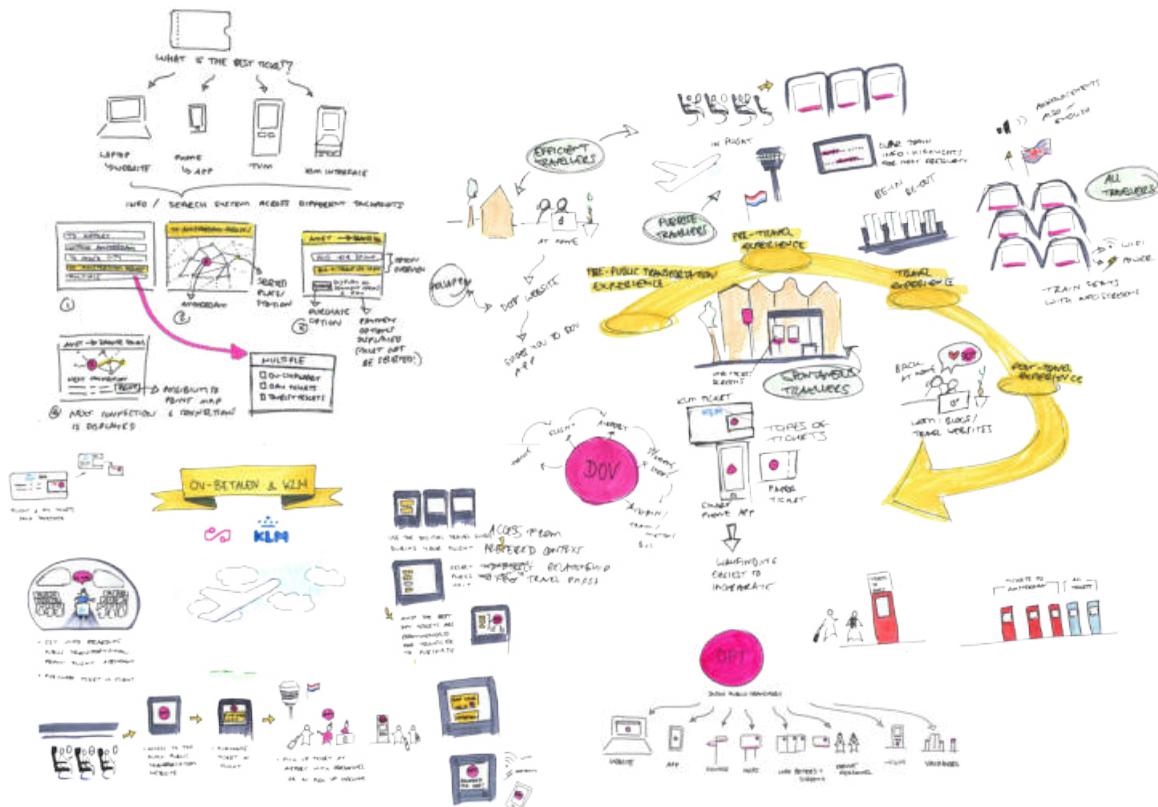


Figure 19. Ideation: Hand sketches

in figure 20 show some of the same ideas, like the ticket selection on a map (top left), a unified branding throughout touchpoints (top centre) or how public transportation can be linked to air travel (top right), as well as an idea regarding a Dutch public transportation app (bottom left) or interactive screens on bus stops (bottom right). Each visualised idea includes a brief description and some ideas additionally have a description of the interaction steps to explain the usage of the touchpoint in more detail. Chapter 4.2.4 illustrates examples of the different ideas and their descriptions within the different categories (searching for information, wayfinding, knowing what to do [next], payment).

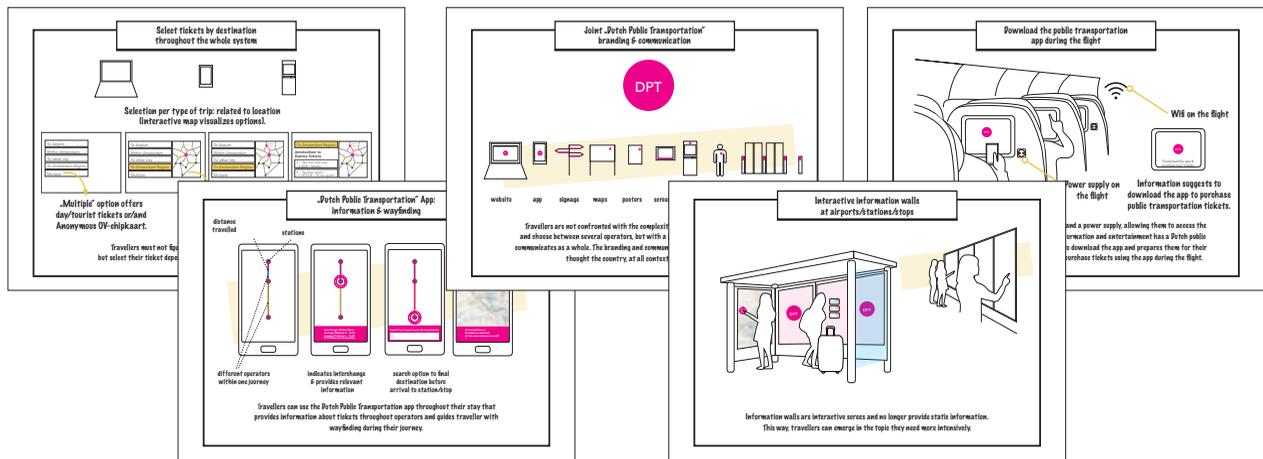


Figure 20. Ideation: Low fidelity digital visualisation

04 - Idea Generation & Evaluation

4.2.4 Idea Examples

In total 44 ideas are visualised with digital line sketches, vectors and in some cases supported by photography. Multiple ideas belong to multiple improvement areas, as the proposed solution covers different aspects. Appendix B lists all 44 ideas and shows to which area of improvement each idea belongs and contains the visualisation of all of the ideas.



Searching for Information

Within this area, solutions are proposed regarding the way travellers search for information about the system in general, about travel possibilities and ticket options from multiple possible contexts.

The example, figure 21, shows idea 09. *Downloading the public transportation app during the flight*. Travellers inform themselves about their public transportation opportunities during the flight time. They are able to directly download the app, which provides concrete and personalized information to the traveller.

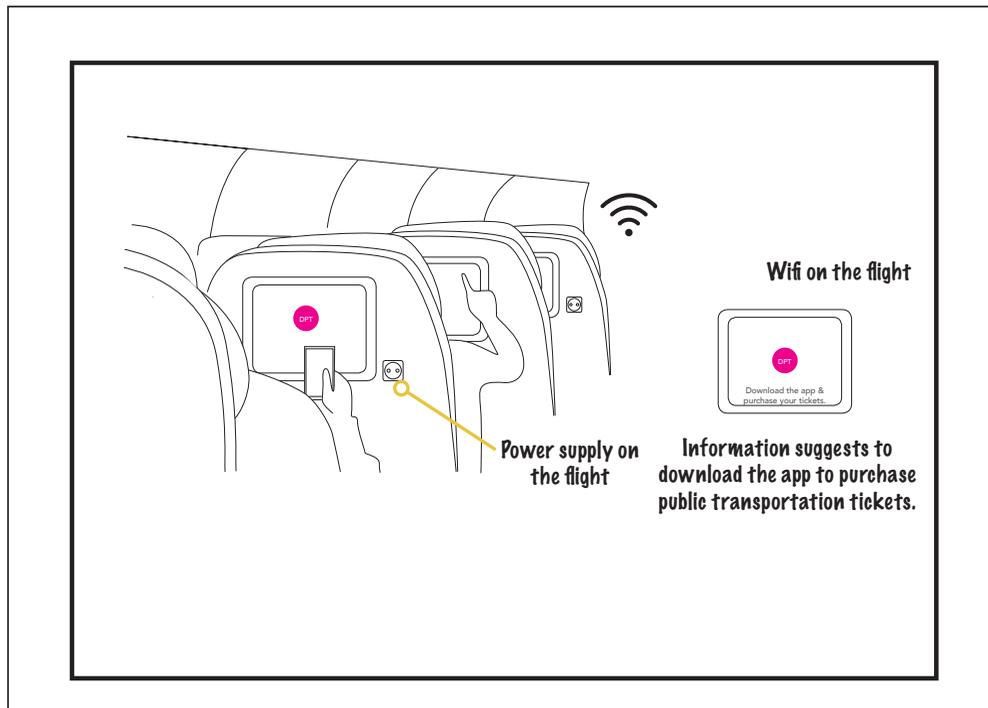


Figure 21. Example idea 09. *Downloading the public transportation app during the flight*



Wayfinding

Within this area, solutions are proposed regarding methods used to search for the way and guidance provided by the system so that travellers efficiently find their way during their travels.

The example, figure 22, depicts idea 28. „Dutch Public Transportation“ App: information & wayfinding, which suggests combining travel routes (of multiple operators) within an app and giving travellers the means to find their end destination and not only the final stop of the public transportation journey.

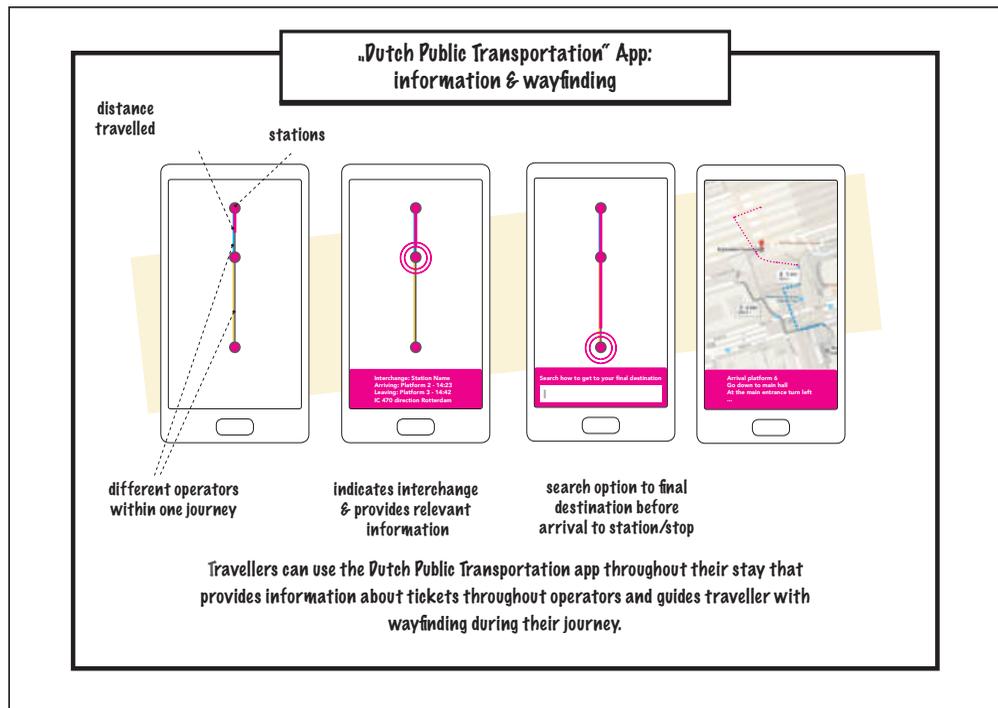


Figure 22. Example idea 28. „Dutch Public Transportation“ App: information & wayfinding

04 - Idea Generation & Evaluation



Knowing what to do (next)

Within this area, solutions are proposed that guide the traveller through the multiple steps of their journey.

Figure 23 showing idea O1. *Free ride to the main city with your airplane ticket* provides the traveller with a more seamless journey during the arrival to the Netherlands. The step to purchase a ticket upon arrival at the airport is abolished. Travellers know they can travel with the ticket they already have.

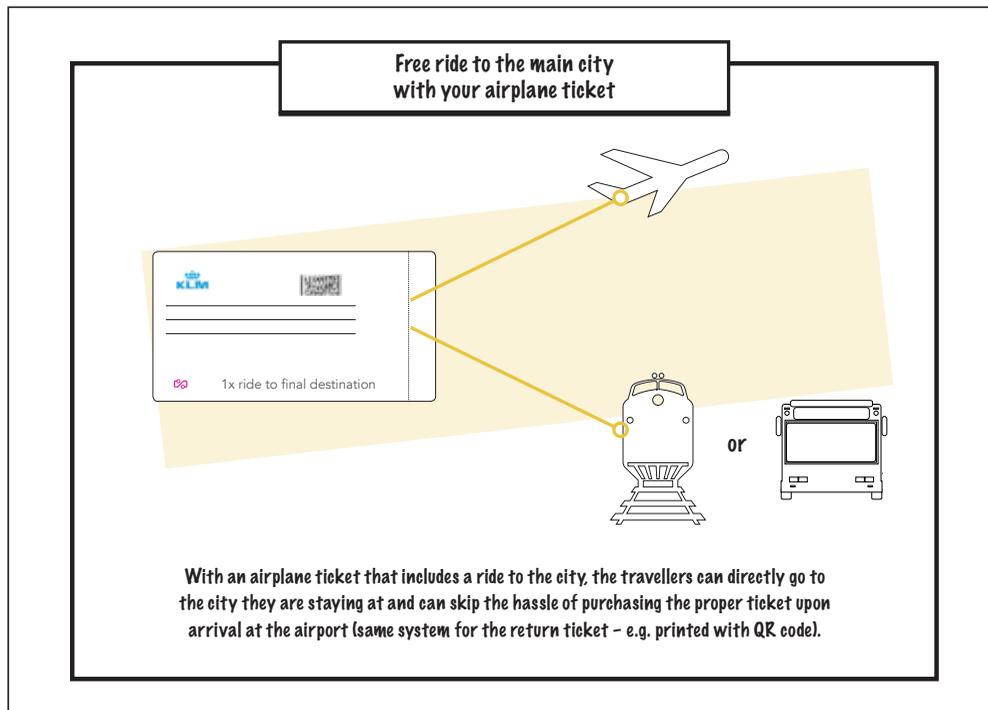


Figure 23. Example idea O1. *Free ride to the main city with your airplane ticket*



Payment

Within this area, solutions that suggest the facilitation of payment of public transportation tickets are proposed.

The example, figure 24, idea 04. *Download the app and “pay as you go” through the app on your phone*, suggests that travellers no longer use paper tickets and interact with the system only through the app that is linked to a payment method, such as a bank account.

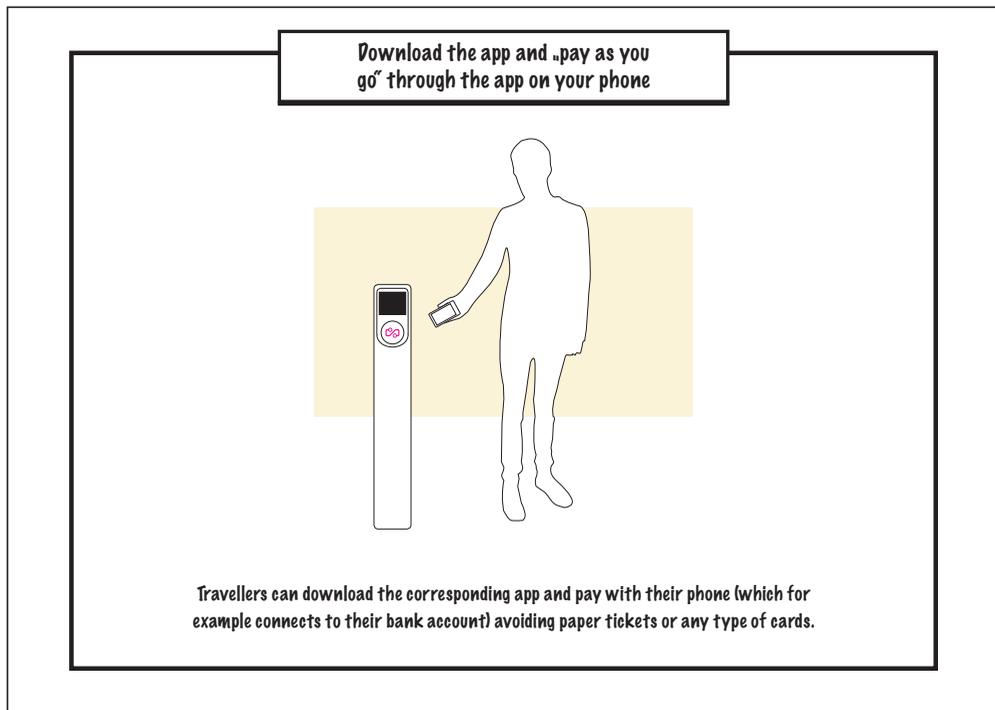


Figure 24. Example idea 04. *Download the app and “pay as you go” through the app on your phone*

04 - Idea Generation & Evaluation

4.3 Idea Evaluation by Project Partners

Chapter 4.2 presented the idea generation process and examples of these ideas to solve the current problems that international have when using and interacting with OV-betalen, which were established in the research phase. The improvement areas (searching for information, wayfinding, knowing what to do [next] and payment) are tackled through the development of multiple solutions for one problem, context or touchpoint. In this chapter it is discussed how the project partners evaluated the ideas. The involvement of the project partners (Connexion, GVB, KLM, NS, RET and Schiphol airport) is essential during the ideation phase considering the overall integrated design approach taken in the project, which integrates the human, the societal, the technological and the business aspect of public transportation to come to user-friendly solutions (chapter 1.4). The project partners, with their expertise in the field, can evaluate the ideas in terms of what they think will improve the users' experience, and most importantly in terms of feasibility and viability of the technological and the business considerations. Due to the nature of the project the human aspect, namely creating user-centred design solutions, is studied in more depth than the other aspects. Gaining an understanding from the project partners perspectives on individual ideas will lead to a better understanding of the impact that the proposed solutions have on the individual companies and on the system as a whole. NBTC Holland Marketing is included as an evaluating partner, due to their expertise in the field of hospitality and knowledge on the visiting groups in the Netherlands. When the term "project partners" is discussed in this chapter, NBTC Holland Marketing is included with all the other project partners.

4.3.1 Aim

Share the research results and present the different design ideas to the project partners in order to receive feedback on each idea about what they think will improve the users' experience, feasibility and viability in terms of technological and business considerations per idea.

4.3.2 Research Questions

- What ideas are preferred by the project partners and why?
- Which ideas are conflicting and why?
- What tendencies can be identified from the workshop sessions?

4.3.3 Method

The workshop's goal with each of the project partners was to select what design ideas are best for the user according to them and to gain an understanding on why the ideas are feasible or not feasible in terms of technology and business. Each partner was visited at their work space for a 2-3 hour session. The project partners were free to invite colleagues to assess the ideas with them; hence, the sessions were with different amounts of people, ranging from 1 to 20 people per company. Figure 25 shows how the idea cards were discussed during the workshops. The session began with a presentation of the research results that contained the main findings and examples of situations that are currently problematic for travellers, in order to inform and engage the workshop participants with the topic. Individually or in small discussion groups, a stack of cards with 44 ideas in A5 format was distributed. Each card presented one idea.



Figure 25. Workshop: Idea evaluation by project partners in a group setting

The project partners rated the ideas into four groups and wrote their arguments for the ratings and concerns about the ideas on the cards:

- High like
- Middle like
- Low like
- Dislike

The following legend will be used throughout the results in this subchapter.

Legend

	2.25 - 3	Ideas liked (high)		0.75 - 1.5	Ideas somewhat disliked (low)
	1.5 - 2.25	Ideas somewhat liked (mid.)		0 - 0.75	Ideas disliked

A four point Likert scale is selected in order to gain a clear general feeling for the positive and negative ideas and avoid placing ideas into a neutral rating. Due to the large amount of ideas, it is preferable to have a strong indication on the ideas which were liked and the ideas which were disliked during further development phases in order to focus the design on ideas with the most potential. Additionally, the qualitative data gained from the sessions strengthens the results, as it gives the workshop participants a chance to explain their selection to make the reasoning behind the categorization as explicit as possible.

The results are both analysed numerically, according to the idea ratings, and qualitatively. The qualitative analysis is a summary of the pros, cons, conditions and suggestion for the ideas. In some cases new ideas were suggested by the workshop participants, these were then added to the list of ideas.

04 - Idea Generation & Evaluation

4.3.4 Results

The four areas (searching for information, wayfinding, knowing what to do [next] and payment) are used to assess the project partner's selection and argumentation regarding the different ideas. However, some ideas are placed in two or more areas, as many of these ideas fit into multiple improvement areas. For example, an idea regarding searching information might be closely related to wayfinding, as is idea 28. „Dutch Public Transportation“ App: *information & wayfinding*. The idea assessment is additionally rationalized in terms of two significant topics addressed by the project partners: *digital over non-digital means* and *new infrastructures/machines*. Tables 2 - 6 summarize the insights gained after assessing the workshop outcomes with the project partners. Appendix C provides the individual ratings of all the ideas from the highest to the lowest, the argumentations per partner per idea and the summary of the analysis per idea.

Searching information

In general ideas regarding the way information is provided by the operators/searched by the travellers were selected the most and ranked highest as table 2 shows. Often the argument to select these ideas is that the more information at different contexts and provided through different touchpoints the better. This is due to the fact that the travellers can use public transportation more independently when they possess more information. Amongst the highest scoring ideas are *providing information in English throughout touchpoints*, *developing a Dutch Public Transportation website and app*, and *Dutch public transportation branding and communication*. In terms of feasibility developing digital touchpoints, such as an app is not a technological problem. However this poses the question of how to manage the data, whether the public transportation operators should manage data by themselves or partner with companies, which are doing this already such as Google or 9292. It was also mentioned during the evaluations that it is not only about having an app, but also about developing ways to get the travellers to download and use it. Furthermore, some ideas ranked highly if they in some way are already being implemented, for example, the idea that *airport and public transportation personnel at the airport merge*. Overall, providing more information does not seem as a problem to the project partners, because the information required is available already, even if it is not yet communicated effectively. Nonetheless, providing information often implies organizational procedures. In the case of the Dutch public transportation system these procedures often must take place amongst multiple parties, making the process to settle the terms for a change and implement it a complex and long one. The cooperation between companies and operators is necessary, as they operate in shared contexts and often require financial investments such as to training personnel. These investments can have a large impact on the companies, because, for example, in the case of training personnel, it means that for a few days a group of personnel is removed from the current system, which has its own consequences. On the negative side of the ratings for the "searching information" area were ideas that seemed to make the information providing more complex by adding components to the already complex system, such as ideas that seem to add steps to the travellers' journey. An example for this is the idea of *purchasing tickets in the flight and picking them up at the airport* or *developing a certification for the public transportation information*. These ideas also require companies to cooperate and engage in a complex process to settle goals and implement them without providing a real tangible improvement in the users journey, hence making the ideas not viable.

Table 2. Ranking for ideas suggesting improvements in the “Searching for information” area

Area	Design Idea (System & Touchpoint based)	Average
 Searching for information	31. Always communicate information in Dutch and in English	2,9
	28. „Dutch Public Transportation“ App: information & wayfinding	2,6
	09. Download the public transportation app during the flight	2,4
	27. Dutch public transportation (mobile) website: info about the system/pre-order/purchase tickets	2,4
	14. Traveller friendly airport baggage claim area	2,3
	17. Airport personnel & OV-personnel merge	2,3
	36. Select tickets by destination throughout the whole system	2,2
	40. Floor signage for main interchanges from the respective platform/stop	2,2
	12. The „Flight travel guide“ recommends the best ticket options for your stay	2,1
	26. Joint „Dutch Public Transportation“ branding & communication	2,1
	43. OV-basics campaign for tourists	2,1
	06. Clear map/explanation of public transportation location in the airplane	2,0
	32. Ticket settings provide information in your own language throughout touchpoints	2,0
	16. Highlight connections to main city/cities at the airport	1,9
	33. Interactive information walls at airports/stations/stops	1,9
	34. Information screens, that also print tickets	1,9
	29. WhatsApp with service personnel	1,8
	44. Augmented Reality (better wayfinding and interchanges)	1,8
	18. TVMs only for travellers going to Amsterdam/Rotterdam at the respective airport	1,7
	15. Clear division between Schiphol Plaza and public transportation area	1,6
	05. OV timetables in the flight	1,5
	07. OV-folder in the flight seat pockets	1,3
	13. Partner with travel guides (books): Scan code and purchase public transportation tickets	1,3
	30. „Hollapp“ Visit the Netherlands App	1,3
	38. Final destination map on paper tickets	1,3
	10. Purchase public transportation tickets in the flight and pick them up at the airport	1,2
	37. Selection of tickets includes overview of all possible options (lines/modalities) throughout the whole system	1,2
	39. Paper tickets with foldable map	1,2
	08. Tickets and information regarding public transportation is available in the flight	1,0
	22. Personalized information during train journey: Interactive screens on train seats	0,9
	21. „Schiphol Express“ train	0,8
42. Certified OV-info in travel guides (digital and analogue)/ OV-guarantee	0,6	
35. Blank information screens, information only appears if searched for	0,5	
11. Purchase public transportation tickets in the flight and print during the flight	0,3	

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Wayfinding

The project partners also gave high scores to ideas suggesting changes in order to improve wayfinding, see table 3. In general, the project partners prefer ideas that suggested digital solutions to this issue, such as apps or information on airplane screens. As mentioned in the “searching for information” area, the project partners explained that the information in itself is available to improve the wayfinding, especially because it easily can be implemented into digital means, such as apps or the inflight entertainment system. However, the cooperation between companies and operators, for example, first amongst public transportation operators and then amongst the operators and the airlines, makes implementation a more complex process. All parties must divide responsibilities and settle the requirements for the touchpoint. Furthermore, keeping the data updated also requires investment. Adding or changing signage and branding thought contexts is complex due to regulations, for instance, at airports or stations, which must consider the synergy of information for all sorts of purposes. The idea to *more clearly divide the public transportation area from other Schiphol airport areas, like arrivals and retail* was generally liked. Still, the public transportation operators usually rated it lower due to the fact that it is a long-term goal and in the hands of the airport itself. Conversely, the partner from Schiphol airport rated the idea higher. The idea, which rated lowest in terms of wayfinding, was the idea to *have blank information screens, on which travellers can search for their specific question*. The idea was proposed with the thought to avoid information overload. Nonetheless, the project partners agreed that travellers will not be attracted by the screens and usually do not know what to search for, making the idea non viable even though it is technologically feasible.

Table 3. Ranking for ideas suggesting improvements in the “Wayfinding” area

Area	Design Idea (System & Touchpoint based)	Average
 Wayfinding	31. Always communicate information in Dutch and in English	2,9
	28. „Dutch Public Transportation“ App: information & wayfinding	2,6
	36. Select tickets by destination throughout the whole system	2,2
	40. Floor signage for main interchanges from the respective platform/stop	2,2
	26. Joint „Dutch Public Transportation“ branding & communication	2,1
	06. Clear map/explanation of public transportation location in the airplane	2,0
	32. Ticket settings provide information in your own language throughout touchpoints	2,0
	16. Highlight connections to main city/cities at the airport	1,9
	33. Interactive information walls at airports/stations/stops	1,9
	34. Information screens, that also print tickets	1,9
	29. WhatsApp with service personnel	1,8
	44. Augmented Reality (better wayfinding and interchanges)	1,8
	15. Clear division between Schiphol Plaza and public transportation area	1,6
	30. „Hollapp“ Visit the Netherlands App	1,3
	38. Final destination map on paper tickets	1,3
	39. Paper tickets with foldable map	1,2
	22. Personalized information during train journey: Interactive screens on train seats	0,9
21. „Schiphol Express“ train	0,8	
35. Blank information screens, information only appears if searched for	0,5	

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Knowing what to do next

Within the area of guiding travellers through their journey so that they know what to do at different moments, see table 4, some examples for ideas that rated highly are providing travellers with a free ride to the city with their airplane ticket and making a campaign with the basic steps on how to use the OV- system. Providing travellers with the possibility to use the flight ticket to use public transportation facilitates the first step of the journey. Nevertheless, this requires the airline and operators to cooperate and provide a joint ticket that should work for both the airport and the public transportation payment borders. Technologically this is not a challenge as an electronic or barcode ticket could do this. Yet, it is an investment that is providing a pleasant service to the traveller, but would only solve the first step of the travellers' journey and would not solve further problems that travellers currently experience. The idea rated that the lowest was the one of *adding gates everywhere in the system* (which would force travellers to check-in and check-out, hence to always know what to do in terms of ticket validation) because of the high costs that it implies and the fact that it can only be implemented with metro and train and not with trams and buses. The project partners rated several ideas that require a systematic change such as a *WhatsApp messaging with service personnel* or *selling flight and public transportation tickets together* relatively high, due to the benefits travellers would have from them. However, these ideas seem harder to implement due to organisational requirements and the viability of the changes. For instance, the idea that *travellers can WhatsApp with service personnel* cannot directly be implemented, because the availability of the service personnel is an issue: currently service personnel only work until 17:00hrs and such a live messaging service would require a 24 hour availability. Not only having service personnel at all times is a concern, but the personnel should be able to communicate in several languages. Moreover, capacity could become an issue, because an immediate response is required by the traveller. Even though the benefits of the idea for the user are very clear and the technology is available, the backend of the service must apply large changes for what seems a small change in the frontend.

Table 4 . Ranking for ideas suggesting improvements in the “Knowing what to do (next)” area

Area	Design Idea (System & Touchpoint based)	Average
 Knowing what to do (next)	31. Always communicate information in Dutch and in English	2,9
	28. „Dutch Public Transportation“ App: information & wayfinding	2,6
	27. Dutch public transportation (mobile) website: info about the system/pre-order/purchase tickets	2,4
	01. Free ride to the main city with your airplane ticket	2,3
	14. Traveller friendly airport baggage claim area	2,3
	36. Select tickets by destination throughout the whole system	2,2
	40. Floor signage for main interchanges from the respective platform/stop	2,2
	26. Joint „Dutch Public Transportation“ branding & communication	2,1
	43. OV-basics campaign for tourists	2,1
	06. Clear map/explanation of public transportation location in the airplane	2,0
	32. Ticket settings provide information in your own language throughout touchpoints	2,0
	16. Highlight connections to main city/cities at the airport	1,9
	33. Interactive information walls at airports/stations/stops	1,9
	34. Information screens, that also print tickets	1,9
	29. WhatsApp with service personnel	1,8
	44. Augmented Reality (better wayfinding and interchanges)	1,8
	18. TVMs only for travellers going to Amsterdam/Rotterdam at the respective airport	1,7
	23. „Be-in Be-out“	1,7
	02. Flight & public transportation tickets are sold together	1,6
	15. Clear division between Schiphol Plaza and public transportation area	1,6
	05. OV timetables in the flight	1,5
	07. OV-folder in the flight seat pockets	1,3
	30. „Hollapp“ Visit the Netherlands App	1,3
	38. Final destination map on paper tickets	1,3
	10. Purchase public transportation tickets in the flight and pick them up at the airport	1,2
	39. Paper tickets with foldable map	1,2
	25. Single check-in & check-out	1,1
	08. Tickets and information regarding public transportation is available in the flight	1,0
	22. Personalized information during train journey: Interactive screens on train seats	0,9
	21. „Schiphol Express“ train	0,8
	19. Pick up ticket order with your passport	0,7
	24. Gates everywhere	0,5
	35. Blank information screens, information only appears if searched for	0,5

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Payment

In terms of payment, the project partners gave the highest ratings to solutions that avoid selling travellers separate tickets, such as *having an app to pay or having one single process to purchase flight and public transportation*. The project partners argued that these ideas seem to simplify the steps that traveller's go through when viewed from the users perspective. Also, the project partners generally believe that these ideas can easily be executed from the companies' and operators' perspective as the investment in digital solutions is largely perceived as worthwhile, due to the current technological trends, suggesting that more and more people will be using smartphones and apps during their travels (see chapter 3). Moreover, the idea of *providing all forms of payment to travellers* was regarded as very traveller friendly solution. Though, also as a very expensive one with unclear limits about where the service stops, because very time more and more online payment methods are available. Having no limit makes the idea intangible and complex. Ideas that seem to make the system more complex and that are based on the traveller having to carry out multiple steps when purchasing a ticket rated lowest, and are regarded as not worthy to invest on. See table 5.

Table 5. Ranking for ideas suggesting improvements in the "Payment" area

Area	Design Idea (System & Touchpoint based)	Average
 Payment	31. Always communicate information in Dutch and in English	2,9
	04. Download the app and „pay as you go“ through the app on your phone	2,6
	27. Dutch public transportation (mobile) website: info about the system/pre-order/purchase tickets	2,4
	36. Select tickets by destination throughout the whole system	2,2
	26. Joint „Dutch Public Transportation“ branding & communication	2,1
	32. Ticket settings provide information in your own language throughout touchpoints	2,0
	41. All forms of payment throughout operators & touchpoints	2,0
	34. Information screens, that also print tickets	1,9
	23. „Be-in Be-out“	1,7
	02. Flight & public transportation tickets are sold together	1,6
	13. Partner with travel guides (books): Scan code and purchase public transportation tickets	1,3
	30. „Hollapp“ Visit the Netherlands App	1,3
	10. Purchase public transportation tickets in the flight and pick them up at the airport	1,2
	25. Single check-in & check-out	1,1
	03. Pay 50 Euros upfront and get the money back that you don't use	0,5
	24. Gates everywhere	0,5
	35. Blank information screens, information only appears if searched for	0,5
	11. Purchase public transportation tickets in the flight and print during the flight	0,3

New infrastructures/ machines

The project partners disliked ideas that clearly require developing or building new infrastructures or machines, such as *adding screens to every train seat* or a *new airport train line*, see table 6. This is because the development of these infrastructures or machines implicates extremely high development costs compared to the perceived benefit. Interestingly, all ideas regarding the way people validate their public transportation tickets rated very low (below 1), except for *Be-in Be-out*. This is due to the fact that any change to the current system is large, due to the large scope (it must work country-wide) and therefore also implies high costs to change. Be-in and be-out however is a system that is planned for the long-term (approximately for the year 2025) and ideally can work throughout operators and modalities.

Table 6. Ranking for ideas that imply developing new infrastructures or machines

	Design Idea (System & Touchpoint based)	Average
New infrastructures/ machines	4. Traveller friendly airport baggage claim area	2,2
	34. Information screens, that also print tickets	1,8
	18. TVMs only for travellers going to Amsterdam/Rotterdam at the respective airport	1,4
	20. Space to put luggage while in vehicles	1,0
	22. Personalized information during train journey: Interactive screens on train seats	0,9
	21. „Schiphol Express“ train	0,4
	11. Purchase public transportation tickets in the flight and print during the flight	0,1

Digital over non-digital

Across all the different solution areas, digital solutions were preferred over non-digital ones. For example, *paying with the smartphone* was mostly preferred over any solution regarding paper tickets the same way *digital inflight information about public transportation* was preferred over information provided in a folder. Digital solutions were related by the project partners with sustainability and a better investment strategy to improve the system.

4.3.5 Conclusions & Discussion

The integrated approach of the project, which includes the human, societal, technology and business aspect of developing a product-service system, is largely influenced by the project partners' input. I asked the project partners to evaluate the ideas in regards to their expertise in the field of (public) transportation, the technological and the business aspects of the proposed system and individual touchpoints. In some cases the project partners argued their evaluations taking the users perspective, in other cases they took the companies/operators perspective (and viewed the idea from technological and business point of view) and often the project partners argued an idea from both perspectives.

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Because public transportation should be accessible for everyone in society, including the international travellers, the societal aspect has been of fundamental importance throughout the project. This aspect was discussed indirectly, while the human, technological and business aspects were discussed more prominently. The fact that the idea that suggest communicating both in Dutch and in English throughout the public transportation system rated highest out of all the ideas shows the intent of the project partners to be as inclusive as possible. NBTC Holland Marketing also addressed the holistic goal to improve the public transportation system for international travellers so that they have a convenient access to the whole country (as most inbound tourists only travel to Amsterdam), to provide a benefit for society in the Netherlands as a whole by spreading tourism. Often, when an idea only seemed to improve the system for a small group of people or specific type of user, like using augmented reality for information provision and wayfinding, the investment on the idea was not perceived as beneficial for the whole and therefore not viable. This enforces the societal nature of a system, such as public transportation.

In terms of technology, the project partners perceived a digitized system as positive for the user and as feasible, because the information required to do this is already available. This was the case especially for ideas that require developing/improving apps and interactive information throughout the system. The main concern regarding these types of suggestions is data managing and updating, as it is something that must be organized and invested on. Only when large infrastructural changes were proposed the project partners disregarded the ideas, due to large economical costs implied to change things in the whole system. Furthermore, ideas which seem beneficial for the travellers, but very costly to implement, such as including as many payment options as possible throughout the system, were also rated lower. In general, several ideas were perceived as very beneficial for the travellers, such as providing a joint “Dutch public transportation” branding and communication, as it would provide ease of use, but extremely hard to implement due to the organizational nature of the system, which involves many parties that share several contexts and have different interests and agendas as individual operators.

Businesswise, international travellers are an important group for the project partners. Inbound tourism is a major growth industry for the Dutch economy (NBTC Holland Marketing, 2015), hence catering to tourists is also politically relevant for the individual companies/operators and for the Netherlands as whole. An important insight regarding the evaluation of ideas from the business perspective, is that in some cases, the project partners perceived some ideas as easy and beneficial for the users, but as very hard to implement on the backend due to the large systematic changes required for what seems a small change in the frontend.

Overall, the evaluated ideas mostly were technologically feasible and the largest difficulty to overcome in terms of implementing the ideas usually seems to be of organizational nature, due to the complexity of collaboration between the companies and operators involved; in some cases even if the travellers would benefit from the proposed ideas.

The limitations of the results provided by these idea evaluation workshops with the project partners is presented in the following subchapter.

4.3.6 Limitations

The results from the workshops with the stakeholders provide insight to the human, societal, technological and business aspects related to improving the public transportation system for international travellers in the Netherlands. The experts from different companies/organizations all work within the field of transportation and the topic of international travellers and therefore provided valuable arguments for each idea. Having a wide range of arguments, from experts from different departments, in favour or against the ideas strengthens the reasons to select certain ideas. The gathered results summarize the multiple views of different ideas. In order to interpret the results properly it must be considered that the sessions were conducted with different amounts of people each time and therefore the assessment was not exactly the same at all the companies/organizations. In some cases the participants assessed the ideas independently, which provided very specific reasoning for the rating of the idea. However, when assessed in smaller groups the discussions per idea were more elaborate as sometimes different opinions were argued. It also must be considered that the experts in some cases assessed the idea with the users perspective and sometimes with the companies (business/technological) perspective, showing that the value of assessing the system and touchpoints from a users' perspective is perceived as important to better the system. The ideas were not all discussed in depth due to time constraints, but the top three and bottom three ideas were discussed in detail in order to get more qualitative data and asses better strengths and weakness of the ideas. Furthermore, these evaluation sessions did not include the follow-up question for each idea of what should be done by the project partners individually and collectively to further develop and implement the ideas. Having this input is an important step towards improving the system, as it would provide an indication on concrete steps that should be taken in short-, mid- and long-term.

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4.4 Idea Evaluation by Users

In order to carry out a user test regarding the different possibilities, a selection of ideas were visualised and discussed with users. I visualised the ideas, presented to users, as individual concepts for different contexts and parts of travellers' journeys. The improvement areas (searching for information, wayfinding, knowing what to do [next] and payment) are implicit in the concepts. Separating the concepts by context of use provides a representation the users' situation when interacting and using with the different touchpoints during their journey and help to understand and envision the users' perspective more accurately.

Some ideas that the project partners rated negatively, but still are relevant from the users perspective, are tested in order to more thoroughly analyse if the user's experience would benefit from them. Based on the workshops with the project partners several ideas which were negatively rated and clearly outside of the projects' scope, such as *adding more space for luggage in the public transportation vehicles* (idea 20) or *an app to manage bookings and payments of hotels, flights, public transportation and payment* (idea 30) were eliminated. The overview and explanation for the disregarded ideas is in appendix D. Moreover, some ideas were iterated after discussing the pros and cons of the proposed idea with the partners, such as idea 16. *Highlight connections to main city/cities at the airport*. The essence of the idea of making the most prominent city for travellers as clear as possible was perceived as important. However, there were concerns that most trains pass main cities and that the highlighting would be overwhelming or unclear due to the amount of information. Therefore, the idea was iterated into providing dedicated information for the main city, at Schiphol airport it would be providing a dedicated screen to Amsterdam, like concept 04C - *There is a clear indication on the trains that are going to Amsterdam* illustrates.

4.4.1 Aim

Present multiple touchpoint concepts within different use context to international users of the Dutch public transportation system to understand their preferences regarding searching for public transportation information, wayfinding, guidance in knowing what to do in the system and payment of tickets.

4.4.2 Research Questions

- What ideas are preferred by the international users of the Dutch public transportation and why?
- Which ideas are conflicting and why?
- What tendencies can be identified amongst the international travellers?

4.4.3 Method

International travellers in Amsterdam at the Museumplein, who have used the Dutch public transportation system, are asked to participate in the user test. The location is selected, as it is a touristic hot spot, where people often rest in the park and are likely to have time to participate in the test. Participants from different countries and within a wide age range are recruited in order to address a large range of traveller types and traveller preferences, see figure 27.

The concepts presented to the participants are visualised in a higher fidelity than the ones presented to the project partners, as the user test participants (real international travellers) are less knowledgeable of the system's workings and organisation. To do this, photos of different locations through the travel

phases are used. Per photo/location of use, several ideas are visualised with digital sketches that show the touchpoint idea that is being suggested, as shown in figure 26. The photos are in black and white to provide a homogenous assortment of locations. The digital sketches always are illustrated in a bright colour palette on the black and white photo, so that the idea suggestion stands out from the background and can quickly be spotted by the participants. Each concept provides a one sentence explanation that if required is verbally further explained during the user test. Appendix E provides an overview of all the concepts presented to the users, the improvement areas they cover and to what idea number (ideas presented to the project partners) they relate to, as well as all the visualisations. The photos are presented in a travellers' chronological travel order:

- At home
- In the flight
- At the Dutch airport: At the baggage claim & at the arrivals area (or public transportation)
- At street stop /At stations/ In vehicles

The participants are asked to rate each idea suggestion from zero to three, one being “like a lot” and four “dislike a lot” (the same scale used with the project partners) and to explain the reason for the rating they have provided. After each concept within a context has been selected, the participants are asked to select the best idea per photo/location if there is no clear preference from the previous rating. The argumentation provided by the users is essential to the further concept development.

For all the answers participants provide, notes are taken to capture the argumentation for their ratings per concept. Participants are required to sign a consent form if they allow for the user test to be recorded with a GoPro camera. The footage provides access to the research data during the analysis and synthesis phase of the project. If the participants don't agree to be recorded, only the notes will be used.

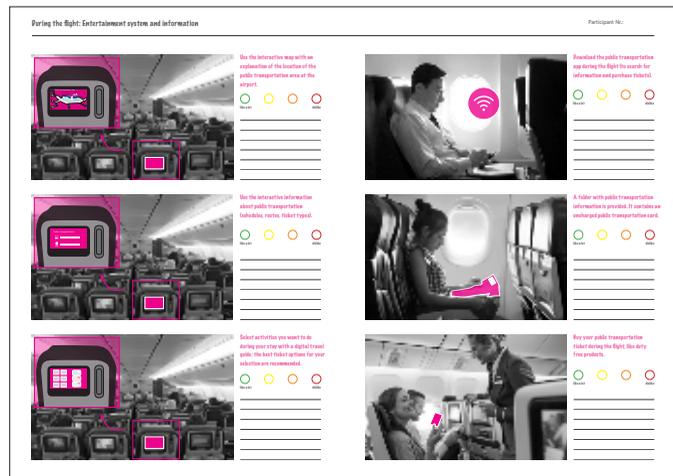


Figure 26. User test materials example: concepts presented within flight context to users

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Figure 27. Concept evaluation by users

4.4.4 Results

Overall, all the concepts were rated highly, none of the concepts has an average rating lower than 1,7 out of 3, with 3 being the highest possible mark. Appendix F includes a table that shows the numerical rating of all the ideas from the highest to the lowest, the individual argumentations per participant (a total of 15 travellers) per concept, and the summary of the analysis per concept. Each context is assessed in terms of the perception the participants had per touchpoint concept, see tables 7 - 13.

Generally, concepts regarding having the proper information at the right time ranked highly due to the impact they have on the traveller reaching his destination from A to B more effectively, such as concept 4B - *There are dedicated screens/information for transportation to Amsterdam*, concept O2A - *Use the interactive map with an explanation of the location of the public transportation area at the airport* or concept O5C - *There is wifi at stations and stops to access public transportation information and purchase tickets on the spot*. Also the availability of service personnel was often preferred over self-service or at least suggested to have a combination. Participants explained a wide-ranging need to get confirmation from an experienced human being, however avoiding to wait in lines is just as important in some cases. Furthermore, most participants prefer to be able to access information and have tickets digitally on their own smartphone due to the comfort of having it already, with the condition that the system offers enough wifi in order for it to work. Some of the concepts that ranked lowest were concepts such as O1A - *Purchase 1 single ticket for both, your flight and public transportation in the Netherlands* or O2F - *Buy your public transportation ticket during the flight, like duty free products*, because travellers have a feeling of lacking flexibility and in some cases a lack of trust towards the company, because they believe that the companies are offering more expensive options.

The results highlight that a system that should be accessible to everyone in society, such as public transportation, should cater to as many types of travellers as possible, as argued in the research phase of the project (Lehr, 2016). The diverging concepts, especially in terms of ticket types and ways to select tickets, balanced each other out depending on the type of traveller participating in the user test.

The following legend will be used throughout the results in this subchapter.

Legend

	2.25 - 3	Ideas liked (high)		0.75 - 1.5	Ideas somewhat disliked (low)
	1.5 - 2.25	Ideas somewhat liked (mid.)		0 - 0.75	Ideas disliked

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01 - At home: Searching information and purchasing ticket

The idea that scored the highest within the home context, is the idea that allows travellers to *save activities from a travel guide in an app and suggests the best ticket options* with the argument that it makes the search process easier and the information can be transported in one single place, the smartphone. Furthermore *downloading the public transportation app on the phone in order to have the proper information and eventually buy a ticket* was well perceived by the participants. Both the variables to have a pre-paid ticket and to have a pay as you go option were judged as useful mostly with the argument that it depends on the sort of trip. Both options were argued to be less expensive, the pre-paid ticket as it allows the traveller to budget and the pay as you go option as the traveller only spends money for the actual usage. Most participants would accept a suggestion for the proper public transportation website after booking a flight ticket. Nevertheless, *purchasing one single ticket for the flight and the public transportation in the Netherlands* was less attractive to several participants, who argue that this sort of ticket would not allow for flexibility or last minute schedule changes. *Searching for the public transportation website separately from the flight process* is perceived as one extra step, which nonetheless provides a fuller picture of options, some participants perceive it as positive to find information on their own terms.

Table 7. Ranking of concepts for “01 - At home: Searching information and purchasing tickets”

Context	Concept (System & Touchpoint based)	Average
 At home	01F - Select the activities you want to do and places you want to go with your travel guide and save them on the app: the best ticket options for your selection are recommended.	2,6
	01D - Download the public transportation app on your phone and pre-pay your ticket.	2,3
	01E - Download the public transportation app, so that you can pay as you go, when you are in the Netherlands.	2,3
	01B - Purchase your flight ticket first and then look at the suggested public transportation website.	2,2
	01C - Search for public transportation tickets (no link to the flight website) on the public transportation website and eventually purchase them.	1,8
	01A - Purchase 1 single ticket for both, your flight and public transportation in the Netherlands.	1,7

About information and tickets in the smartphone

A: “Definitely, great idea. So much easier. It’s in your pocket.”

B: “It is easy ‘cause you have it on your phone, you’ve got your phone on you all the time.” - Couple, age 40-50, England

02 - During the flight: Entertainment system and information

The option to *have an interactive map of the airport during the flight, that shows the public transportation area*, ranked highest amongst the ideas presented to participants regarding their flight. Most arguments relate to having orientation during arrival and efficiently using the flight and arrival time. One participant suggested

to not only show public transportation, but to showcase all available options including taxis and rental cars to have the complete overview. The idea to *select activities on a digital travel guide during the flight that recommends the best ticket options, searching public transportation information and downloading the public transportation app during the flight* scored slightly lower, as most participants believe they would only use the option if they did not have the time to already have researched this previously. Nevertheless, it is perceived as a nice add on, especially for longer flights. One participant mentioned concern with using the digital travel guide and public transportation information of the flight, as he is not able to save the information, which is necessary at later steps of the journey. With regards to *downloading an app during the flight* some participants mentioned a concern about security and not being scammed, the app should, for example, be government sponsored in order to be trusted. The idea of *providing an information folder with an uncharged card* was also perceived as a nice add-on, however most participants prefer to have the information and ticket digitally in their phone, as it is one single place. *Purchasing a ticket with the stewardess* was the least selected ideas as the participants believe the prices of such a ticket might be higher and that they will not have enough information or time to select the best option. Many travellers mentioned, that they believe, that when they arrive they will have the overview of ticket and might regret their previous purchase. Also concerning the paper option, most participants are afraid they might lose the papers/tickets, while they believe they won't lose their phone; one participant was concerned about the environmental effect of printing paper and several participants believe that paper tickets are out-dated.

Table 8. Ranking of concepts for “O2 - During the flight: Entertainment system and information”

Context	Concept (System & Touchpoint based)	Average
 During flight	O2A - Use the interactive map with an explanation of the location of the public transportation area at the airport.	2,9
	O2C - Select activities you want to do during your stay with a digital travel guide: the best ticket options for your selection are recommended.	2,5
	O2B - Use the interactive information about public transportation (schedules, routes, ticket types).	2,4
	O2D - Download the public transportation app during the flight (to search for information and purchase tickets).	2,2
	O2E - A folder with public transportation information is provided. It contains an uncharged public transportation card.	1,9
	O2F - Buy your public transportation ticket during the flight, like duty free products.	1,8

About interactive airport map in the flight

“Yes it would be good. It was not available (interactive map of airport in the flight). Because it was the first time you visit the city, it is good information, very helpful.” - Male (with wife), age 40-50, Brasil

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03 - Arriving at the airport: At the baggage claim area

In general the participants would like to *use the waiting time at the baggage claim area to already inform themselves*, as it is perceived as the right moment to think about the next step of the journey. Mostly a combination of self-service and service personnel is believed to be the best and most efficient option. Travellers do not want to wait in lines. The preferred option by the participants is to *have a service desk or any kind of service personnel*, as the personnel is perceived as knowledgeable and as a reliable source for travellers to confirm their thoughts, route or ticket selection. The only concern expressed regarding service personnel, is long waiting lines to talk to the personnel. Moreover, some participants mentioned that they are searching information with their lack of knowledge, therefore the information available at the screens and interactions should be extremely clear in order for it to be useful. Even though ticket vending machines are perceived mostly as useful, one participant was hesitant about using them as he believes the interface will be a problem to use. Also because of language, some participants explained that they would only go to the ticket vending machines if they knew exactly what to purchase.

Table 9. Ranking of concepts for “03 - Arriving at the airport: At the baggage claim area”

Context	Concept (System & Touchpoint based)	Average
 At baggage claim area	03C - A service desk is available.	2,8
	03A - Interactive information screens are available.	2,7
	03B - Ticket vending machines are available.	2,4

About public transportation information and tickets at baggage claim area

“Yeah ‘cause that makes sense. It is providing information that you need at the point at which you have the realization ‘I need to get out of here, I need to get from the airport.’ That is when you need to know it. Here is the information supply and then here are the mechanisms for doing it: here is your, the train ticket, and here is where you need to transfer and somebody needs to tell you when you get to the central station how you then transfer to a tram and which tram to get to your particular hotel. ” - Female (with husband), age 70-80, USA

About self service and service personnel

“Yes I like the person. Yeah I like the searching on my own and then confirmed what I just learned with a real person. I like to go to the real person moderately well informed, ‘like it seems to be like we need to do this and do that and we are going to change here and then we are going to walk this way - am I right?’ (So they can say) ‘yeah, yeah you need to take the (line) two or the five’.”
 - Female (with husband), age 70-80, USA

04 - At the Dutch airport arrivals/public transportation area

Within the airport arrival context the participants rated the idea to *have dedicated screens showing the trains that go to Amsterdam (as Schiphol airport)* highest as having the information as obvious as possible, especially as they are in that context for the first time. *Having an indication on the trains (or other vehicles) themselves* is also perceived as a good idea to make the journey even easier. However, it was mentioned that it is a way for the travellers to double check that they are getting in the right train (or other vehicle), but having the information previously is of major priority. Several participants believe that *dividing the airport areas and making them as clear as possible* is a positive thing, especially for large airports. Nonetheless, the retail area should not be completely separate as travellers enjoy spending the time there and find it necessary. *Having an airport express train* also is perceived as positive because participants believe it would be easier to find and that it might be fastest. Nevertheless, some participants did acknowledge that Schiphol Airport is very close to the city centre and are concerned that such a train would have a higher cost than regular trains and would therefore not use it.

Table 10. Ranking of concepts for “04 - At the Dutch airport arrivals/public transportation area”

Context	Concept (System & Touchpoint based)	Average
 At arrivals hall	O4B - There are dedicated screens/information for transportation to Amsterdam.	3,0
	O4C - There is a clear indication on the trains that are going to Amsterdam.	2,8
	O4A - Different areas/functions of the airport are clearly recognizable.	2,7
	O4D - There is a Schiphol Airport Express train.	2,7

About dedicated screens for transportation go to Amsterdam from Schiphol airport

“That is a good idea, because it is not very clear sometimes. Yeah, it really isn't clear. We have got quite a few people coming to visit us from the UK while we have lived here and some people are just lost about the entire process. Even when I have gone to meet people out at the airport, I've found it always kind of... I always want to go to Amsterdam Central, so that's yeah that would be really helpful.” - Male, age 30-40, England

04 - Idea Generation & Evaluation

05 - During your travels: Searching information and purchasing tickets at a stops/stations

All participants rated the option to *have wifi access at all stops and stations* highly, as most travellers claimed that they prefer the option of searching for information on their own phone, because it is faster than waiting on a line for any other device, it is in their own language, and one participant mentioned that for her it is important because it is more hygienic. *Having interactive screens to search for information* is perceived as user friendly, however travellers mentioned that these should be very easy to use, because they are searching with their lack of knowledge about the system. Furthermore, *having a service desk to get information and purchase tickets* is in general also perceived as positive. Still, travellers are concerned with waiting lines and losing travel time to talk to someone, it is perceived as a backup option. Information that print tickets rated lowest in this category; even though travellers like the idea of having everything together, which unifies the process of information and purchase, they are concerned that some travellers before them will take a long time to use the devices. Moreover, paper tickets are seen as out-dated. In terms of how participants acquire tickets at ticket vending machines most participants would prefer to see *all ticket options from the different operators with information regarding the time it takes to travel and the cost of the trip* as they can make a decision that suits their trip better. The idea to *select the tickets by destination* seems as easier to the participants than selecting tickets from a list of ticket names. One participant mentioned that one must clearly know where one is going to, which in some cases is difficult. Many participants mentioned that having a map is good, but being able to type an address is also necessary, because they might not be able to locate things on the map.

Table 11. Ranking of concepts for "05 - Searching information and purchasing tickets at a stops/stations"

Context	Concept (System & Touchpoint based)	Average
 A public transportation stop	O5C - There is wifi at stations and stops to access public transportation information and purchase tickets on the spot.	2,8
	O5E - All types of tickets and the respective routes are presented for you to choose from.	2,7
	O5A - Interactive information screens are available.	2,6
	O5D - You can select your ticket by destination.	2,6
	O5F - You can purchase your tickets with service personnel at desks.	2,6
	O5B - Interactive information screens and ticket vending machine are both in one device.	2,4

About having wifi at stations and stops

"I don't use the *datos*, the mobile (data), because it is very expensive to me here, so I use the wifi in everything, every place I can, so I like it a lot." - Male (with mother), age 20-30, Argentina

About having an overview of options purchase tickets

"In order to make you chose the best solution, according to, more to the time you have at disposition or the money you spent." - Female (with husband), age 40-50, Italy

O6 - At station/in vehicle: Public transportation ticket validation

The way to interact with the system in terms of ticket validation shows that most travellers believe that as a first-time user of the system, having gates simplifies the process. However, the participants explained that as a local, gates are less pleasant. Some participants explained that if there are no gates it should more clearly be communicated that people must check-in and out, only people who talked to service employees knew the workings of the system. Furthermore, most participants believe that the idea of *single check-in and check-out* instead of tapping the card on interchanges between operators would simplify the usage of the system, hence was highly rated. The idea of *having to only check-in and paying a flat fee at buses and trams* was rated high, as it reduces steps to use the system. Nonetheless, several participants are concerned that the price of their travel will be higher with a flat fee. One participant suggested having a daily capping price of 10 Euro. *Be-in Be-out* was perceived as the easiest option in terms of usage and had no problems with privacy issues. One participant explained that as long as there is no face-recognition or fingerprint tracking it is not a problem. Nevertheless, a few travellers, did have a privacy concern and agreed that this option is easiest to use, but disagree with the control factor, hence this idea rated lowest within the category of ticket validation.

Table 12. Ranking of concepts for “O6 - At station/in vehicle: Public transportation ticket validation”

Context	Concept (System & Touchpoint based)	Average
 At street stop At station In vehicle	O6A - Gates are available at all train and metro stations in the Netherlands, so you don't forget to check-in and out.	2,7
	O6C - There is „single check-in and check-out“: you don't have to tap you card on interchanges between operators, but only at the beginning and the end of the trip.	2,5
	O6B - There is a flat fee on buses and trams: you only validate the public transportation ticket once.	2,1
	O6D - The system works with „Be-in Be-out“: the system recognizes when you enter and exit the system and you pay automatically.	1,9

About gates

“You can't forget with this (gates), but it is not very French - pas beaux, ces't a little prison... For people who know the system it is not good, but for people like me who don't know exactly you know what you have to do. “ - Male (with wife), age 60-70, France

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07 - General: Signs & Information

All participants rated the idea of *having one single operator for public transportation* highest. The participants argued that this would be the easiest way to use the system, as there is no searching for different options and having to understand what it implies to use one or the other. Also the ideas regarding languages ranked highly. Most travellers believe that providing English is necessary, as people don't usually speak Dutch and believe it is encouraging when a message is provided in a language that they understand. Some people expressed that they still are restricted by English and would actually prefer having more languages. In terms of providing travellers information in their own language through different touchpoints, most travellers believe that it is useful and makes the usage of the system easier when the language is understood. Some traveller explained that it is a nice feeling when the messages are to an extent personalized. In this case some travellers believe that with English it is enough to use the system and see this as less necessary. One participant explained that having his own language available takes away from experiencing a foreign country. The idea of *having signage on the floor for the different interchanges or touristic attractions in general* was perceived as useful, but some people are concerned that the signage will be overwhelming if there is too many at once or that with time it will erase. A solution suggested was to keep it simple and only provide it at specific locations. *Accessing information via augmented reality* was perceived as useful and easy, especially for wayfinding. Nonetheless, several travellers are concerned with the effects this kind of technology has on society and inter-human relationships. They believe that talking to people would be underrated and the experience of the place they are visiting is spoiled by a screen.

Table 13. Ranking of concepts for "07 - General: Signs & Information"

Context	Concept (System & Touchpoint based)	Average
General	07A - There is one single operator for the whole public transportation system: information is in one style and you can use a single type of ticket.	3,0
	07D - Information is provided both in Dutch and in English everywhere.	2,6
	07E - The information provided during different steps of your journey is in your own language.	2,6
	07B - Signage on the floor shows the way to the main interchanges or specific routes (like touristic attractions).	2,4
	07C - Information & signs are provided through digital means, like augmented reality.	2,4

About adding information also in English

"Yeah. This I had some problems, because I took an intercity train. I bought a ticket, but I took by mistake an intercity train instead of... so many, many things were written just in Dutch, so having something more explaining in English also could have simplified a things little." - Female, age 50-60, Italy

4.4.5 Conclusions & Discussion

The human aspect, which refers to the desirability of a product-service system, was studied during the concept evaluation with international travellers. Their evaluation of concepts is essential to develop a final concept of the design, as it highlights the users' preferences and concerns when using individual touchpoints and the system as a whole. Overall, the travellers evaluated the touchpoint and system concepts positively. This seems to indicate, that travellers perceive most concept suggestions as an improvement to their current experiences.

The participants rated concepts regarding to searching/finding information highly, as information is perceived to be key to use the system in the most convenient way. Two concepts stand out, which were ranked highest by all the participants, namely dedicated information provision at the airport for travellers going to Amsterdam and providing one single public transportation operator throughout the country due to the perceived ease of use that these concept offers. Furthermore, most participants stressed their necessity to have the option to talk to service personnel, as well as to use self-service touchpoints. A further concern of travellers is the requirement to have a free wifi network available to use the well-liked digital touchpoints effectively. Generally, the participants explained that they don't desire a joint procedure for flight and public transportation ticket purchase. However, participants do consider getting a suggestion from the airline as positive, though only if the suggested pages are from an official source and not from private companies, because travellers often believe that the suggestions will lead them to more expensive or even fraudulent websites. Moreover, diversity in ticket types is considered necessary in order to cater to travellers with different purposes. When all public transportation options available are clear to the participants they experience the system as transparent and are more confident about their choices. This was also a primary finding from the research phase of this project. The findings from the user evaluation show that to improve the system, travellers require information about what the options (tickets, modalities, self-service, service personnel, etc.) are and how to use them. The benefits of the options are clear to them both in content and form. Additionally, digital means are perceived as useful, however participants worry about how to access digital services if, for example they don't have wifi access.

The limitations of the results, provided by the evaluations with users, are presented in the following chapter. The insights together with the insights from the evaluations by the project partners are considered to develop a future vision for the Dutch public transportation that will benefit all travellers, including international travellers in the Netherlands. This vision is presented in chapter 5.

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4.4.6 Limitations

The evaluation of concepts with travellers provided a large range of insights regarding preferences and concerns travellers have within their travel process from the moment they book a trip onwards. The wide range of ages (from 25 to 75 years) and multiple nationalities provides a large array of travellers. Participants mostly were from Europe, and North & South America, as well as one participant from Asia (Bangladesh). Unfortunately, no more Asian travellers participated, as the ones approached could not speak English. Carrying out the research with more participants from Asian countries would strengthen the quality of the results, as Asian travellers increasingly are visiting the Netherlands (NBTC, 2014). To assess the participants' reasoning it must be considered that for some participants speaking in English was a language barrier, as they are not always capable of expressing exactly what they intend or find the right words. However, the numerical evaluation helps to assess the importance each participant gives to each concept. Because many participants were travelling together with one more person, often the assessment of the concept was a summary of what both people had concluded together. Therefore, the notes are summarized into what the couple answered as one. The evaluations were carried out in Amsterdam at a touristic hotspot (The Museumplein), hence a representation of all travel patterns possible when travelling from abroad via a Dutch airport and within the Netherlands, defined during in research report (chapter 3.4.3), are not represented. Carrying out the same evaluation at different contexts and throughout the Netherlands might strengthen the results as a wider range of people with different experiences throughout the system would assess the proposed system and its touchpoints.

Most participants did not permit being recorded, therefore the notes from the interviews are the main source of data, which implies that there is certain amount of interpretation in the notes, even though the exact words used by the participants were noted. For the participants, who did allow being recorded, the recordings are used as a backup and a source to listen to the arguments in detail. During the test the priority was talking to the travellers and gaining insight, more than having the video recordings.

In some cases the participants have not yet experienced all the elements being questioned, hence they answers on hypothetical explanations e.g. Interchanging and single check in and check out. A direct comparison to previous research and to the project partners' evaluation is essential in order to assess these situations.

Most interviewed people did arrive to an airport, specifically Schiphol airport; nonetheless some travellers arrived to The Netherlands by train, for example, within part of longer trip to Europe coming from Paris. Executing this user test at the departures area of Dutch airports might provide more concrete results regarding the ideas for the specific user group of this project (international travellers arriving at an airport in the Netherlands, who use public transportation). The departures area would provide a wide range of travellers from different countries and with different travelled purposes. The participants would be more able to accurately express their opinion on the airline and airport related concepts. Additionally, people in

the departures area, have experienced the current public transportation system during their whole journey and might have a more complete picture of the multiple steps and touchpoints than people who are in the middle of their trip. For this project entering the departures area was not possible, however this would be recommended to test the concept in the future.

4.5 Conclusions

This chapter has presented the ideation phase, which will lead to the vision and concept presented in chapter 5. The idea generation consisted of developing a variation of system and touchpoint concepts within the four areas of improvement (searching for information, wayfinding, knowing what to do [next] and payment) for the Dutch public transportation, which were established during the research phase of the project (Lehr, 2016). The project partners evaluated the ideas and considering their input I developed these ideas into concepts for different contexts of use. International travellers in the field then evaluated these concepts. In both evaluation stages the participants rated the ideas on a scale from like (3) to dislike (0) and argued why they give such a rating to qualitatively understand the strengths and weaknesses as well as concerns per idea/concept. Considering both evaluation results (by the project partners and by the travellers) certain aspects have proven to be more relevant in order to optimize the system and develop a future vision for public transportation that is friendly to international travellers, as described in the following points:

Information provision

Both the project partners as well as the users rated ideas, which relate to information provision highest. A simplification of information that can still provide an overview of the multiple options in terms of operators, modalities, routes and benefits (time and price relation) was mostly reckoned to be the best for the travellers, who are mostly not familiar with the system. The concept to provide one communication and branding for the system was considered as best for the users, but a challenge organization-wise by the partners and was one of the concepts that rated highest amongst the travellers. The information provided by the system should not only be transparent, but it should also be provided at the right moment within the journey so that it is useful for the traveller, in this case catering multiple types of travellers is important as the "right moment in time" differs depending on the traveller's journey. Furthermore, communicating at least in English, if not in more relevant languages, was perceived as a high priority by the project partners and as inclusive and pleasant by travellers. With the proper information the travellers can more easily make decisions regarding ticket selection, as well as find the way properly and generally know what to do.

Digital means

Overall, both the project partners and the travellers preferred digital means for travellers to interact with the system. Mainly the smartphone was perceived as the best way to search for information, acquire and use tickets. The project partners argued that the development of analogue variations is becoming outdated and when investment the digital world is more promising. Travellers argue that the smartphone is

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one thing to carry throughout their journey, one place to access everything, in their own language, less likely to be lost (than, for example, a paper ticket or brochures) and even more hygienic (than touching ticket vending machines). However, travellers are greatly concerned with the requirement of having a working connection to the internet all the time, which currently is still not available everywhere. A condition for this to work is to have wifi everywhere. Furthermore, the phone's battery not lasting for a whole day or just forgetting the phone are concerns that travellers mentioned, hence alternative options are recommended.

Service personnel

The concept evaluation showed that travellers often prefer talking to service personnel; some even regard it as indispensable. Several travellers explained that they like the option of having a combination between self-service and service personnel, as many would like to try independently first, but would like the backup. Also a concern regarding service personnel are waiting lines to talk to them, travellers often prefer the quickest option. Overall, the project partners did not explicitly dislike having service personnel throughout the system. Nevertheless, they did have concerns regarding merging service personnel. Whether the service merger is only for the public transportation operators amongst themselves or if it includes airports, the concern lays on the complex organizational implications. In terms of including airlines into the equation, the main concern of the project partners is that the airlines' have a completely different core business and that the airline service personnel have enough on their plate with flight-related services. Thus, having joint personnel between airlines and public transportation operators, or even personnel, which informs the traveller about the other company, is not described as realistic by the project partners.

Flight process separate from the public transposition process

Mostly travellers prefer separate processes regarding their flight and their public transportation. Additionally, the project partners mostly were concerned with the differences between the core business of each of the sectors and the difficulty to join them. The solution to provide public transportation suggestions within the flight related activities were mostly positively perceived, both by project partners and by travellers. Travellers frequently mentioned that the suggestions, for example, website links or public transportation products in the flight, should clearly be reliable, for instance sponsored by the government. Many travellers expressed a fear of being sold more expensive products this way, showing certain distrust towards the companies/industry.

The following chapter presents the final concept developed from the gained insights from the multiple research phases and the evaluations by the project partners and international travellers.



Travellers at gate line of Amsterdam Bijlmer Station



5



DPT (Dutch Public Transportation) app (wayfinding)

Future Vision Concept Development & Evaluation - 05

5.1 Introduction

This chapter presents the future vision of public transportation designed to improve the experience of international travellers arriving at an airport in the Netherlands and the evaluations of this vision by users and by the project partners.

The vision illustrates the core of the concept and is established parting from the research findings in the Netherlands and abroad (London, Hong Kong and Denmark, see research report). As the research phase concluded, purchasing public transportation tickets, as an international traveller, means more than just buying a ticket. Hence, the four improvement areas (searching for information, wayfinding, knowing what to do [next] and payment) are implicit throughout the proposed system and its touchpoints. The vision's touchpoints and the way they compose the whole system are developed in consequence to the findings in the previous idea evaluation by project partners and users presented in chapter four. The vision therefore highlights the main findings of the idea evaluation and showcases the most relevant properties of the system related to information provision, digital means, self-service and service personnel and the link between the airline and the public transportation in the journey of different types of travellers. This vision is visualised in video format and is once more evaluated by users and by the project partners. The main difference in the evaluation of the vision compared to the previous idea evaluations, is that now not only the individual touchpoints are addressed, but that the way the touchpoints are used in a sequence by travellers to establish the system as a whole is more prominent.

The chapter is split into three stages, as illustrated in figure 28. The chapter's conclusions integrate insights from the three stages. These insights are key in the finalization of the design, presented in chapter 6.

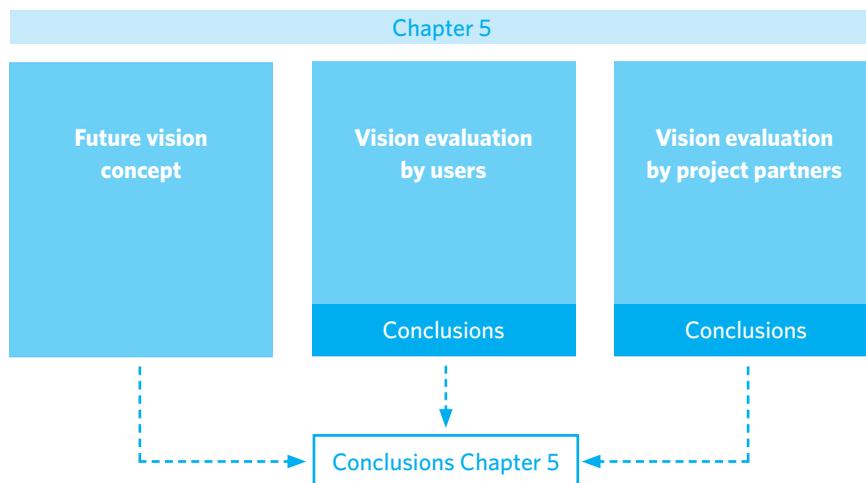


Figure 28. Chapter 5 structure

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5.1.1 Aim

Develop and visualise a future vision to improve the way international travellers arriving at a Dutch airport use and experience the public transportation system. The vision should consider the whole customer journey of the international travellers from the moment they decide to travel to the Netherlands, to the moment when they return to their home country. Furthermore, the aim is to evaluate the vision with the input from users and the project partners.

5.1.2 Research Questions

- What is the essence of the future vision concept for the Dutch public transportation system to improve the experience of international travellers arriving at an airport in the Netherlands?
- What touchpoints are required in order to improve the current usage and interaction experiences international travellers have when using the Dutch public transportation system?
- How do users and project partners perceive the proposed service design vision?
- How is the future vision customer journey of international travellers arriving at an airport in the Netherlands?

5.1.3 Approach

Establish the future vision to improve the experience of international travellers using the Dutch public transportation system based on the results from the research phase, that includes:

- a variety of types of travellers (spontaneous, efficient, purpose, all set)
- four travel phases with their respective steps
- the insights from the benchmark
- the four areas of improvement (searching for information, wayfinding, knowing what to do [next] and payment)

and the idea evaluation by project partners and users, which determined that the service should be based on:

- providing better ways to search/provide information
- boosting the interaction with the system through digital means, while keeping alternative options
- continuing to provide self-service together with the support from service personnel
- offering suggestions that bridge the flight travel process and the public transportation process without mixing them up

5.2 Future Vision Concept

To achieve the project goal to *develop user-centred solutions to improve international travellers' experience when selecting, paying and using their public transportation ticket(s) for their stay in the Netherlands*, it is essential to keep in mind that the conclusions from the research phase show that purchasing public transportation tickets, as an international traveller, means more than just buying a ticket. The four improvement areas (searching for information, wayfinding, knowing what to [next] and payment), established during the research phase, are fundamental to develop the concept's vision, because they directly influence the experience of international travellers. In the following segment, the vision of the concept is described in its essence and two use cases exemplify how two different types of travellers interact with the system at different contexts and with different touchpoints. Also four touchpoints are presented individually to illustrate their role within the service proposition.

5.2.1. Vision

In order to define the optimal future state of what the public transportation system's service should become over time, I used a vision statement. The vision provides guidance and inspiration to develop the service (Evans 2010). Also, in the vision statement I used a comparative metaphor to evoke the meaning of the service (van Boeijen et al., 2014) as described in the following paragraphs.

Like a carousel, the Dutch Public Transportation system is one entity composed by multiple moving parts. It is an umbrella company; composed by different operators and transportation modalities available throughout the Netherlands. DPT provides a unified service and communicates in one coherent style with its customers. It also benefits international travellers, who are not familiar with the public transportation system in the Netherlands. Comparable to the DOT umbrella company in Denmark, that provides information and sells tickets to travellers unanimously for all the different operators (Lehr 2016), DPT communicates in the same brand style in the frontend, while the public transportation operators run the system in the backend.

Similar to the way a carousel provides the possibility to its users to select what horse they like best for their ride, DPT offers multiple travel options, allowing for the users to select most suiting one depending on their specific situation. In a carousel, going from one horse to another is easy, comparable to the way that DPT facilitates travellers to switch and combine their travel possibilities. Also, a carousel can be accessed at any time and when using DPT, international travellers can access public transportation at any moment during their travels.

When using the DPT system, the travellers are provided with the information they require at the moment they require it. Hence, they will also be able to effortlessly use the system, which is comparable to the way a carousel ride is effortless, because the user can enjoy the ride and clearly will be indicated what to do.

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Similarly to the way parents are standing by a carousel to encourage and support their children, the Dutch Public Transportation system provides information alternatives and backup options to the users who require more assistance when using the system. A carousel is visualised in figure 29.

As a whole, the DPT system design aims to make the system accessible, seamless and clear in order to improve the experience of international travellers using it. The system should be:

- **Accessible:** Travellers can easily access it at any moment during their travels.
- **Seamless:** Travellers can effortlessly use the public transportation system throughout contexts, touchpoints and travel phases.
- **Clear:** Travellers can understand the information provided throughout the system, as it provides an understandable overview of options and in terms of language and terminology.



Figure 29. The carousel is used as a metaphor to describe the vision for the Dutch Public Transportation system

5.2.2 Use Case Examples (Story of Travellers: Customer Journey)

This subchapter provides examples of DPT use cases for different types of travellers. The use cases show different approaches to interact with the same system, as they illustrate different touchpoints, at different contexts and within different travel phases. The approach of an efficient traveller (more prepared type of traveller) and the approach of a spontaneous traveller (less prepared type of traveller) together cover the possibilities that DPT offers. These two examples already showcase the working of the whole proposed system. Therefore, the usage of the system by a purpose traveller and a set traveller, which were also classified during the research phase of the project (Lehr, 2016), are not further elaborated.

The use cases are visualised in videos that show the travel journey of Anisa, an efficient (prepared) traveller, and Iñaki, a spontaneous (unprepared) traveller. The videos are used during the evaluation with users and with project partners, presented chapters 5.3 and 5.4. Figure 30 illustrate some scenes of the videos. In appendix G, screen shots of the videos are used to illustrate the interactions of the users with the DPT system. The videos can be found under:

tinyurl.com/DPTtraveller1

tinyurl.com/DPTtraveller2



Figure 30. Scenes from the concept video for the DPT service proposition showing travellers in different contexts of use and interacting with different touchpoints

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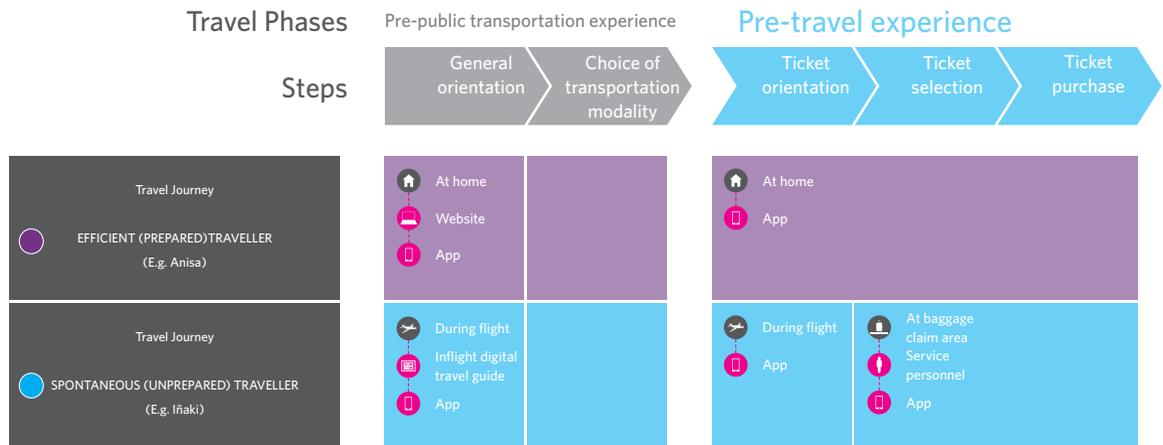
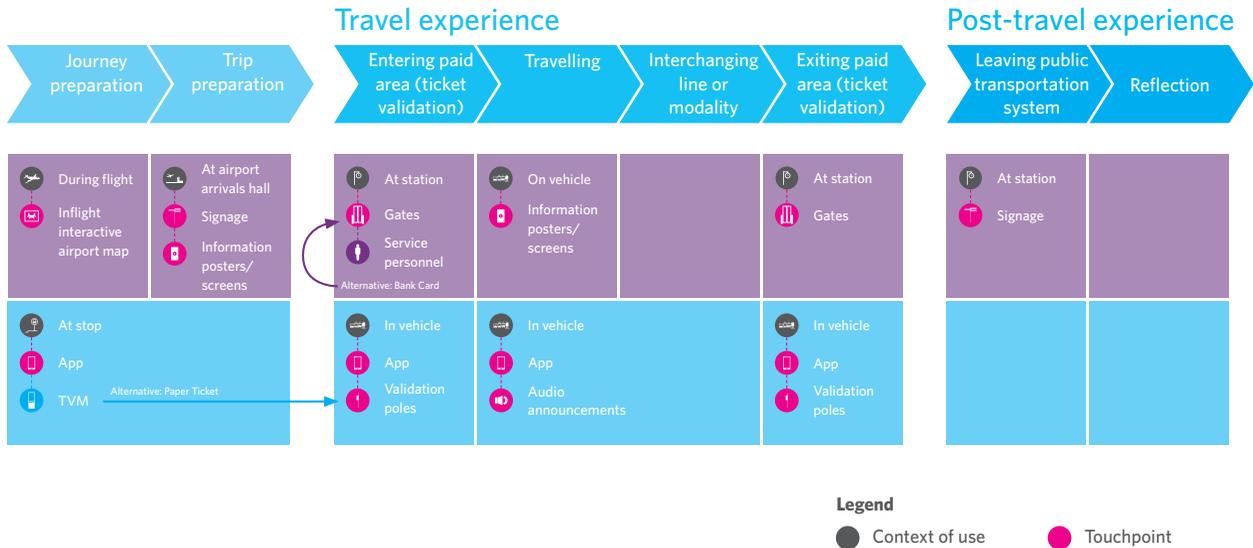


Figure 31. Customer journey map illustrating different ways to interact with the system, exemplifying different types of travellers, contexts and touchpoints throughout the travel phases.

Figure 31 depicts the customer journey for the efficient and the spontaneous traveller per travel phase, context of use and touchpoint. The use case examples for Anisa (efficient traveller) and Iñaki (spontaneous traveller) are illustrated. The customer journey shows that the efficient (prepared) traveller experiences the *Pre-public transportation* and the *Pre-travel experience* at home and uses the website and the app to do so. The spontaneous (unprepared) traveller experiences these phases in the airplane with the interactive inflight travel guide and the app, as he did not plan his trip beforehand. At the baggage claim area in the Netherlands, the spontaneous traveller interacts with the service personnel to clarify his doubt and uses the app to select and purchase his ticket.

The efficient traveller, who purchased her ticket at home, prepares her train journey during the flight by using the interactive airport map. At the arrivals hall of the airport she is guided by the DPT signage and information to prepare her trip. The spontaneous traveller uses the app when he is at the bus stop and also uses a ticket vending machine to prepare his journey and trips. Because the efficient traveller uses the train, her ticket is validated at gates in the stations. The spontaneous traveller uses trams and buses. Hence, his ticket is validated at validation poles in the vehicles.

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During their *Travel experience* they both use the information provided in the vehicles, the efficient traveller informs herself with the information posters and screens, while the spontaneous traveller listens to the announcements and uses his app for guidance. The *Post-travel experience* of the efficient traveller takes place at a station, where she uses the signs to find her way.

5.2.3 Touchpoint Examples

Touchpoint examples of the proposed DPT system are presented to illustrate the role they play for the users' experience when using the system. The following segments describe the systems' app, the ticket vending machines, service personnel and gates in terms of which travellers' goals they fulfil for and in which contexts they can be used. The rest of the touchpoints are presented in appendix H.

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App: There is one official Dutch Public Transportation app. The app provides information regarding all routes, modalities and ticket possibilities. It is available in multiple languages. The information provided is live and therefore updated. Travellers can have a digital ticket on their smartphone to use on the go. See figure 32.

Travellers' goals

- Search for transportation possibilities and compare the benefits of each.
- Search information about the types of tickets at destination and compare them.
- Compare differences between tickets in regards to the travel purpose and travellers preferences.
- Choose a ticket for the whole trip or next travel journey.
- Pay for the selected ticket.
- Search for the route from the current location to the destination (modalities, lines, interchanges); If multiple options: select preferable travel option.
- Find the correct vehicle for trip within journey.
- Find the way towards final destination.

Context of use

The Dutch Public Transportation app is likely to be used in all contexts and throughout the whole travel journey of all types of travellers. Travellers can download the app at home, during their flight, at the airport or at stations or stops, and can use the information of the app in any of these contexts. Furthermore, they are able to pay for their tickets through it and validate them with their phone at stations and vehicles. In vehicles the app provides live information and feedback regarding the trip and wayfinding towards the final destination. Therefore, the app might even be used outside of the public transportation contexts.

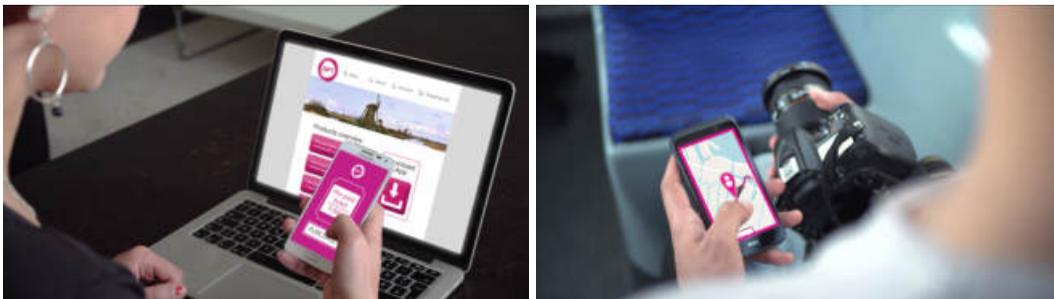


Figure 32. Scenes from the concept video for the DPT service proposition that show the users' interaction with the app



Ticket Vending Machines: DPT ticket vending machines allow the travellers to select their ticket by destination, both on a map, as well as by typing an address. All possible transportation tickets for a specific route/destination are displayed showing the different modalities, travel times and ticket prices so that the travellers can select what suits them best. See figure 33.

Travellers' goals

- Search information about the types of tickets at destination and compare them.
- Search for the route from the current location to the destination (modalities, lines, interchanges); If multiple options: select preferable travel option
- Choose a ticket for the whole trip or next travel journey.
- Acquire and pay for the selected ticket.

Context of use

Ticket vending machines are provided as an alternative to travellers, who for any reason do not use the smartphone tickets, throughout the system.



Figure 33. Scenes from the concept video for the DPT service proposition that show the users' interaction with the ticket vending machine

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Service Personnel: The Dutch Public Transportation works with a balance of self-service and service personnel. See figure 34. The personnels' role is the one of a host to the Netherlands. Service personnel is knowledgeable about the whole system including the different modalities, routes, schedules and prices. The service personnel can access specified information if travellers require them to. The personnel can communicate in Dutch and in English. At certain contexts there is personnel who can speak an even wider range of languages.

Travellers' goals

- Search for transportation possibilities and compare the benefits of each.
- Search information about the types of tickets at destination and compare them.
- Compare differences between tickets in regards to trips nature.
- Choose ticket for the whole trip or next travel journey.
- Pay for the selected ticket.
- Search for the route from current location to destination (modalities, lines, interchanges); If multiple options are available: select preferable travel option.
- Find the correct vehicle for trip within journey.
- Find the way towards the final destination.
- Ask any other questions.

Context of use

The Dutch Public Transportation service personnel is available at the airport, at stations and in the vehicles (drivers or conductors). At street stops usually there is no service personnel available. However, certain stops, such as the bus stops at airports or other non-typical street stops, will in some cases have service personnel to assist travellers who are new to the system.



Figure 34. Scenes from the concept video for the DPT service proposition that show the users' interaction with the service personnel



Gates: Stations are gated. The gates work with Be-in and Be-out (see page 32). The gates have open doors and recognise the travellers' tickets when they pass them, this way the travellers do not actively have to check-in and check-out, the system automatically does so. The gates only close when there is a problem, they do not let travellers enter until they have solved the problem. See figure 35.

Travellers' goals

- Validate ticket.

Context of use

Gates are available at train and metro stations throughout the Dutch Public Transportation system.



Figure 35. Scenes from the concept video for the DPT service proposition that show the users' interaction with the gates at stations

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5.3 Concept Evaluation by Users

Taking into account the integrated approach to design the Dutch public transportation system, a user evaluation of the proposed system is carried out with international travellers to assess the human-aspect of the proposed system. As explained previously, in order to evaluate the service proposition, a video was made that shows the travel journey of an efficient (prepared) traveller and a spontaneous (unprepared) traveller and how they interact with certain touchpoints is made. Users assess the whole service by providing their opinion about the service proposed in the video and specific touchpoints are discussed in order to gain a qualitative view on what travellers think about the proposition and why. This way, the customer journey map for the new service proposition can be mapped to show the experience that travellers can have through their journey with the DPT system. The customer journey illustrates which touchpoints work well and which touchpoints can still be improved to make the experience as seamless and positive as possible.

5.3.1. Aim

Present the video with the service proposition for the Dutch Public Transportation to international users of the current Dutch public transportation system to gain insight on their perception of the future vision and why they perceive it the way that they do.

5.3.2 Research Questions

- What do international users of the current Dutch public transportation think in general about the service design proposition presented in the video and why?
- What do international users of the current Dutch public transportation think about the specific touchpoints and why?

5.3.3 Method

International travellers, who have used and experienced the current Dutch public transportation system evaluate the DPT proposition in the departures area of Schiphol airport (after the security and passport control). These participants, who have used the Dutch public transportation system, will provide more reliable opinions on the proposed service in comparison to people, who judge the video based on a hypothetical understanding of the Dutch public transportation system. The airport itself is part of the research context, which is valuable in the sense that the travellers being asked can directly relate to the material. In total, eight participants rated the DPT service vision. Five participants were male and three female, their ages ranged from 20 to 60 years. Four participants were from Europe, two from North America, one from South America and one from Asia. The set-up is shown in figure 36.

The video is filmed in the contexts in which the travellers interact with the system. The touchpoint propositions are animated and edited into the video afterwards. The visualisation style clearly shows which things do not exist yet and belong to the vision, like shown in figure 37.

Participants saw both, the video that shows the travel journey of a prepared traveller (Anisa) and the video that shows an unprepared traveller (Iñaki) and how they interact with the touchpoints showcased in their journeys.

The participants rated the service proposition as a whole in a four point Likert scale from like a lot to dislike (see chapter 4.3.3 for further explanation of the scale) and explained why. Additionally, the participants rated screenshots of the videos that illustrate each touchpoint used by both, the prepared and the unprepared traveller, using the same scale, and explained why. For all the answers, notes were taken to capture the argumentation for their ratings per concept. Participants were required to sign a consent form if they allow for the user test to be recorded with a GoPro camera. The footage provides access to the research data during the analysis and synthesis phase of the project. If the participants didn't agree to be recorded, only written notes were used.



Figure 36. Set-up of user DPT concept evaluation at Schiphol airport: traveller watches videos on tablet and then is asked to rate the system and individual touchpoints and explain why

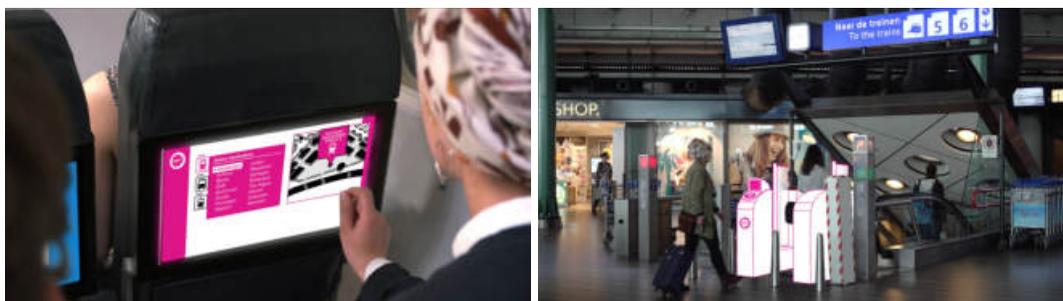


Figure 37. Visualisation examples of touchpoints within real contexts of use in the videos: screen interface during flight (left) and gates in Schiphol airport (right).

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5.3.4 Results & Customer Journey

Overall the participants rated the DPT service proposition with a 2,5 out of 3. Most touchpoints were positively rated as illustrated in table 14. The highest rating element of the system is having Multiple payment options: cash, credit card, debit card, mobile payment throughout the system. It is evident that participants had experienced different situations with payment, that led them to believe, that if the system offers as many payment options as possible the better experience they will have when using it.

About multiple payment options

"For travellers the credit card doesn't work always, which is what happened to me, so its good to have several options." - Female, age 20-30, Canada

About multiple payment options

"Yeah, definitely. It is better to be able to pay with something other than cash, especially when you arrive sometimes you just don't have the currency so..." - Male, age 20-30, Brasil

The methods of payment themselves, such as Be-in Be-out and validating with public transportation with a bank card are more controversial. Several participants see the benefit in regards to saving time and ease of use. However, others are strictly concerned with their privacy and what will happen to the data being transferred from their smartphone or bank card to the system. The bank card rated lowest out of all touchpoints with a 1,7 out of 3.

About Be-in Be-out

"I think it is the best add-on, which I saw in this app, because you don't need to make sure that you check-in or check-out. It just happens automatically. A very good one." - Male, age 30-40, Poland

About Be-in Be-out

"Yeah, but still that is a form of tracking and I really dislike it. That is maybe a little bit related to my background 'cause I work with security and privacy ...and it something that I am always concerned about and that is trivial to turn this into mass tracking, so I really don't like the idea." - Male, age 20-30, Brasil

Table 14. Ranking of system functions and touchpoints of the proposed DPT system from highest to lowest

System function/Touchpoint	Average
21. Multiple payment options: cash, credit card, debit card, mobile payment	3,0
01. Airline website suggesting the public transportation website	2,9
10. Signage on trains going through Amsterdam	2,9
16. Ticket vending machines: searching by destination	2,9
04. Option to save attractions/places/sights information on smartphone	2,8
07. Welcome Hub with DPT services at the baggage claim area	2,8
12. Information provision in native language	2,8
13. All general signs/announcements are available both in Dutch and in English	2,8
17. Ticket vending machine: selecting by having an overview of modalities, time of travel & price	2,8
18. Pre-paid ticket on the smartphone & app	2,8
05. Inflight travel guide suggestion to download the DPT app	2,6
08. Clear division between airport areas/clear recognition of DPT area	2,6
14. Service personnel available throughout the system	2,6
15. App for wayfinding with routes, schedules and ticket types.	2,6
06. Inflight airport map with DPT information	2,6
19. Pay-as-you-go ticket on the smartphone & app	2,5
03. Interactive inflight travel guide	2,4
02. DPT website suggestion to download the DPT app	2,3
09. Dedicated screens/information for travellers going to Amsterdam (from Schiphol airport)	2,3
11. Be-in Be-out at gates and validation poles	2,3
22. Alternative: the use of paper tickets	2,3
20. Possibility to pay/validate public transportation with a bank card	1,7

Legend

	2.25 - 3	Ideas liked (high)		0.75 - 1.5	Ideas somewhat disliked (low)
	1.5 - 2.25	Ideas somewhat liked (mid)		0 - 0.75	Ideas disliked

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About bank card validation

"I hate it. Fraud. If you lose it, it is like losing cash. The only time I would (use it is) if there would be very tight limits on the amount used you know transact." - Male, age 50-60, England

About bank card validation

"I find it really useful, especially if you just arrived in the country and everybody has a credit card or something. So, if it is integrated it would be really nice." - Male, age 20-30, Brasil

Touchpoints and elements of the proposed system that enhance and clarify information regarding the system itself, ticket types, routes and schedules mostly ranked highly. Not only the fact that information is provided is key for travellers, but the way that information is provided makes a significant difference as well as the context in which it is provided. Participants rated the proposition of providing English throughout the system and traveller's native languages at specific touchpoints with a 2,8 out of 3. Also selecting tickets by destination at ticket vending machines and having signage regarding the following stops on the trains when they arrive at the platforms rated highly with 2,9 out of 3.

About English throughout the system

"Yeah, that would be really good, provided that they put some effort in doing it 'cause, as I said, it is really hard to understand, the sound is bad or the pronunciation is bad. Until you get adjusted to how they do the announcements, it is hard to get it." - Male, age 20-30, Brasil

About English throughout the system

"Yeah, that is good. That is really good, because sometimes it is hard to know if you are in the right train, especially because sometimes the train just stops there and goes away and then the next one is the one that you need to take. And for instance here in the Netherlands, the signs are usually in, they are not in English to say like "don't get in" and it is a bit confusing, so it would be nice to have it on the train." - Male, age 20-30, Brasil

About selecting tickets by destination

"Yeah, its very good, just for me maybe I would prefer to have some choices, because I don't speak and I don't write Dutch, so even if you know the place where you want to go, you don't necessarily know how to spell it. Maybe to have, yes some choices to choose - it would be easier." - Female, age 20-30, Canada

Furthermore, catering to different types of travellers was once again highlighted by the participants' arguments in regards to the ticket options. Some participants would prefer the pay-as-you-go ticket option and others the pre-paid ticket. Likewise, some travellers would enjoy to use their flight time and inflight entertainment system to plan their trip, while others would rather do it at home and some would like to remain spontaneous and not do it at all.

About ticket types

"I think it depends really on the situation. If you have a clear idea of what you want to do or the time you want to stay this is the best (pre-paid ticket), because you can save money and everything. This (pay-as-you-go ticket) if you just decided last minute what you want to do...generally, for me personally I prefer this (pay-as-you-go), because I do not know exactly every time what to do so I decide at the last minute..." - Male, age 30-40, Italy

About ticket types

"I'd prefer the pre-paid, just because I wouldn't have to keep figuring it out." - Female, age 40-50, Canada

About the inflight travel guide

"Yeah, that was great. I think the best moment to think about what you are going to do, is when you have time during the flight." - Female, age 20-30, Canada

About the inflight travel guide

"Personally, I wouldn't use it, I don't know. I guess it is more of a personal view of travelling. Yes I don't do a lot of planning and I don't think I would follow tourist information on the plane or anywhere else." - Male, age 20-30, Brasil

Overall, the idea of using the public transportation system with a smartphone and in general very digital touchpoints were liked. The necessity of having wifi to access the information was stressed, because the participants are concerned with the high fees that they would have to pay in present time to have network access. One participant was concerned that her old smartphone would not be able to receive the technology required and some participant mentioned the fact that downloading extra apps might be annoying and suggested to provide the service through apps and digital ecosystems that travellers already use, such as

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Google. Moreover, the need for alternatives, such as paper tickets, was perceived as necessary, because technology might fail. A further concern that some participants rationalized, was that the system should have alternatives for people travelling in groups or families, as not everyone has an enabled smartphone.

About the alternative to use paper tickets

"I think it is important still at the moment to have the option, because your device may fail, may be out power or whatever, you may not want to take it out sometimes. I don't know. I just think the option is good to have an opportunity to travel with your family or whatever, you don't want them all to have a smartphone. So, I think we need, we need the option. "- Male, age 50-60, England

Even though travellers would like to be able to use the system individually, they emphasized the fact (already found during the research phase) that there is a need to be able to talk to service personnel for help and confirmation.

About the service personnel

"Well, I like when I can talk to somebody, because I think machines cannot replace someone. It is the best help we can get, so even if the machines are awesome, my first choice will always be to ask someone. "- Female, age 20-30, Canada

About the service personnel

"As soon as I see something, you know and I have some problem, instead of going to the machine or something, I prefer to speak with people, I feel more comfortable, when there are people just to help you instead of going to the machine. "- Male, age 30-40, Italy

Customer Journey

The results of the user evaluation are visualised in a customer journey for the DPT service proposition, see figure 38. The customer journey maps out the way the two travellers use the system and the relationship their usage has to the travel phases. Also the customer journey shows how the participants evaluated the concept and the assessment per travel phase.

The customer journey, specifically the evaluation of touchpoints, cannot be compared one to one with the customer journey that visualises the current experiences of international travellers (see research report, chapter 6). This is because the proposed DPT system is a unified system set up completely different than the current Dutch public transportation system. Also the evaluation scale used to assess the proposed system is more specific than the one used to assess the current system, due to the fact that participants actually numerically rated the touchpoints. However, from a holistic perspective, the proposed system ranked higher than the current Dutch public transportation system.

Appendix I contains the ratings and argumentations per touchpoint, as well as quotes from the interviews for participants' perception of the whole system and of the touchpoints.

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Customer Journey Legend

Contexts of use

-  At home
-  During flight
-  Dutch airport:
At baggage claim area
-  Dutch airport:
At airport arrivals hall
-  At station
-  At stop
-  In vehicle

Touchpoints

-  Website
-  App
-  Inflight
interactive
airport map
-  Inflight interactive
travel guide
-  Signage
-  Information
posters/
screens
-  Interactive
information
screen
-  TVM
-  Service
Personnel
-  Gates
-  Validation
Poles
-  Audio
Announcements

Use cases

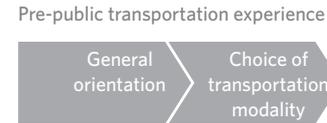
-  Efficient (prepared) traveller
e.g. Anisa
-  Spontaneous (unprepared) traveller
e.g. Iñaki

Figure 38. Customer journey map visualization of the DPT touchpoint rankings given by the participants

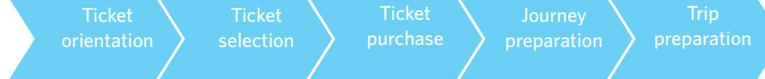


CUSTOMER JOURNEY: INTERNATIONAL TRAVELLERS & THE DPT SYSTEM

Travel Phases
Steps



Pre-travel experience



Travel experience



Post-travel experience

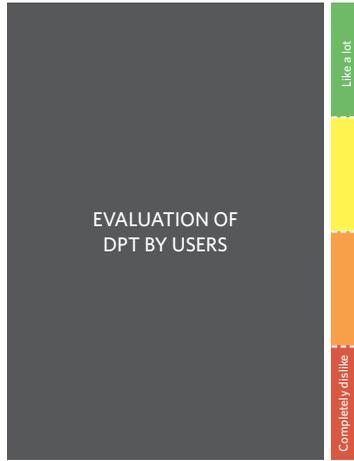


International travellers' GOALS regarding their travel journey and public transportation usage

International travellers' EXPECTATIONS regarding their travel journey and public transportation usage

Travel Journey PREPARED TRAVELLER (E.g. Anisa)

Travel Journey UNPREPARED TRAVELLER (E.g. Iñaki)



ASSESSMENT

<p>Find information about the travel destination.</p> <p>In some cases: search information about public transportation at that destination.</p>	<p>Search for transportation possibilities and compare the benefits of each.</p> <p>Decide what type of transportation to use when at destination.</p>	<p>Search information about the types of tickets at destination and compare them.</p> <p>Wage differences between tickets in regards to trips nature.</p>	<p>Choose ticket for the whole trip or next travel journey.</p>	<p>Pay for the selected ticket - at the T.V.M. - at the service desk</p>	<p>Search for the route from current location to destination (modalities, lines, interchanges).</p> <p>If multiple options: select preferable travel option.</p>	<p>Find correct vehicle for trip within journey.</p>	<p>Validate ticket at gates or in vehicle if required.</p>	<p>Travel from A to B. Know at which station/stop to exit.</p>	<p>Find the correct vehicle for next trip within journey.</p> <p>Catch next possible vehicle.</p>	<p>Validate ticket at gates or in vehicle if required.</p>	<p>Find correct exit and direction towards destination.</p>	
<p>There are sources of information providing information about my travel destination available.</p>	<p>The information provided will guide me to select the most convenient option.</p>	<p>The public transportation website/service personnel/ brochures will have clear information regarding the ticket options available.</p>	<p>A clear overview of tickets and their benefits is available.</p>	<p>The payment will go smoothly at the service desk. The ticket vending machine will guide me through the process.</p>	<p>By knowing where I have to go the proper route will not be hard to find.</p> <p>There is enough information to show me where I should go to.</p>	<p>The signage will lead me to the correct place/ vehicle.</p>	<p>It will be clear to me if I have to do something with the ticket.</p>	<p>In the vehicle there will be information provided about the stations and stops that will show me where I have to exit.</p> <p>The vehicle is comfortable.</p>	<p>The signage will lead me to the correct place/ vehicle.</p> <p>It will be clear to me if I have to do something with the ticket.</p>	<p>It will be clear to me if I have to do something with the ticket.</p>	<p>There is enough information to show me where I should go to.</p> <p>The signage/maps will lead me to the correct place.</p>	
<p>At home</p> <p>Website</p> <p>App</p>		<p>At home</p> <p>App</p>		<p>During flight</p> <p>Inflight interactive airport map</p> <p>At airport arrivals hall</p> <p>Signage</p> <p>Information posters/ screens</p>	<p>At station</p> <p>Gates</p> <p>Service personnel</p> <p>Alternative: Bank Card</p>	<p>On vehicle</p> <p>Information posters/ screens</p>	<p>At station</p> <p>Gates</p>	<p>At station</p> <p>Signage</p>				
<p>During flight</p> <p>Inflight digital travel guide</p> <p>App</p>		<p>During flight</p> <p>App</p>	<p>At baggage claim area</p> <p>Service personnel</p> <p>App</p>	<p>At stop</p> <p>App</p> <p>TVM</p> <p>Alternative: Paper Ticket</p>	<p>In vehicle</p> <p>App</p> <p>Validation poles</p>	<p>In vehicle</p> <p>App</p> <p>Audio announcements</p>	<p>In vehicle</p> <p>App</p> <p>Validation poles</p>					
<p>01, 02, 03, 04, 15, 18</p>		<p>05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22</p>										
<p>Travellers generally appreciate suggestions about DPT from other sources (e.g. airline).</p>	<p>Decision is based on convenience: accessibility, comfort, distance, efficiency and price.</p>	<p>The website, app or TVM should provide enough information to make a decision.</p> <p>Service personnel should be available to provide assistance and confirmation.</p> <p>Ticket alternatives catering to different types of travellers should be available.</p> <p>Multiple payment options are perceived as necessary.</p>		<p>Selecting by destination is logical and easy.</p> <p>An overview of travel possibilities by modality, time of travel and price provide a transparent service leading travellers to make the most suitable choice.</p> <p>Travellers require assistance from both machines and service personnel.</p>		<p>Be-in Be-out is perceived as easy and time saving, however concerns some travellers regarding their privacy.</p> <p>Bankcard payment is the least preferred option due to travellers' safety concerns.</p> <p>Service personnel are necessary if problems happen.</p> <p>Information provided in English is perceived as a must. Information in other languages is perceived as comforting (and facilitates the usage of the system for some travellers).</p> <p>The DPT app is perceived as useful and helpful provided that travellers have wifi access.</p>		<p>Positive experience when clear guidance during exit phase: information also in English is necessary.</p>				

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5.3.5 Conclusion & Discussion

Users evaluated the DPT service proposition, providing insight on the human aspect and therefore on the desirability of the proposed public transportation service. The evaluation of the DPT service proposition by users shows that overall the proposition is a positive and desirable one, which facilitates the usage of public transportation. The customer journey map shows clearly that the participants mostly perceive the touchpoints and the way they work together positively, at least on the conceptual level, which was presented to them. The main reasons provided by the participants for the high rating are:

- The system provides alternatives of payment, ticket options and media (smartphone, bank card, paper tickets).
- The information provision and the way information is provided is positive in regards to language, contexts of use and transparency of options (transport modalities, travel time, prices).
- The incorporation of technology, specifically the digital means such as the smartphone, facilitate possibilities to plan upfront and on the go.
- The system provides the option to use the self-service touchpoints without losing the availability to approach service personnel.

The more negative aspects of the proposed system mainly are regarding participants concerns with privacy of their data when paying with the smartphone or bank cards within the system. According to some participants' responses, the threshold to pay with such methods can decrease if the system communicates very clearly what data is being used when interacting with the system. Moreover, the internet connectivity concerns travellers in regards to current data prices when abroad and insufficient wifi coverage; and is perceived as essential to make the proposed system happen.

The limitations of this user evaluation are described in the following subchapter. The insights from the user evaluation, together with the evaluation of the DPT service proposition presented to the project partners in chapter 5.4, lead to the finalization of the service design proposition, which is presented in chapter 6.

5.3.6 Limitations

The evaluation by users is based on a conceptual proposition. The videos themselves were designed and executed in an objective and explanatory manner, rather than in an advertisement-like convincing manner. The videos' purpose was not to convince participant that the proposed system is better, but to get their honest feedback about the proposal. Hence, the explanations of the travellers' journey were described and depicted in enough detail to explain why the touchpoints are a certain way and in a specific context. Also, alternative scenarios for both users were presented, in which they encountered a problem for which they required an alternative to show a realistic view that even within the presented vision problems can occur. It is important to consider the conceptual level posed by this method and evaluation during the assessment of results, because it differs greatly from actual usage. If the participants would use the individual touchpoints, very different types of results would emerge, which would be more specific about the individual elements.

In order to get a wider scope of insights, interviewing more international travellers in different context of use might provide a broader range of perspectives, as travellers with a wider range of travel purposes could be addressed. As mentioned before, the fact that the interviews are carried in English is restricting, due to the fact that participants might not be able to express their thoughts as accurately as in their native language and some nationalities are less represented throughout the evaluation.

5.4 Concept Evaluation by Project Partners

The project partners assess the whole service by providing their opinion about the service proposed in the video, which was also shown to users (see chapter 5.3). Their thoughts and considerations after seeing the service proposition and the responses of the users are taken into account to conclude the project and provide final requirements for the service proposition.

5.4.1 Aim

Present the video with the service proposition for the Dutch Public Transportation to the project partners to gain insight on their perception of the future vision and why they perceive it the way that they do. Furthermore, share the users' evaluation of the system and discuss the service proposition in terms of the integrated approach, including the human and societal aspect, and more prominently the implementation requirements from the business and technological perspective.

5.4.2 Research Questions

- What do the project partners think about the service design proposition presented in the video and why?
- What do the project partners think about the specific touchpoints and why?
- What do the project partners learn from the users' evaluation of the DPT proposition?
- What concerns do the project partners have in regards to the implementation of the service proposition and why?

5.4.3 Method

A meeting together with all the project partners took place at the TUDelft. See figure 39. I briefly recapitulated the findings of the research phase and of the design process that lead to the DPT service proposition. The project partners see both videos (the efficient traveller, Anisa, and the spontaneous traveller, Iñaki) that illustrate the proposed DPT system and note their thoughts on the proposition for positive and negative aspects. These thoughts are shared in the group and assigned to the specific touchpoints. Afterwards the project partners see videos with excerpts from the user tests and again discuss the main insights they gained from these travellers' perspectives. The meeting concludes with a discussion regarding what can be done to implement (parts of) the proposed concept, with a focus on the technological and business perspective.

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Figure 39. Concept evaluation discussion with project partners

5.4.4 Results

Overall, the project partners discussed the strengths and weakness they saw in the proposed concept and pointed out the possibilities and limitations for implementation. The videos showing the ways users evaluated the concepts reinforced what is important for travellers, emphasizing key points for the further development of public transportation, to improve the experience of international travellers arriving at an airport in the Netherlands.

The following topics were most prominent throughout the discussion regarding the general impressions and thoughts of the project partners regarding the proposed DPT system. They are not presented in any specific order:

- **Language:** Providing bilingual information throughout the system and information in the travellers' native language at specific touchpoints is perceived as extremely important, because communicating effectively with as many users as possible is fundamental to provide a good service. Yet, the project partners explained that implementing language changes in the system is difficult, due to the complexity of the terminology and finding the proper translations. It was mentioned, that even amongst the operators there are different terminologies, such as *one-way ticket* or *single-ticket* for the same thing.

- **Payment and Ticket types:** In terms of ticket names the project partners explained that it is difficult to offer the same ones countrywide, because of the area/region the individual operators cover. It is difficult to come to the same type of ticket, because the type of travel offered by the operators vary and there is a significant difference between the service for a single city, region or the whole country. Also, including all forms of payment is expensive for the operators, as it not only depends on their implementation. It also depends as much on the requirements of the other company. For example, if the percentage of every transaction that a company like Apple Pay requires, is much higher than what the operators pay other companies, then providing the alternative to use Apple Pay to travellers does not make the business case for the PTOs.
- **Travel and tariff information:** Providing information regarding the trip and the tickets available, is perceived as useful and logical by the project partners, as the information would help users to make the best decision depending on their personal travel situation. In terms of implementation, this was considered useful on a website and especially an app, but the project partners mentioned that having product advisors in the TVMs has the potential consequence that long cues will occur in front of machines, causing further problems for the PTOs.
- **Unified Branding & Communication:** The project partners perceive a unified style for signage and information provision as helpful for travellers, especially for international travellers. However, they argued that it poses an implementation challenge for them, due to the radical systematic change it would require. This partly is due to the fact that all PTOs currently have individually established systems and contracts with their own suppliers, which are hard to discontinue.
- **Information throughout touchpoints and contexts:** Providing several informational touchpoints throughout contexts, like the app, is perceived as good for the users as individuals, but also for the entire system. The main concern expressed for a touchpoint like the app, is not only that it should be developed, but that the PTOs are not sure about how to get the travellers to download and use it.
- **Be-in Be-out - Open system:** The concept of having an open system is appealing to the PTOs. It is a concept that is believed to be technologically possible, but in a more-long term future (than 2024, like suggested in the video). The main problem that operators see with the implementation, is that there currently is no tangible solution to the consequence of having people who purposely do not pay for their tickets.
- **Service personnel:** After viewing the user evaluations the topic of service personnel was addressed, because of the emphasis and importance that the users gave to having human to talk to. The PTOs agree with the fact that personnel must be available also in the future of public transportation, especially for a target group, which is not familiar with system, such as international travellers.
- **Privacy concern (be-in be -out & bank card):** The matter of privacy was also addressed after the project partners saw the responses of the users to the proposed system. Some users are deeply concerned with

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the data that is being transferred when using the smartphone or bank card to pay in the system. The project partners mentioned that this is a concern not only for international travellers, but also for the Dutch customers. The question remains open on how to solve the issue responsibly.

- **Alternatives (types of tickets, payment methods, smartphone, paper tickets, information and overview of this options, self-service and service personnel, etc.):** The project partners mentioned the necessity of having alternatives, which also was discussed after seeing the users' evaluation of the service. The project partners see a challenge in finding a balance between a clear array of products and options and having enough alternatives for the different types of travellers and different possible situations travellers might encounter when using the system.
- **Inflight touchpoints:** The project partners see the value for the user for touchpoints proposed for the airplane. The accessibility of public transportation information throughout travel phases including the flight is perceived as logical and helpful for the users and as a natural moment in which people have time to think about public transportation. For KLM specifically the touchpoints are a way to extend their service to their customers and propose ways to make the whole travel experience better. Still, this inflight services can only be implemented when the PTOs have developed solutions together.

Implementation

In order to effectuate change, the project partners explained that the first step is for the operators to gain awareness of the problems happening in the field. Specifically on the topic of international travellers, operators have little to no insight on the users' problems. It was explained that some things are not perceived as a big issue, because nobody complains about them, as international travellers do not usually write complaints about their experience with the system. When, for example, the organization Rover complains, the complaints are of a completely different nature, than the findings that the project about international traveller have shown, due to the fact that the Rover users also know the Dutch system and use it on a regular basis.

Moreover, it was discussed that harmonization of product names and touchpoint interfaces is difficult, because every company already has their own system in place with different suppliers and contracts. Not every PTO follows the same rules. There are official tenders and the concession periods vary, which are regarded as natural moment to make changes. Also, it was argued that if there were a neutral party to orchestrate all the PTOs, the distance between the neutral party and the users would become even bigger than the current distance that the PTOs already have from users. The solution discussed during the meeting, was that the operators would have to organize projects themselves. One of the main insights from the meeting, which had not been vocalized in the previous meetings, was that projects that do not impact the PTOs competitive position could be a first step towards working together. An example for this is OV-betalen itself, because it will not distinguish one PTO from another. Also signage is something that could be collaborated on and service personnel, like in the OV-servicewinkel (joint service office), something that already is taking place: Staff from the different companies is trained to answer the top 10 questions, which is about 90% of questions. It was suggested that the operators could make guidelines for how travellers should use the system together.

5.4.5 Conclusions

The evaluation of the DPT concept with the project partners provided insight on their main concerns and implementation possibilities parting from the current system. The discussion addressed all the aspects (human, society, technology, business) within the integrated project approach. It is evident that the users' evaluation of the proposed system caused the project partners to address some aspects, which they did not discuss initially, showing the impact and relevance of a user-centred mind set to improve the system.

In general, the PTOs explained that there is a better chance to implement changes together, when they are not competing directly with each other. Examples for these types of things are OV-betalen, information provision throughout contexts, signage or service personnel. These examples show the intension to improve the system for the greater good, which would benefit the user directly and society as a whole. This approach to change, is a well-defined business consideration, as it intends to let the PTOs continuously operate and grow individually, but also cooperate and strengthen each other's services to the travellers.

The project partners argued that providing a countrywide ticket will be too expensive for the traveller, suggesting that for now there is no smart way for implementation and making a business case out of it. Also the project partners perceive the general idea of providing a more similar product range and using the same terminology in the whole country as good in theory, but as hard to implement. This is because of the concessions system: the PTOs operate in very different types of regions and within different time spans. A much more radical systematic change would be required for this to change and is therefore perceived as extremely difficult to achieve businesswise.

In terms of technology, the project partners consider the concept of having an open system with the Be-in Be-out beacon technology to be good in theory. However, the open system with Be-in Be-out is not implementable by 2024, as there is no solution for keeping out travellers, who purposely do not pay for their tickets. The project partners perceive the mobile application and providing travellers with tariff and travel information throughout contexts as technologically feasible and clearly understand the benefits of these touchpoints for the users. These types of applications can be implemented in different ways, for example, the PTOs could develop applications by themselves or they could cooperate with companies that are already doing similar things. The users' concerns regarding wifi are less important to the project partners, because they believe that in the future, wifi will be available everywhere. Privacy of data is a matter, which must still be addressed and solved, as it affects the users directly, society as a whole and is closely related to the way technology is implemented.

Overall, the presented DPT concept is perceived as useful for the international travellers. Nonetheless, one umbrella brand for public transportation in the Netherlands seems to be a too radical solution, which will realistically not be implemented. What can realistically be done, is a cooperation by the PTOs to improve certain aspects in the current system together on a more project/touchpoint based level, for matters in which the operators do not compete with each other.

The limitations of the DPT service proposition evaluated by the project partners is presented in the following subchapter.

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5.4.6 Limitations

The only material presented to the project partners were the videos of the two different types of travellers using the DPT system. These videos only show the frontend interactions between the users and the different touchpoints. For this reason, it is possible that different people in the workshop interpreted the backend implications differently. For example, some people understood that DPT would only merge payment. However, DPT was designed as a merger of brands on the frontend, with the individual operators running the system on the backend. If such an evaluation is carried out in the future, it would be best to support the video material with content referring to the parts of the service that are not evident from the video.

During the meeting not all project partners could be present. The discussion might have been more extensive and elaborate if all the partners had attended. However, the project partners who could not attend the meeting provided written feedback. The written feedback was also taken into account when drawing conclusions. The evaluation of the concept remained in a conceptual level and was less specific than the evaluation with the users, as the individual touchpoints were not rated using a scale, due to time constraints. This approach of evaluation was useful in order to spark discussion about the current system and its problems as well as about the proposed DPT system. The project partners agreed with each other and were supporting of each others arguments, making the conclusions of the meeting unanimous.

5.5 Conclusions

This chapter has presented the DPT vision, which was developed after the idea generation and evaluation by users and project partners. The DPT vision once more was evaluated by users and project partners. These evaluations have provided insight on the way the proposed touchpoints work together for different types of users and within different contexts and travel phases. Also, the evaluation by the project partners specified opportunities and challenges to implement the proposed vision.

As a whole, the DPT service proposition and its' touchpoints are positively perceived both by users and by the project partners. The human aspect and the desirability of the service become evident after the evaluations. The desirability of the proposed system mainly lies in the fact that the system would cater to different types of travellers by having alternatives of tickets and payment throughout contexts and an accessible information provision. In general, both users and project partners, agree that a digitized system is a positive development with many benefits. Given that users have wifi access, using the smartphone to search for information and purchase tickets is practical, as people usually carry their phone with them and can personalize the service, for example, in terms of language. Nonetheless, having backup options such as paper tickets is perceived as a necessity, for instance when technology fails. A combination of self-service and service-personnel also appeals to users, as in many cases users prefer to talk to humans. The users generally expressed that they do not want to use bank cards as tickets, due to security concerns and mistrust. Overall, the concept of DPT and integration (of information and tickets) does not seem as a futuristic or advanced to users and the participants' recurrent question, whether this proposal doesn't exist already, suggests that it is expected for such way of providing the service to already exist.

Both the users and the project partners perceived the societal aspect of making public transportation as inclusive as possible to be the key towards an improvement of the system for international travellers. A good example for this social aspect, is that the suggestion of adding English and peoples' native languages to better communicate throughout the system is predominantly perceived as a must.

In terms of technology the proposed DPT service is feasible. The project partners expressed their concern with the proposal of an open system that works with Be-in Be-out beacon technology. The technology itself will be developed to work. Nevertheless, the project partners believe there is no implementable solution to keep out travellers, who purposely do not pay for their ticket. That is a matter, which influences the PTOs greatly in terms of business and income. Furthermore, the users' concern with privacy and the data that is retrieved from their smartphones or bank card is an important component to be further elaborated, when developing a more digital system. Solutions for this concern could range from providing users a clear explanation of what is being done with the data, to providing users with alternatives with which they can avoid the whole problematic, as is the purchase of paper tickets.

The implementation of the DPT service proposition is the most challenging from the business perspective. The project partners clearly stated that they could only contribute with projects that do not affect their competition with each other. Conversely, the examples that the project partners provided in which they could cooperate are most of the building blocks of the proposed DPT service, namely OV-betalen itself, information provision throughout contexts, signage or service personnel. The natural moments for change in the system are when the concessions of a PTO end, and due to the fact that the PTOs have different concession periods, it is hard for them to make changes together. Although from the human aspect, having one single brand for public transportation in the Netherlands is the most user-friendly solution, as tested conceptually during this project, the current's system set-up makes it very challenging for the partners to achieve this. Hence, a solution in which the PTO's can cooperate on individual projects to improve the system as a whole is the most realistic.

These insights composed by the insights gained from the DPT service proposition evaluation by users and by the project partners, contribute to the finalization of the service design proposition, which is presented in chapter 6.



PTOs share a platform to provide information and sell tickets

6.1 Introduction

The future vision for the way public transportation could be for international travellers arriving at an airport in the Netherlands is presented in this chapter. The vision is based on the previous research of the current situation (see research report) and the results of all the ideas and the DPT concept evaluated by project partners and by users (see chapter 4 and chapter 5). The vision presented in chapter 5 is iterated based on the arguments provided by users and project partners to make the Dutch public transportation system more desirable, but also feasible and viable. To explain this service design vision, the requirements to improve the system and implement the vision are established and exemplified with touchpoints that compose the proposed service. Also, a service blueprint for the envisioned service shows the variety of touchpoints available per service step. It exemplifies the travel journeys of an efficient (prepared traveller) and a spontaneous traveller (unprepared traveller) and recommends actions to develop the frontend and backend of the proposed vision. Thereafter, recommendations for the project partners to achieve this future vision are proposed for a short-, mid- and long-term.

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6.2 Future Vision

In comparison to the vision presented in chapter 5, the vision presented in this chapter deconstructs the essence of the concept to proceed with what makes the concept desirable, but in a way that also makes it viable. Feasibility of the concept is further described in the touchpoint examples in chapter 6.3. The vision is iterated from

The Dutch Public Transportation system is of an umbrella company composed by different operators that provides a unified service and communicates in one coherent style with its customers.

to

The Dutch public transportation is one system, ran by multiple operators, that cooperate in the backend to provide transparent and unified information to facilitate the usage of the system to its customers in the frontend, in areas, where they do not compete.

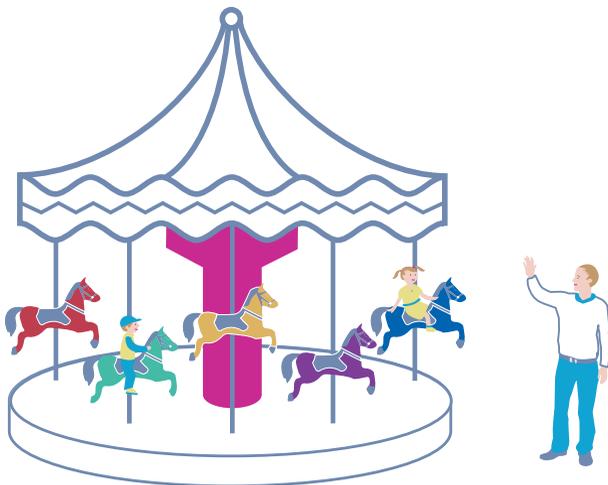
This iteration is based on keeping the benefits posed by the touchpoints evaluated by users and project partners and the remaining challenge to realistically implement one brand for public transportation in the Netherlands. The final vision proposed to improve the experience for international travellers arriving at an airport in the Netherlands, who use public transportation is the following:

Like a carousel, the Dutch Public Transportation system is one entity composed by multiple moving parts. Different operators and transportation modalities are available throughout the Netherlands for travellers to chose from, the same way a carousel poses the choice of the different horses to its users. Comparable to the horses in a carousel that are driven by one operating engine, the public transportation operators in Netherlands share a backend to provide a shared frontend regarding tariff, ticket and general information about public transportation to travellers. This set up particularly simplifies the information for users, who are not familiar with the system, such as international travellers.

In a carousel, going from one horse to another is easy, comparable to the way that DPT facilitates travellers to switch and combine their travel possibilities by providing the information required to do so. When using public transportation in the Netherlands, the travellers are provided with the information they require at the moment they require it. Hence, they will be able to effortlessly use the system. Also, international travellers can access public transportation at any moment during their travels, the same way carousel can be accessed at any time.

Similarly to the way parents are standing by a carousel to encourage and support their children, the public transportation system in the Netherlands provides alternatives and backup options to the users who require more assistance when using the system. The iteration is visualised in figure 40.

The Dutch Public Transportation system is of an **umbrella company** composed by different operators that provides a unified service and communicates in one coherent style with its customers.



The Dutch public transportation is one system, ran by **multiple operators**, that cooperate in the **backend** to provide transparent and unified information to facilitate the usage of the system to its customers in the **frontend**, in areas, where they do not compete.

Figure 40. The vision is iterated using the same metaphor of the carousel: instead of having one umbrella company with the same brand, the carousel horses in the new vision keep their individuality, but still are part of one joint system

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6.3 Design Requirements & Service Proposition

This chapter presents the urgent factors that must be tackled to implement the vision presented in chapter 6.2 to ultimately improve the current situation of international travellers arriving at an airport in the Netherlands, who use the public transportation system. These factors are exemplified with four touchpoints.

To achieve the project goal to *develop user-centred solutions to improve international travellers' experience when selecting, paying and using their public transportation ticket(s) for their stay in the Netherlands*, it is essential to keep in mind that purchasing public transportation tickets, as an international traveller, means more than just buying a ticket. It means that the travellers have to succeed in searching for information and wayfinding, they have to know what to do from context to context and travel phase to travel phase and must be able pay for their tickets (Lehr, 2016). Throughout the project it has been established that, in essence, improving information provision is a key towards bettering the system and the experience of international travellers when using it. Also, a homogenous array of tickets and payment methods available for all public transport operators would simplify the process of ticket section, purchase and usage for international travellers throughout the system. To achieve this, the public transportation operators have to share certain touchpoints (such as a website, an app, the interface of ticket vending machines or staff), as well as cooperate to homogenise ticket names and payment options. In order to improve the way information is provided and offer a harmonious array of ticket options and payment methods, the operators should share a platform to provide information and facilitate ticket purchase. There are basic requirements that must be taken into account, when developing the vision and service proposition:

- **Accessibility of information:** Travellers should be able to access information about public transportation throughout travel phases, contexts of use and touchpoints.
- **Transparency of information:** Travellers should have an overview of the available possibilities within the public transportation system in terms of transportation modalities, time of travel and price to travel.
- **Clarity of information:** Travellers should be able to understand the information provided to them in the languages available, the terminology used and the design of the different touchpoints.

The following touchpoint examples, the app, ticket vending machines, service personnel and payment borders, show how these requirements apply to the individual elements of the service. The whole assortment of touchpoints, that compose the proposed system are showcased in the service blueprint in chapter 6.4 and described individually in appendix J.



Example 1 - App: The public transportation operators develop one official app to provide all information regarding the public transportation system in the Netherlands. The app provides information about all possible routes, modalities and ticket possibilities. With the app, travellers can have a digital ticket on their smartphone to use on the go. See figure 41.

Travellers' goals

- Search for transportation possibilities and compare the benefits of each.
 - Search information about the types of tickets at destination and compare them.
 - Wage differences between tickets in regards to trips nature.
 - Choose ticket for the whole trip or next travel journey.
 - Pay for the selected ticket.
 - Search for the route from the current location to the destination (modalities, lines, interchanges); If multiple options: select preferable travel option.
 - Find the correct vehicle for the trip within journey.
 - Find the way towards the final destination.
- **Accessibility of information:** Travellers can access information about public transportation throughout travel phases and contexts with the use of one single app. The app for public transportation in the Netherlands is the touchpoint, which most likely will be used within all contexts and throughout the whole travel journey of all types of travellers. Travellers can download the app at home, during their flight, at the airport or at stations or stops, and can use the information of the app in any of these contexts. Furthermore, they are able to pay for their tickets through it and validate them with their phone at stations and vehicles. In vehicles the app provides live information and feedback regarding the trip and wayfinding towards the final destination, therefore the app might even be used outside of the public transportation contexts.
 - **Transparency of information:** The app offers travellers an overview of the available possibilities in regards to routes, modalities and ticket possibilities, helping them to make the best choice based on their personal preference.
 - **Clarity of information:** The app is available in multiple languages. The terminology used for the different things, such as tickets, is the same throughout operators. The app is designed in a user-friendly way and travellers can easily adopt it for their (short) stay in the Netherlands.

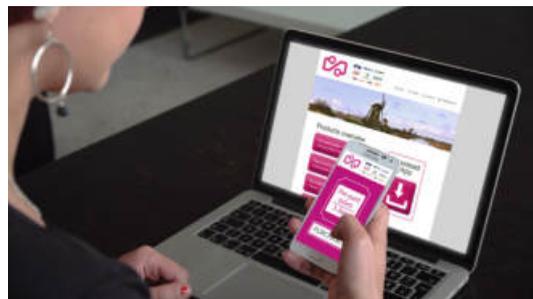


Figure 41. Scenes from the concept video for the DPT service proposition that show the users' interaction with the app

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Example 2 - Ticket Vending Machines: The public transportation operators have contributed to develop more user-friendly ticket vending machines, that allow the travellers to select their ticket by destination, both on a map, as well as by typing an address. All possible transportation tickets for a specific route/destination are displayed showing the different modalities, travel times and ticket prices so that the travellers can select what suits them best. The operators develop the operational system of the ticket vending machines together, however each operator has their own machines. See figure 42.

Travellers' goals

- Search information about the types of tickets at destination and compare them.
 - Search for the route from current location to destination (modalities, lines, interchanges); If multiple options: select preferable travel option
 - Choose a ticket for the whole trip or the next journey.
 - Acquire and pay for the selected ticket.
-
- **Accessibility of information:** Travellers are able to access information about public transportation and purchase tickets on ticket vending machines at stations and stops throughout the system. The ticket vending machines provide an alternative to users, who for any reason do not use smartphone tickets.
 - **Transparency of information:** All possible transportation tickets for a specific route/destination are displayed showing the different modalities, travel times and ticket prices so that the travellers can select what suits them best.
 - **Clarity of information:** Travellers are able to purchase tickets guided by a more user-friendly interface, that allows them to select their ticket by destination, both on a map, as well as by typing an address. The ticket vending machines are available in a larger range of languages and the terminology used for the different types of tickets is the same throughout operators.



Figure 42. Scenes from the concept video for the DPT service proposition that show the users' interaction with the ticket vending machine



Example 3 - Service Personnel: Service personnel of all operators have the role of a host to the Netherlands. Service personnel are knowledgeable about the whole system including the different operators, modalities, routes, schedules and prices. The service personnel can access specified information if travellers require them to. See figure 43.

Travellers' goals

- Search for transportation possibilities and compare the benefits of each.
 - Search information about the types of tickets at destination and compare them.
 - Wage differences between tickets in regards to trips nature.
 - Choose a ticket for the whole trip or the next journey.
 - Pay for the selected ticket.
 - Search for the route from the current location to the destination (modalities, lines, interchanges); If multiple options: select preferable travel option.
 - Find the correct vehicle for the trip within journey.
 - Find the way towards final destination.
 - Ask any other questions.
- **Accessibility of information:** Service personnel are incorporated into the system as an alternative and backup option for travellers, who require more assistance or do not only want to use self-service touchpoints.
 - **Transparency of information:** Service personnel is equipped with digital information, for example, tablets, to provide travellers with an overview of their available possibilities within the public transportation system in terms of transportation modalities, time of travel and price to travel. The personnel guides the travellers to the most convenient option.
 - **Clarity of information:** Service personnel is fit to speak also in English, or more languages, to communicate and provide information to traveller.

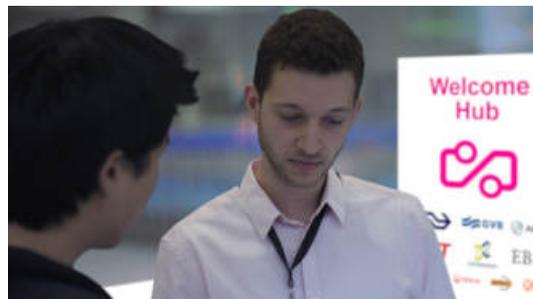


Figure 43. Scenes from the concept video for the DPT service proposition that show the users' interaction with the service personnel

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Example 4 - Payment borders: Gates & Validation Poles: The gates at stations work with the same technology through the Dutch public transition system regardless of the operators. See figure 44. Be-in and Be-out (see page 32) is implemented in the system, especially benefiting the open payment borders (vehicles and stations with validation poles and no gates) preventing travellers from forgetting to check-in and check-out.

Travellers' goals

- Validate ticket.
- **Accessibility of information:** Travellers have enough information to know how checking-in and checking-out works throughout the system. The information regarding checking-in and checking-out is provided throughout travel phases, for example, at the moment of ticket purchase, and within the specific contexts and touchpoints, in this case especially valuable for open payment borders (as when there are closed gates, travellers know that they must open the gate by checking-in or checking-out).
- **Transparency of information:** Travellers have an overview of the system basic requirements and are aware of checking-in and checking-out throughout their travels.
- **Clarity of information:** Information provided by the gates can be set in different languages and the terminology used by the operators is consistent. The design of the gates gives travellers enough feedforward for them to understand that checking-in and checking-out is expected from them. However, validation poles in vehicles and stations hinder travellers from forgetting to check-in and check-out.



Figure 44. Scenes from the concept video for the DPT service proposition that show the users' interaction with the gates

6.4 Service Blueprint

The service blueprint is a way to visualise the system from both the customers' and the businesses' perspective, illustrating also what lies behind the scenes. There are five steps a user of a service goes through when interacting and using the system, which are taken into account when mapping out the service blueprint. These steps are when the customer becomes aware of the service, joins the service, uses the service, develops his relationship to the service and leaves the service (Løvlie and Polaine, 2013).

The service blueprint, figure 45, shows what touchpoints are related to the steps. Also, it exemplifies the way that two different users interact with the service in terms of the context they are in and the touchpoints they use per step. Moreover, the service blueprint shows what these touchpoints and users' interactions mean for the frontend and backend design of the service. It is important to mention that the travellers' goals, previously described with touchpoint examples in chapter 6.3 (and appendix J), are directly related to the frontend interactions. The frontend interactions are there to meet the users' goals. The backend interactions create a two-way-street process to these frontend interactions and therefore make the travellers' goals possible to achieve.

The service blueprint presented in this chapter is a suggestion for a starting point to develop a better service for public transportation in the Netherlands and to improve the experience of international travellers. The touchpoints suggested and exemplified have only been developed in a conceptual level and therefore need to be treated as new projects if further developed in the future. Hence, the frontend and the backend proposed in this blueprint are also high-level suggestions on how to proceed if the operators cooperate to improve the system. Both the frontend and the backend must be designed and tested before implementation.

The steps in relation to touchpoint usage are described individually in the following segments.

6.4.1 Service Blueprint Steps: Touchpoints

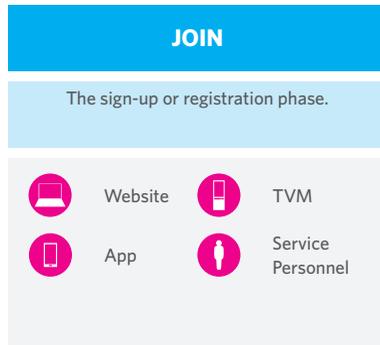
The following descriptions explain how the proposed system touchpoints relate to each of these steps for international travellers using the public transportation system in the Netherlands. The examples of the two travellers, previously used to evaluate the proposed DPT system in chapter 5, are used to visualise the service blueprint for the public transportation system in the Netherlands. This service is described in a conceptual level that applies to the vision of operators cooperating in the backend to provide transparent and unified information to facilitate the usage of the system in the frontend. When relevant, the difference between the efficient (prepared) and the spontaneous (unprepared) types of travellers is clarified. The touchpoints they use during their journey might vary depending on the amount of knowledge they previously have about the system.

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Travellers can first learn about the system through four possible touchpoints within different contexts of use:

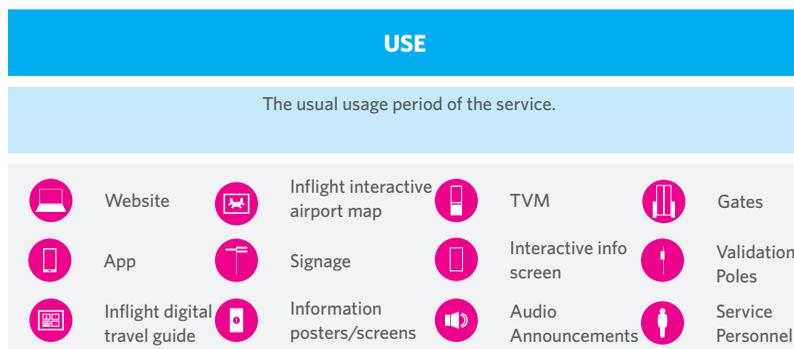
1. The website - usually visited by travellers, who prefer to prepare their trip more in detail at home. The website offers the whole scope of information to travellers, who intend to use public transportation in the Netherlands. However the website can be accessed through any other context throughout a traveller's journey.
2. The app - the only touchpoint (except for the website) that is available throughout all contexts of use. The app can be downloaded and used from home, on the flight, at the airport, at stations and stops and in vehicles. Travellers searching for information online become aware of the systems' services through the app. The app is a touchpoint addressed at all types of travellers using the system, as it is accessible within during all travel phases.
3. The inflight travel guide can be accessed on the flight via the inflight entertainment system. It makes travellers aware of the options they have for their travel in terms of activities, attractions and places and how to get there using public transportation. This touchpoint will most likely be used by travellers who have not previously prepared their trip at home.
4. The service personnel at the airport, stations, stops and vehicles can be the first contact point between travellers and the public transportation system in the Netherlands. Service personnel can make travellers aware of the options and possibilities available when they use the system. The service personnel can be relevant for all types of travellers (prepared and unprepared). Service personnel, who is not directly related to public transportation, like hotels might also be the first contact point, yet is an aspect, which is not further developed within the scope of this project.



Travellers can join the system through four possible touchpoints within different contexts of use. In this service proposition, joining the system is understood as purchasing a ticket as it is the stepping-stone required to use the service of public transportation. Joining the system consists of a similar process for different types of travellers. The only difference is the moment within the journey when the travellers decide to join. Usually, more prepared travellers would join it as soon as possible from the moment they plan their trip and an more unprepared travellers only briefly before the actual usage.

1. The website – travellers can purchase tickets on the website and in that way join the system. More prepared travellers are likely to inform themselves on the website and acquire a ticket there, as a visit to the website usually takes place previous to the trip to their Netherlands.
2. The app – travellers can download the app, which in itself is a way of joining the system, and furthermore they can purchase tickets on the app. All types of travellers are likely to use the app, the difference lies in the moment or travel phase, when they download the application to use it.
3. The ticket vending machines – several travellers who do not download the app, have forgotten their phone or have another reason not so use the smartphone are provided with the option to purchase tickets at ticket vending machines.
4. The service personnel – Some travellers prefer talking to service personnel rather than trying the self-service options. Therefore, it is possible that a number of travellers acquire their tickets at ticket desks or with the help of service personnel.

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All proposed touchpoints are part of the usage of the system, except for service personnel who is not used, but approached for assistance.

1. The website - travellers can use the website throughout their journey to search information and acquire tickets.
2. The app - travellers can download and use the app throughout their journey to search information and acquire tickets.
3. The inflight travel guide - travellers can use the inflight travel guide during their flight and in that way get to know the Dutch Public Transportation system and start to use other service touchpoints.
4. The inflight interactive airport map - travellers can use the inflight interactive airport map during their flight and in that way acquire the information to physically use the public transportation system upon their arrival in the Netherlands.
5. The signage - travellers use the signage for wayfinding through their whole journey and direct interaction with the system at multiple public transportation contexts.
6. The information posters/screens - travellers use the information posters and screens throughout their whole journey and interact with the public transportation system at different contexts. Travellers also can use the interactive information screens at specific contexts to search information regarding their journey, tickets and their way.
7. The ticket vending machines - travellers, who do not use their smartphone to pay for tickets have the alternative to use the ticket vending machines to acquire public transportation tickets.
8. Service personnel - travellers can approach service personnel throughout the travel phases and contexts when they have questions or require assistance.
9. The payment borders

a. Gates - in order to validate tickets travellers must pass the gates at train and metro stations within the public transportation system. Because the system will remain closed (considering the vision is for the year 2024), even though Be-in and Be-out is implemented, travellers must manually validate their ticket on their smartphone. Travellers must only validate paper tickets and bank cards actively.

b. Validation poles - when entering buses and trams travellers' tickets are validated by the poles with Be-in and Be-out, meaning that the use is not active, as the validation is automatic when the smartphone is used as a ticket. Travellers must only validate paper tickets.

10. The audio announcements - travellers do not actively use audio announcements, thus use them passively when they take action depending on the information given to them both at stations or in vehicles.

DEVELOP

The user's expanding usage of the service.

Within the short period of time in which travellers use the system they can expand their usage from touchpoint to touchpoint, for instance from using the website to using the app, or from using the inflight travel guide to using the app.

As international travellers usually only use the system within a short period of time of only a few days, the "develop" step is not considered relevant for this study. It is possible that travellers re-use the system on further trips to the Netherlands, however research regarding this aspect is not part of the project's scope.

LEAVE

The point when the user finishes using the service.

-  App
-  Gates
-  Validation Poles

Travellers can leave the system through three possible touchpoints within different contexts of use:

1. The app - when travellers are done using the public transportation in the Netherlands, they are likely to delete the app from their smartphone and leave the system.
2. The payment borders
 - a. The gates - when travellers exit a train or metro station they must pass the gates. As soon as they are checked-out they leave the system for that specific trip.

It is possible that many travellers leave the system forever at the airport station again, as that is the moment when they leave the Netherlands.

b. The validation poles - when travellers exit a bus or tram, they must pass by the validation pole. As soon as they are checked-out they leave the system for that specific trip. It is possible that many travellers leave the system forever from a bus at the airport, as that is the moment when they leave the Netherlands.

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Figure 45. Service blueprint for the service proposition



***DEVELOP**

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6.5 Implementation Recommendations: Short-, Mid-, & Long-Term

Currently, the public transportation system in the Netherlands is operated by several individual public transportation operators, that provide a range of train, metro, tram, bus, ferry and other services, such as bicycle rental, as shown in figure 46. The government grants concessions to the transportation operators to offer transportation services to the whole country. The main rail company NS is the only operator that provides a countrywide service. The other companies, including Arriva, Connexxion, EBS, GVB, HTM, Qbuzz, RET, Syntus and Veolia, have concession determined by the governments of provinces and urban regions (Lehr, 2016). The previous research carried out during this project shows that even though the OV-chipkaart system is country and operator-wide, international travellers struggle to use the system because of the complexity posed by having multiple operators. The operators offer different travel products and communicate with individual touchpoints, often within the same contexts. For example, at several stations, like in Amsterdam Centraal, there are ticket vending machines from NS as well as from GVB, international travellers do not know the difference between the machines and must take extra steps in their journey to figure out which one to use or use the wrong one.

		Dutch public transportation organisations									
Public transportation company		01. Arriva	02. Connexxion	03. EBS	04. GVB	05. HTM	06. NS	07. Qbuzz	08. RET	09. Syntus	10. Veolia
Transportation Modality	Train	●	●	●	●	●	●	●	●	●	●
	Tram	●	●	●	●	●	●	●	●	●	●
	Metro	●	●	●	●	●	●	●	●	●	●
	Bus	●	●	●	●	●	●	●	●	●	●
	Other	●	●	●	●	●	●	●	●	●	●

Figure 46. Overview of Dutch public transportation organisations and their transportation modalities

Starting from this current state, a service design proposal to improve the experience of international travellers was developed in an iterative process. The ultimate vision proposed is the following:

The Dutch public transportation is one system, ran by multiple operators, that cooperate in the backend to provide transparent and unified information to facilitate the usage of the system to its customers in the frontend, in areas, where they do not compete.

The following short-, mid- and long-term developments are proposed to implement the proposed vision to ultimately improve the experience of international travellers, who arrive at an airport and that use the public transportation in the Netherlands. The amount of time per term (short-term: now-2 years, mid-term: 2-5 years and long-term: 5-8+ years) was determined after discussing the ideas with the project partners during the idea evaluation workshops.

Short-term (now - 2 years)

1. PTO's establish projects that they can work on together to improve the system, without disrupting their own competition with each other. In the specific case of improving the system for international travellers the recommended projects are regarding payment for public transportation and information provision:
 - OV-betalen (ticket types available and terminology)
 - Information provision by digital touchpoints (app, website, TVMs)
 - Payment for public transportation with the smartphone and alternatives, such as paper tickets.
 - Information provision in shared contexts (signage, information posters, screens at stations, etc.)
 - Service personnel in shared contexts (training and equipment to provide a transparent service, focusing on the travellers needs and investment in the personnel's communication skills in English and more languages)
2. For each PTO there is a top level management representative involved in the decision making process that concerns the conceptual nature of the proposed projects.
3. The PTOs establish guidelines for the development of shared touchpoints for international travellers (payment and information provision) in regards to:
 - Privacy (related to data management when introducing technologies such as mobile payment and Be-in and Be-out)
 - Terminology (consistency and accuracy of words used for specific things)
 - Payment methods for tickets (range of methods available)

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4. PTOs establish goals to achieve the implementation of touchpoints and start small-scale cooperation, meaning that at least two PTOs with a shared touchpoint/context initiate projects in which they work together on the backend of the service to provide an improved frontend service. This means that PTOs in some cases will have to cooperate not only with each other, but also with other parties that have the means and the know-how to develop the shared touchpoints, such as IT and design companies to interaction concepts and develop digital touchpoints, but also language experts to harmonise communication throughout the system. The initial focus being, providing information in Dutch and in English throughout the system.
5. The most essential shared touchpoints to provide information and facilitate payment, such as a website and app are launched and tested in the field in order to be optimized in an iterative process. The individual operator websites link the user with the shared platform. Projects that require larger investments, like TVMs are tested in pilots to better assess the value of the concepts and proposed interactions and functions and are further developed in the mid-term.

Mid-term (2 - 5 years)

1. A network of external parties that respond to the PTOs during the development of the separate touchpoints is established. These parties are design and IT companies to develop interaction concepts and the design of the different touchpoints both digital (e.g. the app, website, TVM interface) and analogue (e.g. the users' interaction with the payment border).
2. The shared touchpoints are maintained and information is updated on a regular basis. New technologies are continuously being implemented to improve the provided touchpoints. Examples are providing a stable and reliable wifi connection throughout contexts or the introduction of multiple payment methods amongst touchpoints. Furthermore, the implementation of Be-in and Be-out can gradually be tested, especially at open payment borders.
3. It has become the norm that information is provided in both Dutch and English throughout contexts and touchpoints both digitally (e.g. the app, website, TVM interface) and analogue, like information posters, signs, audio announcements, etc.
4. Further languages (apart from Dutch and English) are taken into the scope of relevance at specific touchpoints and contexts. Thus, experts in the linguistic field are hired to implement communication in several languages in the long-term.

5. PTOs start the development of service add-ons to provide a better system that are prominent to improve the service provided to international travellers visiting the Netherlands, such as providing public transportation touchpoints in relation to attractions in the country and the airline. Hence, companies and organizations related to tourism and travel as well as the airline and airport are involved in the process. A relationship between places to visit, attractions and sights is developed in relation to public transportation. These concepts are developed by the established IT and design companies.

Long-term (5 - 8+ years)

1. It has become the norm that terminology throughout the system is consistent, meaning that all PTOs communicate in the same style and language and have the same names for tickets, touchpoints, contexts, modalities, etc.
2. It has become the norm that information is provided not only in Dutch and English, but also in more languages at relevant contexts. The digital touchpoints such as the app and the website are available in several languages.
3. Be-in Be-out at payment borders are introduced, being especially relevant at open payment borders.
4. The launch of TVMs that operate equally in the backend are introduced by the operators.
5. The operators and airlines launch touchpoints and services related to tourism and travel.

Figure 48 visualizes the previously described development steps to implement this future vision parting from the current state of the public transportation system in the Netherlands. The diagram shows the developments over time (short-, mid- and long-term steps) on the horizontal axis. The vertical axis is divided into two parts: the bottom part shows what actions are required to establish the PTOs' shared platforms and touchpoints, named backend actions. The top part shows the visible service on the frontend.

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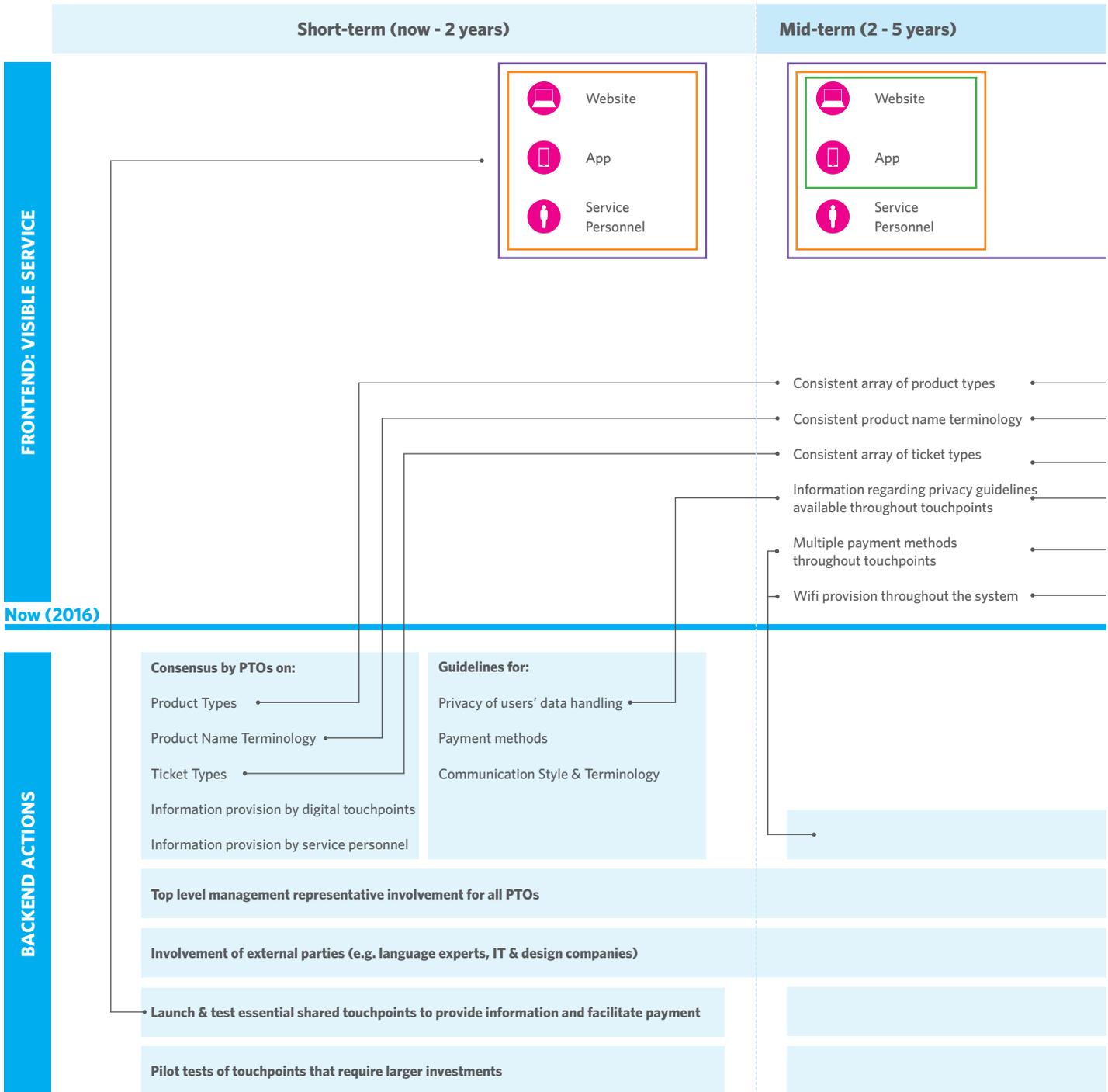


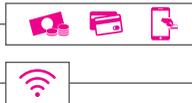
Figure 48. Short-, mid- and long-term implementation of the service proposition

Long-term (5 - 8 years)

-  Signage
-  Information posters/screens
-  Audio Announcements

-  Website
-  App
-  Service Personnel*
-  TVM
-  Inflight digital travel guide

-  Signage
-  Information posters/screens
-  Audio Announcements
-  Inflight interactive airport map
-  Gates
-  Validation Poles



Future (2024)

Legend

-  Information is always communicated both in Dutch and in English throughout touchpoints. Terminology constant throughout the system.
-  Shared digital platform throughout touchpoints for information provision about:
 - transportation modalities
 - time of travel
 - price to travel
 - ticket types
-  Information communicated in more languages (apart from Dutch and in English) at some throughout touchpoints. * In specific contexts personnel that speaks further languages is available.
-  Be-in Be-out. Still closed system at gated stations.

New technologies are continuously implemented throughout the system.

Established network of external parties (e.g. language experts, IT & design companies)

The shared touchpoints are maintained and information is updated on a regular basis.

Companies and organizations related to tourism and travel as well as the airline and airport are involved in the process.



➤ Schiphol Airport

● Amsterdam Lelylaan

● Amsterdam Sloterdijk

⊙ Amsterdam Centraal

⊙ Almere Centrum

⊙ Lelystad Centrum

Intercity direct

Toeslag verplicht
Supplement required
Rotterdam - Schiphol

7.1 Introduction

This chapter discusses the conclusions drawn from the results acquired throughout the project that lead to the future vision and service proposal presented in chapter 6, as well as the limitations of the study and the recommendations for further development of the service proposition.

The goal of this project was to *develop user-centred solutions to improve international travellers' experience when selecting, paying and using their public transportation ticket(s) for their stay in the Netherlands*. The user group is narrowed down to international travellers, who arrive at an airport in the Netherlands and use the public transportation system. I approached the project in an integrated manner that considers the human (desirability of the PSS), societal aspect, technological (feasibility) and the business (viability) aspect of the PSS. The emphasis however, lies on the human aspect, as the project has a user-centred focus and aims to understand and improve the product-service system to address the users' needs. I carried out evaluations with users in the field to gain insight on the desirability of the proposed service, as well as with the project partners. The project partners have the expertise to assess the impact of proposed solutions in terms of technology and business implications. The research is of qualitative nature and looked deeply into the reasoning of why certain behaviours and interactions with the system take place and also considered the argumentations of users and project partners to develop the vision and service proposal. Overall, it is evident that the project partners addressed some aspects, which they did not discuss initially after seeing interviews with users and users' evaluations of the individual touchpoints and the proposed system. This shows the impact and relevance of a user-centred mind-set to improve the system.

07 - Conclusions & Discussion

7.2 Conclusions

The ultimate future vision proposal to improve the experience of international travellers is the following:

The Dutch public transportation is one system, ran by multiple operators, that cooperate in the backend to provide transparent and unified information to facilitate the usage of the system to its customers in the frontend, in areas, where they do not compete.

The service proposition consists of an array of touchpoints and a service blueprint, which is based on improving information provision and providing a homogenous array of tickets and payment methods available for all public transport operators. These factors are essential in bettering the system and the experience of international travellers when using it. To achieve this, the public transportation operators have to share a platform and certain touchpoints (such as a website, an app, the interface of ticket vending machines or staff), as well as cooperate to homogenise ticket names and payment options. In order to improve the way information is provided and to provide a harmonious array of ticket options and payment methods, there are basic requirements that must be taken into account when developing the vision and service proposition:

- **Accessibility of information:** Travellers should be able to access information about public transportation throughout travel phases, contexts of use and touchpoints.
- **Transparency of information:** Travellers should have an overview of the available possibilities within the public transportation system in terms of transportation modalities, time of travel and price to travel.
- **Clarity of information:** Travellers should be able to understand the information provided to them in the languages available, terms of the terminology used and the design of the different touchpoints.

The human, society, technology and business aspect of this study are elaborated in the following paragraphs.

7.2.1 Human Aspect

The desirability of the proposed system is evident from the users and the project partners' evaluation. It mainly lies in the fact that the system would cater to different types of travellers by having alternatives of tickets and payment throughout contexts and an accessible information provision. Given that users have wifi access, users and project partners agree that a digitized system is desirable, as it caters to all types of travellers. For example, using the smartphone to search for information and purchase tickets is practical, as people usually carry their phone with them and can personalise the service, for example, in terms of language. Nonetheless, users believe that having backup options such as paper tickets are a necessity, for instance when technology fails. Also, a combination of self-service and service-personnel also appeals to users, as in many cases users prefer to talk to humans rather than interacting with machines. Overall, the concept of integration (of information and tickets) does not seem as a futuristic or advanced to users and the participants interviewed expected for such ways of providing the service to already exist.

The main concern of users when presented with the proposed vision was regarding privacy of data. There is a high threshold for travellers to validate their public transportation ticket with a bank card and some travellers were also concerned about the smartphone data handling if Be-in and Be-out would be implemented. Solutions for this concern could range from providing users a clear explanation of what is being done with the data, to providing users with alternatives with which they can avoid the whole problematic, as is the purchase of paper tickets.

7.2.2 Societal Aspect

Because public transportation should be accessible for everyone in society, including the international travellers, the societal aspect has been fundamental throughout the project. Both users and project partners indirectly addressed this matter. They both rated ideas improving the public transportation system for everyone highly. For example the suggestion to implement Dutch and English information through contexts and touchpoints in the whole system is perceived as inclusive and essential. Moreover, if the Dutch public transportation system provides a better service, not only the travellers benefit from the improved service, but the Netherlands as a country can largely benefit from the travellers. Travellers would have a convenient access to the whole country (as most inbound tourists only travel to Amsterdam) meaning that tourism would spread in the Netherlands.

7.2.3 Technological Aspect

In terms of technology the proposed service is feasible. Creating a digital platform to provide information and sell tickets is currently already possible. The information from the operators exists and would now have to be integrated with each other. Other companies already do this, like Google or 9292. Both users and project partners are in favour of a more digitized system, like the incorporation of the smartphone to interact with the system. Pilot tests to pay public transportation with smartphones have also already been carried out in the field and are being further developed. The users' recurrently expressed concerns regarding wifi access, due to the present high prices to access it aboard. The project partners, however, are less concerned with this matter, because they believe that wifi will be available everywhere in the future. To provide a better service, both digitized self-service touchpoints and the availability of service personnel throughout contexts of use must be designed, as some users prefer or need assistance from humans. Furthermore, the project partners believe that Be-in and Be-out will be developed to work, nevertheless have no implementable solution to keep travellers out of the system, who explicitly do not pay for tickets. For that reason an open-system at stations with gates is not further proposed. Privacy of data is a matter, which must still be addressed and solved, as it affects the users directly, society as a whole and is closely related to the way technology is implemented.

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7.2.4 Business

Businesswise, international travellers are an important group for the project partners. Inbound tourism is a major growth industry for the Dutch economy (NBTC Holland Marketing, 2015), hence catering to tourists is also politically relevant for the individual companies/operators and for the Netherlands as whole. An important insight regarding the evaluation of ideas from the business perspective, is that in some cases, the project partners perceived some ideas as easy and beneficial for the users, but as very hard to implement on the backend. Usually this due to large systematic changes required for what seems a small change in the frontend. The project partners clearly stated that they could only contribute with projects that do not affect their competition with each other. The first vision that proposed one umbrella brand for public transportation in the Netherlands is a too radical solution in terms of implementation. Although, from the human aspect, having one single brand for public transportation in the Netherlands, is the most user-friendly solution. The current system's set-up makes it very challenging for the partners to achieve this, due to the concession system and the difficulty for the PTOs to break contracts with their different, individual suppliers. The examples that the project partners provided in which they could cooperate are most of the building blocks of the proposed service, namely OV-betalen itself, information provision throughout contexts, signage or service personnel.



Tickets on the smartphone are recognized by beacon technology

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7.3 Limitations

This study established essential aspects towards improving the public transportation system in the Netherlands. The research carried out was of qualitative nature and provided rich insight on the desirability, feasibility and viability of the system. Throughout the different evaluation phases, from ideation to conceptualization, arguments and concerns from users and project partners were repeated, giving certainty to the results. It must be addressed that qualitative research is susceptible to interview bias and rests upon leading questions that can vary depending on the interpretation (Kvale, 1994).

The evaluations by users and project partners are based on a conceptual proposition. If the touchpoints, the frontend and the backend of the service proposition are further developed, they must be designed and tested before implementation individually and as part of the whole service.

Users from different nationalities and between the ages of 20 and 75 were interviewed through the course of the design phase, giving the results value in terms of diversity. Nevertheless, most users, who participated in the evaluation, have a European nationality, some are from North and South America and only two from Asia. Having a wider range of nationalities will not necessarily change the general outcome, however, it might provide a larger range of arguments and concerns. The interviews were carried out in English, which can be restricting, due to the fact that participants might not be able to express their thoughts as accurately as in their native language and some nationalities are less represented throughout the evaluation. Still, the numerical evaluation helps to assess the importance each participant gives to each touchpoint and the concept as a whole. The evaluations were carried out in Amsterdam at a touristic hotspot (The Museumplein) and in Schiphol airport. Hence, a representation of all travel patterns possible when travelling from abroad via a Dutch airport and within the Netherlands, defined during in research report (chapter 3.4.3), are not represented. Carrying out the same evaluation in different contexts and throughout the Netherlands might strengthen the results as a wider range of people with different experiences throughout the system would assess the proposed system and its touchpoints. In some cases the participants have not yet experienced all the elements that they were asked to evaluate, hence they answer on hypothetical explanations.

The gathered results from the evaluation by project partners summarise the multiple views of different ideas. To interpret the results properly it must be considered that the sessions were conducted with different amounts of people each time and therefore the assessment was not exactly the same by all the companies/organizations. In some cases the participants assessed the ideas independently, which provided very specific reasoning for the rating of the idea. However, when assessed in smaller groups, the discussions per idea were more elaborate as sometimes different opinions were argued. It also must be considered that the experts in some cases assessed the idea with the users perspective and sometimes with the companies (business/technological) perspective, showing that the value of assessing the system

and touchpoints from a users' perspective is perceived as important to better the system. The ideas were not all discussed in depth due to time constraints, however the most important ideas and topics were discussed in detail in order to get more qualitative data and better assess their strengths and weaknesses. The material presented to the project partners' only showed the frontend interactions between the users and the different touchpoints. For this reasons it is possible that different people interpreted the backend implications differently. If such an evaluation is carried out in the future, it would be best to support the material with content referring to the parts of the service that are not evident from it.

7.4 Recommendations

Cooperation amongst PTO's

To improve the experience of international travellers arriving at an airport in the Netherlands, who use public transportation, it is essential that the public transportation operators cooperate with each other. The operators currently share a system, but do not always share their services in terms of providing information, assistance or tickets. This makes the interactions for the users complex and impairs travellers' experiences with the Dutch public transportation system. It is imperative that operators work on the service of transportation as a unity; as for international travellers the division amongst brands is not relevant. Travellers' goals consist of successfully getting from A to B. When travellers must interact with multiple operators within one journey they require continuity for a more seamless travel. Using multiple operators should facilitate their trips and not make them harder. The benefits of selecting one operator over another or a combination of operators should be communicated to travellers in a transparent way so that the travellers can positively experience the system as a whole.

Include all stakeholders in the process

Not only PTOs are relevant parties that can improve international travellers' experience with the Dutch public transportation system. Further stakeholders, such as travel and tourism organisations, points of entry such as airports and passenger airlines (see research report Figure 14. Overview of stakeholders) can positively contribute when developing solutions to improve the experiences of international travellers with public transportation in the Netherlands. Because the stakeholders share contexts and in some cases the touchpoints that travellers use and interact with, collaboration is necessary to optimize the customers' journey. Unifying services or providing smoother switches from one service to the next by paving the path for travellers will improve their overall travel experience in the Netherlands. Collaboration amongst the different parties has the potential to not only benefit the users of the system, but also the Netherlands as a whole. This is due to the fact that the travellers will have the possibility to travel all-around the country, making the Netherlands grow as a touristic destination, even more if travellers have good impressions of the Dutch service provision.

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Have a user-centred mind-set

A user-centred mind-set is fundamental to improve the users' experience with the public transportation system in the Netherlands. Travellers (in this case international travellers) are the most important group of stakeholders of the product-service system of public transportation. Without them and their need of mobility, there would be no necessity of providing public transportation. Often the system is only designed from a technological or a business perspective leaving out the real needs of users. The impact that the PSS design has on users is critical to provide a better service and also impacts the technological, business and societal aspect of the system. In order to be more user-centred the PTOs (and other stakeholders) should continue to involve the users in the solution developments by letting them evaluate, test or even co-create the service.

Improve the accessibility of information throughout the system

The research has shown that information is a key element towards a successful and more independent use of the system. When users have the proper information they are apt to make well-founded choices and decisions regarding their travels as well as being able to act more independently and tend to make less mistakes. Because public transportation is a service designed for everyone in society, optimizing information accessibility means that the different types of travellers, throughout different travel phases, in different contexts of use, that interact with different touchpoints must be able to access information. The information they access should cover the system's usage as a whole, as well as travellers' specific journeys and trips. Digital touchpoints, such as an official public transportation website and an app, as well as more context-specific touchpoints, such as signage and audio announcements, should provide enough feedforward and feedback for travellers to easily get from A to B. The PTOs and other relevant stakeholders must create guidelines to achieve a more homogenous information provision and implement solutions that are accessible and cater to as many travellers as possible.

Unify information provision

The PTOs (and other stakeholders) should improve the way information is provided throughout the entire system. Not only accessibility of information is important, but also the homogeneity of the information is. This requires cooperation amongst operators, as not only their individual services should be clear to travellers, but also the system as one entity should be properly communicated. To do this, unifying information is necessary. Unified information will avoid that confusing or misleading information is provided, as well as information overload, which is caused by multiple parties providing information about the same thing differently. The information provided should be transparent (providing an overview of transportation modalities, times of travel and price of travel) delivering enough knowledge to the travellers for them to make the best choices concerning their trip and their preferences. The information should be clear and understandable to all travellers. PTOs should work on using the same communication style (language and terminology) and the design of the touchpoints through which the information is provided

so that users can understand the information they require and act upon it. Provision of information both in Dutch and in English, as well as further languages provides knowledge about the system to a larger group of international travellers. The PTOs (and other stakeholders) should work together with external parties that have the expertise to implement the information provision throughout touchpoints and contexts successfully, such as language experts to do proper translations, IT companies that manage the data and design agencies to design interactions and aesthetics of the touchpoints.

Simplify and unify ticketing & payment

Although the Dutch public transportation system shares one payment system, namely the OV-chipkaart system, the individual PTOs have different product types and ticket names. This study shows that international travellers do not often opt for the Anonymous OV-chipkaart and use the operators' disposable public transportation tickets. Selecting the right ticket is a hassle for travellers, who do not understand the benefits of the tickets and travel products, especially on their first contact with the system. Furthermore, different payment methods are required for different operators and not all travellers can use their preferred payment method depending on the context of use and touchpoint they want to purchase a ticket on. Simplifying the ticket range, unifying the product range and providing a wide range of the same payment methods throughout the system can make ticket selection and acquisition better for international travellers better. To do this, the PTOs have to establish guidelines on payment and at least on the frontend give tickets the same names and use a consistent terminology.

Design and test the individual touchpoints, frontend and backend recommendations

The service proposition in this study has been designed in a conceptual level. Therefore, the individual touchpoints, as well as the frontend and backend of this proposition must be designed thoroughly and tested before implementation. The touchpoint descriptions and frontend and backend recommendations established by this study are starting points to further develop the system and to ultimately improve the experience of international travellers arriving at an airport in the Netherlands, who use public transportation.

Test the service proposition with travellers throughout the whole country – expand the scope

The service proposition has only been evaluated by users in a limited scope of locations (in Amsterdam Schiphol airport and Amsterdam Museumplein). In order to implement the service proposition in the Netherlands, it is recommended to expand the scope of the service evaluation. Carrying out the same evaluation at different contexts and throughout the Netherlands will prove a fuller picture of how the service should be as a whole.

Guided by these recommendations, a more user-centred and user-friendly public transportation service can be developed. Improving the public transportation system will benefit the users, the PTOs and other stakeholders, as well as the travelling in the Netherlands as a whole.

References

Assies, H. (2014, June 22). How airports are responding to today's connected travellers with mobile-based services and tech amenities. Retrieved April, 2016, from <http://www.airporttrends.com/2014/06/the-connected-traveller-in-control-how-airports-can-create-personalised-travel-experiences/>

Carlile, P. R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization science*, 13(4), 442-455.

European Commission. (2015, September 30). Intelligent transport systems, Innovating for the transport of the future. Retrieved April, 2016, from http://ec.europa.eu/transport/themes/its/index_en.htm

Evans, J. (2010, April 24). Vision and Mission - What's the difference and why does it matter? Retrieved December 2, 2015, from <https://www.psychologytoday.com/blog/smartwork/201004/vision-and-mission-whats-the-difference-and-why-does-it-matter>

GoAbout.com. (n.d.). Go About - de persoonlijke reisplanner. Retrieved April, 2016, from <https://goabout.com/pages/about>

Henze, L., Mulder, I., & Stappers, P. J. (2013, June). Understanding networked collaboration: fields and patches of interactions. In *Engineering, Technology and Innovation (ICE) & IEEE International Technology Management Conference, 2013 International Conference on* (pp. 1-8). IEEE.

IDEO (2009). *Human Centred Design Toolkit* (2nd ed.). San Francisco, California, US: IDEO.

Joppien, J., Niermeijer, G., Niks, T., & Kuijk, J. (2013). *Exploring new possibilities for user-centred e-ticketing*. Delft University of Technology.

Kvale, S. (1994). Ten standard objections to qualitative research interviews. *Journal of phenomenological psychology*, 25(2), 147-173.

Kollau, R. (2014, February 13). *Airline trends.com » KLM first airline to let passengers pay 'socially' via Facebook or Twitter*. Retrieved April, 2016, from <http://www.airlinetrends.com/2014/02/13/klm-social-payment-facebook-twitter/>

Kollau, R. (2016, January 15). *Airline trends.com » Airlines and airports let passengers pre-order food via mobile apps*. Retrieved April, 2016, from <http://www.airlinetrends.com/2016/01/15/choice-convenience-food-beverages-pre-ordering-airlines-airports/>

References

- Lehr, L. (2016). OV-betalen for international travellers arriving at an airport in the Netherlands. Delft University of Technology.
- Levere, J. L. (2016, March 28). The New York Times. Retrieved April, 2016, from <http://mobile.nytimes.com/2016/03/29/business/using-apps-to-ease-the-hassle-of-navigating-airports.html?referer=>
- Løvlie, L., Polaine, A., & Reason, B. (2013). Service Design: From Insight to Implementation. New York: Rosenfield Media, LLC.
- Lynn Shostack, G. (1982). How to design a service. *European Journal of Marketing*, 16(1), 49-63.
- Marr, B. (2015, May 27). How Big Data And The Internet Of Things Improve Public Transport In London. Retrieved April, 2016, from <http://www.forbes.com/sites/bernardmarr/2015/05/27/how-big-data-and-the-internet-of-things-improve-public-transport-in-london/#6395a4a53ab3>
- Messenger.klm.com. (n.d.). Enjoy KLM on Messenger. Retrieved April, 2016, from <https://messenger.klm.com/>
- Milligan, B. (2016, April 30). Mobile phone roaming charges cut within EU. Retrieved April, 2016, from <http://www.bbc.com/news/business-36171266>
- Mooveitapp.com. (n.d.). Getting Started is Easy! Retrieved April, 2016, from <http://mooveitapp.com/features/>
- NBTC Holland Marketing. (2014). 2014 Inbound Tourism Survey - A closer look at our international visitors. Retrieved September, 2015, from <http://www.nbtc.nl/en/homepage/research-statistics/inbound-tourism-en.htm>
- NOVB (2014, December). Visie OV Betalen. Retrievable from <https://www.rijksoverheid.nl/documenten/rapporten/2015/09/18/visie-ov-betalen>.
- Nu.nl. (2016, April 12). Eén toeristenkaart voor al het ov, ook GVB doet mee. Retrieved April, 2016, from <http://www.nu.nl/amsterdam/4245770/toeristenkaart-al-ov-gvb-doet-mee.html>
- Passengerterminaltoday.com. (2016, April 7). Passenger Terminal Today. Retrieved May, 2016, from http://www.passengerterminaltoday.com/video_home.php
- Peachey, K. (2015, October 27). Mobile phones: Data roaming charges will be abolished. Retrieved April,

References

2016, from <http://www.bbc.com/news/business-34646434>

Stompff, G., Smulders, F.E.H.M. (2014, September). The right fidelity: Designedly representations that enhance multidisciplinary product development. In Proceedings of the 19th DMI: Academic design management conference 828-847. (2014). The Design Management Institute.

van Boeijen, A., Daalhuizen, J., Zijlstra, J., & van der Schoor, R. (Eds.). (2014). Delft Design Guide: Design Methods. BIS publishers.

van Kuijk, J. (n.d.). Innovatie? Lecture presented in Delft University of Technology, Delft.

WeCity Guide Amsterdam on the App Store. (n.d.). Retrieved May, 2016, from <https://itunes.apple.com/us/app/wecity-guide/id972680999?mt=8>

Wecity.guide. (n.d.). WeCity. Retrieved April, 2016, from <http://www.wecity.guide/>

Figure References

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The other photos were mostly taken during the field research by myself.

The following list provides the references for images retrieved from websites as well as the source of icons used throughout the report.

Images retrieved from websites

GoAbout.com. (n.d.). Figure 13. Go About - de persoonlijke reisplanner. Retrieved April, 2016, from <https://goabout.com/pages/about>

Messenger.klm.com. (n.d.). Figure 16. Enjoy KLM on Messenger. Retrieved April, 2016, from <https://messenger.klm.com/>

Mooveitapp.com. (n.d.). Figure 14. Getting Started is Easy! Retrieved April, 2016, from <http://mooveitapp.com/features/>

Passengerterminaltoday.com. (2016, April 7). Figure 17. Passenger Terminal Today. Retrieved May, 2016, from http://www.passengerterminaltoday.com/video_home.php

Touristdayticket.nl. (n.d.). Figure 12. Tourist Day Ticket. Retrieved from [http://touristdayticket.nl/?gclid=Cj0KEQjwhtO7BRctwuO9gfTH-fQBEiQAdJ8FYyUFHQgx0DD4rVohZW_J2inWJgaZ_7d2m2xRaHz-wPEaAj\\$28P8HAQ](http://touristdayticket.nl/?gclid=Cj0KEQjwhtO7BRctwuO9gfTH-fQBEiQAdJ8FYyUFHQgx0DD4rVohZW_J2inWJgaZ_7d2m2xRaHz-wPEaAj$28P8HAQ)

Icons used from The Noun Project website

23 icons. (n.d.) Billboard. Retrieved from <https://thenounproject.com/search/?q=billboard&i=145535>

Adaleru, A. (n.d.). Windmill. Retrieved from <https://thenounproject.com/search/?q=netherlands&i=190355>

Bovolden, J. (n.d.) Cell Phone. Retrieved from <https://thenounproject.com/search/?q=using+smartphone&i=38956>

Figure References

Creative Stall. (n.d.). Internet Browsing. Retrieved from <https://thenounproject.com/search/?q=internet&i=110518>

Drusilla. (n.d.). Street Sign. Retrieved from <https://thenounproject.com/search/?q=street+arrow&i=15073>

Elzahra, A. (n.d.). Robot. Retrieved from <https://thenounproject.com/search/?q=friendly+robot&i=15493>

Fevzi Çelik, M. (n.d.). Hot Drink Order. Retrieved from <https://thenounproject.com/search/?q=ordering&i=199614>

Fevzi Çelik, M. (n.d.). Mobile Payment. Retrieved from <https://thenounproject.com/search/?q=online+payment&i=199649>

Hali Gali Harun. (n.d.). GPS Signal Good. Retrieved from <https://thenounproject.com/search/?q=gps&i=415705>

Hancock, L. (n.d.). Bus. Retrieved from <https://thenounproject.com/search/?q=metro&i=40534>

Hans. (n.d.). Navigation. Retrieved from <https://thenounproject.com/search/?q=map&i=155636>

Hoogendoorn, J. (n.d.). Airport. Retrieved from <https://thenounproject.com/search/?q=airport&i=14018>

Hur, B. (n.d.). Apps. Retrieved from <https://thenounproject.com/search/?q=apps&i=98676>

icon 54. (n.d.). Map. Retrieved from <https://thenounproject.com/search/?q=route&i=223137>

Ivanov, A. (n.d.). Subway Barrier. Retrieved from <https://thenounproject.com/search/?q=subway+barrier&i=168792>

Jaspers, R. (n.d.). Card. Retrieved from <https://thenounproject.com/search/?q=holding+card&i=401945>

Jones, C. (n.d.). Tulip. Retrieved from <https://thenounproject.com/hivernoir/collection/the-netherlands/?i=99982>

Joseph, W. (n.d.). User. Retrieved from <https://thenounproject.com/search/?q=employee&i=28142>

Mitchell, M. (n.d.). House. Retrieved from <https://thenounproject.com/search/?q=house&i=17354>

Mountain, K. (n.d.). Suitcase. Retrieved from <https://thenounproject.com/search/?q=suitcase&i=4685>

Figure References

- Nandha Kumar, V. (n.d.). Volume Up. Retrieved from <https://thenounproject.com/search/?q=loudspeaker&i=221759>
- Orlandini, L. (n.d.). Erasmusbridge. Retrieved from <https://thenounproject.com/search/?q=rotterdam&i=26763>
- Pardo, L. (n.d.). Bus Stop. Retrieved from <https://thenounproject.com/search/?q=bus%20stop&i=268826>
- Piger. (n.d.). Credit Cards. Retrieved from <https://thenounproject.com/piger/collection/money/?oq=money&cidx=0&i=192263>
- Rosas Licht, P. (n.d.). Musuem. Retrieved from <https://thenounproject.com/search/?q=museum&i=17140>
- Ruiz, N. (n.d.). Bus. Retrieved from <https://thenounproject.com/search/?q=bus&i=9696>
- Schilder, S. (n.d.). Netherlands. Retrieved from <https://thenounproject.com/search/?q=netherlands&i=22755>
- Shlain, A. (n.d.). Station Clock. Retrieved from <https://thenounproject.com/search/?q=station&i=59508>
- Sotnikova, K. (n.d.). Arrow Right. Retrieved from <https://thenounproject.com/term/arrow-right/12589/>
- Sotnikova, K. (n.d.). You Are Here. Retrieved from <https://thenounproject.com/search/?q=wayfinding&i=12586>
- Trillana, J. (n.d.). Central Exchange. Retrieved from <https://thenounproject.com/search/?q=Central+Exchange&i=80111>
- Trillana, J. (n.d.). ATM. Retrieved from <https://thenounproject.com/search/?q=train&i=80106>
- Vermette, S. (n.d.). Cable Car. Retrieved from <https://thenounproject.com/term/tram/14233/>
- Vermette, S. (n.d.). Tram. Retrieved from <https://thenounproject.com/search/?q=metro&i=14231>
- Vicons Design. (n.d.). Information. Retrieved from <https://thenounproject.com/search/?q=information&i=15359>
- Volkova, P. (n.d.). Train. Retrieved from <https://thenounproject.com/search/?q=train&i=3809>
- Wiercinski, S. (n.d.). Buy. Retrieved from <https://thenounproject.com/search/?q=money&i=42256>

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