The design of an Demand Responsive Transport service for non digital travellers

Design report, October 2020

Seamless Personal Mobility Lab

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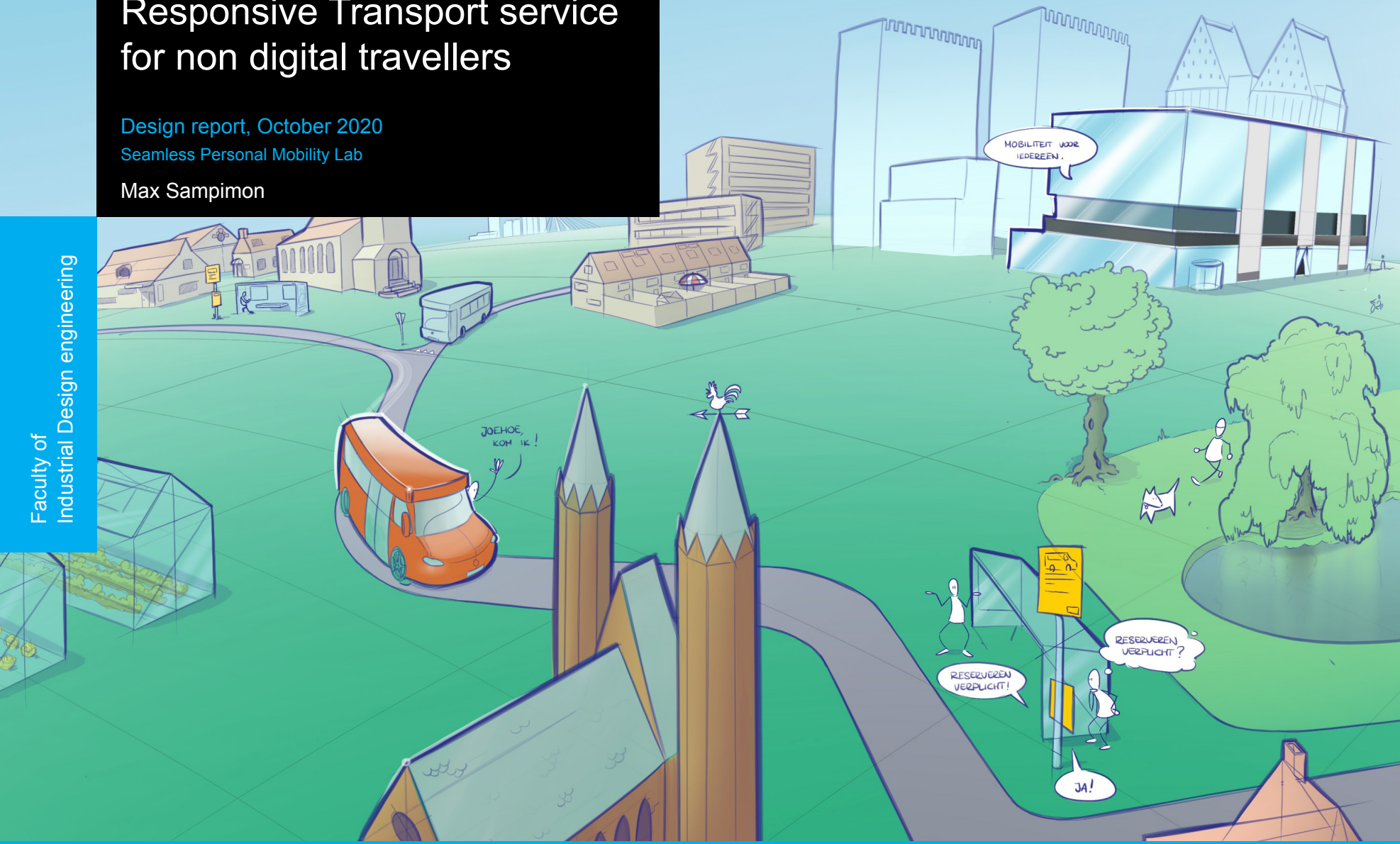
Faculty of Industrial Design engineering



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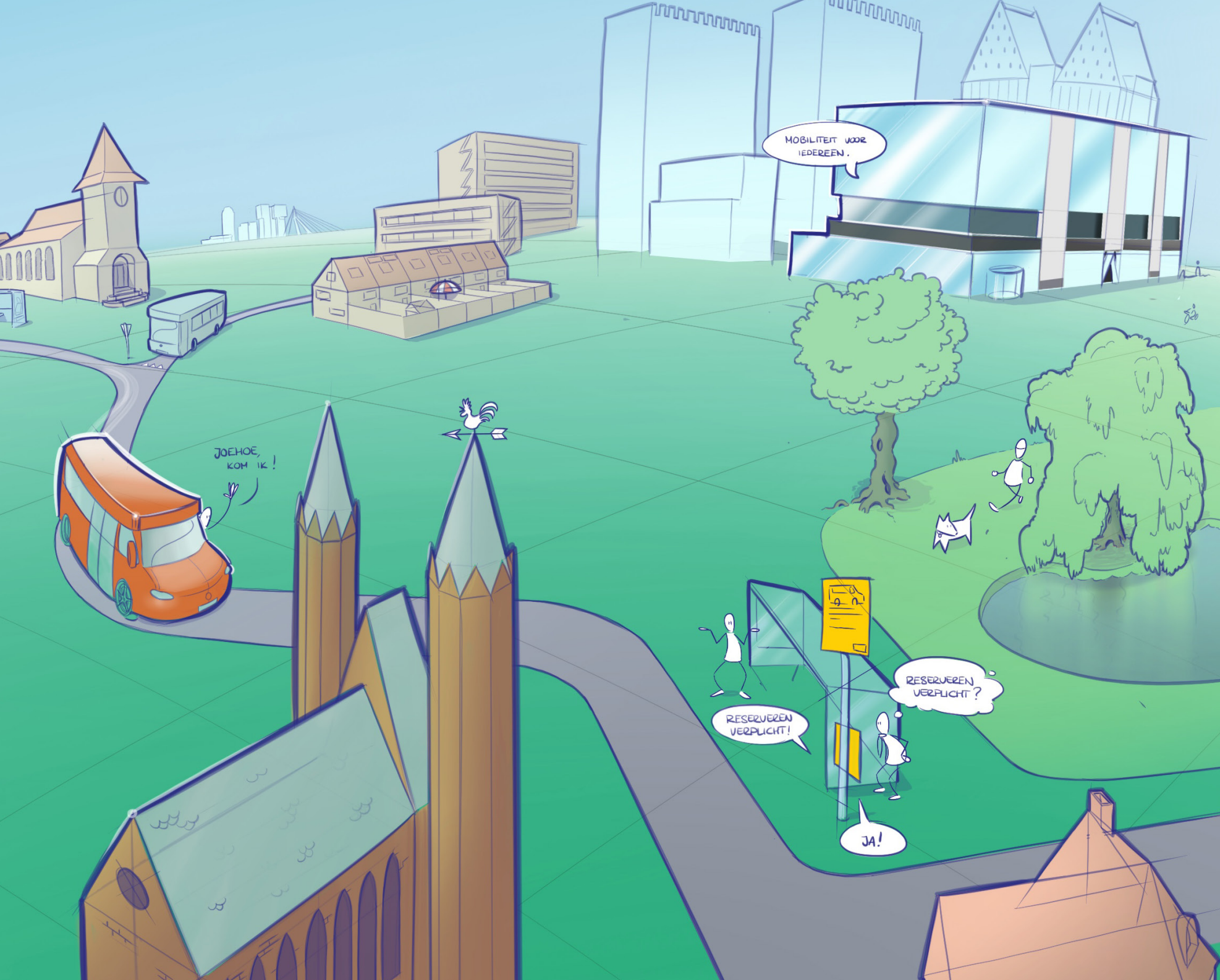
MOBILITEIT VOOR IEDEREEN.
JOEHOE, KOM IK!
RESERVEREN VERPLICHT?
RESERVEREN VERPLICHT!
JA!

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List of definitions

Concession	The right to perform public transport to the exclusion of others in a certain area during a certain period of time (Overheid.nl, 2019).
Concessionaire	Licensed public transport operator to whom a concession has been granted (Overheid.nl, 2019).
He/She	Wherever used in this report, the masculine third person is pronounced indiscriminately and it can be replaced by the opposite sex: ‘he’ can be ‘she’ as well.
Inclusivity	The practice or policy of including people who might otherwise be excluded or marginalized, such as those who have physical or mental disabilities and members of minority groups.
Indication	Throughout this report an indication refers to a person’s permission to paratransit in the Netherlands as a result of a specified disability.
On-demand	A service comes into play once it is being requested by a person.
OV-chipcard	The OV-chipcard is the payment method for public transport in the Netherlands. The OV-chipcard is a plastic card the size of a bank card and you charge the card with a balance in euros or you put a travel product on it, such as a one-way ticket, a monthly home-work travel subscription or a travel card. They are offered by different providers, as for example, NS, GVB or RET. Personal OV chip cards and anonymous OV chip cards are available. An OV-chipcard is always recognizable by the pink logo. The chip in the OV-chipcard is not visible (Translink, 2019c).
Special group transport	Special group transport refers to the form of on-demand transportation provided to travellers with an indication, which is also known as paratransit.
Public transport operato	A company that is primarily responsible for supervising or operating wheel vehicles to transport within a specified public transport region.
Usability	The extent to which a system, product or service can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use (ISO, 2010 / 2019?)
User/traveller	The research is concerned with the end-user or traveller. In most cases the term ‘user’ refers to a person that travels by using a DRT based vehicle in PT.

List of abbreviations

User experience	A person's perceptions and responses that result from the use and/or anticipated use of a system, product or service (ISO, 2010 / 2019?)
Fixed line transit	A bus that has a fixed route according to a fixed timetable.
Mobility-as-a-service	A new transport concept that integrates existing and new mobility services into one single digital platform, providing customized door-to-door transport and offering personalized trip planning and payment options. Instead of owning individual modes of transportation, or to complement them, customers would purchase mobility service packages tailored to their individual needs, or simply pay per trip (Durand, Harms, Hoogendoorn-Lanser, & Zijlstra, 2018).
Public transport authority	In the Netherlands, there are 12 public transport authorities, referred to as PT-authority, which are the authorities that specify the requirements of public transport within a specified area.

PT	Public transport
DRIP	Dynamic responsive information panel.
DRT	Demand responsive transport
Dova	Decentrale OV-autoriteiten
FLT	Fixed Line Transit
GVB	Gemeentelijk Vervoerbedrijf
RET	Rotterdamse Elektrische Tram
CROW	Centrum voor Regelgeving en Onderzoek in de Grond-, Water- en Wegenbouw en de Verkeerstechniek
IenW	Ministerie van Infrastructuur & Waterstaat
MaaS	Mobility as a Service
OV	Openbaar vervoer (In english: Public Transport)
AE	Autoethnographic
SGT	Special group transport
B2C	Business to customer
UI	User interface

Executive summary

Project setup

The Seamless Personal Mobility Lab is an initiative of the Faculty of Industrial Design Engineering at the TU Delft. In collaboration with several project partners a variety of graduation projects have been determined, of which this project is one. This project started in october 2019 with an analysis of Demand Responsive Transport (DRT) and relevant aspects, which was the starting point for this project (Sampimon, 2020).

Project relevance

Whereas Fixed Line Transit (FLT) runs according to a fixed schedule and route, DRT services operate on demand and therefore, only when and where needed. DRT services typically involve users calling a booking service which plans a route for the day to pick-up users and take them to their required destination (Interreg Europe, 2018). Due to the current usage of internet and GPS-enabled smartphones, operators are able to operate in real-time and on a large scale (Alonso et. al., 2018).

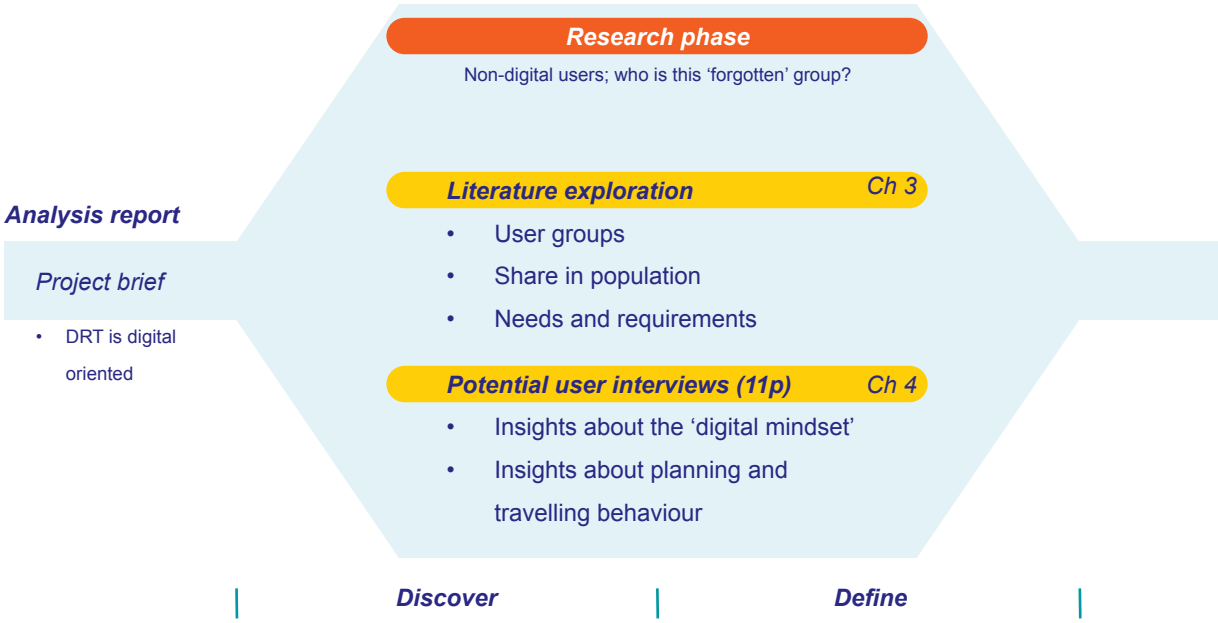
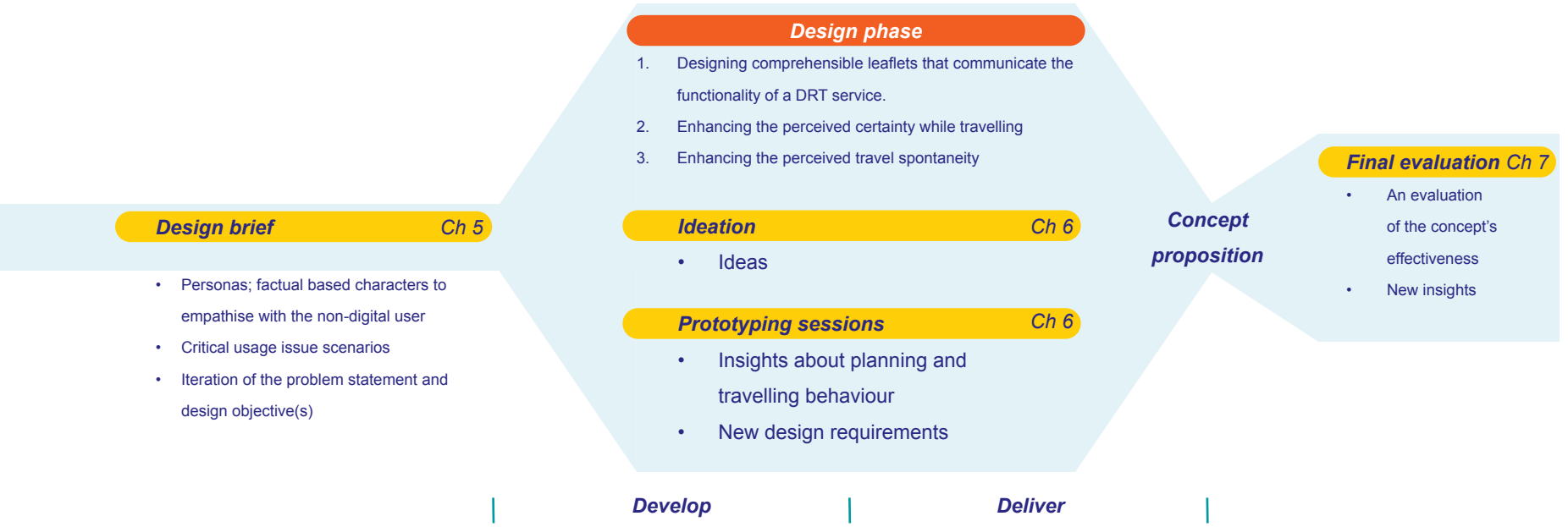


Figure 0.1: An overview of research and design activities described in this project.


Design phase
1. Designing comprehensible leaflets that communicate the functionality of a DRT service.
2. Enhancing the perceived certainty while travelling
3. Enhancing the perceived travel spontaneity
Design brief Ch 5
• Personas; factual based characters to empathise with the non-digital user
• Critical usage issue scenarios
• Iteration of the problem statement and design objective(s)
Ideation Ch 6
• Ideas
Prototyping sessions Ch 6
• Insights about planning and travelling behaviour
• New design requirements
Concept proposition
Final evaluation Ch 7
• An evaluation of the concept's effectiveness
• New insights
Develop
Deliver

Currently, there are 37 DRT services active in The Netherlands under the umbrella of 8 operators. They often get implemented in order to maintain public transport in low-demand areas.

Many cases in the Netherlands show that occupancy rates have dropped once DRT services get implemented. From conducting interviews, reading online reviews and exploring literature (Sampimon, 2020) (OV loket, 2019), it has been concluded that the majority of users find the implementation of DRT a deterioration of the user experience, playing a role in the dropping rate. The issues are:

1. People are not familiar with DRT and therefore, the fact that a reservation is required remains unnoticed.
2. It requires more actions to initiate the journey and therefore, more effort.
3. The minimum reservation time in advance limits the spontaneity.
4. Departure and arrival times are often inconsistent. Insufficient feedback decreases the certainty of travelling.

With the digital possibilities that are provided in smartphone apps, these issues are acceptable. However, lacking these possibilities makes the user experience even worse. Currently 20% of Dutch households are lacking digital skills. Therefore, the objective of this project is to design a DRT service that is enhanced for the non-digital users.

Approach

For the design structure a double diamond approach is taken. The first diamond consists of a literature exploration in which the non-digital user is identified, including the share in the population and their needs and requirements in the context of products and services. Secondly, the identified users were approached for in-depth interviews in which their travel and planning behaviour is determined.

The second diamond is dedicated to designing a DRT service accessible for the non-digital users. The insights of the in-depth interviews have led to design requirements. From there, in the second diamond ideas have been prototyped leading to new insights.

Results

Literature has provided a list of characteristics that are often related to low digital literacy (Durand et. al., 2019) (Stichting lezen en schrijven a, 2017).

- Being elderly
- Having low literacy
- Having a migration background
- Having a low income
- Being long term unemployed
- Having a low education degree

Besides demographic characteristics, there are also three groups of non-digital users identified in this research based on interviews and observations; the obstructed, the not-invested and the fundamentalists. These groups can be categorized in whether they do not want to use digital services or whether they cannot use it because they lack the skills. In order to empathise with the people within these groups, five personas are created: the low literates, the conservatives, the low understanders, the opportunists and finally, the digital detoxers. These personas are inspiring during the research and development process of any service that is influenced by the digitisation.

Apart from whether they want to use it or not, low literates lack digital skills because they have difficulties reading. The conservative however, is not willing to develop digital skills. A less severe type is the low understander. This group does use often digital products and services, but has difficulties understanding them and therefore rather avoids them. The opportunist can be very invested in their smartphone and using apps such as whatsapp and their camera a lot. However, their knowledge is mainly situated in recreational apps, rather than functional apps. Finally, the digital detoxers are deliberately choosing not to use a smartphone because they find it a degeneration of society and believe that they are better off without. Besides, they do not want to be obliged to use a smartphone and therefore, they are fundamentally against it too.

Interviews with users that fit the description of the personas have provide an understanding of the issues related to the non-digital users, which is described below.

Being aware

The non-digital users are not familiar with DRT services. They do not feel addressed with the advertisements which often include the instructions of using a smartphone app and believe that it does not apply to them. This results in ignoring the fact that they have to make a reservation.

Not feeling certain while travelling

Users are afraid that they do something wrong during the booking process, which leads to missing the bus. A lack of information in the bus shelters, makes them feel uncertain while waiting for the bus.

Planning and booking

Most users find DRT a deterioration of PT. They feel like it limits them in travelling spontaneously and it requires more effort and sometimes experience complications in their planning. Nevertheless, when users leave from home, they find it acceptable to call the call centre to make a reservation. Also, they often go straight to their destination. When they go back however, they want to have more flexibility and not be restricted to a fixed time or route, nor being depending on having a (mobile) phone.

Concept proposition

Based on the insights, the concept proposes a customer journey that is enhanced for the needs of non-digital users.

First of all, the user is informed about the existence and functionality of the DRT service via comprehensible and appealing posters and leaflets. The leaflets are distributed at locations that are often related to the characteristics of the non-digital users.

Secondly, the bus platforms are equipped with Dynamic Responsive Information Panels (DRIPs) that display the actual departure times of the DRT bus. In this case, the user has a confirmation of the bus. The second addition is a reservation pole, which allows the user to call up the DRT service if missed and letting them know that he/she is standing there. This enhances the perceived certainty.

Thirdly, a device is provided that enables the user to make a reservation while travelling at the last moment. Using the device requires two tasks: the user has to choose the destination and to make a booking by switching the button. The user can cancel the ride by switching it back, which results in having a more spontaneous journey. Additionally, the device displays the actual departure time of the next possible option, which enables the user to consult travel information in one glance.

Final evaluation of desirability and technical and financial feasibility

Whether the concept is achieving these predefined goals, is evaluated with a group of voluntary test participants. Most participants see the additional value of the concept as a whole.

The leaflet and poster are found appealing and clear. The format in which short bits of text are richly supported by pictures, with a clear reading direction

from why to how, a large font size and contrasting colours, is a huge improvement regarding the readability for any type of user and particularly the non-digital user.

The reservation device is well received too. Although participants mentioned some flaws in the interaction of the interface, they said that having a small handheld device enabling to book easily does enhance the perceived travel spontaneity and certainty.

The financial and technical feasibility is evaluated by companies in the PT industry. It is technically feasible. The busses could be equipped with GPS systems and connected to currently existing software. This software allows the operator to send out information about actual arrival and departure times to the DRIPs and reservation devices. Also, the reservation device could be equipped with a SIM card and GPS, enabling the user to make reservations from the bus station most nearby.

It is arguable whether the PT companies are willing to invest in the concept. Regarding the reservation device, they mentioned that buying and even paying a deposit is considered to be a huge barrier for the target groups. Also, RET, responsible for the STOP&GO stressed that DRT services are often deployed for low demand areas and therefore aim to save costs, which contradicts investing in extra equipment without knowing how many more rides it could gain.

Final conclusion

There is a substantial amount of people (almost 3,5 mln) in The Netherlands that do not want or can’t use a smartphone. The personas achieve in raising awareness about these user groups while getting acquainted with their motives, needs and requirements. The personas are usable throughout any industry that is changing due to the digitisation.

Using posters and handing out flyers that are comprehensible is an effective approach in making DRT services more accessible for non-digital users, while being relatively easy to implement and inexpensive. The DRIPs take care of a reasonable provision of travel information, contributing to a confident travel experience. Whereas the reservation device requires more development, the poster, flyers and DRIPs are suitable to implement in the short run.

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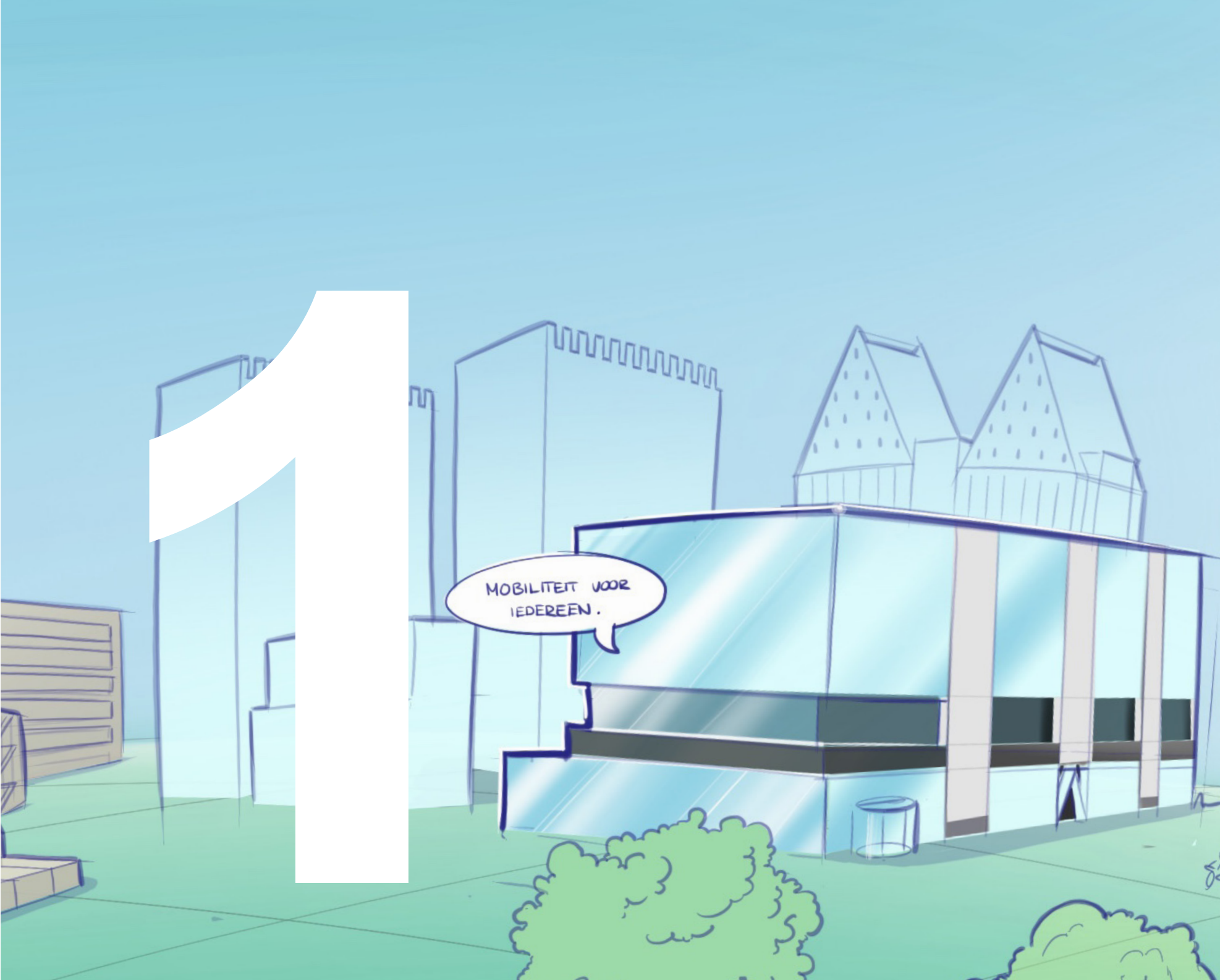


01 - Project introduction

In the last years, a variety of Demand Responsive Transport (DRT) services in the Netherlands have arisen. In previous research DRT services have been analysed and have determined the factors that influence the user experience. A problem has been identified which is the starting point of this project. This chapter describes what a DRT service is and why it is implemented. Secondly, the problem is defined including the corresponding research questions and a project objective. Finally, an appropriate research and design approach taken to achieve the project objective is described.

1.1 Demand Responsive Transport

1.1.1 What is DRT?

Traditionally, public transport has a fixed schedule and route. Demand responsive transport (DRT) is a flexible mode of transportation that adapts to the temporal and sometimes spatial demands of its user groups (Interreg Europe, 2018). DRT services can range from fully flexible routes, destinations and timetables, to more rigid configurations (Alonso et al, 2018). The various configurations are presented in an overview of Davidson et. al. (2012).

Whereas fixed line transit (FLT) runs according to a fixed schedule and route, DRT services operate on demand and therefore, only when and where needed (see figure 4).

	Configurations		
Route	Fully flexible	Semi flexible, route deviation	Fixed
Timetable	On demand	Checkpoint	Fixed
Booking timescales	More than a week in advance	A week in advance to the day before	On the day
Booking method	Online	Call centre	On bus
Vehicle type	Car	Minibus	Bus

Figure 1.1: The various configurations of DRT (Davidson et. al., 2012).

The concept of DRT did its appearance in the early 90's. DRT services typically involve users calling a booking service which plans a route for the day to pick-up users and take them to their required destination (Interreg Europe, 2018). Due to the current usage of internet and GPS-enabled smartphones, operators are able to operate in real-time and on a large scale (Alonso et. al., 2018). For the users this means that the services often provide a website or a mobile application that enables the users to order by using a computer or a mobile,- or smartphone.

Dutch DRT services typically use mini buses with a capacity of 8 passenger seats. In lower-demand areas passenger cars are used (Sampimon, 2020).

This research is focussed on the most common type of DRT in the Netherlands, which seems to be most reliable too. Busses in this type move from station to station within an area. Theoretically, there is a route including a time schedule, but it possibly skips a station on the route. So, a traveller only gets picked up if a reservation is made and besides, there is a limited capacity, since these services use smaller vehicles in which a seatbelt is obliged.

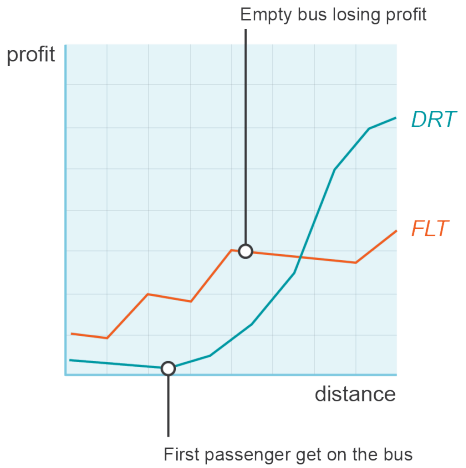


Figure 1.2: The distance over profit ratio of FLT compared to DRT based on impression.

Figure 1.3: A typical mini bus used for DRT services.

1.1.2 Why is DRT being implemented?

In the Netherlands, there are 12 decentralised public transport authorities. PT-authorities aim to provide public transport for a specified area by recording the requirements of PT in their regional policies. These policies are described in a concession. A concessionaire is a public transport operator that has the right to exploit public transport according to the concession (Europadecentraal, 2020) (Rijksoverheid, 2018). The Ombudsman has identified that concessionaires in consultation with their decentralised public transport authority put focus on profitable connections, such as DRT. In low-density or other less lucrative areas, this results in replacing fixed transit lines by demand responsive transport (DRT) services (OV-loket, 2017). But why is it more profitable?

As has been described above, it only runs when needed. Compared to FLT, this effective approach, combined with the typically smaller vehicles are responsible for less congestion, less vibrations and lower costs for the operator. Besides improving the effectiveness of transport, it is expected that increasing the flexibility enables the operator to better respond to user needs, which, if the user is aware, results in higher attractiveness of using PT (Sampimon, 2020). All in all, in theory the performance of this new type of transport is considered to be an improvement compared to FLT. However, it seems that the user's opinion is not taken into account enough.

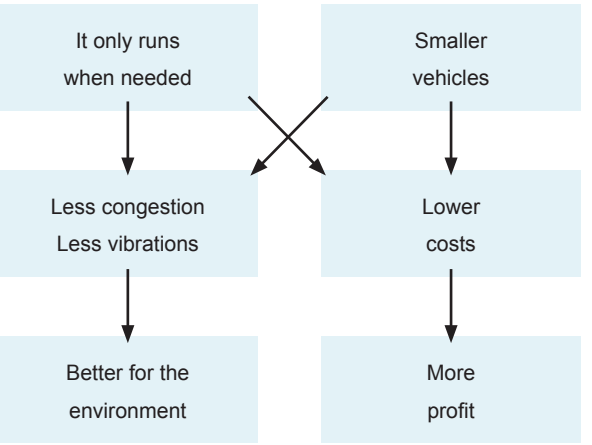
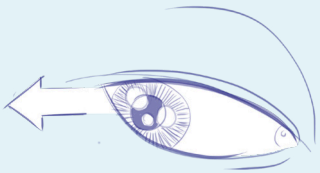


Figure 1.4: The benefits of DRT services.

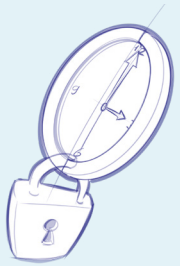


“I’m not familiar with DRT.”
“It is only distracting and I don’t want it.”

Travellers are unfamiliar with DRT and therefore, ignore it.

“It requires more effort and planning than I’m used to.”

It requires more actions to initiate the journey and therefore, more effort.



“I want to be able to drink another cup of coffee.”

The requirement to make a reservation in advance limits the spontaneity.

“Sometime I have no clue if the bus actually comes.”

Departure and arrival times are often inconsistent. Insufficient feedback decreases the certainty of travelling.

Figure 1.5: Source: Sampimon (2020).

1.2 The problem statement

Theoretically, the performance of DRT in terms of environment and costs beat these of FLT. However, many cases in the Netherlands show that occupancy rates have dropped once DRT is implemented. It has been identified that there are several problems playing a role in these dropping rates. From conducting interviews, reading online reviews and exploring literature (Sampimon, 2020), it has been concluded that the majority of users find the implementation of DRT a deterioration of the user experience. The most common reason is that it requires more actions to initiate the journey and therefore, more effort. Other issues are shown up here (figure 5).

But, this same research also shows that the digital possibilities partly solve these problems and therefore, enhance the perceived user experience. More problematic are users that do not have access to these digital possibilities. At the symposium of Railforum about digital inclusivity, this group was referred to as the ‘unseen and forgotten’ group. This group might be different than most of us are and therefore, they are often forgotten.

More and more services and routines are “digital by default”, including the nature of DRT services. According to previous research (Sampimon, 2020), it is considered that many new DRT services throughout the Netherlands are digital oriented. It seems that the services are designed with the digital possibilities in mind rather than having a physical alternative. Lacking a

digital device, which is the case for this ‘forgotten group’ limits the possibility to get informed about the new type of service’s functionality. Also, it limits the feedback about actual schedule updates and finally, lacking the ownership of a mobile,- or smartphone limits the traveller’s spontaneous planning. For the user, this means that having and willing to use an internet and GPS enabled device, such as a smartphone, significantly enhances the user experience.

The problem statement is defined as follows:

“Travellers that do not want to or cannot use a smartphone have limited access to the digital possibilities that enhance the user experience. These travellers lack being informed sufficiently about the new type of service’s functionality, which might result in issues during usage. Also during usage, they have less feedback about actual schedule updates. And finally, lacking the ownership of a mobile phone limits the traveller’s spontaneous planning.”

1.3 The bigger picture

1.3.1 A digitising world

We live in a digitising world: More and more services and routines are “digital by default”, including the most common appearance of DRT services. If the rise of a digital infrastructure in public transport is accompanied with a disappearance of physical accessibility, the travellers’ dependency on ICT in transport increases. For travellers that do not want to or can not cope with the digital transformations this can result in an increase of digital inequality or even digital exclusion (Durand et al., 2019).

This “digital barrier” causes mobility poverty for this group, which might result in exclusion from the society (Durand et. al., 2019) (Sampimon, 2020). This is not in line with the vision of our government. The government aims to act from a social and ethical point of view. Rijksoverheid states in their mobility vision for 2040 that mobility is inclusive, so that everyone in the spectrum could travel: rich and poor, young and old, healthy and disabled (Rijksoverheid, 2019). According to Cambridge university the definition of inclusivity is “The practice or policy of providing equal access to opportunities and resources for people who might otherwise be excluded or marginalized, such as those having physical or mental disabilities or belonging to other minority groups” (Lexico, 2020). Also, considering the crowded room during the symposium about digital inclusivity organized by Railforum, it can be concluded that inclusivity is high on the agenda for policy makers and management in the transport industry. During the symposium speakers and the audience raised concern about who is affected by (digital) exclusion and how to design for them.

1.3.2 The ‘forgotten and unseen group’

The approximate size of this group in the Dutch population is two million people, which is considered to be a high number for a country that has a relatively high degree of internet usage. According to several statements of visitors of the symposium, it became apparent that there is not a clear view of who these groups actually are, let alone, how to design for them. Therefore, the second problem that has been identified is that the industry has no sight of which travellers are affected by these digital transformations.

The groups that are often related to low digital literacy are elderly, resulting in people thinking that the problem will disappear over time. However, other groups might cope with it too, as for instance people with a lower education degree, people with a lower income and people with low literacy (Durand et al., 2019) (Pact-Amsterdam, 2017). There will remain at least 10% low digitally skilled in the future which is a reason to include them in public services. A more elaborated differentiation accompanied with a description, including demographic information about the target group is described in the literature exploration on digital behaviour (chapter 3).

1.3.3 Opportunities

Any problem comes with opportunities. The objective of this study is to enhance DRT services for people that are not using digital devices in public transport. Therefore, it aims to contribute to defining this user group and getting an understanding of their needs and requirements related to DRT services. The outcome might be inspiration for the rapidly digitising mobility industry as a whole.

Finally, designing policies and services for the needs of this still unexplored user group could lead to new market penetration, which eventually lead to an increase of occupancy and therefore, profit (see figure 6).

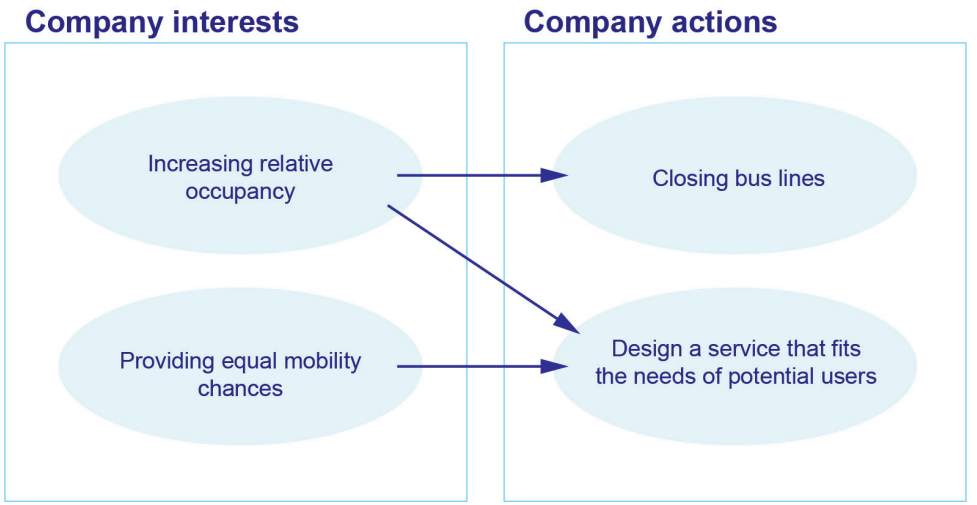


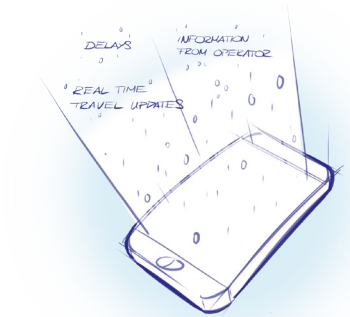
Figure 1.6: Identified interests of governmental organisations and affiliated organisations, such as public transport organisation places in a matrix, followed by possible strategies.

1.4 Research and design approach

In the previous sections, a definition of the problem statement is described and substantiated with the relevance of the problem in the digitising world. Also, the opportunities provide more reasons to dedicate this project to it. This section aims to deconstruct the problem statement in such a way that it is workable for this project. Therefore, some corresponding research questions are defined in section 1.4.1. Also, it proposes a suitable research and design approach, that describes a general outline for the process in section 1.4.2. An overview of the project's process including conversions of focus is shown in figure 1 in the executive summary.

1.4.1 Research questions; Demand Responsive Transport and its 'forgotten' users

The previous sections describe the problem statement. When deconstructing it, two questions arise.



"the digital possibilities"

What are the digital possibilities and how is it affecting the user experience for these users?

1. What are the digital possibilities and how is it affecting the user experience for these users?
2. Who are the users that do not want or cannot use the digital possibilities?

Since the previous research already has touched upon the digital possibilities and how this affects the user experience for general users, this data is consulted first.

The second research goal is to identify the travellers that do not want to or cannot use a smartphone. Also, it is aimed to determine their needs and requirements in order to design for them and finally, as we know that this group is below the radar, it is aimed to determine its population share in order to substantiate the relevance of this project.

"Travellers that do not want to or cannot use a smartphone"

Who are these users?

1.4.2 Methodology; justification of the research and design proces

A grounded approach for coming up with a proposition that has a high success potential requires an highly iterative process of validating assumptions. From experience, such a process is not linear, but rather messy and involves reflection and taking steps back sometimes. This is illustrated in figure 7.

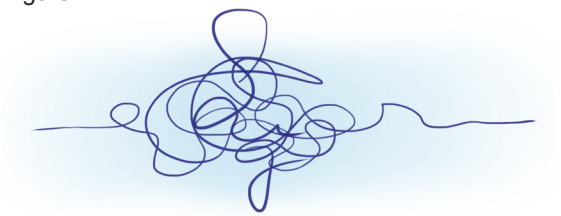


Figure 1.7: An illustration of the design process mess.

Nevertheless, the general outlines of a research and design process, can be illustrated according to a double diamond. A double diamond articulates a typical outline structure for many design processes (Stickdorn et. al., 2011).

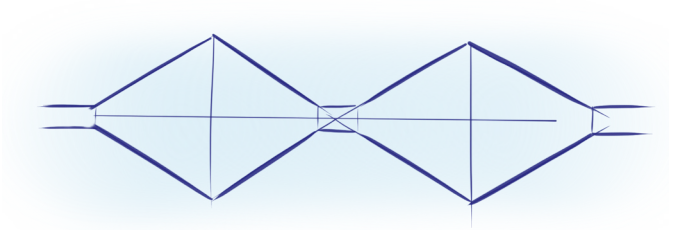


Figure 1.8: An illustration of the double diamond.

Each diamond can be split up in halves. The left halves of a diamond refer to diverging the information and directions and the right halves refer to scoping down again.

More specifically, the first diamond exists of discovering the problem related to the users within their context, followed by defining the problem. According to the Delft Design Guide (van Boeijen et. al., 2014a), this is called the analysis phase related to the design problem or goal, such as values, needs and functionality.

The second diamond consists of developing and delivering. Everything in the first half is referred to as ideation or development, followed by delivering a promising concept.

During the development and delivery stages of the second diamond, the Delft Design Guide describes an iterative plan to take into consideration. This plan is circular and therefore allows repetition several times. This repetition of synthesizing, simulating, evaluating, deciding and iterating is referred to as design cycles. This is elaborated in chapter 6.

Eventually, designers have to switch between detail and holistically and make decisions about desirability of the users, technical feasibility, financial feasibility and social responsibility (IDEO, 2015) and of course, the views of the clients (Stickdorn et. al., 2011a).

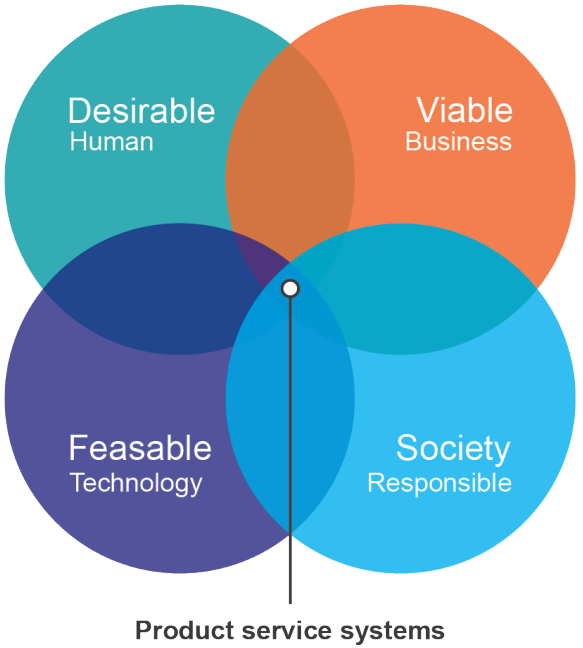


Figure 1.9: The adapted model of IDEO's ideal product service system (Van Kuijk, 2016).

The model on the left side shows where the ideal service lies in the spectrum of four drivers: technological and financial feasibility, social responsibility and human's desirability. Designers have to switch between a detailed and a holistic view of these drivers. Since this project aims to enhance the users experience, this research is wrapped around the needs and requirements of the users, which are taken as a starting point for the design process.


2
JOEHOE, KOM IK!

02 - Demand Responsive Transport; an elaborate description of digital features

The digitisation provides us with opportunities and possibilities. Most people in the Netherlands make optimal use of the possibilities of a smartphone, but some less and others not at all. This is called the digital divide and is described in chapter 3.1. We assume that this is a given fact. However in the scenario of implementing DRT there is no alternative, which is problematic because we need mobility to participate in everyday life. For example buying groceries, social intercourse and taking part in the labour market. Previous research has shown (Sampimon, 2020) (Velaga et.al., 2012), that switching from FLT to DRT is perceived as a deterioration for the majority of the users, but the compromise is that the digital possibilities makes adapting rather easy. Nevertheless, this is not true for non-digital users, which makes the change FLT to DRT a huge deterioration. In this chapter it is explained why digital possibilities make it easier. In order to do so, the previous research on a DRT customer journey map presented in the analysis report has been resourced (Sampimon, 2020). The analysis report describes the general actions involved in interacting with a DRT service, which are referred to as interaction moments. This is accompanied by the available resources required to perform the actions. This customer journey map including the actions and resources presented in section 2.1.

In section 2.2, the time related issues using a DRT service is described. It also explains how DRT affects the spontaneity in travel behaviour compared to FLT and how non-digital users are even more disadvantaged on the time related aspect.

Besides the time related aspect, section 2.3, presents other benefits of using a mobile- or smartphone. This implies that users without these resources do not have access to the benefits. Section 2.4 investigates if the OV-chipcard is digital oriented and finally, in 2.5 this chapter is wrapped up with some conclusions and take-aways.

2.1 Interaction moments and resources related to the pre-booking phase

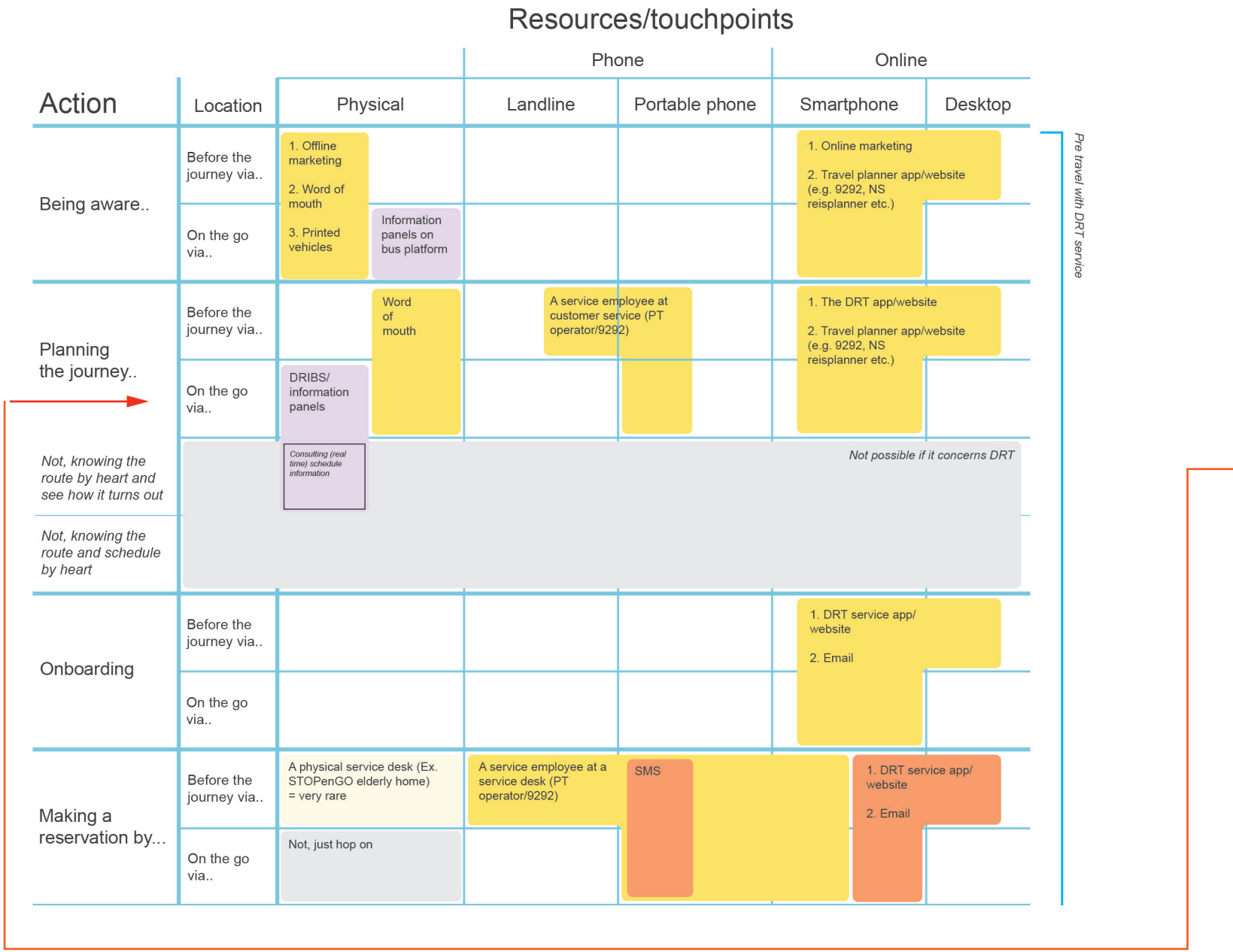
2.1.1 Interaction moments related to the pre-booking phase

Compared to FLT, the user has to perform several additional actions before the actual in-vehicle time. This section aims to present these actions and its available resources involved in the pre-booking phase.

Basically, it is everything in which the user gives information to or gets information from the service operator before the actual “in-vehicle time” (De Ridder, 2018). For this research we look into the first part of the customer journey map, which is everything before actually getting on the bus. This phase is referred to as the pre-booking phase. The customer journey of the pre-travel phase, including the pre-booking phase is presented in figure 2. For each action in the customer journey, the available resources are shown. It also proposes that the actions can be performed either before the journey or while travelling, with a difference in available resources.

Figure 2.1: An example of the marketing stickers on the minibus.

Figure 2.2: An overview of each interaction moment in the pre-travel phase (Sampimon, 2020).


Resources/touchpoints
Phone
Online
Action
Location
Physical
Landline
Portable phone
Smartphone
Desktop
Being aware..
Before the journey via..
On the go via..
1. Offline marketing
2. Word of mouth
3. Printed vehicles
Information panels on bus platform
1. Online marketing
2. Travel planner app/website (e.g. 9292, NS reisplanner etc.)
Planning the journey..
Before the journey via..
On the go via..
Word of mouth
A service employee at customer service (PT operator/9292)
1. The DRT app/website
2. Travel planner app/website (e.g. 9292, NS reisplanner etc.)
DRIBS/ information panels
Consulting (real time) schedule information
Not, knowing the route by heart and see how it turns out
Not, knowing the route and schedule by heart
Not possible if it concerns DRT
Onboarding
Before the journey via..
On the go via..
1. DRT service app/ website
2. Email
Making a reservation by...
Before the journey via..
On the go via..
A physical service desk (Ex. STOPenGO elderly home) = very rare
Not, just hop on
A service employee at a service desk (PT operator/9292)
SMS
1. DRT service app/ website
2. Email
Pre travel with DRT service

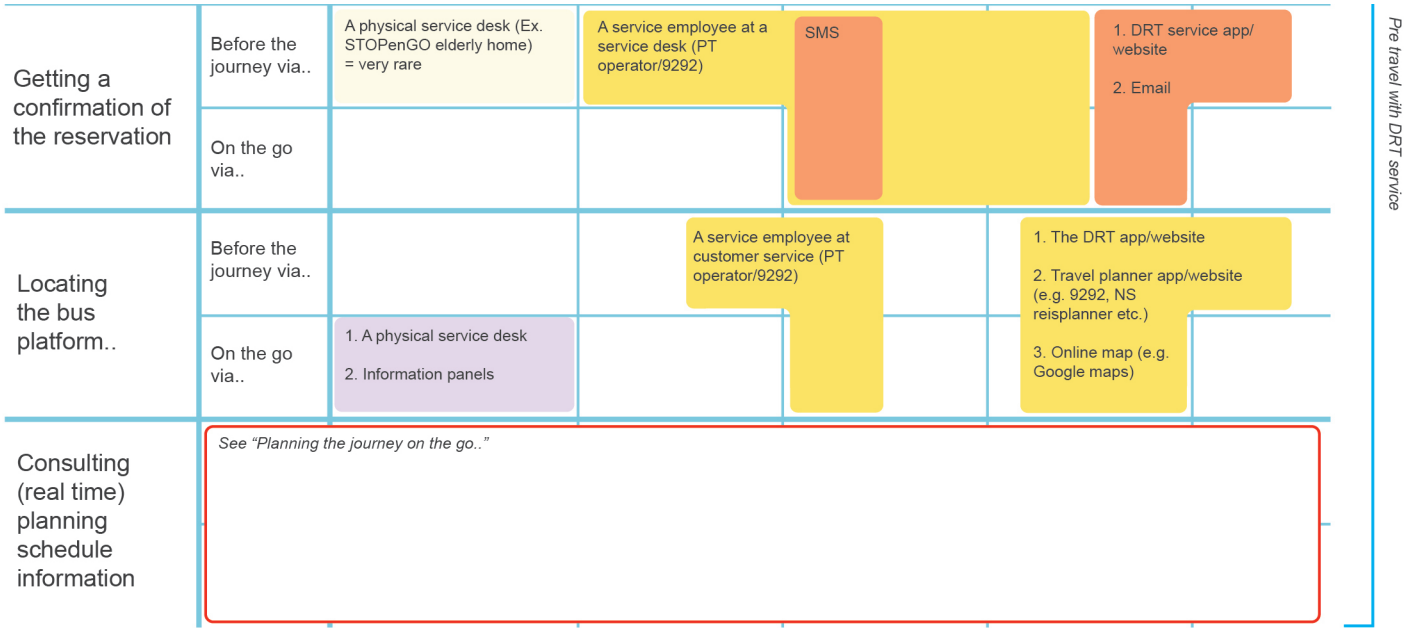


Figure 2.3: The customer journey map of available resources per action (Sampimon, 2020)

2.2.2 Resources related to the pre-booking phase

In figure 3 a customer journey of the pre-travel phase is presented. This overview shows the resources that are available for each interaction moment. The resources categorised as physical are for example bus company names, information panels on bus platforms or physical service counters. Furthermore, landline and mobile phone are classified under phone, which refers to the call centre as a resource and finally, the smartphone and desktop computer are classified as online and refers to the online planning websites and applications. Note that mobile phone- and smartphone users are able to perform the actions while travelling, whereas the physical resources, the landline and the desktop computer are fixed in one place. Besides, physical service desks are except for one example, never incorporated in Dutch DRT services. This implies that the physical accessibility of the actions are limited, but this also affects the spontaneity of the travel behaviour. More on this is described in the next section.

2.2 Requiring to book in advance limits the travel spontaneity

De Ridder (2018) considers the pre-booking and the minimum pre-booking time as distinctive features of DRT.

The minimum pre-booking time is considered to be affecting the perceived spontaneity of the travellers. Users are not in the position to just start their trip when they want, but instead have to order in advance, and sometimes long in advance. The majority of users prefer to plan the trip instantly (De Ridder, 2018). Timeline also shows that the traveller has to deal with inconsistent departure and arrival times. For departure times there is a lack of flexibility in most DRT schemes.

Ideally, you can book your return trip online at the last moment and you can get information on real time disruptions and detours at any time to minimise unnecessary waiting. But, users without a mobile - or smartphone are forced to plan ahead and are not updated on disruptions or detours. If travellers are used to FLT, this infringes spontaneous travel behaviour and perceived reliability. Additionally, the mobile- and smartphone have other benefits. These benefits are described in section 2.3.

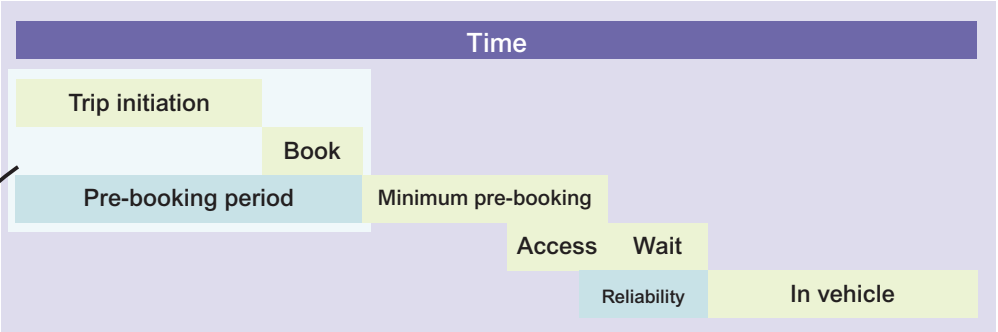


Figure 2.4: A timeline of time-related elements of DRT (bars are not scaled) (De Ridder, 2018).

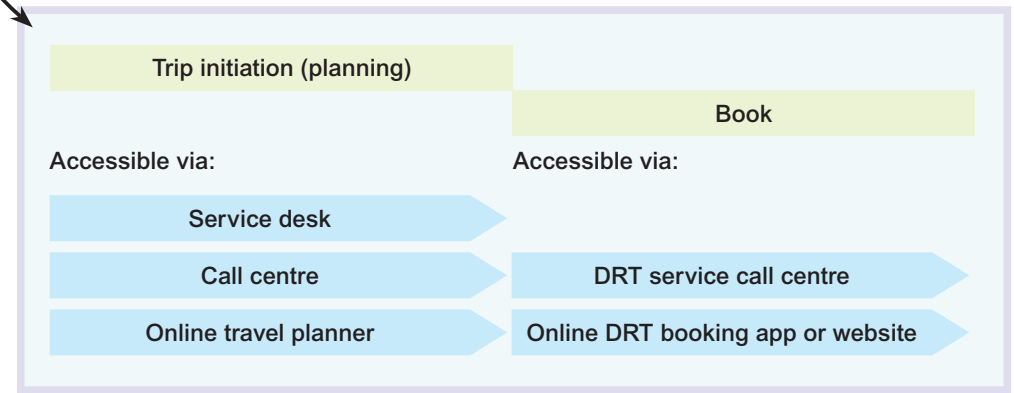


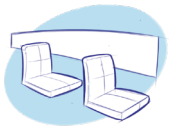
Figure 2.5: An extended overview of the trip initiation including the options to plan via a PT information counter, via the 9292 travel planner call centre or via the online travel planner websites or applications.

2.3 Why mobile- and smartphones have benefits

A study from the Netherlands concentrate on the user perspectives of the elderly for the DRT service BrengFlex. Jittapirom et. al. (2019) presented the user perspective of this service, a public shared on-demand transport service, where users can make a reservation using their smartphone or calling a helpdesk. Experts in their study considered BrengFlex not a viable option for the elderly as they can make no use of digital possibilities; “to fully benefit from the available service functionalities, travellers are required to access the service via its app. The advantages of using a mobile- or smartphone as a resource to perform each action is shown in the overview of figure 6 and is further described below.

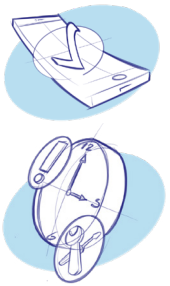
Being aware of the existence is not self-evident

First, being aware of the DRT service’s existence is often determined by a certain type of marketing. Think of stickers on buses or information panels on bus platforms. However, travellers that plan the journey via the online travel planner get a notification about the new type of service. This is an advantage, because it allows the traveller to use the deep link and consult the relevant information. Also, they are immediately able to use it and therefore to anticipate their transfer.



Making a booking requires a phone connection and consulting real-time schedule information requires a data plan

Second, making a reservation requires a phone connection. However, people without a mobile phone cannot do this while travelling. Travellers who make a reservation via a call centre do not get a confirmation nor the possibility to consult real time travel information like delays.



Getting a confirmation and updates about the ride is only possible if the user is onboard

If the user has an account for the app and made a reservation, she/he gets a confirmation. This also allows the user to track the bus which eliminates unnecessary waiting at the bus station.

Figure 2.6: The benefits of using a smartphone apps when using a DRT service (Sampimon, 2020) (Jittapirom et. al., 2019)

2.4 The OV-chipcard and digital skills

Besides the typical digital features of DRT, there are other aspects of PT that are digital oriented. An important aspect is the payment transaction with the OV-chipcard. Basic functionality of the current OV-chipcard involves obtaining the physical card and managing transactions, which can be performed both online and offline. However, a certain amount of digital knowledge is needed to perform these actions and getting the most out of the possibilities. Examples that require digital skills are; filling online forms, downloading and uploading a personal picture (for a personal OV-chipcard), setting up personal preferences and consulting the history of the travel transactions. Interviews in Utrecht by FIXME have shown that some users struggle with the OV-chipcard and some even walk to the central station of Utrecht. On the other hand, the majority of users including elderly wish to use the OV-chipcard (Afdeling onderzoek gemeente Utrecht, 2015). Since the basic functionality is accessible offline, the OV-chipcard is considered to have a place in the final design, which later on will be assessed during interviews and prototyping with the users (chapter 4).

2.5 Conclusions

The customer journey map shows that mobile resources, such as the mobile phone and smartphone allow the user to perform the required actions at any time and any place, which lets the user plan and book their journey at the last moment. The smartphone also allows the use of several more important features that significantly improve the user experience, such as getting notified about the existence of a DRT service, having the possibility to plan anywhere, getting a confirmation of the reservation, the possibility to locate the bus platform and to consult and being notified about (real-time) schedule updates, which minimises unnecessary waiting at bus station in case of changed departure times. This means that users who lack these resources do not have access to the benefits and is it fair to say that these users are not taken into account for this type of service.


3
RESERVEREN VERPLICHT!
RESERVEREN VERPLICHT?
JA!

03 - A literature exploration on the ‘forgotten’ group

It is safe to say that many DRT services are digital oriented. Additionally, there are some leads, touched upon in the problem statement described in chapter 1, indicating that some travellers cannot or do not want to cope with the digital transformations and therefore, these travellers do sometimes not have the same opportunities. This is called the digital divide (Durand et. al., 2019) and is elaborated in section 3.1. This group is earlier referred to as the ‘forgotten group’ because in the current digital society, they are not always taken into account.

The objective of this chapter is to present the knowledge gained from comprehensive studies of literature about the ‘forgotten’ group and digital behaviour. Since it is unclear who this group consists of, the leading question to answer is; who is on the other side of the digital divide and what are their reasons. Also, what should be taken into account when redesigning or enhancing DRT services in order to be more accessible.

Since the literature studies have shown that their reasons do not have one origin, categories are made. Literature by Durand et. al., (2019) has attempted to make categories, which will be leading in this chapter.

These people often have one or more of the following characteristics:

- Being elderly
- Having low literacy
- Having a migration background
- Having a low income
- Being long term unemployed
- Having a low education degree

Each pre-defined category has a dedicated sub section in this chapter. This is followed by a section that is dedicated to present an estimation of the population share and expectations for the future. Finally, the chapter is closed with the most important take-aways in some concluding statements.

3.1 The digital divide and public transport

The fact of people not having access to the tangible outcomes of using technology, is called the digital divide (van Dijk, 2005). This section aims to explain how the digital divide applies on public transport and how it is recognized. (Most) people in the Netherlands benefit from their digital skills because of the opportunities and possibilities. But big majority of the people in the Netherlands benefit less and others not at all. There are different levels in the extent to which someone has access to the digital possibilities. These levels are illustrated in the 'ladder model' of van Dijk (2005). Durand et. al. (2019) adapted the model and added public transport related examples such as journey planning to it.

The third-level and highest in the digital divide consists of users who actually enjoy tangible benefits from using the app, such as saving travel time. Everyone within the 'forgotten' group have at least on thing in common and that is that they cannot access the tangible benefits. Some people who do not always have access and do not use it often or lack the skills needed to, are placed in the second digital divide. Thereafter, an individual lacking the required materials is within the first digital divide. Finally, it requires motivation. The following groups are within the second or third digital divide which are elaborated in the following sections.

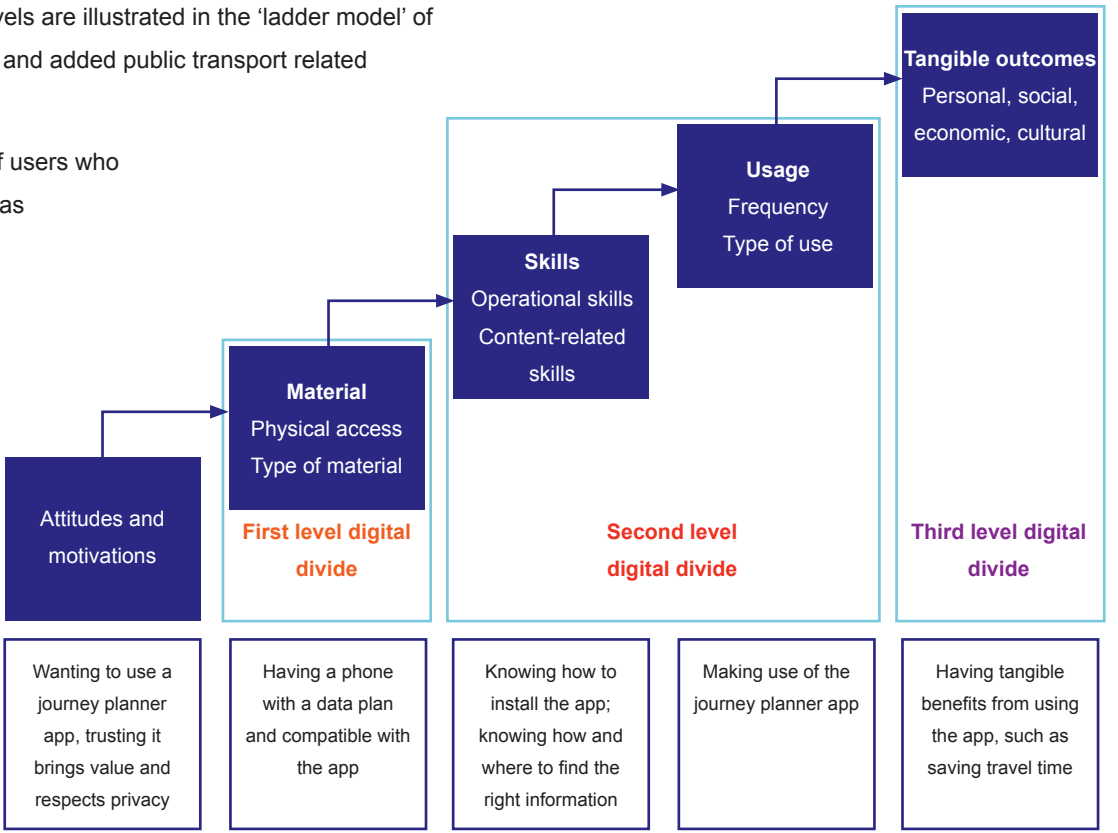


Figure 3.1: The different levels in digital divide in relation to trip/journey planning (Durand et. al., 2019).

3.2 The population size

CBS noted for 2016 that 17 % of the Dutch population of 18 years or older had too little or no digital skills. According to Digisterker (2017) some 20 % of the households in the Netherlands do not seem to have enough digital skills; 5 % lacks these skills completely, and 15 % needs support. In the EU this percentage is 32 %. All-in-all, it is safe to conclude that in general 20 % of Dutch households lack the possibility to make active use of digital possibilities. A huge part of the 20 % consists of elderly (some 60 % above 65 years old, with a preponderance of women) (CBS Statline, 2013a), but also, amongst lower literacy households there are many non-digital skilled and only 1/3 is elderly. Therefore, it is likely that there will remain a persistent group of at least 10 % of the Dutch population non-digital skilled in the future. Which is even more taking into account that the average life expectations are increasing.

3.2.1 The population size; low literates

In general low literacy is 13,3 % of the Dutch population within the ages of 16-65 and 18 % for the 65+ population. 11% does suffer from low digital skills too. An overview of the numbers is elaborated in appendix A.

So; only a small 20 % of the 1,33 mln low literates 16-65 year old has enough skills to be online and to use the flexibilities offered in DRT. This percentage will be lower among the older low literate citizens (Baay et. al.,, 2015). We have no data on the elderly low literates, but 15 % seems reasonable. This means that it is fair to state that at least 1,56 mln low literates have no access to the flexibilities offered in DRT.

3.2.2 The population size; elderly

Moving broader, it is known that there are 3,4 mln elderly (65 years and older) in The Netherlands. 18% is low- or illiterate, but what about the other 82%? Some 9,5 % of people with the age between 65-75 never use the internet, corresponding to 180.000 persons. Above the age of 75 this increases to 32%, which is 500.000 persons. In total this is 680.000 elderly who have never used the internet. We also know that 51% of all elderly, which is 1,7 mln people, do not feel IT skilled (Ackermans, 2016). In total this is approximately 2,4 mln of which 0,49 mln is low literate.

According to CBS (2018), since 1950 life expectation for people of the 65+ age is increasing. Since then,

the average life expectancy for 65 year olds was another 19,9 years. The increase of life expectation does not develop equally over the years. There are periods in which the trend accelerates or stagnates. Nevertheless, it is relevant to take into account this user group when designing services for another two decades.

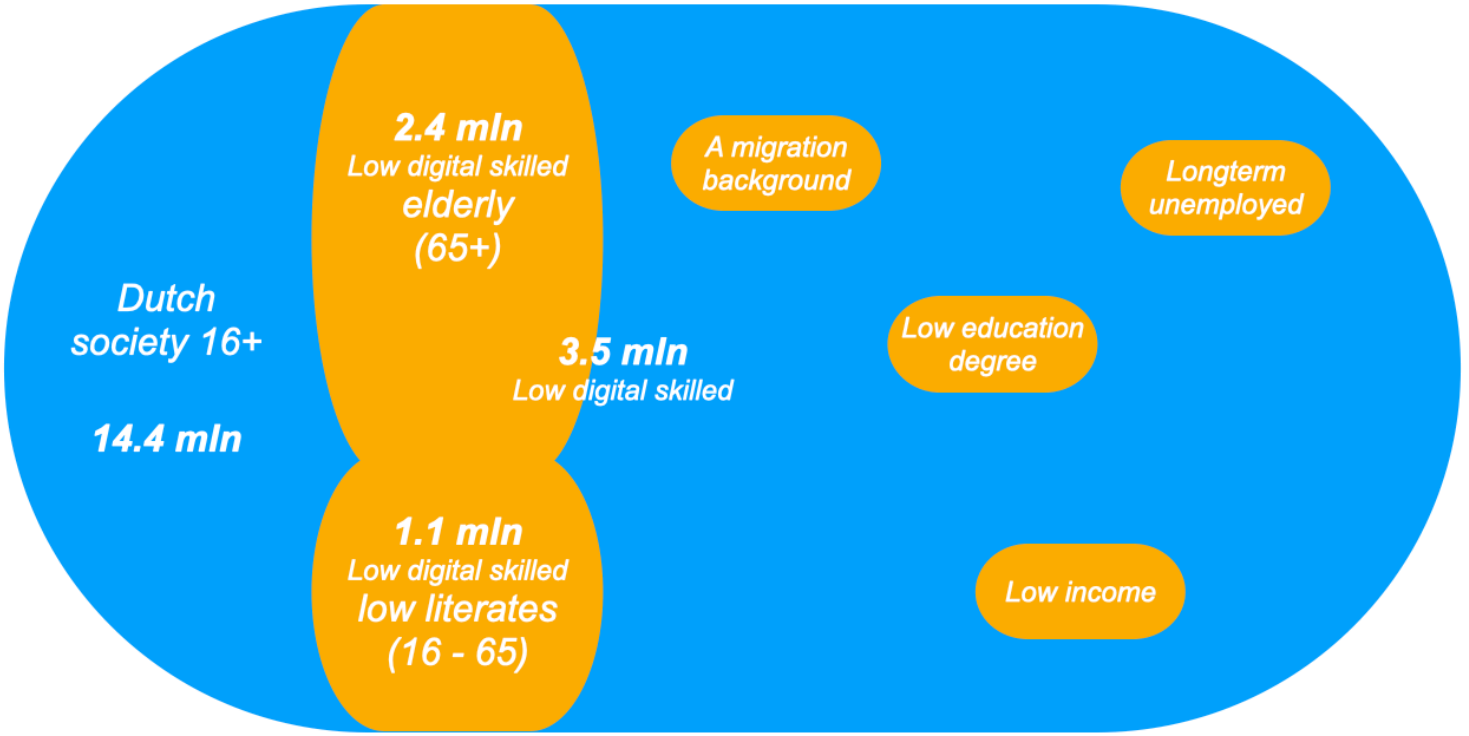


Figure 3.2: The overview of population share low literates and elderly that are not digitally skilled.

3.3 Low literacy and digital skills

Who is defined as low literate?

People with low literacy often struggle with reading, writing and/or arithmetic. Examples are tasks as filling forms, reading street signs, paying by card/ withdrawing money and understanding information about health and care. On top of that, 9,3 % also have difficulties with digital skills. The group of low-literate people who have a computer and internet, have low information skills. They can perform simple online tasks, such as emailing. They do however, lack skills to perform more complex tasks online. For instance, clicking through / navigating through different pages to find the right information, “smart” search within large amounts of information - such as spreadsheets - or comparing information, products or services online and assessing relevance or reliability (Lezenenschrijven, 2017b) (NOS, 2017).

Lezen en schrijven (2019c) published a report that presents a list of jobs that are often related to low literacy. The top four jobs are housekeeping (approximately 40%), construction workers (approximately 37%), production machine operators (approximately 37%), agricultural workers (approximately 34%). These jobs often do not require any digital skills.

What to take into account when designing?

To understand, the text needs to be on level A2/1F out of A1, B1, B2 and C1. A2 refers to waystage or elementary. When designing the communication of information, there could be looked at several levels: a clear and logical structure of the information and the use of easy language. Furthermore, the design should have a relatively large font size, high contrasts and avoid the need of a birds eye. For instance, many floating boxes that are not in a logical order require a birds eye (The guideline of Human factors, 2019). The text could also be supported with visuals and pictures (Lezenenschrijven, 2017e).

Design guidelines

- The text level equals A2/1F;
- Clear structure of information
- The use of easy language
- Relatively large font size
- High contrasts
- Avoid the need of a birds eye
- Support text with visuals and pictures

3.4 Elderly and digital skills

Who is defined as elderly?

According to Hodge et. al. (2017) we need to differentiate somewhat as they found, in terms of internet activities, that older people use the internet primarily to communicate with friends and relatives, stay socially connected, access instant information or entertainment, or for daily routine tasks such as shopping, travel and banking. Online engagement with public authorities or civic service providers appears to be comparatively limited. On this issue, Ackermans (2016) argues with Dutch CBS data that computer and smartphone users not necessarily use all facets of digital options. Elderly might use digital devices, but for a limited range of tasks. For example, they might use it for social contact only.

What to take into account when designing?

De Ridder (2018) has proposed that students, employed people and families with children prefer booking via the internet, whereas the middle-aged and the elderly prefer booking by calling.

In a study about elderly in the DRT service Brengflex of Jittapirom et. al. (2019), the elderly considered several elements as important for a DRT service.

Additionally, online assessment panels of 17 providers have been investigated. The needs and requirements of elderly have been determined and extended. Combined with the previous mentioned needs and requirements, below an overview of them that are considered to be in the scope of this project. The needs and requirements that are considered to be within the scope of this project are presented below.

Design guidelines

- The availability of the call centre for booking by phone.
- The option to pay with the OV-chipcard.
- The possibility of paying in the bus with their bankpas/cash.
- Short waiting times at the bus station.
- Short waiting times in general.
- Personal interaction with the driver.

3.5 Other groups and digital skills

People often related to low digital skills are also those having a low-income, being long-term unemployed, having a migration background and having a low education degree are also often related to low digital skills. From literature, the population share of these groups that are related to low digital literacy does not have become clear. However, their motives are more clear. This is argued in the following section.

People with low incomes, having a migration background, being long term unemployed and having a low education degree

According to Armoede regisseur gemeente Amsterdam (2017), most low-income households in Amsterdam own a smartphone, tablet, laptop and/or computer. However, in practice it has become apparent that the devices are often outdated and therefore, new and more user friendly software and applications cannot be downloaded. Besides, many low-income households lack a Wi-Fi connection. Parents state that they can not find the time to develop their digital skills.

Van Deursen & van Dijk (2015) show that the degree of income has a significant effect on ownership and therefore indirectly, on skills and diversity of usage. Ownership refers to access to digital resources and required devices including software. Ownership is more than owning a digital device; the internet bill has to be paid, cheap hardware has to be replaced or repaired more often and software is getting more expensive. This maintenance of technology often goes hand in hand with continuously, sometimes high economic and social costs (of time and energy) (Gonzalez, 2015). Partly, because especially these families are dependent on organisations that communicate digitally more and more often with abstract language and poor or no visual support (Armoede regisseur gemeente Amsterdam, 2017). This is also the problem for people with a migration background who speak the language poorly.

People who are long term unemployed do not have any need to develop digital skills. This sometimes results in a deprivation of digital skills. Catching up to the standards can be rather difficult.

People with low education degrees can have multiple reasons that are described above. Nevertheless, having lower cognitive capacity might be a limitation in developing digital skills or coping with digital transformations.

All in all, multiple factors play a part in forming a barrier to benefit from digital possibilities, such as with DRT. Think of the ladder model of Van Dijk (2015), in which the low income forms a barrier to access the required materials. But also, a lack of time and language skills can form a barrier in developing skills on a frequent base.

3.6 Conclusions

Numbers

There are 14.4 mln people above the age of 16 in the Netherlands, of which 2.5 mln elderly that are low digital skilled and 1.1 mln low literates that are low digital skilled. Together, this is 3.5 mln people, which equals to 20% of dutch population above the age of 16. This number is already quite extensive, but on top of that, there are also other demographic groups that are often related to low digital literacy: people with a migration background; longterm unemployed; a low education degree; low income. There are no numbers about the size of these groups available in literature.

Concluding statements about motives

We have come to a full circle, now that the motives are all related to the different steps of the ladder model of Van Dijk (2005). Low literates have difficulties with developing skills because of language barriers, just as for people with a migration background. People with a low income simply do not have acces to material (and maintenance) because of financial reasons, but they also struggle finding the time to develop skills on a regular basis. People with low education degrees are obstructed from developing skills as well and long term unemployed people have limited reasons to develop digital skills.

Take-aways for designing

Elderly prefer booking via the call centre and it is presumed that people with low literacy too. To design for low literates, texts need extra attention on the structure, the use of language, possible responses of the user and if they can get support of people in the personal environment or customer service. Visuals enhance the accessibility for low literates. Elderly find it important that the waiting time at the bus station is minimised.

Next steps

These insights are taken to the design phase. First, it is aimed to get a better understanding of planning and travel behaviour in the context of using PT and DRT services and how digital possibilities play a role. In the next chapter it is described how interviews with (potential) users have generated new data on this topic.


4

04 - Interviews; how digital possibilities and skills play a role in planning and travel behaviour

A better view on the ‘forgotten group’ has derived from the explorative literature research described in the previous chapter. Literature has provided a differentiation of user groups (Durand et. al., 2019) (Stichting lezen en schrijven a, 2017) which allows us to identify people related to the problem.

Some data on digital behaviour, and planning and travelling is described too. Such as motives for not having access to the digital possibilities and affiliated needs and requirements, are useful to take into account when designing. However, currently there are too many unverified assumptions to design with.

This study aims to validate assumptions in addition to the data of the explorative literature research. According to IDEO (2015), the designer has to immerse in the context and speak with the target group. This study aims to determine more principles about the target group’s planning and travelling behaviour and the role of digital possibilities. This would increase the following idea’s chances of success.

After the literature explorations, there are several uncertainties. First of all, from previous research, described in chapter 2, it is known that actual users find the implementation of DRT a deterioration. It is assumed that this applies to the target group too and it is expected that they are disadvantaged even more. This study aims to validate this assumption. Secondly, the study aims to reveal the user group’s behaviour in the context of planning and travelling, which includes their preferred information sources. Third, it is aimed to explore how digital skills and access to the possibilities affect the use of public transport and how this is perceived.

The objective of this chapter is to communicate the general outline of the research approach, its results and conclusion taken to design with.

Section 4.1 describes the approach of the research. The results of the interviews are to read in section 4.2 and divided per studied group, summarized with some conclusions and insights that are useful to design with. In the final section, conclusions are drawn on the differentiation of users, which are used to define and later on in the process to empathize with the target group.

4.1 Approach

4.1.1 Study focus and research questions

This section outlines the approach for empathizing with the user groups and validate assumptions about their expectations in planning and travelling. Ideally, this study focuses on planning and travel behaviour of users who are related to the ‘forgotten group’ that has experience using DRT services. However, it is expected that finding them is a difficult task. Therefore, the focus of this study is expanded to planning and travel behaviour in general rather than DRT usage specifically. This includes relevant perceptions about digital possibilities and skills.

The objective of this study is to get a better understanding of this subject during an in-depth interview. Because the assumptions are partly known, a semi structured interview setup is taken. This allows the researcher to build the interview on the answers of the interviewee accordingly.

Although a rather exploratory interview structure is taken for this research activity, there are three leading research questions:

1. What are the perceptions towards a Demand Responsive Transport service? This includes several aspects of it, such as;
    a. What are the perceptions about the requirement to make a reservation?
    b. What is the preferred way of booking (online, via landline, physical)?
2. What is the approach in planning a journey and travelling when using public transport? This includes several aspects of it, such as;
    a. How does the user plan a journey?
    b. What is the preferred source for schedule information including updates?
3. How do digital skills and possibilities affect the use of public transport?
    a. In what digital divide is the interviewee categorised?
    b. How does this affect the use of public transport?

4.1.2 The generative interview tool

During the interview it is aimed to determine products, services or systems that were used in the past and recall past experiences and future dreams (Visser et. al., 2005). For this purpose, the principles of context mapping (Visser et. al., 2005) are used to set up the interview structure.

It prescribes to start with an introduction and something that allows the participant to experience the present. Therefore, the participant is asked to explain how current living situation and daily in- and outdoor activities has changed since COVID-19, which provides a sneak peak in the life before COVID-19.

The second part aims to take a leap to the past. The participant has to make a timeline of some journey while using public transport; from beginning the trip to arriving at the destination. Together, these stories provide enough material to discuss and to fit in the predefined questions.

4.1.3 Obtaining and processing the data

For obtaining and processing the data the qualitative research approach of Baarda et al. (2010) is taken. This procedure is described in the appendix.

4.1.4 Participant recruitment

Chapter 3 proposes a list of characteristics that potentially are affiliated with the problem (Durand et. al., 2019) (Stichting lezen en schrijven a, 2017). To refresh the memory, the groups related to the problem are people:

- Being elderly
- Having low literacy
- Having a migration background
- Having a low income
- Being long term unemployed
- Having a low education degree

The characteristics of these user groups are taken into consideration for the recruitment of the participants for this study.

The list of user characteristics shown at the beginning of this section would allow the researcher to recruit appropriate participants for the study. However, the researcher is a student who is not familiar with these user groups. Besides, it is concluded the described groups are not low digital literates eminently and therefore, reaching out by chance would feel pointless. It was therefore chosen to limit recruitment to two user groups, easily accesible by the researcher. For example, the elderly are known to have problems with this subject and are easier to recognize, whereas people with a low income or low digital literacy are not.

The plan was to interview at least 3 participants per group. At first, the researcher asked around in his personal circles. This provided mainly elderly and it led to a new user group within the scope of the project. This group, which are called the 'digital detoxers' and described in section 4.3, has risen from a snowball sampling structure. Later in the project's process it became possible to interview and test prototypes with several former low literates. An organisation called 'het digi-taalhuis', has appointed former low literates as ambassadors. These ambassadors are available to assess the accessibility for low literates. Finally, the study sample consists of a majority of elderly, three digital detoxes and three low literates. See appendix D for an overview.

4.2 Results; elderly

4.2.1 Perceptions about demand responsive transport

The opinion of elderly about DRT is similar to the regular users of previous research; it restricts them in their spontaneity. However, in general this feeling applies to the return journey rather than the outward journey.

About the requirement to make a reservation

> "Because this really restricts me in my spontaneity. Erm, now I think of it, it is OK when I'm still at home. Then I take the time to plan my journey anyway. When I go back however, I want to have the freedom to take a detour or to stay somewhere. Also, I don't like to rely on my phone.."

4.2.2 Planning and travel behaviour

Most elderly participants mentioned that they use the 9292 travel planner app. They plan their journey thoroughly before leaving and write it down or make a screenshot on their phone. But when there was a deviation from the predetermined journey plan, they would consult the route and time schedule presented in the bus/tram shelter and always ask the bus driver to confirm their new planning.

4.2.3 Digital skills and possibilities

Low computer self efficacy and computer anxiety

Four out of five participants in the elderly group mentioned that encountering new technology could feel overwhelming and that they quickly think that they have done something wrong. The colour red leads to being stressed and sometimes starting all over again.

> "I encountered a DRT service once, but I thought that it would take me more effort to understand how it works, than that it would take to walk to the destination."
>
> "I get anxious when a computer is involved"
>
> "If a computer is involved, I automatically assume that I have done something wrong. Or that I am clumsy with it."

Remembering commands

It is striking that most participants remember a certain order of actions and that they mention to forget them quickly. Basically, they aim to memorise commands i.e. the specific steps to fulfil a certain task.

Developing digital skills and seeing possibilities

One participant mentioned that learning to use the smartphone was easier because she used a mobile phone from the beginning. The first mobile phone incrementally changed towards the smartphone and therefore, she has gradually developed digital skills and learned to use a smartphone.

Five participants mentioned that they had to use ICTs for work. This was an urgent obligation to learn these systems and therefore they developed certain digital skills. For two of the participants this was a stepping stone to develop computer skills, but sometimes the skills only applied within work context.

Besides people developing digital skills because of their job, other users see the urgency of travelling. This is illustrated with a statement of an elderly STOP&GO user. She mentioned that she learned how to use a smartphone because of the convenience when travelling with the STOPenGO.

> "I didn't use a smartphone before, but I learned how to use the STOPenGO app". (SG user)

Paper and personal interactions

Some participants get overwhelmed by the information and the questions when using ICTs, which makes them desperate. Three participants mentioned that the different layers of computer systems are perceived to be complex and confusing and therefore, they prefer to read texts on paper.

> ".. and everything goes via a computer and then it is this jumble of questions and passwords and who knows what. Then I just can't anymore."
>
> "I want to talk to a person because that is a conversation that goes back and forth"

One participant mentioned that if you type slowly, it is frustrating when you are required to type the text on a qwerty keyboard.

Embarrassment

Three out of five participants mentioned that they find their degree of digital literacy embarrassing; they feel silly about it.

4.2.4 Concluding statements of the results; elderly

Elderly that are affiliated with the problem are recognisable by several characteristics. First of all, they have computer anxiety and a very low self esteem i.e. self efficacy when it concerns fulfilling a task with technology. Therefore, they get anxious when a task involves a computer or smartphone. They prefer to read information from prints or to have personal interactions, rather than with digital interfaces that show several layers of information. They are not aware of digital possibilities, but if they are they learn the commands to use it. If they cannot figure it out, they approach relatives within their personal circles. Furthermore, the interviewed elderly are characterised by lacking digital skills because of lacking interest and willing to invest effort acquiring digital skills.

Based on these conclusions, several insights are considerd when designing. First of all, screens and complicated computer-like machines have to be avoided. When there is an interface, it should avoid showing different layers of information such as jumbles of questions and passwords. Also, if it requires more action there should be clear instructions and feedback of the order. Within the feedback, red lights and colours should be avoided. Besides, the possibilities of any design are supposed to be carried (Voor mij onbegrijpelijk) and therefore, encouraging to use.

Preferably, the design should not require to type on a qwerty keyboard. Furthermore, possible payment methods are the OV-chipcard and by bankpas.

Design guidelines; elderly

- Use a non-computer like form style
- Avoid screens with layers of information, such as jumbles of questions and passwords
- Provide instructions and feedback; Avoid red lights and colours
- Clarify the possibilities
- Enhance human interaction (via telephone or in real life)
- Avoid the need of typing
- Payment by OV-chipcard
- Payment by bankpas

4.3 Results; Digital detoxers

4.3.1 Perceptions about digital skills and possibilities

In contrast to the elderly digital detoxers said that they are or have been digitally skilled and aware of the possibilities, but deliberately not use them. This group consists of digital savvy participants with a fundamental reason; it is about the quality of life. “Whereas digital interactions are empty, human interaction has a certain quality that otherwise would be missed.” Additionally, some participants mentioned that the stimuli of smartphones take up a lot of their headspace in a negative way.

> “The smartphone causes a lot of external stimuli. I believe that everything can wait and I don’t want to feel rushed all the time.”
>
> (The motivation to stop using a smartphone;)
> “Because I was using it too much. (...)
> “I aimed to do more analog activities and I wanted to get rid of the reflex of grabbing your pocket if you walk up the stairs or if you dislike the conversation.”

Also, they do not want to be obliged to use a smartphone in their daily life and being obliged to have a data plan. One participant mentioned that he finds a data subscription too expensive and chooses not to take it. Another participant mentioned that compared to a smartphone, a mobile phone is cheaper. Besides, it is “indestructible”, has a long battery life and she could not care less if it breaks or gets lost.

Distancing from a smartphone results in lagging behind

Whereas one participant is highly computer skilled in certain areas, such as programming computer language, he mentioned that he lost interest in basic computer functions. He noted that he could learn it, but he has to invest time in it. Because he is secluded from it for a long time, he is lagging behind in the development of his digital skills.

4.3.2 Planning and travel behaviour

Similar to the elderly, the digital detoxers plan their journey before leaving the house, rather than during their journey and therefore, they do not deviate from the pre-planned journey. Typically, they write down the route and time schedule on a piece of paper.

> “Before I leave, I look up the route on the internet and write it down on a piece of paper. I can’t anticipate any delays or changes, but I don’t care. It would make me restless.”

4.3.3 Concluding statements of the results; digital detoxers

Digital detoxers are often digital skilled, however they are fundamentally against (being obliged to) using technology in their everyday life. Their motives are economical reasons - no data plan or expensive phone; their quality of life - increasing human interaction; and finally, their (mental) health - much screen time filling up their cognitive capacities. Therefore, they prefer to call or to drop by.

Design guidelines; digital detoxers

- Avoid requiring a personal smartphone/data plan
- Avoid long screen times
- Enhance human interaction (via telephone or in real life)

4.4 Results; Low literates

4.4.1 Perceptions about demand responsive transport

Low literates said that this system is quite complex and that generally it is difficult to understand the functionality of DRT. Also, in terms of planning it gets more complicated. And comparable to the other groups, they mentioned that they find it inconvenient and restricting to make a reservation before leaving.

> "Vertrekken komt als kakken, ik wil niet eerst moeten reserveren." - This is an expression which implies that you would like to leave at any moment.

4.4.2 (Digital) skills and possibilities related to travelling with public transport

One low literate does still not use a smartphone. The other two participants said that they would rate their skills a 3 out of 10 when they were still low literate. One of them developed it to a 5 and the other one a 7. They noted that screens with many links to pages are making it difficult and are the reason for avoiding.

> "I struggle with reading text above language level A2 and writing. This is one disability that I have to cope with, but in the last decade another one arose: the digitisation. For me it is difficult to use a computer, tablet or smartphone, because I have low literacy skills and I have a low understanding of the digital world."

Issues when using Public Transport

One of them said that he rather takes his car or scooter than using PT. Two participants mentioned that they preferably avoid using PT, because there could go something wrong.

> "If for example a family event is planned, a low literate tends to stay at home. A family event is not necessary and they assume that something could go wrong. If the appointment is necessary, the low literate will always consult the help of a certain trusted person."

If a low literate travels, he or she will encounter many problems. For instance, street names; “Where do I have to get out?” “What if I don’t recognise it or what if I miss it for some reason?” An obvious solution according to two participants is to ask the bus driver, which is the first contact point voor most low literates. “How many stops before I have to get out?” His experience is that a bus driver signs when it is the right stop, but it is a fear that the bus driver sees through and possibly “teases” them by not saying it.

> “It has happened that they do not say it and let you stay in the bus to the final stop. They notice the low literacy and they will probably bully you. That is a fear of many low literates.”

One participant said that he always takes the Metro. The metro clearly shows which directions it goes and because they announce the stop every time including the arrival time, he has sufficient feedback that gives certainty.

Paying method

Paying with an OV-chipcard is not a problem if it charges automatically. But, for many low literates managing this is yet a bridge too far.

Reading

Low literates have low reading skills. However, they are not particularly illiterate. They are expert in hiding the low reading skills; most low literates have a smartphone to fit in.

4.4.3 Concluding statements of the results; low literates

There are many possible obstacles for a low literate when using PT and therefore, commonly they look for alternative means of transport. Especially the requirement to make a reservation via the internet is a barrier. Additionally, the internet scares them off. Therefore, it is assumed that being clear about providing an offline possibility too, would encourage them.

Instead, they prefer personal and verbal interactions rather than digital interfaces with layers of information. Other obstacles are not being able to read street names and the fear of being bullied. If it is necessary, they reach out to a trusted relative for help. They can use the OV-chipcard, but it also requires some (digital) skills that are a bridge too far.

Design guidelines; low literates

- They are not illiterate, but avoid too much text
- Avoid digital interfaces with layers of information
- Instead, provide personal and verbal interactions
- Be clear about the difference in online and offline possibilities
- Provide enough landmarks during the journey, such as directions, street names, departure and arrival times, and possibly add relevant announcements
- The OV-chipcard may be incorporated in the design, but should not involve the requirement to include ‘travel subscriptions’*

* A travel subscription is a certain feature that an individual can upload to his/her OV-chipcard. Examples of features are discounts or access to specific services.

4.5 Concluding statement of the results in general

4.5.1 A ladder that illustrates one's degree of digital skills

One has to keep up with the digital possibilities and develop or maintain one's digital skills in order to prevent lagging behind. Keeping up with the possibilities and developing or maintaining digital skills is driven by an incentive, such as work. For example, one being unemployed is not invested in the digital possibilities and is not encouraged to maintain his or her skills. Since technology is evolving continuously, one has to follow these developments accordingly. These incremental developments are illustrated with a ladder; each step illustrating another development involving new knowledge and skills. Never stepping on the ladder or stepping out of the ongoing technological developments can cause a lag behind, and then it takes great effort to catch up.

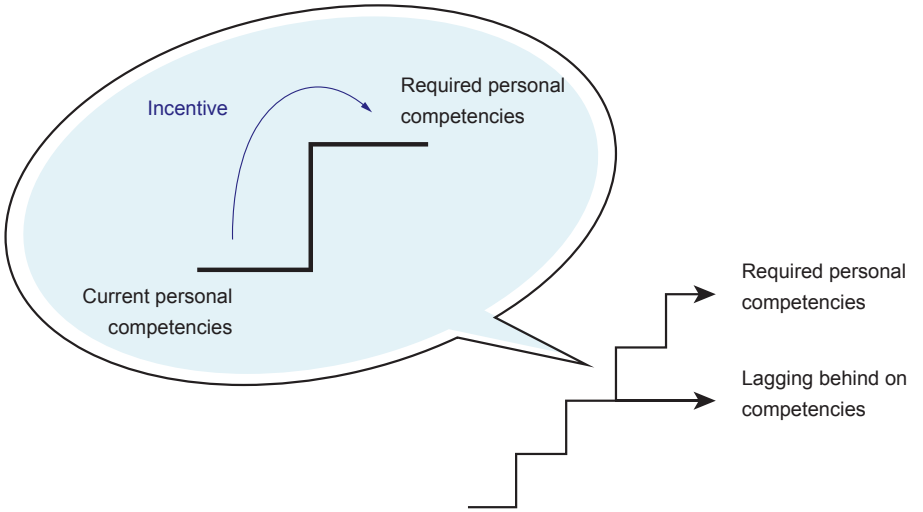


Figure 4.1: An illustration of a ladder figuratively for gradually developing digital skills.

4.5.2 Using the ladder to define users

Some elderly have chosen never to step on the ladder and are conservative in that regard. They cannot and they do not want to. Digital detoxers however, stepped off the ladder at some point. Therefore, they do have the skills or are able to keep up with developments and maintain their skills, but they abstain from technology because of fundamental reasons. Basically, they can, but they won't use it. Then, there is a group that is simply not able to develop enough skills to take advantage of the digital possibilities; the low literates and the mentally disabled. Finally, this study has shown that someone using ICTs for work, is digitally skilled in performing the work related tasks. However, it does not mean that this user is able to perform digital tasks in another field. These people have stepped on the ladder, but they are half way on the ladder; they have a low or limited understanding or they are using it when the tangible outcome is clear and worth

investing in. Finally, there is a group that is on top of the ladder. They can and want to develop and maintain their digital skills; the digital savvy.

This leads us to a differentiation of users. It consists of three core categories, which are branched in several groups. The first category consists of people that have a barrier to developing digital skills nor understanding caused by a disability. The second category is defined by the people that have not invested in developing digital skills and therefore, they severely lag in digital skills and understanding. The third category is defined by deliberately choosing not to use digital resources.

The sub groups relate to each other in two aspects, which is described by people that can't and people that won't. This is illustrated in the figure below.

In the next chapter the categories and subgroups are supported with rich information, based on research data.

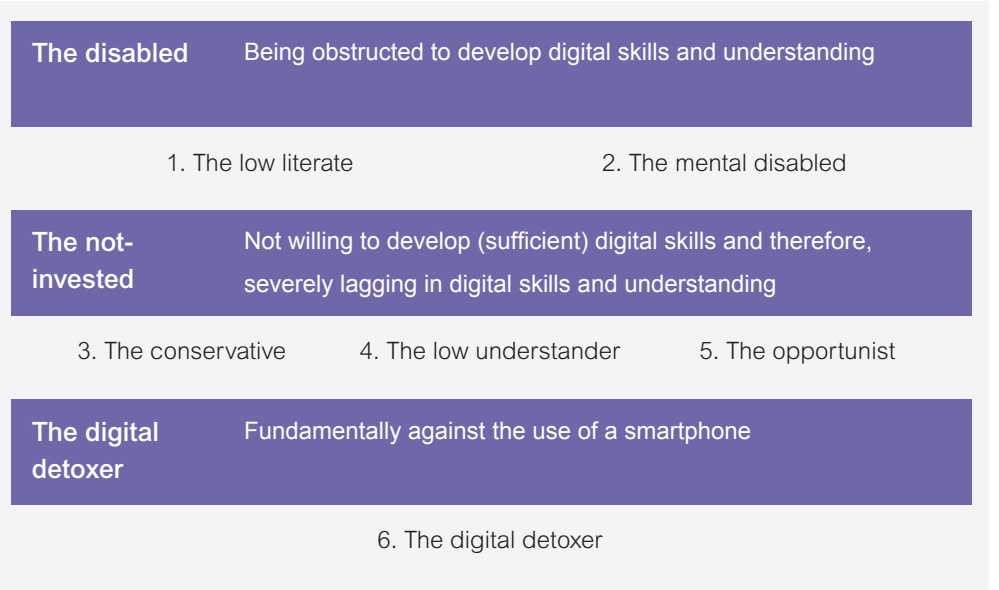


Figure 4.2: An overview of the new 6 type user differentiation based on motives.

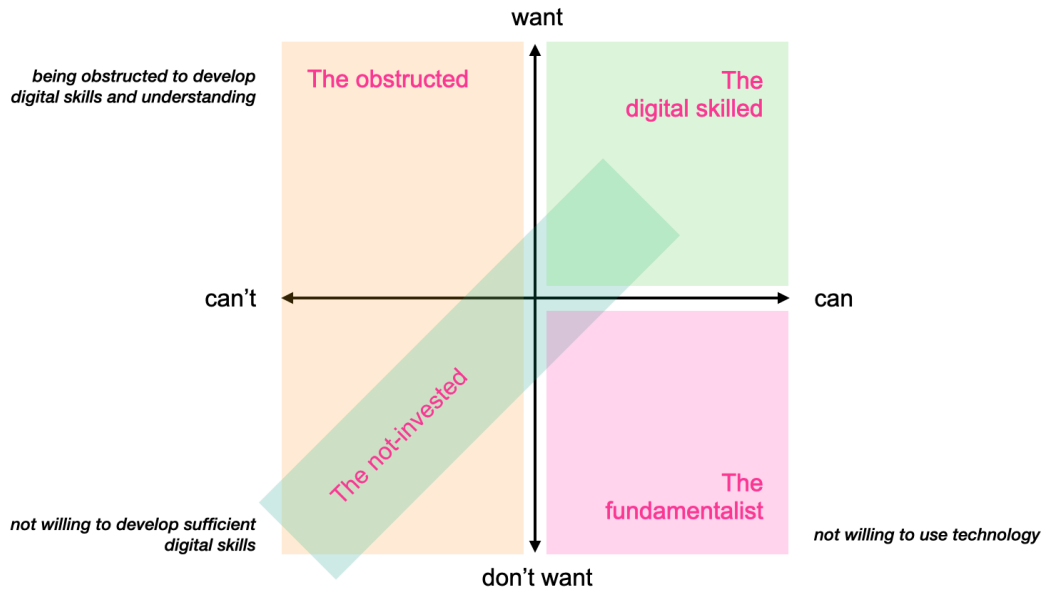


Figure 4.3: An overview of the personas plotted in the field of willingness over capabilities to use ICTs.

4.6 Discussion about the research setup

Changing research setups

In times of COVID-19, approaching the participants proved to be difficult. For a context mapping session, it is required to observe the participant while performing the generative exercise. Therefore, the third exercise is supposed to take place during the interview session. However, in this situation it is not possible to observe it and therefore, the participant is asked to explain what they put down on paper and discuss it afterwards, while thinking out loud to keep revealing emotions (Sanders, et. al. 2016). Additionally, this has resulted in differences in research setups of the interviews: sometimes at home via phone and sometimes at location.

Furthermore, the interviewees were recruited along the project's proces. This allowed the researcher to assess new assumptions and continue with new insights. But, this also led to a changing interview setup. This was especially the case with the low literates; instead of the context mapping assignment, questions were asked according to prototypes. The approach and prototypes are elaborated in the next chapter.

05 - Tools to empathise with the user and the problem

The research described in the previous chapter has provided a set of insights about the users that allow us to empathize with them. However, these insights are floating around and are not easily to access at all times. Therefore, this chapter presents the insights in a workable format that aims to inspire during the design process.

Based on the insights derived from the literature exploration and the user interviews, personas are created. The personas tell the story of the users about motives for lacking digital skills or means. Secondly, critical situations of using DRT that apply to the user groups are constructed. These scenarios help to immerse in the situations allowing to reflect on the outcome of the design.

Finally, the design goals are defined giving a clear focus for the design phase.

5.1 Persona; fact based characters to design for

5.1.1 The aim of the persona

An effective way of presenting insights about particular user groups from literature and empirical study are personas. The persona is a representation of a character including the shared needs and requirements incorporated in a medium, such as a descriptive story, anecdote, illustration or pictures. This medium allows you to engage with the potential user groups and get inspiration for the design (This is service design thinking, 2015).

The persona that has been made is based on insights from the literature studies and the interviews about digital skills. These insights have been categorized on common characteristics groupings. Whereas the literature deepens in demographics and numbers, the personas convey a workable “character”. The goal is to make an engaging profile including the motives for not or barely using ICTs and their specific needs. (This is service design thinking, 2015) (Koos service design, n.d.). This section is followed by the new categories used for the persona, which are all part in the context of people who do not want to or can not use a smartphone.

5.1.2 The persona descriptions

Each persona is illustrated with a quote. This quote consists of the story, including motives, needs and requirements of the specific character and allows the reader to empathise as if it is told by the actual user. The quotes are followed with a concise summary of things to take into account when designing, which are referred to as the design guidelines.

The low literate

"I often missed class during my time at elementary school, which caused a severe lack of literacy skills. I am ashamed of it and I'd rather not tell anyone about it. I am good at hiding it by avoiding any text related tasks.

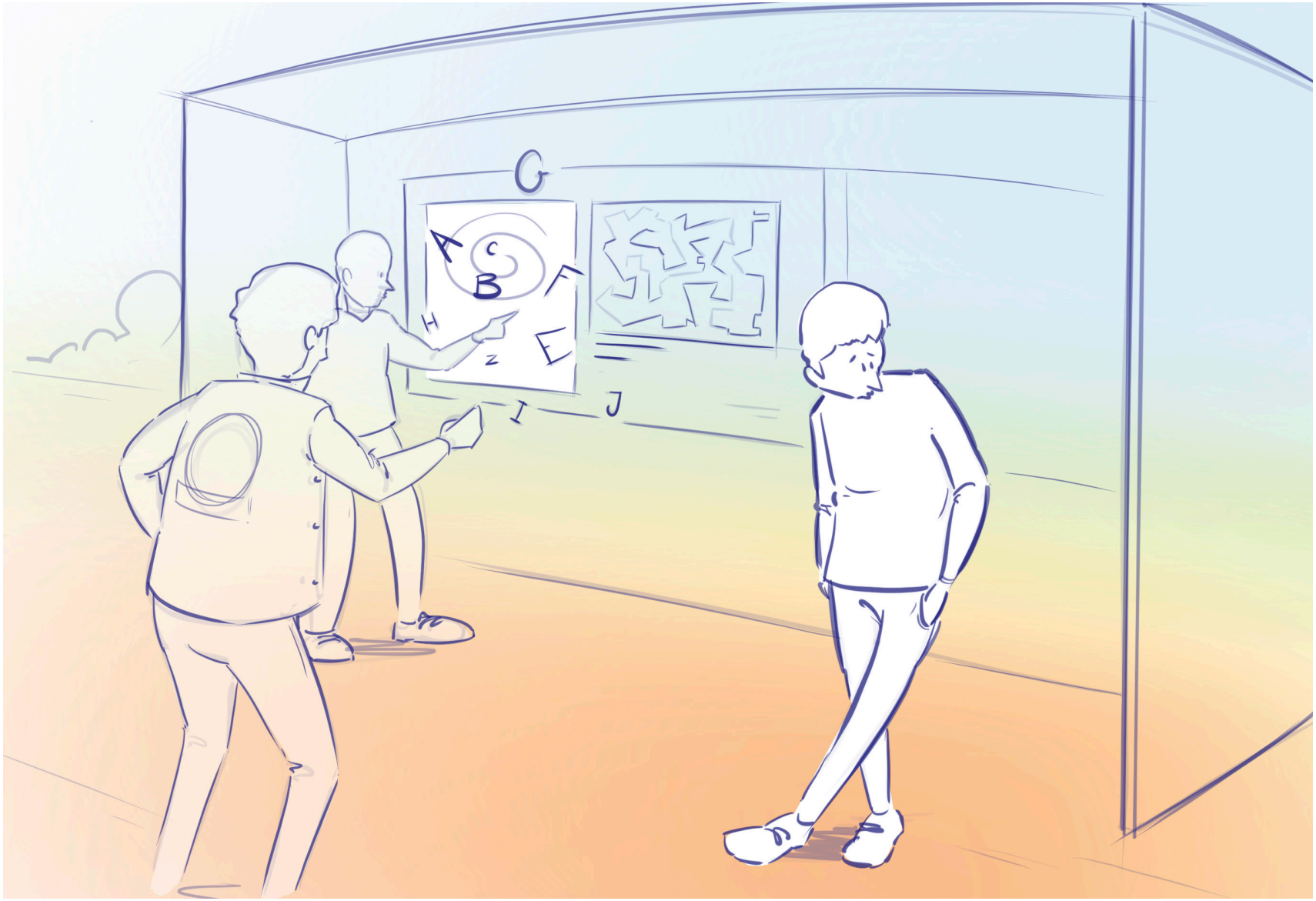
I struggle with reading text above the language level A2 and writing myself. Especially, text becomes less accessible if it is long, has small characters and many text boxes. When I have to fill in forms including writing my credentials and answering questions, I am likely to give up. This is one disability that I have to cope with, but in the last decade another one arose: the digitisation. For me it is difficult to use a computer, tablet or smartphone, because I have low literacy skills and I have a low understanding of the digital world, like exploring and assessing information, digital safety and privacy. At home I have the internet, but I don't feel safe using it.

I prefer to speak to a real person. If it involves text, it helps if it is supported by visuals and photos of the actual situation, rather than just icons."

Design guidelines; low literates

- Avoid too much text.
- Avoid digital interfaces with layers of information.
- Instead, provide personal and verbal interactions.
- Be clear about the difference in online and offline possibilities.
- Provide enough landmarks during the journey, such as directions, street names, departure and arrival times, and possibly add relevant announcements.
- The OV-chipcard may be incorporated in the design, but should not involve the requirement to include 'travel subscriptions'*

** A travel subscription is a certain feature that an individual can upload to his/her OV-chipcard. Examples of features are discounts or access to specific services.*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The not-invested

Some people do not have any incentive to develop skills. For instance, work could be a major incentive to develop digital skills. People with a low income, people that are long term unemployed, (retired) elderly or people that work in a conservative way, are not required to invest time in developing digital skills. Although they are able to, they choose not to invest effort in it and therefore, they are referred to as the not-invested. Take into account that this category is not related to a low or high education degree nor age. They are divided in three levels of not being invested; the conservatives, the low understanders and the opportunists. Each has its own persona which is presented below, but first the design guidelines that apply on all of them.

Design guidelines; the not invested

- Use a non-computer like form style
- Avoid screens with layers of information, such as jumbles of questions and passwords
- Provide instructions and feedback; Avoid red lights and colours
- Clarify the possibilities
- Enhance human interaction (via telephone or in real life)
- Avoid the need for typing
- Payment by OV-chipcard
- Payment by bank card

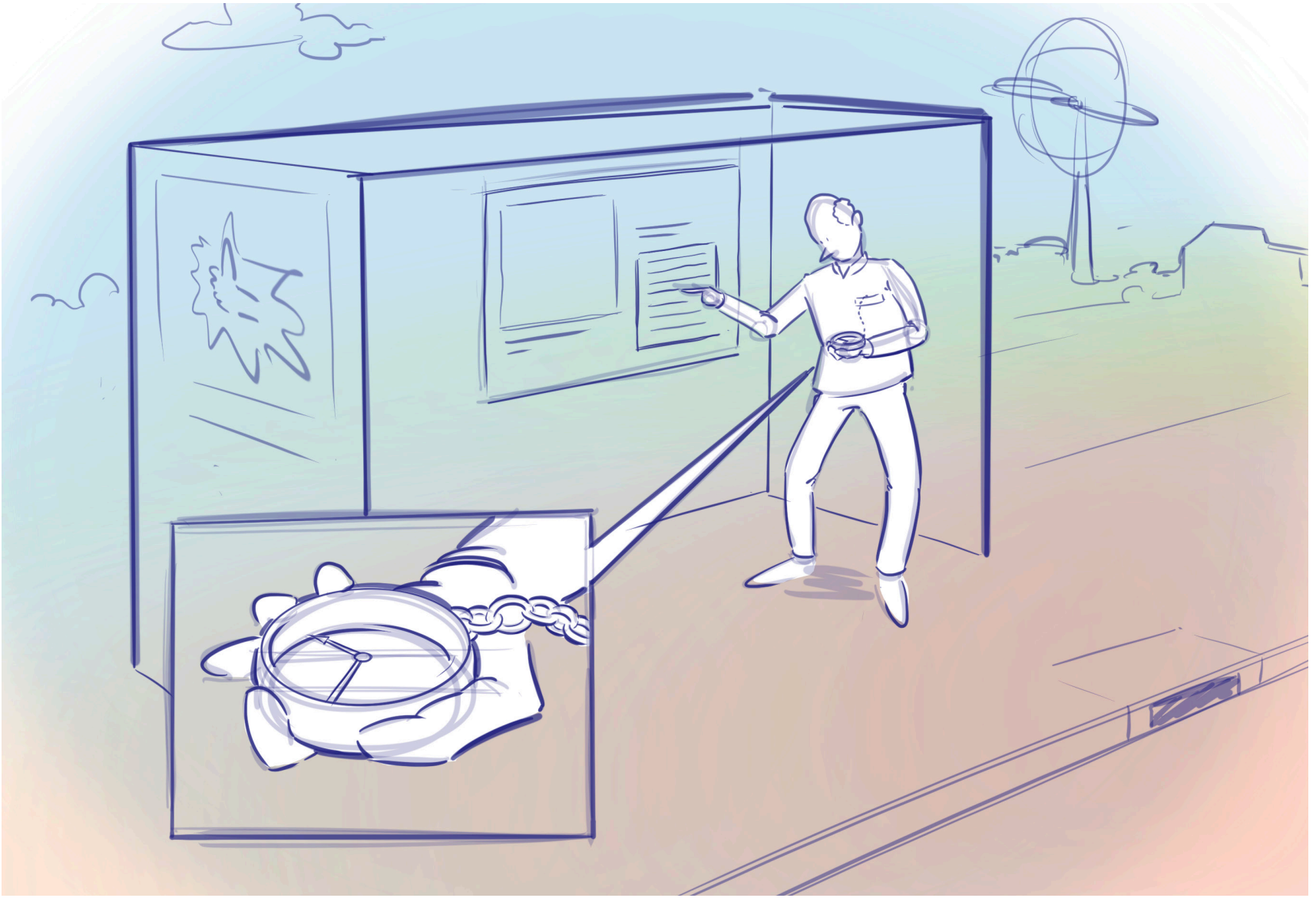
The conservative

"I never felt the urge to understand any of the digital developments. Personally, I prefer working in the conservative way and this has worked for me. I don't see the benefits of using any digital option, so I won't use it. Back in the days the world was much easier and nowadays, the world has become extremely complex. I am not ashamed of it and to be honest, I feel discriminated against if there is no analog or physical option; you can't expect everyone to adapt by spending all their time developing digital skills. I don't even like it.

I prefer to go to an actual person at a counter and if not possible, I prefer to speak to them on the phone. I write down information on paper if I won't remember it or I ask for a brochure."

Design guidelines; the conservative

- Provide an equal offline possibilities next to the online possibility.



The low-understander

“I have a very little understanding of computers. There was never really a reason to, but now I regret that I stepped into it too late. It has become too complex. It feels that it is the norm to use it and I feel silly that I just can’t. When it comes to computers I have a low self esteem and I always think that I did it wrong. For some reason it does not stick and I don’t understand any of the structure. I feel overwhelmed by text, many layers of information, log in credentials and other questions. This feeling is accompanied by being afraid to make irreversible mistakes. Especially when things turn red, then I know it is wrong and I want to start over. If I need to use a computer for some reason I get anxiety. Besides, I wouldn’t use computers, because I am unaware of the possibilities.

I prefer to fulfill the task without a computer involved. Preferably, I speak to an actual person, because then I have a real interaction. This allows me to ask questions that otherwise a computer is not able to answer. If I need to do a task online, I will get help from others. However, it feels as burden to them, so I prefer not to.”

The opportunist

“I use my smartphone for calling, using whatsapp, to take pictures and several other basic stuff. My digital skills are limited to these tasks. I don’t need more than that. I hate it if I need to download apps, unless someone else has recommended it to me. If I have enough time and I am calm, I can learn any basic digital skill. However, I rarely need them so I only learn them if I clearly see the benefits outweighing the required effort. When an issue occurs which I am not able to cope with, I get irritated. I would try it myself first, but I give up easily.”

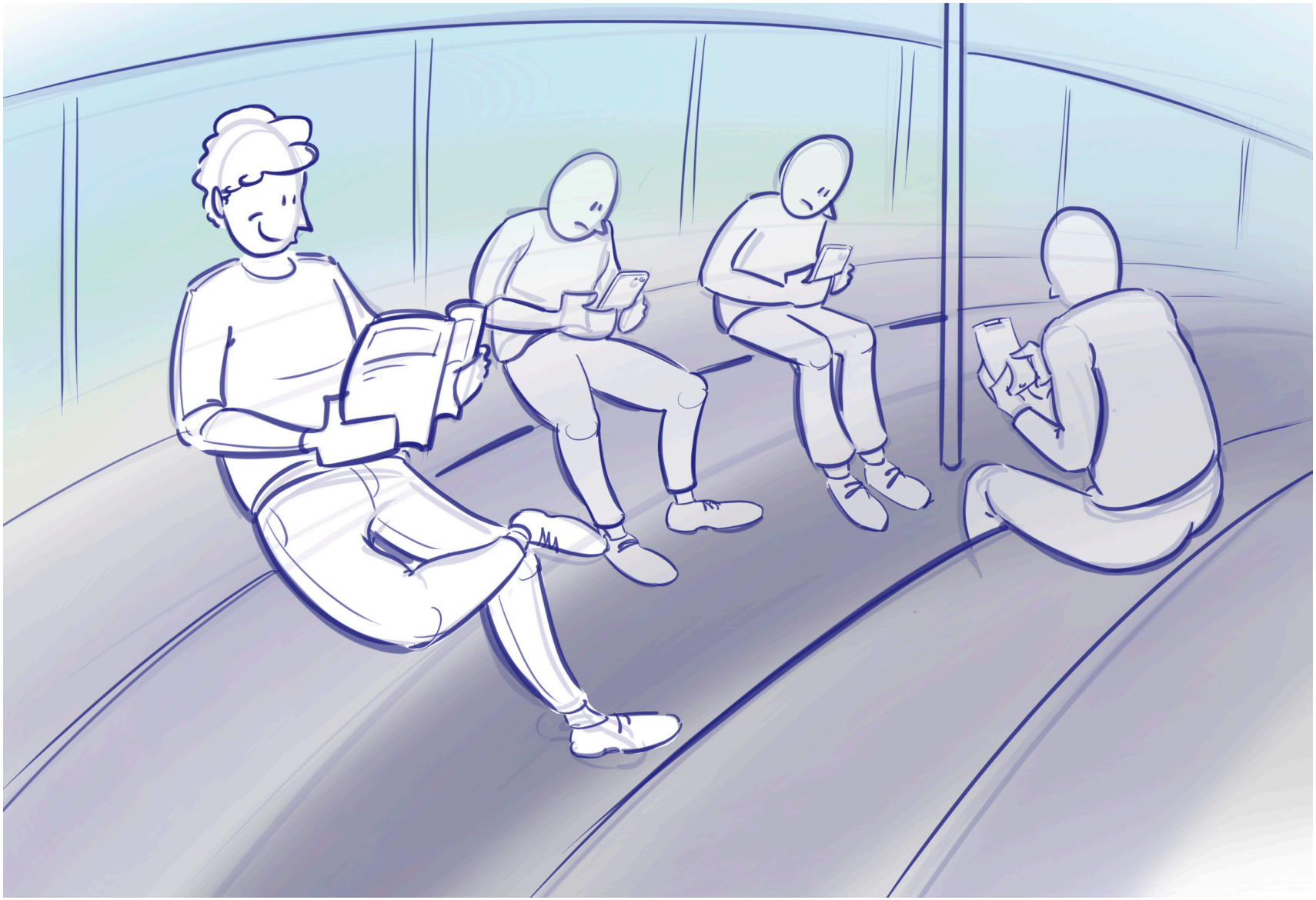
The digital detoxer

"I use a mobile phone to stay connected. But, I deliberately choose not to use a smartphone in my daily life, because it is a distraction and it makes me restless. I believe that it degenerates society because people get disconnected to each other and have less time for quality activities, such as reading a book or human interactions. Besides, it is unacceptable that people are required to use a smartphone for basic activities as banking or transportation.

People can reach me on my mobile phone and if needed I perform tasks online. Although, I appreciate it if there is a physical person available. After some time without using a smartphone, I start to lose my digital skills and knowledge."

Design guidelines; the digital detoxer

- Avoid requiring a personal smartphone/data plan
- Avoid long screen times
- Enhance human interaction (via telephone or in real life)



5.2 Design requirements

The studies that are described in chapter 2, 3 and 4 substantiates the predefined problem with new bits of information. Therefore it is worth collecting the key quotes and core needs that have led to a more specific problem statement and a corresponding design goal.

5.2.1 From key quotes to core needs and design requirements

This section describes the process from key quotes to core needs and design requirements.

The most critical situation is a traveller finding out about the requirement to make a reservation too late and has no digital possibilities accessible to solve this problem. Since the instructions often first explain the use of a smartphone application, non-digital users are unhooked easily, because they think that they do not need any new online services; see this research in appendix FIXME. Also, the online journey could be overwhelming and complex, which could be a barrier using it for low understanders or low literates.

Information remains unnoticed

Some examples of the situations where information stays unnoticed are:

- Posters and web planners often show an advertisement saying that you have to download an app. When a conservative, low understander or opportunist is used to FLT, they are not interested in any new (online) services. Therefore, they deliberately choose to ignore that new bit of information. If they are not able to figure it out, they are stranded.

- A low understanding user possibly has a low self computer efficiency and computer anxiety too. From previous user research this has led for one non-digital user to avoid using it.

- Another example is a low literate user who is used to FLT and because of the low reading skills, missed the relevant information.

- Or, she or he could feel overwhelmed by complicated texts and therefore avoid using it.

The bus is late

A conservative or low understander may have made the reservation, but when the bus is late, they have no clue. They start doubting themselves and this uncertainty is perceived as an unpleasant feeling.

What if you missed the bus

Another critical issue that applies for any non-digital user, is when they were not able to catch the reserved

Key quotes	Key insights and core needs	Design requirements
"It is only distracting and I don't want it."	*Users are not familiar with DRT and therefore, not aware of the requirement to make a reservation. They need clarification.*	*Convey the existence and functionality of DRT in a way appropriate for the user group and eliciting the behaviour to make a reservation.*
"Sometimes I have no idea if the bus is actually coming.." *"If I'm delayed, how do I know if the bus already left?*	*Users need feedback whether the bus is coming.*	*Physically communicate real-time departure and arrival times, delays and route updates.*
"This really limits my freedom of travelling. It should be possible to drink another cup of coffee if you want that."	*Users need to travel spontaneously.*	*Enable travellers to book anywhere at any time without requiring to use a mobile- or smartphone.*

Figure 5.4: The steps from key quotes and core needs leading to the requirements.

bus. They have no alternative and therefore, they are stranded. Therefore, the service could be enhanced with a reservation possibility at the station.

You need to book back and forth

Also, non-digital users experience limited departure spontaneity. When the traveller is at home, she/he has the possibility to take time to plan the journey, including making a reservation via the landline. However, planning and booking during the journey is perceived as limiting and therefore, undesired. Instead, the traveller books the return from home too.

5.2.2 An iteration on the problem statement

Not being aware of the existence of a DRT service is a commonly appearing problem with big consequences for both digital as non-digital users (Sampimon, 2020). But, if one is aware, at least she/he could anticipate the requirement to make a reservation and thereby, avoid an unpleasant first experience that significantly decreases the chance to give it a second try.

Accessing planning information online often leads to getting educated about the existence and functionality of a DRT service. Nevertheless, a non-digital user is much less likely to encounter this knowledge before travelling.

The other possibilities provide benefits such as planning and booking anywhere at any time, leaving at the last moment and getting real-time route and time schedule information. Not having access to these possibilities significantly deteriorates the user experience. This is described in chapter 2.

The redefined problem statement:

"Non-digital users lack digital skills or equipment. This gives them no access to the online travel planners which often raise awareness about DRT services within suggested travel schedules. Therefore, they might be aware of the requirements and possibilities of the DRT service too late, while not being able to resolve and catch the next one. Besides, they do not have access to real time travel information, which affects their perceived certainty.

When they do know the service, in certain situations they might need to plan their outward and backward journey at the same time, which leaves no room for deviating from the planning and therefore, eliminates any travel spontaneity.

All-in-all, it affects the overall perceived ease of use and therefore, usefulness of the new type of service."

5.2.3 Defining the conditions for an enhanced Demand Responsive Transport service

In order to provide a DRT service for non digital users that is acceptable and pleasant, the service should meet three conditions shown in the diagram on the right side of the page.

Based on the conditions, three corresponding design goals are formulated. A design goal is a tool to use throughout the design process allowing to reflect and stay on the right track.

Design goal 1

To elicit the behaviour of making a reservation via comprehensible information on posters and flyers.

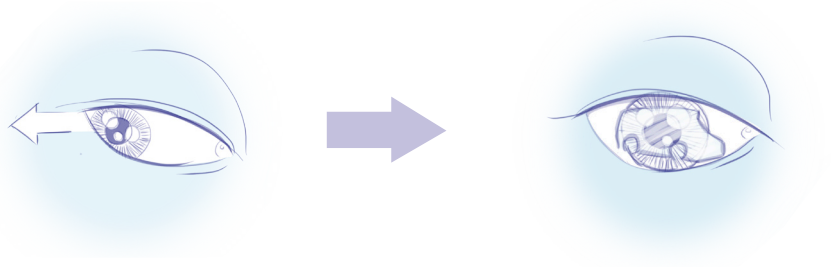
Design goal 2

To enhance the non-digital user's certainty while travelling with providing real time route and time schedule information.

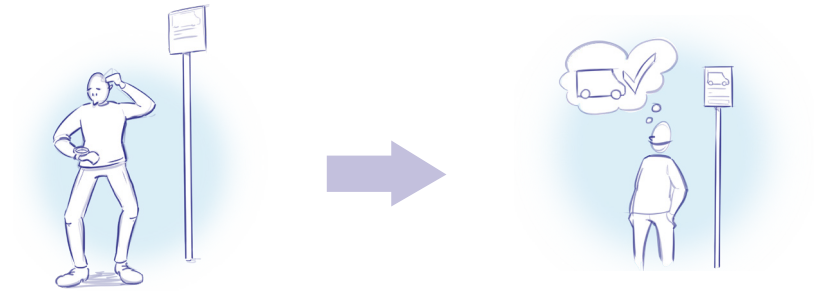
Design goal 3

To enhance the non-digital user's perceived travel spontaneity.

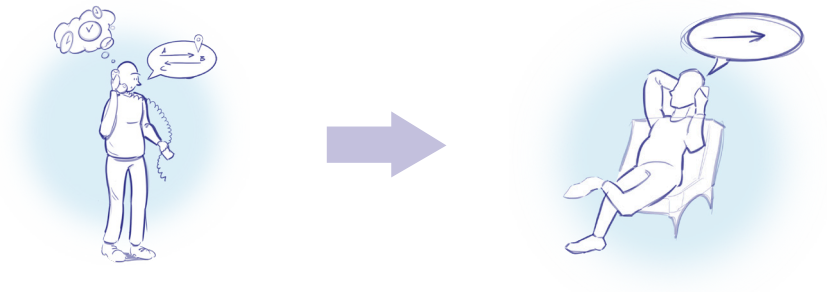
The non-digital user is aware of the existence and functionality of a demand responsive transport service before the journey and encouraged to make a reservation.



The non-digital user is certain about the departure and arrival times while travelling with providing real time route and time schedule information.



The non-digital user is able to travel spontaneously.




6
BOEK & GAAN
1
Volgende halte:
8
2
Actuele vertrek tijd:
19:00
Boek
laatmiste
30 minuten
voor vertrek
Geboekt

06 - Conceptualisation; from ideas to a concept

The previously defined problem statement is redefined based on insights from the literature exploration and the user interviews. A design goal is defined accordingly. This is used throughout the rest of the process as a compass to stay on the right track, figuratively speaking. The previous chapter also describes the research data from previous studies being structured in a workable format; the personas and critical usage issue scenarios. This inspires us to come up with new ideas and allows us to assess new ideas towards developing a concept. The objective of this chapter is to communicate the process of developing a concept, including the reasoning behind the research and design approach. The approach and general structure of the process is elaborated in section 6.1. The approach consists of several design cycles. These design cycles are a series of pragmatic activities, each with a specified goal, results and conclusions and new criteria that lead to the next design activity. Because it is highly iterative, the first section refers to other sections that are part of the design cycles.

6.1 Design cycles; an elaborate description of the process

The design cycles are a series of repetitive activities. According to the Delft Design Guide it starts with setting the criteria, followed by generating ideas. These ideas are prototyped and the experience gets simulated to validate the extent of achieving the design goals. Throughout the process it provides new insights for generating new ideas. In the following sections, the general methodology of the ideation and prototyping sessions are described.

Figure 4 provides an overview of each activity within the conceptualisation process. Each activity is accompanied with a research objective, a tool and a reference to the concerned section that elaborates on the results and conclusion of the test.

6.1.1 Design approach; ideation and prototyping

Ideation

Ideation is the process of coming up with new ideas. From experience, it is partly research driven and partly intuition driven. One method to generate ideas is brainstorming. This helps to diverge in a rather short amount of time and explore the possibilities within a certain domain. The creative facilitation theory and principles of Tassoul (2009) is taken to spark the creativity and guide the creative process. See appendix for an elaborate description of the tools.

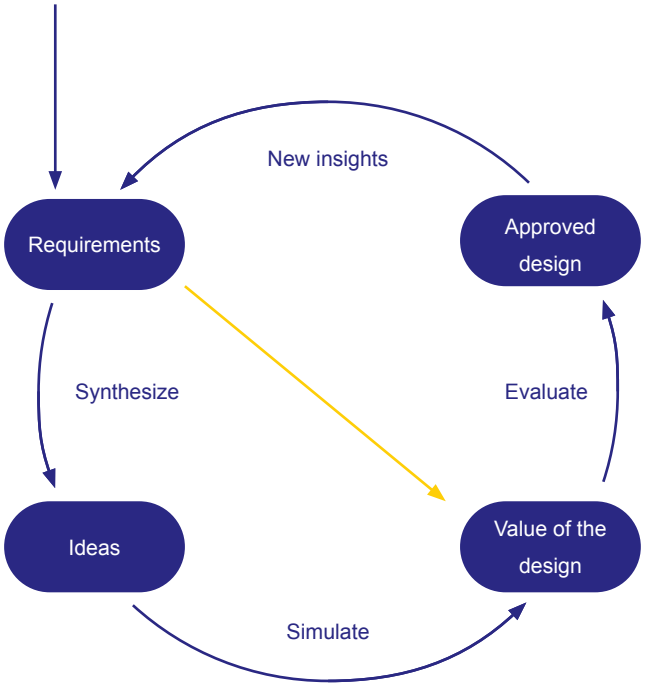


Figure 6.1: Illustration of a basic design cycle (van Boeijen et. al., 2014a).

Figure 6.2: A screenshot of the online brainstorm.

Idea simulation

In interaction design, a common method for exploring the perceived experience around an idea is to use prototypes. The prototyping sessions allow the designer to validate assumptions around ideas and get new and refreshing insights in return which inspire us to come up with new ideas. In an early stage of the design phase, it is unnecessary to develop the prototype in any detail, but does it suffice to determine what has to be validated and how this can be validated with minimal effort. Therefore, the prototypes are kept to a low fidelity.

During the prototyping sessions, the researcher interviews the participant and gives predefined tasks that aim to validate assumptions. The participants interact with the prototypes and speak out their thoughts, which lead to a further discussion.

6.1.2 Participants

For the first three prototyping sessions, the researcher consulted his personal and professional networks in order to recruit participants characterised by being elderly. For the final three sessions, an organisation is deployed that provides former low literates.

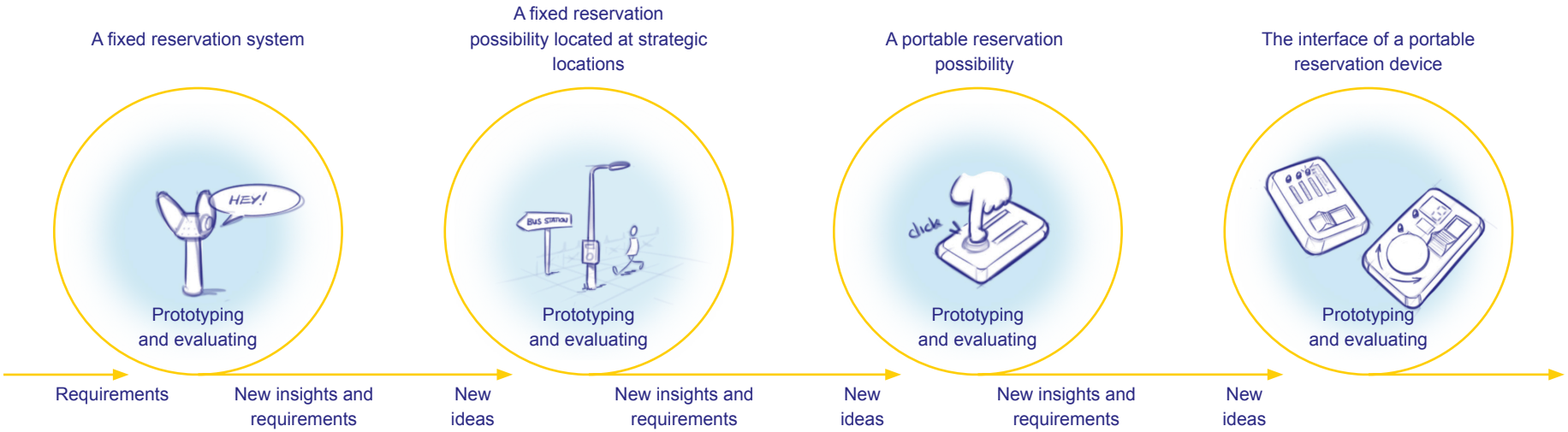


Figure 6.3: The structure of the design cycles including prototyping sessions.

6.1.3 An overview of the research and design activities

This section provides an overview of the several design cycles that have led to the concept proposition. Each cycle consists of an objective. The cycles started with a brainstorm that led to several ideas. These ideas are simulated and evaluated during the prototyping sessions. A more thorough description of how the design requirements have led to design directions and ideas is presented in section 6.2. The prototyping sessions are elaborated from section 6.3 and onwards.

0 Determining the focus

Objective	Determining the design directions and focus.
Outcome	Several design directions
Section	6.2

Figure 6.4: An overview of each design activity including the objective, key conditions, key outcomes and reference to the subsections.

1 Brainstorm

Objective	Generate ideas to explore possibilities.
Participant(s)	Various
Method and tools	Brainstorming on a collaborative online whiteboard platform designed for remote and distributed teams and co-creating with non-digital users
Outcome	Ideas to provide physical reservation options. Ideas to provide travel schedule information
Section	6.2

2 Prototyping a fixed reservation possibility

Objective	Prototyping the perceived experience around a fixed physical reservation possibility.
Participant(s)	1 (elderly)
Method and tools	A low fidelity prototype; sketch of the idea in its context.
Main insights	The long waiting times involved in fixed reservation possibilities are not accepted.
Section	6.3.1

3 Prototyping a fixed reservation possibility located at strategic locations

Objective	Prototyping the experience of a physical reservation possibility located at strategic locations and in connected PT vehicles.
Participant(s)	2 (elderly)
Method and tools	A low fidelity prototype; sketch of the idea in its context.
Main insights	This is not always accessible and therefore, not reliable enough to fully make use of it.
Section	6.3.2

4 Prototyping a portable reservation possibility

Objective	Pexperience of having a portable reservation possibility.
Participant(s)	2 (elderly)
Method and tools	A low fidelity prototype; sketch of the idea in its context.
Main insights	This idea is desired; the participants find it acceptable to book the outward journey via the call centre. Also, multiple participants often travel the same way back, but do not want to be tied to one specific time slot. The participant the device enhances convenience and travel spontaneity.
Section	6.3.3

5 Prototyping the interface of the reservation device

Objective	Prototpying the experience around the interface design of a portable reservation device.
Participant(s)	3 (low literates)
Method and tools	A low fidelity prototype; paper interface cards
Main insights	This device is desired if the functionality is extended to booking detours and if the interface is adjusted accordingly while maintaining comprehensibility.
Section	6.3.4

6 Prototyping the comprehensibility of the leaflet

Objective	Prototyping the comprehensibility of the leaflet and exploring the factors that determine the comprehensibility.
Participant(s)	4
Method and tools	A leaflet design.
Main insights	The insights mainly concern he comprehensibility of used language and it is advised to use real pictures to explain the functionality of the reservation device.
Section	6.3.5

6.2 From requirements to design directions

The design directions are the first intuitions towards a design. Before skipping to the design cycles, these intuitions are grounded and backed with the preliminary research. The data, conclusions and requirements are presented in section 5.2.2 in the previous chapter. This section aims to clarify the design directions by continuing on these series. The design directions are presented per design goal and each design goal is closed with a rationale behind choosing the most relevant design directions to continue the design process with.

Raise awareness and elicit behaviour

In the previous chapter, the research data has been collected, that points out that the non-digital user groups are not familiar with DRT, resulting in neglecting the information about the requirements to make a reservation. Therefore, the design requirement is to raise awareness of the existence and has to elicit the behavior of making a reservation. This leads to two design directions that are shown in figure 5.

Design requirements	Design directions
Convey the existence and functionality of DRT in a way appropriate for the user group and eliciting the behaviour to make a reservation.	*A variety of marketing channels that have potential reaching the concerned users.* *Graphic design that elicits behaviour.*
Physically communicate real-time departure and arrival times, delays and route updates.	*Devices that give feedback about departure and arrival times, delays and route updates at the bus stations.*
Enable travellers to book anywhere at any time without requiring to use a mobile- or smartphone.	*A device that enables users to book while travelling.*

Figure 6.5: From each requirement to the first design directions.

The first design directions is to adjust the graphic design of flyers and posters in order to be more comprehensible and accessible for the concerned group, while eliciting the behaviour of making a reservation. Additionally, it suggests approaching non-digital users via a variety of marketing channels that have potential to reach the concerned group. It is assumed that through this way, the chances increase that individuals are aware of why it exists and what this means for them.

Enhancing the perceived certainty while travelling

Due to a limited amount of time, it considered leaving some of the aspects out of the scope for further research. The graphic design that aims to elicit behaviour could be validated rather quickly and therefore, it is decided to dedicate some minor tests to validate the assumptions and provide some suggestions for future designs. A list of potential channels derived from some brainstorms, which is described in the appendix H. However, it is left out of the scope for further research.

Enhancing the perceived travel spontaneity

Finally, the requirement to enable travellers to book a trip during their journey is translated to providing a physical reservation possibility. During the interviews, it is heard from every participant that DRT limits their travel spontaneity. Therefore, mainly this design direction is explored during the conceptualisation phase.

6.3 Prototyping results; From a fixed to a portable reservation device

6.3.1 Prototyping a fixed reservation possibility

An obvious idea would be to place reservation systems at the bus stations. These reservation systems allow the travellers to plan their journey and make a reservation. An example of this type of system is the Hubtaxi. They upcycled old ANWB emergency poles, previously used for motorists with car trouble on the highway, with a button that connects the user with the call centre through an intercom. Travellers have to wait for 20 minutes at most.

Objective	Prototyping the perceived experience around a fixed physical reservation possibility.
Method and tools	A low fidelity prototype; sketch of the idea in its context.
Main insights	The long waiting times involved in fixed reservation possibilities are not accepted.

Figure 6.6: A picture of the blue intercom (Ecoleon, 2018)

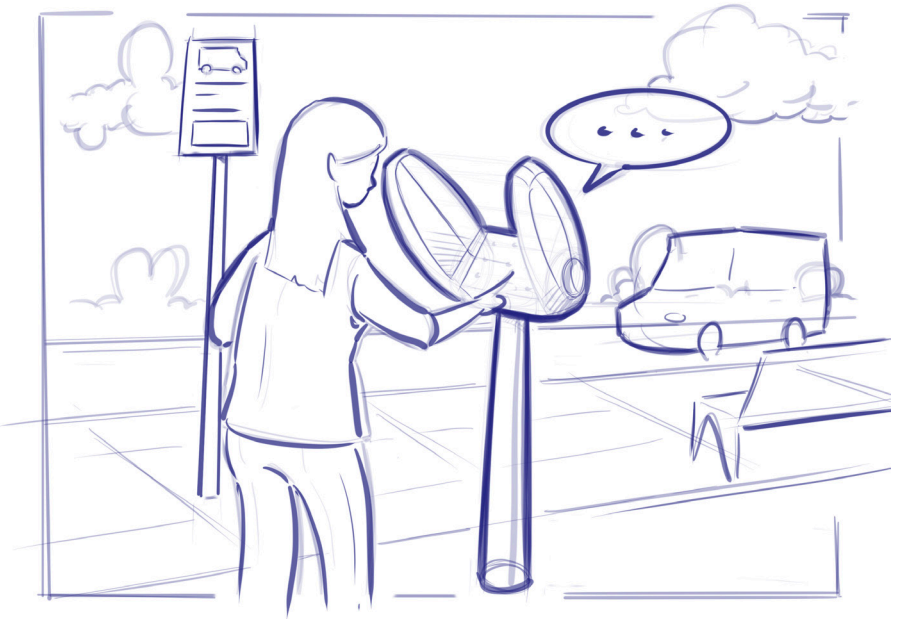


Figure 6.7: The quick sketch of the idea used as low fidelity prototype.

Key quotes	Key insights and core needs	Design requirements	Idea
"It feels like I would have to wait unnecessarily long."	*The long waiting times involved in fixed reservation possibilities are not accepted.*	*The design needs to minimise the waiting time at the bus station.*	*Provide a physical reservation possibility that is available at strategic locations in order to minimise time.a*

Figure 6.8: From the key quotes derived from the prototyping session to a new idea.

6.3.2 Prototyping a fixed reservation possibility located at strategic locations

In response to the long waiting times, this idea aims to minimise the waiting times by providing reservation poles at strategic locations. This allows the traveller to make a reservation on the way towards the bus station.

Objective	Prototyping the experience of a physical reservation possibility located at strategic locations and in connected PT vehicles.
Method and tools	A low fidelity prototype; sketch of the idea in its context.
Main insights	This is not always accessible and therefore, not reliable enough to fully make use of it.

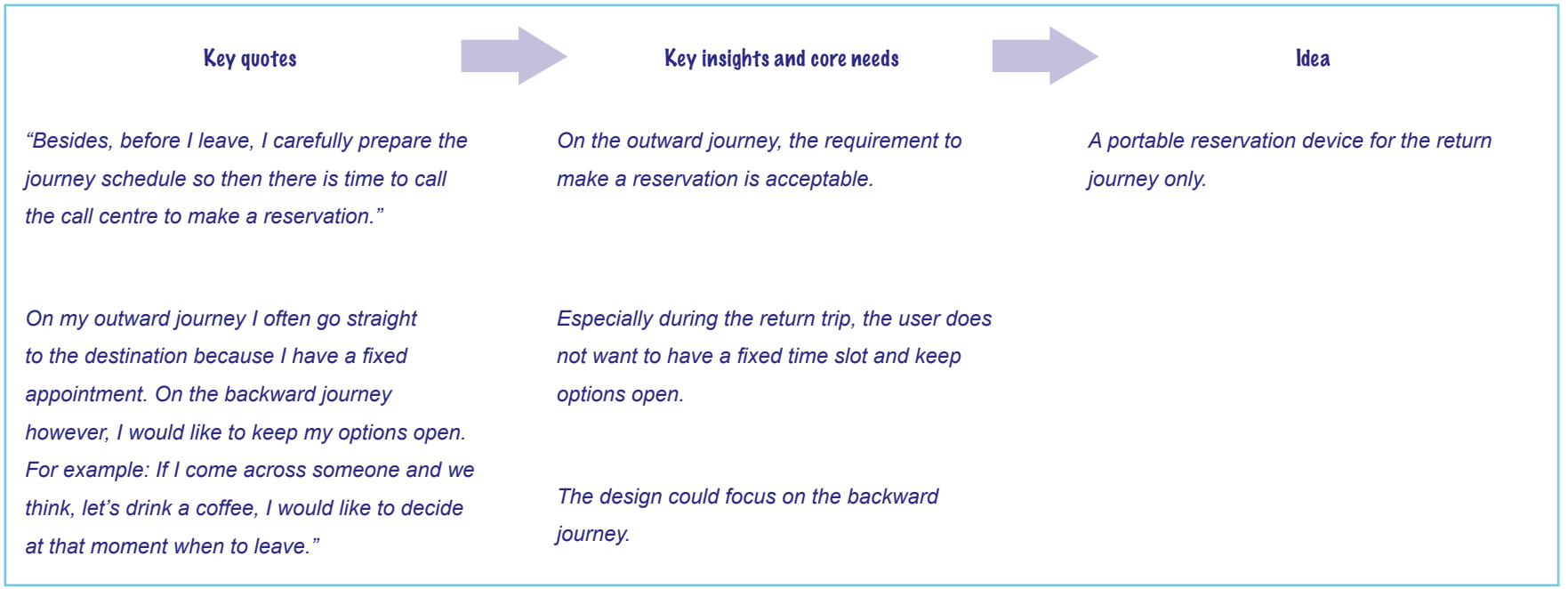


Figure 6.9: From the key quotes derived from the prototyping session to a new idea.

Figure 6.10: The quick sketch of the idea used as low fidelity prototype.

6.3.3 Prototyping a portable reservation possibility

Since both participants mentioned that they plan their journey at home and that they find it acceptable to make a reservation. The problem however, is mainly related to the backward journey. Built upon that insight, the idea is to provide a portable reservation possibility for the backward journey only.

Objective	Pexperience of having a portable reservation possibility.
Method and tools	A low fidelity prototype; sketch of the idea in its context.
Main insights	This idea is desired; the participants find it acceptable to book the outward journey via the call centre. Also, multiple participants often travel the same way back, but do not want to be tied to one specific time slot. The participant the device enhances convenience and travel spontaneity.

Key insights and core needs

The user has experience with a DRT service and thinks that this actually improves the user experience. But, he also believes that this will be too expensive for the operator. He finds it acceptable to pay a deposit.

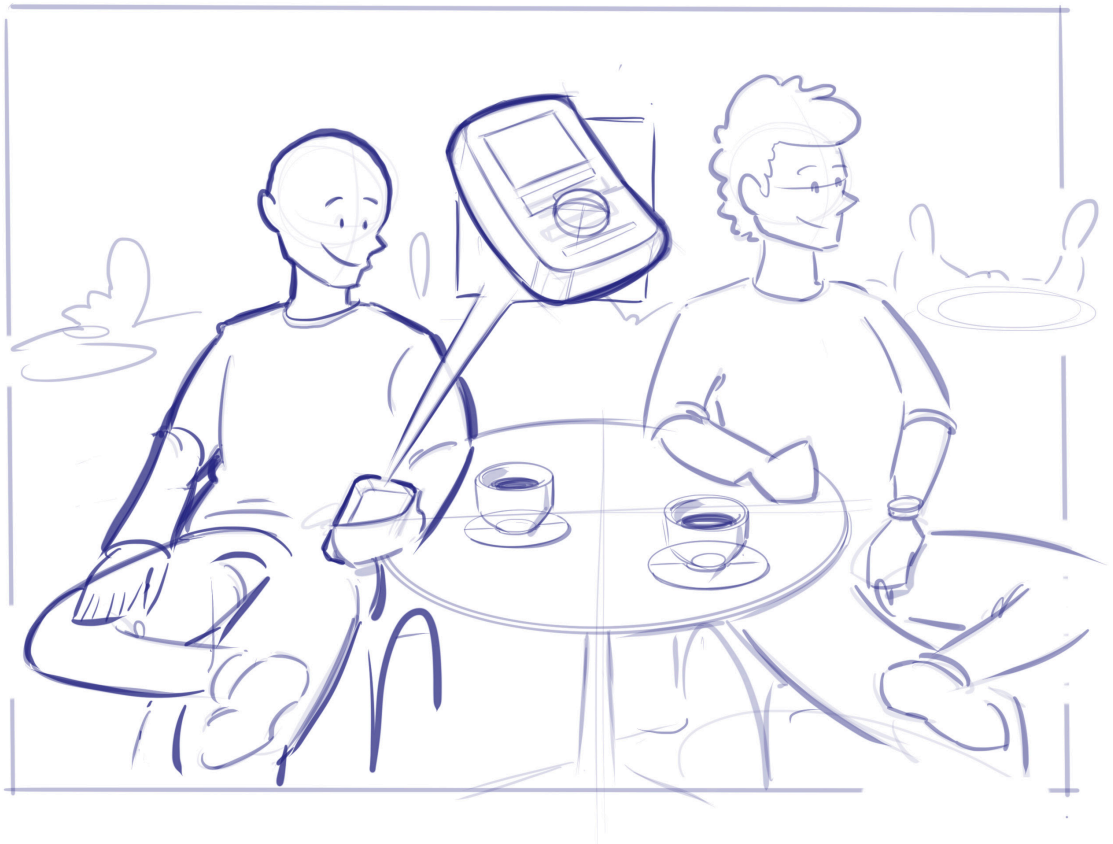


Figure 6.11: The quick sketch of the idea used as low fidelity prototype.

6.3.4 Prototyping the interface of a portable reservation device

In response to the positive feedback of the previous prototyping session, it is argued to test different configurations and interfaces of the reservation device.

Objective	Prototpying the experience around the interface design of a portable reservation device.
Method and tools	A low fidelity prototype; paper interface cards
Main insights	This device is desired if the functionality is extended to booking detours and if the interface is adjusted accordingly while maintaining comprehensibility.

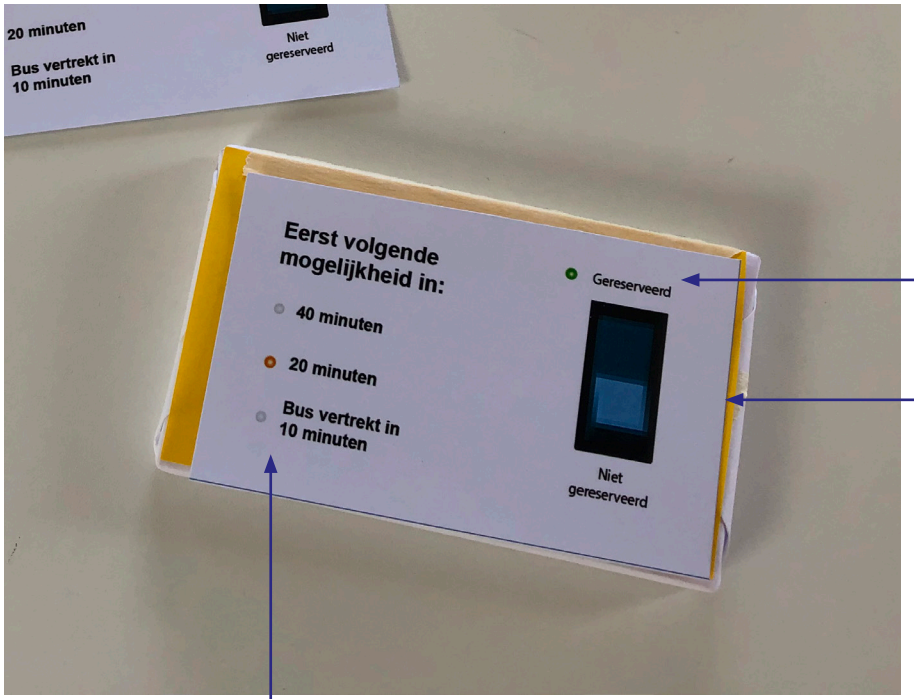
How it is prototyped

Two paper prototypes for each configuration. Each configuration includes several paper cards with different “states”. The participants interacting with the prototypes lead to a discussion about the pros and cons.

With who it is prototyped

The participants are available via the organisation “Het digi-taalheid”. This organisation arranges sessions with low literates, such as product development.

Figure 6.12: The paper prototypes of the interfaces.



a LED confirming the reservation

a switch to book

it indicates the next possible departure time to travel van B to A with LEDs

Device 1

This device has limited possibilities; it indicates the next possible departure time to travel from B to A with LEDs and has the switch to book.

it indicates the destination and next possible departure time with a 2 digit screen

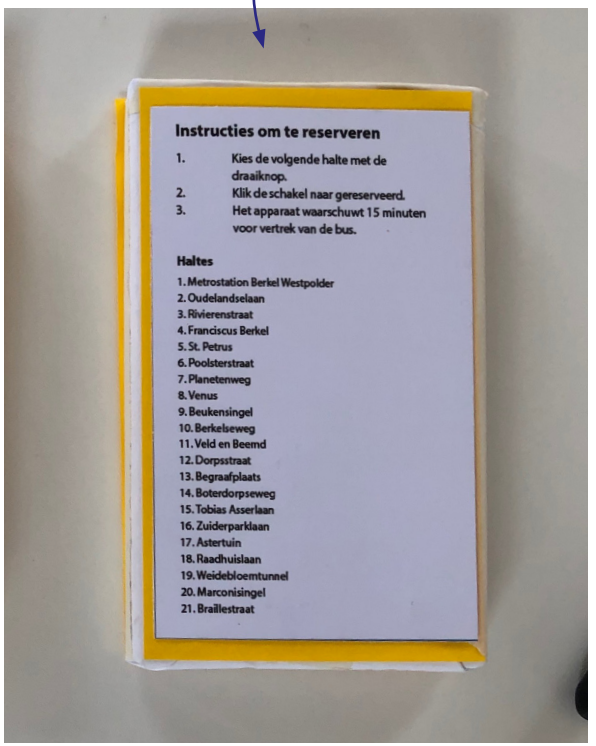
indicating the screen mode with LEDs

a dial to choose the destination

a LED confirming the reservation

a switch to book

the instructions and destination on the backside



Device 2

This device allows the user to book a trip to a new destination and therefore, a bit more complex. This interface has one screen that shows two modes: the countdown time to the next option for departing and the next destination. Whether it shows one or the other, is indicated with LED lights. If the participant turns the dial, the screen changes the mode to the next destination. After some time, it changes back to the departure time mode.

Results; from two interfaces to one

It is clear that the reservation is made with the switch button. However, some other aspects of the interfaces are confusing. The results are described per interface.

Results; both

Device 1 and 2 did not suffice in communicating the time. Instead of LED indications or countdown style, it was preferred to see the actual departure time.

Results; Device 1

The LEDs were interpreted in two ways; either it takes at least the x amount of minutes, or it stands for taking a maximum amount of minutes.

If the minimum reservation has passed, the timer jumps back to 40 minutes. However, it was not clear until when they had the possibility to turn on the switch, which led to confusion. Instead, it is desired to see the actual departure time on a screen.

Insights

- LEDs are ambiguous
- Need to see the actual departure time

Results; Device 2

One participant did not understand that this device has the possibility to book a new destination. She immediately preferred the first device.

The other two participants did understand that the dial button operates the destination. However, it seemed that the participants did not understand that it automatically changes back. Also, they did not know which mode was displayed and mentioned that this would be too difficult for low literates. Nevertheless, the possibility to book a detour is definitely desired. Therefore, the discussion leads to a third prototype that allows to book a detour while improving comprehensibility.

Insights

- The layers of the screen are not accessible
- Booking to a new destination is desired

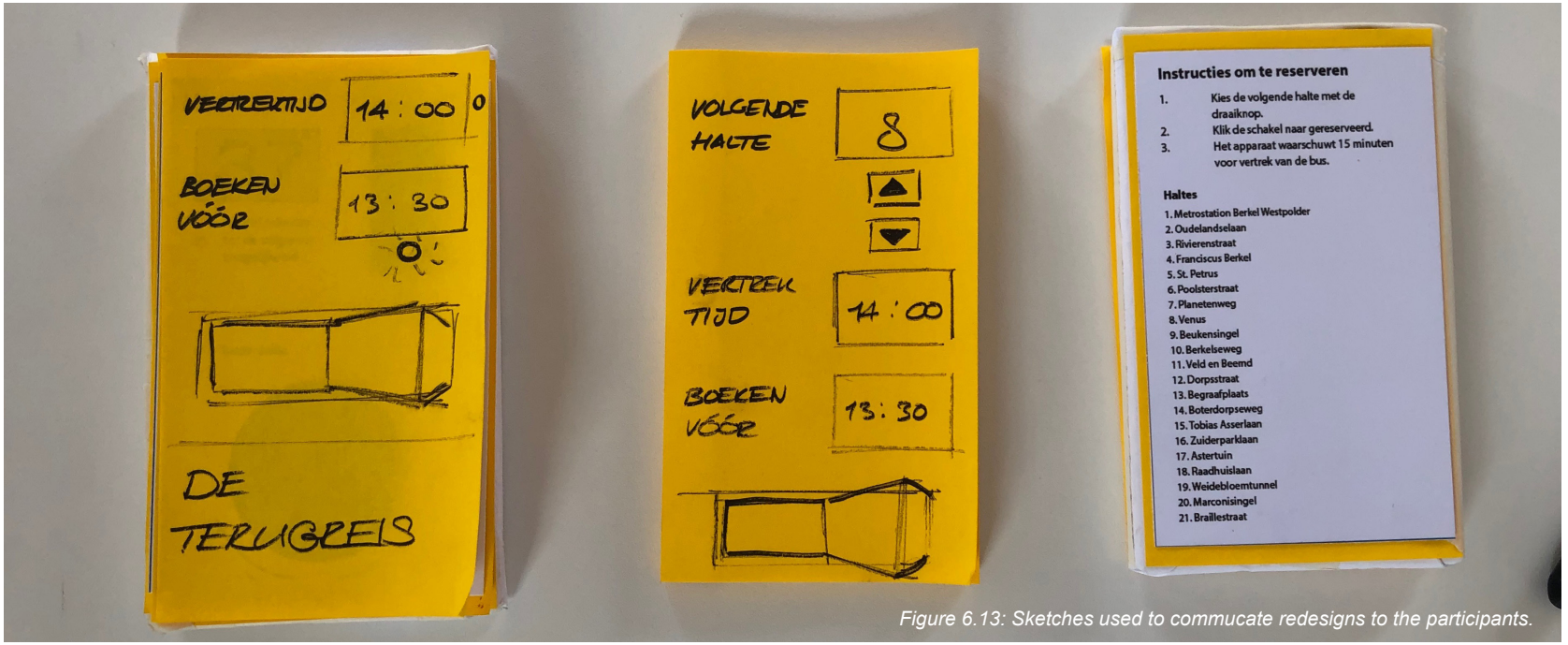


Figure 6.13: Sketches used to commucate redesigns to the participants.

Language

Sentences should not be too long and individual words should not have too many syllables. The word “reserveren” for instance is too complicated.

The name of the device, “de Terugboeker” is affiliated with transferring money. Therefore, it is not an appropriate name.

Booking and planning for a low literate

The extended possibility to book a detour entails complexity. Apart from the device, booking and planning is often a bridge too far for this group, since FLT and PT in general already has many obstacles.

Co-created redesign; Device 3

This design derived from the first two tests and has two configurations. The design has two screens; one that displays the actual departure time and one that displays the destination. This results in not having any layers and therefore all the information in one glance. The second configuration adds the possibility to book a detour and uses two buttons instead of a dial.

All screens are in line with the corresponding text, so it is clear what is connected.

“This is really good. It is short and concise. I really think.. You passed the test.”

Conclusions

From these tests it can be concluded that DRT services are complex to comprehend for low literates. There are many factors that cause barriers for low literates to use PT and the complexity of a DRT service adds upon that. The interface has made improvements, but there are more aspects, apart from the reservation device, that need clarification. They expect many issues during using PT and therefore, they are suspicious and in order to clear out the suspicion, they have to be informed carefully via a visual and tactile medium. The device does enhance the perceived travel spontaneity for low literates, but taking the first step is probably a bridge too far. Any DRT service should be accompanied with a marketing campaign tailored for this user group. For this research, it is argued to focus on the reservation device.

6.3.5 Prototyping the flyer with explanation

Current advertisements do not appeal to the concerned user groups and are ignored. Also, the device requires instructions and therefore, a flyer is prototyped to gain new insights about the comprehensibility for this user group. This section presents the results of testing this flyer leading to design requirements.

Objective	Prototyping the comprehensibility of the leaflet and exploring the factors that determine the comprehensibility.
Method and tools	A leaflet design.
Main insights	The insights mainly concern he comprehensibility of used language and it is advised to use real pictures to explain the functionality of the reservation device.

Figure 6.14: The prototype of the leaflet.

Lay out

The front page shows a brief introduction of the DRT service. The second page shows how to make a reservation via the call centre and the third page shows how to make a reservation with a smartphone. This means that folded out, these bits of information are shown on the same page. This is perceived as confusing and therefore, it is desired that it will be shown in two different flyers.

Use of language

First of all, the name STOP&GO is confusing for a low literate. They would not identify that “go” is an english word. The participant advises to avoid English words and suggests: STOP&GAAN.

Other suggestions are:

- “Geboekt” instead of “gereserveerd”
- Heenreis - Tussenstop - Terugreis

Images

Low literates are suspicious. They observe how things look and compare it with reality. The flyer should contain images that show the reality. This applies to the instructions of the reservation device. But it does also apply to the picture of the call centre employee. He is sitting behind a computer, which is unlikely for a low literate and therefore perceived as misleading. It would be more logical if he actually makes a schedule. Besides, the images should not be in black and white.

The customer journey of the user

is aware before travelling

understands what is required for using the bus service

"Well, makes sense."

plans the journey like always

makes a reservation

possibly misses the appointment

has stress of missing his chance

pushes the button to notify that he is here

saved by the button

consults real time travel information about the bus

"I'm sure that the bus is coming and I know exactly when."

The operator

raises awareness at strategic locations; places that are often related to the non-digital user

provides comprehensible posters and leaflets that elicit the behaviour of making a reservation

provides meaningful human interaction with a call centre that is trained to get non-digital users in a pleasant way

provides a second try button at the bus stations

resends the bus

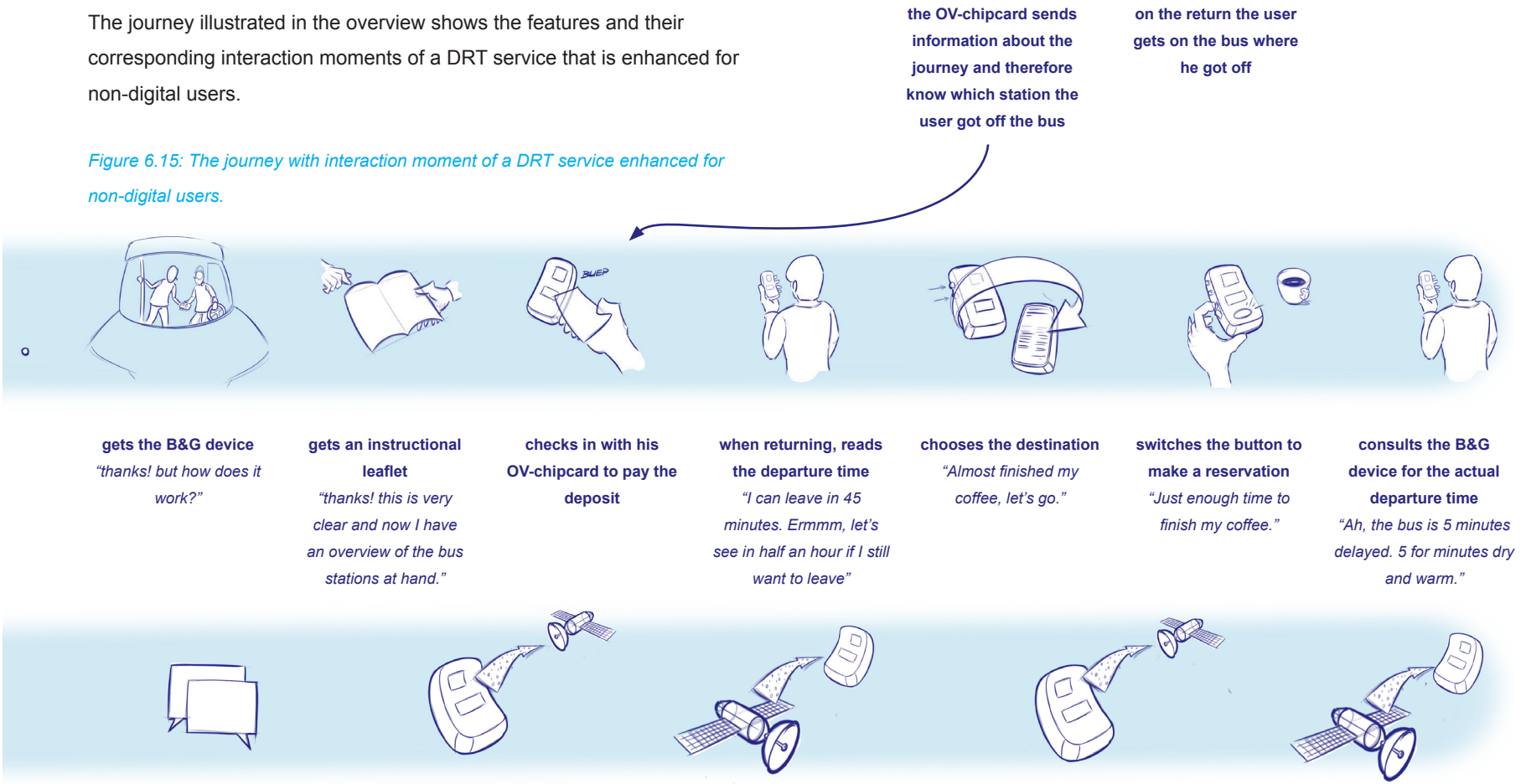
provides actual departure times

6.4 The concept proposition of a Demand Responsive Transport service enhanced for non-digital users

6.4.1 The improved customer journey

The journey illustrated in the overview shows the features and their corresponding interaction moments of a DRT service that is enhanced for non-digital users.

Figure 6.15: The journey with interaction moment of a DRT service enhanced for non-digital users.



gets the B&G device
"thanks! but how does it work?"

gets an instructional leaflet
"thanks! this is very clear and now I have an overview of the bus stations at hand."

checks in with his OV-chipcard to pay the deposit

the OV-chipcard sends information about the journey and therefore know which station the user got off the bus

when returning, reads the departure time
"I can leave in 45 minutes. Ermmm, let's see in half an hour if I still want to leave"

chooses the destination
"Almost finished my coffee, let's go."

switches the button to make a reservation
"Just enough time to finish my coffee."

on the return the user gets on the bus where he got off

consults the B&G device for the actual departure time
"Ah, the bus is 5 minutes delayed. 5 for minutes dry and warm."

the bus driver explains the functionality of the device and answers any DRT related questions

device sends travel information of OV-chipcard to the planning system

planning system sends actual departure information to the device

device sends the booking to the planning system

planning systems keeps updating actual departure time

The leaflet


Flexvervoer
BOEK
GAAN
Beter voor het milieu.
Na 19:00 met de bus?
Eerst boeken!
ZIE hier hoe!
21, Braillestraat

Reizen met BOEK&GAAN

1

Bel tenminste 30 minuten vóór vertrek nummer **010 123 45 67**.

2

Van halte 'A' naar halte 'B' rond 'tijd'

Boek uw rit.

3

Sta klaar op de afgesproken tijd.

Bus gemist?

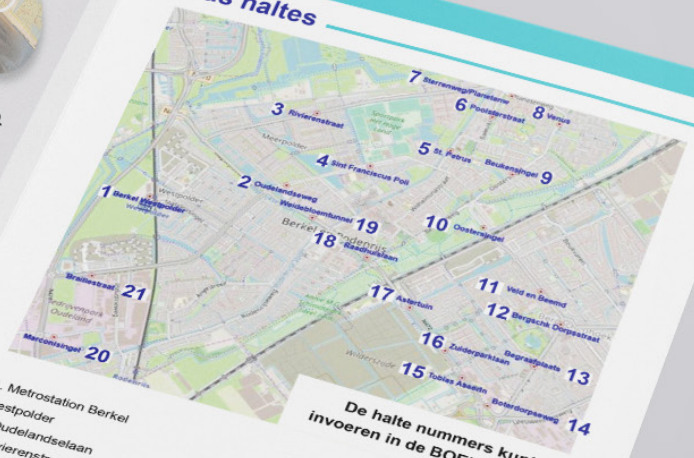
Geen probleem.
Druk op de knop en we halen u zo spoedig mogelijk op.

5

Terug naar huis? Gebruik de BOEKER. Op de achterzijde leest u hoe.

Voor meer informatie belt u met 010 123 45 67 of gaat u naar www.stopengaan.nl.
U kunt ook boeken met de app.

Bus haltes



De halte nummers kunt u invoeren in de BOEK&GAAN

1. Metrostation Berkel Westpolder
2. Oudelandselaan
3. Rivierenstraat
4. Franciscus Berkel
5. St. Petrus
6. Poolsterstraat
7. Planetenweg
8. Venus
9. Beukensingel
10. Berkelseweg
11. Veld en Beemd
12. Dorpsstraat
13. Begraafplaats
14. Boterdorpseweg
15. Tobias Asserlaan
16. Zuiderparklaan
17. Astertuin
18. Raadhuislaan
19. Weidebloem tunnel
20. Marconisingel
21. Braillestraat

Reizen met BOEK&GAAN

1

Bel minstens 30 minuten vóór vertrek naar **010 123 45 67**

Druk op de knop

2

Boek uw rit

3

Sta klaar bij de halte

Terug naar huis?
Gebruik de **BOEKER**
Op de achterzijde leest u hoe

Voor meer informatie belt u met 010 123 45 67 of gaat u naar www.stopengaan.nl.
U kunt ook boeken met de app.

Bus haltes

1. Metrostation Berkel Westpolder
2. Oudelandselaan
3. Rivierenstraat
4. Franciscus Berkel
5. St. Petrus
6. Poolsterstraat
7. Planetenweg
8. Venus
9. Beukensingel
10. Berkelseweg

Geef de halte nummers door of voer in de BOEK&GAAN

11. Veld en Beemd
12. Dorpsstraat
13. Begraafplaats
14. Boterdorpseweg
15. Tobias Asserlaan
16. Zuiderparklaan
17. Astertuin
18. Raadhuislaan
19. Weidebloem tunnel
20. Marconisingel
21. Braillestraat

Boeken met de 'BOEKER'

1

Vraag de boeker aan de chauffeur

2

Houdt uw OV chipkaart bij de boeker en neem deze mee

3

Bus boeken?
Kies de halte met de knoppen

4

Schuif de onderste knop omlaag

*annuleren tot 10 minuten voor vertrek

5

U wordt opgehaald van de laatste halte

BOEK GAAN

Flexvervoer

Na 19:00 met de bus?
Eerst boeken!
ZIE hier hoe!

Another point of recognition for DRT services

Step-by-step explanation supporting to learn through commandos

Real pictures

Explains why it exists

Text clouds to make it more visual

Font size 12

Colour schemes accessible for vision impaired

Reizen met BOEK&GAAN

1

Bel tenminste 30 minuten vóór vertrek nummer **010 123 45 67.**

2

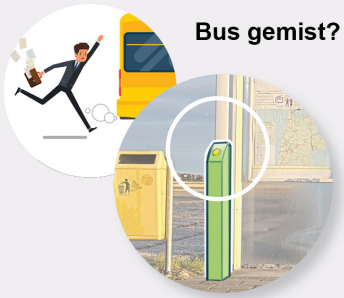
Van halte 'A' naar halte 'B' rond 'tijd'

Boek uw rit.

3

Sta klaar op de afgesproken tijd.

Bus gemist?



Geen probleem.
Druk op de knop en we halen u zo spoedig mogelijk op.

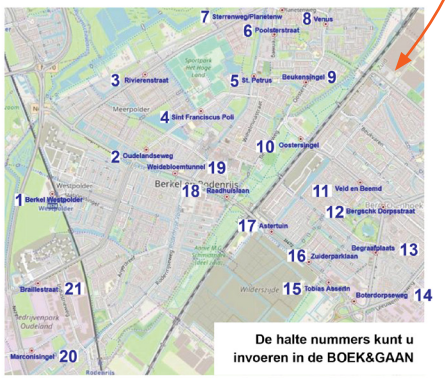
Terug naar huis? Gebruik de **BOEKER**. Op de achterzijde leest u hoe.

Voor meer informatie belt u met 010 123 45 67 of gaat u naar www.stopengaan.nl.
U kunt ook boeken met de app.

Pictures accompanied by icons that explain the text.

Both text as a map of the bus stations inclkuding a referration to a number.

Bus haltes



1. Metrostation Berkel Westpolder
2. Oudelandselaan
3. Rivierenstraat
4. Franciscus Berkel
5. St. Petrus
6. Poolsterstraat
7. Planetenweg
8. Venus
9. Beukensingel
10. Berkelseweg
11. Veld en Beemd
12. Dorpsstraat
13. Begraafplaats
14. Boterdorpseweg
15. Tobias Asserlaan
16. Zuiderparklaan
17. Astertuin
18. Raadhuislaan
19. Weidebloem tunnel
20. Marconisingel
21. Braillestraat

The poster

Maakt u na 19:00 uur gebruik van de bus in het gebied Lansingerland?
Dan moet u eerst een plek boeken.

1

Bel tenminste 30 minuten vóór vertrek nummer **070 123 45 67.**

2

Boek uw rit.

3

Sta klaar op de afgesproken tijd.

Bus gemist? Geen probleem.
Druk op de knop en we halen u zo spoedig mogelijk op.

Terug naar huis?
Gebruik de BOEK&GAAN. Vraag aan de buschauffeur voor meer informatie.

Bus haltes

1. Metrostation Berkel Westpolder
2. Oudelandselaan
3. Rivierenstraat
4. Franciscus Berkel
5. St. Petrus
6. Poolsterstraat
7. Planetenweg
8. Venus
9. Beukensingel
10. Berkelseweg
11. Veld en Beemd
12. Dorpsstraat
13. Begraafplaats
14. Boterdorpseweg
15. Tobias Asserlaan
16. Zuiderparklaan
17. Astertuin
18. Raadhuislaan
19. Weidebloem tunnel
20. Marconisingel
21. Braillestraat

Voor meer informatie belt u met 010 123 45 67 of gaat u naar www.boekengaan.nl. U kunt ook boeken met de app.

BOEK GAAN

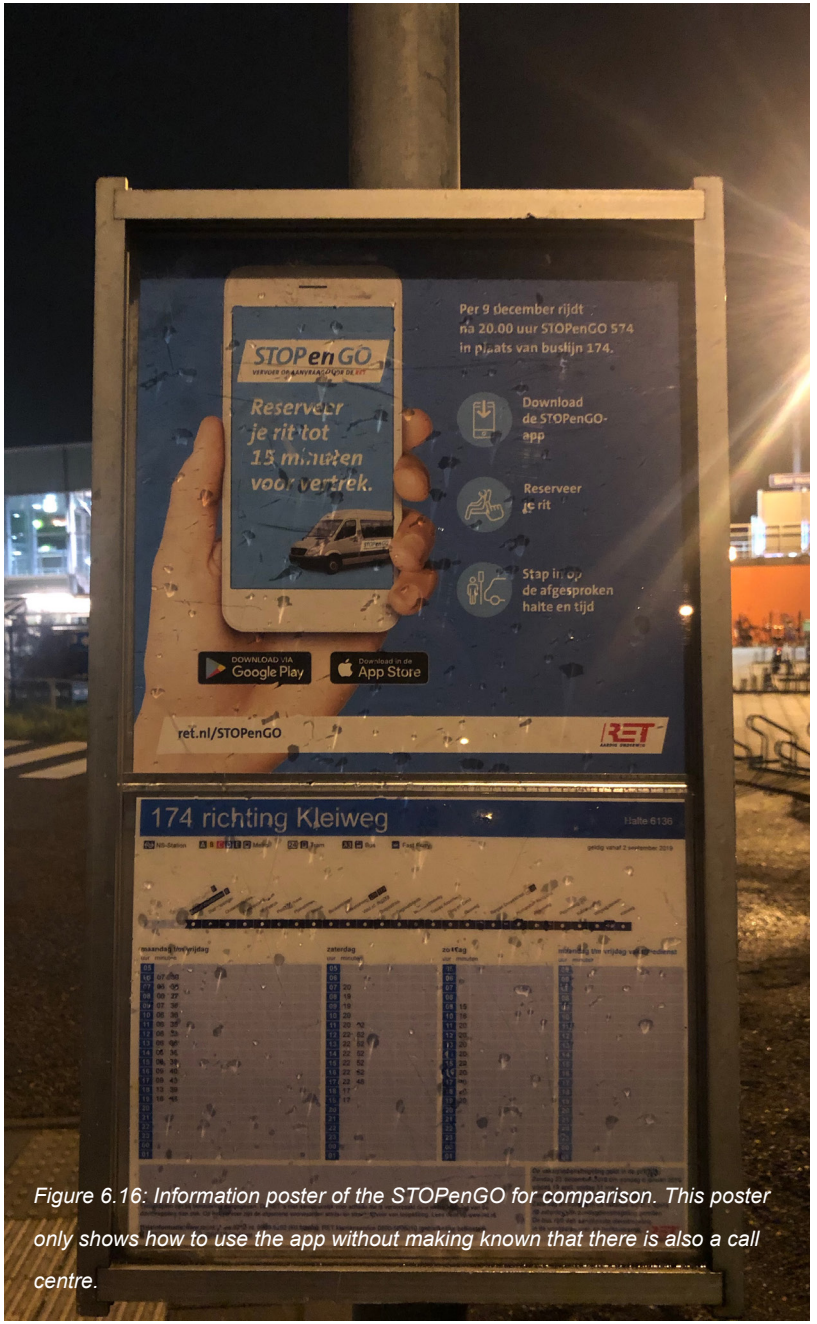


Figure 6.16: Information poster of the STOPenGO for comparison. This poster only shows how to use the app without making known that there is also a call centre.

Figure 6.17: Information poster of the AMLflex for comparison. This poster shows a lot of small text and few pictures or visuals that actually say something about the content.

The new bus shelter

Figure 6.18: A bus sign for DRT services.

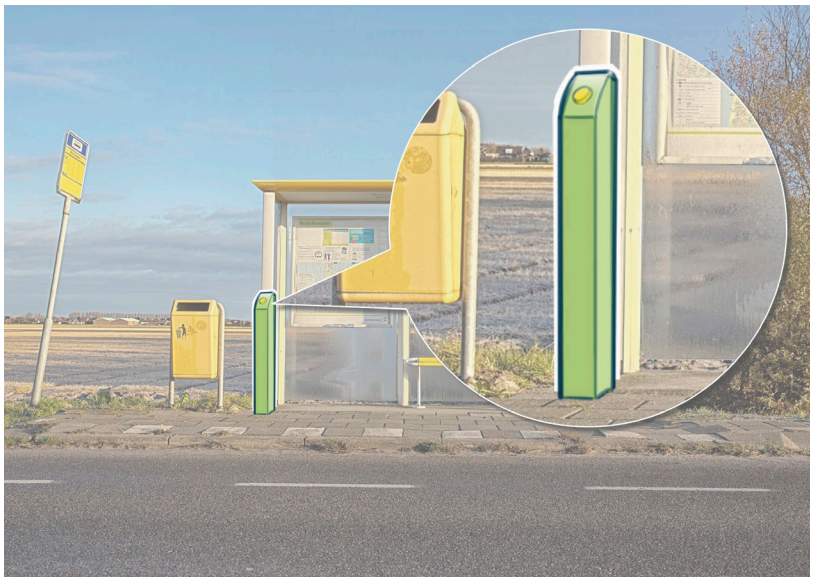


Figure 6.19: A reservation pole that allows the user to re-call the bus if missed.

Figure 6.20: A poster at the information panels.

Figure 6.21: DRIPs showing real time information and confirming if the bus is coming.

The reservation device


Graphics are replaceable with stickers making it suitable
for the specific requirements of any DRT service
Instructies
1. Kies de volgende halte.
2. Schuif tenminste 30 minuten vóór vertrek de onderste knop naar beneden.
3. Sta klaar op de actuele vertrektijd.
Bus haltes
1. Metrostation Berkel Westpolder
2. Oudelandselaan
3. Rivierenstraat
4. Franciscus Berkel
5. St. Petrus
6. Poolsterstraat
7. Planetenweg
8. Venus
9. Beukensingel
10. Berkelseweg
11. Veld en Beemd
12. Dorpsstraat
13. Begraafplaats
14. Boterdorpseweg
15. Tobias Asserlaan
16. Zuiderparklaan
17. Astertuin
18. Raadhuislaan
19. Weidebloem
tunnel
20. Marconi
21. Braillestra


1
2
Actuele vertrek tijd:
19:00
Geboekt


BOEK & GAAN
1
Volgende halte:
8
2
Actuele vertrek tijd:
Boek tenminste 30 minuten voor vertrek
19:00
Geboekt

The front panel

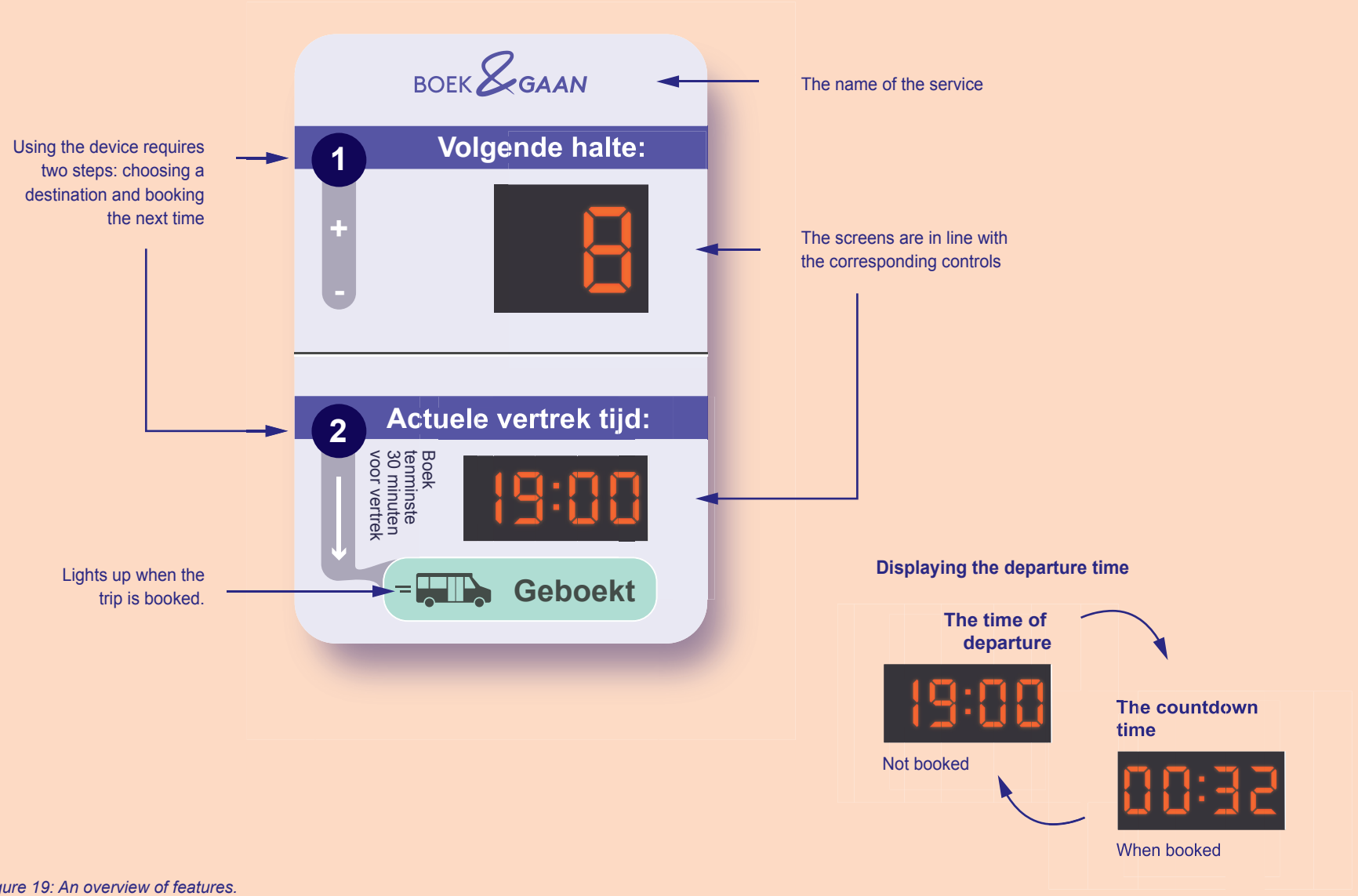


Figure 19: An overview of features.

The controls

Two buttons on the side of the device to choose the destination

A switch on the side of the device turns on the booking

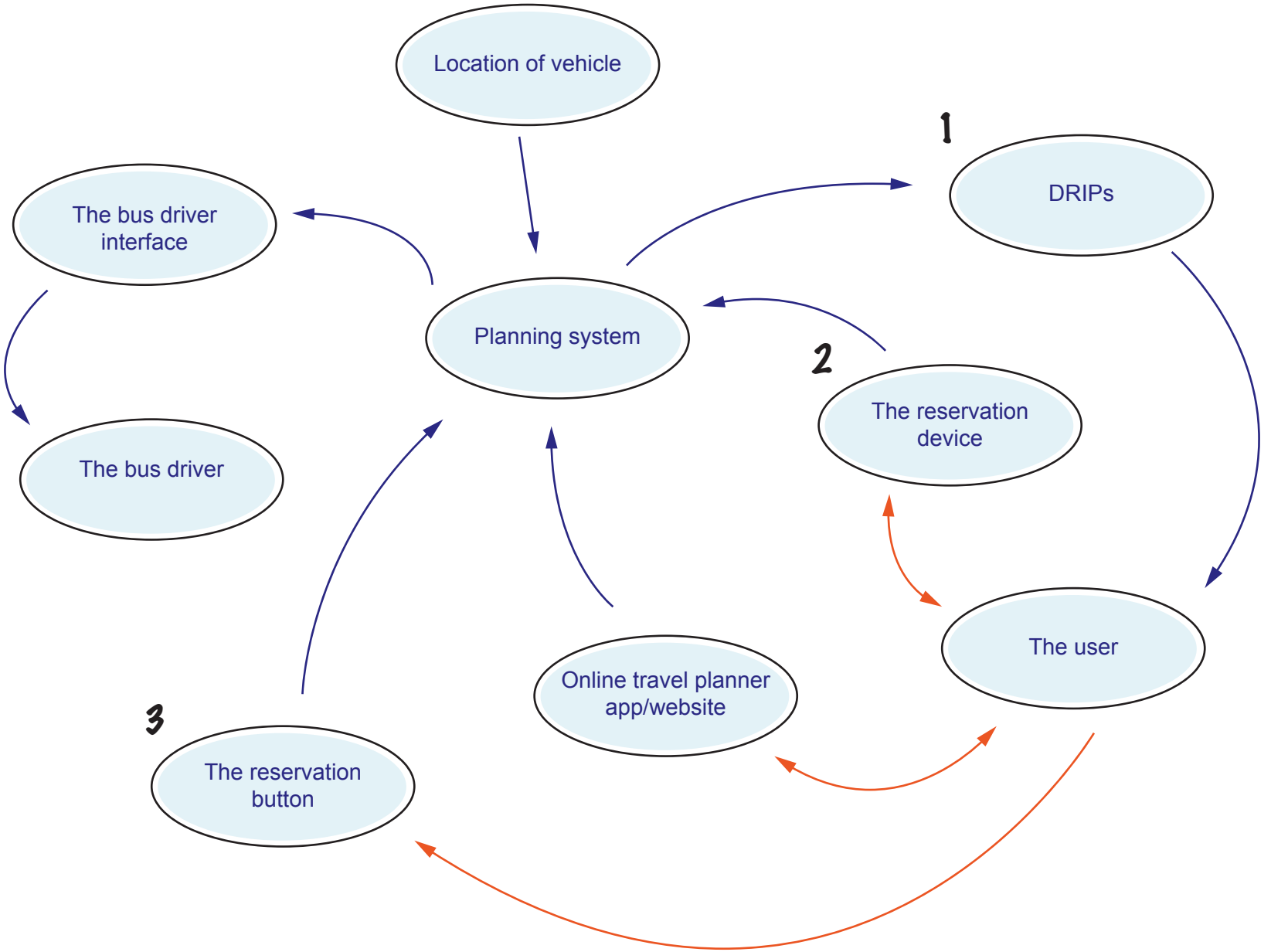
Other configurations of the functionality and displaying the departure time

Functionality: booking a trip to a new destination:

A → B ... B → C

The backside

The concept ecosystem



6.5 Final conclusions

The process

During this phase of the conceptualisation, the focus was mainly on achieving design goal 3; enhancing the perceived travel spontaneity.
The first intuition was to solve the problem by providing a physical reservation possibility.
Through prototyping new insights derived which inspired to take the idea from a fixed to a portable possibility; referred to as the reservation device.

The enhanced customer journey

It is expected that the implementation of the reservation device does not suffice on its own in making DRT more accessible for non-digital users if the other design goals are not achieved as well. Therefore, the other parts of the customer journey, will be developed to a degree which allows us to evaluate the level of desirability.

The reservation device

The most important aspect of the reservation device is whether the main functionality achieves the design goal. The tests proved that it does enhance the experience of the return journey. Furthermore, there are some aspects that need further exploring. Think of the comprehensibility of the interface, the expected form language and use cues and ergonomics of the case and again, different configurations of the functionality. Some interfaces were tested with low literates. Since there was a (rare) possibility to test with low literates, it was argued to focus on exploring the factors that determine the comprehensibility of the interface and its supporting flyer. The test led to a redesign of the first interface designs.
Two participants, 1 elderly and 1 low literate mentioned that instead of booking to a new destination, a return trip only does suffice in achieving the design goal. Nevertheless, two low literates mentioned that having the possibility to go to new destinations is worth the extra struggle of learning it. This will be one of the main features that has to be tested.

Another feature that has to be tested is how the device displays the actual departure time. It has three options:

1. The actual departure time
2. The actual departure time switched to the countdown time when booked
3. The countdown time only

Another important feature is the form language; it should not be too computer-like while keeping the use cues comprehensible. The ergonomy of the case could be explored too and finally, a rather important factor is whether it is feasible to develop and implement, which should be validated with experts.

Discussion of the design approach

The cycles were conducted with a small amount of participants. During the first three cycles there were only three participants available and the fourth cycle another three. It is arguable whether the small amount of participants suffice in providing true insights. Therefore, the design of the portable reservation device in the context of the enhanced customer journey does require more research. It is taken into account that the reliability of the insights are limited, but on the other hand, the purpose of the cycles was to inspire. From the experience of the design it is argued that the design process is research driven for a great part intuition driven for a small part. The starting point of a fixed reservation possibility had many flaws, which was expected. However, through the prototyping sessions it led to the reservation device, which seemed to solve these flaws. The insights from these cycles should not be adopted without conducting a more extended research, but for this project it is considered to be justifiable.

7

07 - Final evaluation of the concept

The research has provided a set of insights, a problem statement that is applicable to many DRT services in the Netherlands and its corresponding design goals. With the design goals as starting point, guided and inspired by the personas, new ideas to enhance the user experience of non-digital users have been determined. Through an iterative process of testing ideas with low fidelity prototypes, a concept has been derived. The concept is an enhanced customer journey that aims to communicate the existence and functionality of the DRT service, to enhance perceived certainty while travelling and to allow the user to travel more spontaneously.

The approach of this final evaluation test and its results, are presented in this chapter. Finally, an overview of recommendations for further development of the concept is described.

7.1 Final evaluation approach

7.1.1 Focus and methodology

The final evaluation consists of two main aspects; The user experience and the technical and financial feasibility.

Evaluation the technical and financial feasibility

It is recommended to display real time travel information in the app, at the DRIPs and at the reservation device. This could significantly help in enhancing the certainty about travel times, but it is not validated if this is feasible yet.

Besides, this comes at a cost. It requires development and several organisational and technical changes within the DRT service operated by the PT company. This evaluation aims to determine the thoughts about the concept of operators with their expertise.

Evaluation the user experience

The concept achieves the goal of making DRT more accessible for non-digital users, if some conditions are met.

- The first condition is that the user is aware of the existence and functionality of DRT.
- The second condition is that the user is able to consult schedule information resulting in having more certainty while traveling.
- The third condition is that the traveller has a physical reservation possibility while travelling resulting in having more travel spontaneity and certainty about schedule information.

The goal of the test is to evaluate the effectiveness of the concept in achieving the goal. However, some aspects are taken into account for the test and others not. Below, it is argued what is taken into account for the evaluation. This is followed by elaborating the test guide.

The marketing strategy

First of all, the marketing strategy is nog designed yet. Therefore, it is impossible to evaluate it. Nevertheless, the test aims to gain insights about expected locations with potential to approach the user group for the marketing strategy.

"What are expected and strategic locations to approach you with these leaflets?"

The poster and leaflet

Nevertheless, the posters and leaflets are designed with the user groups in mind, which allows us to quantify the effect. The comprehensibility of the graphic design and whether it conveys the functionality of DRT resulting in eliciting the behaviour of making a reservation, is taken into consideration for the final evaluation.

"What did you like about the posters and leaflets and what not?"

DRIPs and the reservation button

Concerning the second condition - whether the DRIPs and the reservation button at the bus stops enhance the perceived certainty - this aspect of the concept is explored, rather than quantified. Since the participants do not have any experience with DRT, it is expected that explaining this situation would significantly complicate the test. Nevertheless, the test setup aims to explore the thought about the provision of DRIPs and a reservation button.

"What do you think of the addition of DRIPs and a reservation button?"

The reservation device

The functionality of the reservation device is evaluated on some aspects. When the participants interact with the device, the researcher observes the interactions and keeps track of the performed actions and mentioned thoughts.

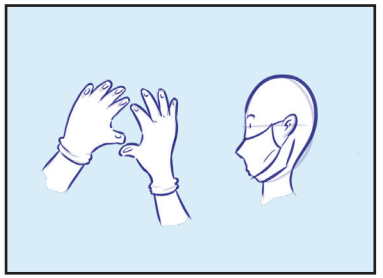
“What do you like about the reservation device and what not?”

The evaluation guidelines

The test setup consists of several parts that are described in the visual overview of the test setup.

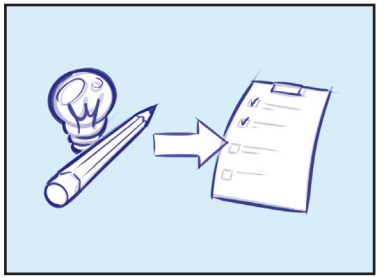
1. *The first part is a brief introduction, including the COVID-19 protocol, the occasion of testing and some “test rules”.*
2. *The second part is letting the participant interact with the redesigned information posters and bus signs. This is accompanied with a picture of the environment in which these posters and signs are displayed.*
3. *The third part is letting the participant think of missing the bus and the functionality of the DRIPs and reservation buttons.*
4. *This is followed by interacting with the reservation device and the accompanying leaflet.*
5. *The evaluation will be wrapped up with some closing questions about the effectiveness and comprehensibility of the concept and finally, the participant is waved goodbye from a distance.*

1



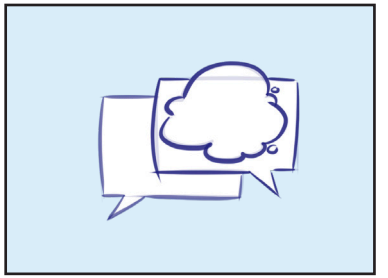
Putting on gloves and desinfecting the prototypes.

2



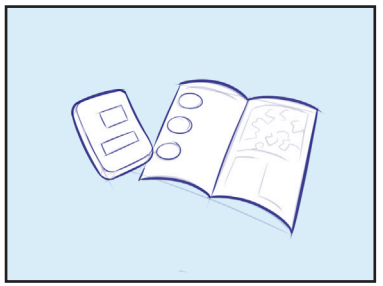
A brief introduction about the goal; evaluation the concept for an inclusive public transport service.

3



Mention to speak out loud as much as possible in order to discuss their thoughts.

7

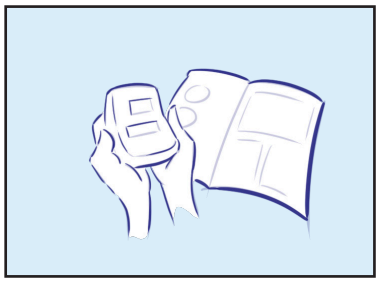


Provide the device and leaflet.

8

Keep track of the performed actions and mentioned thoughts.

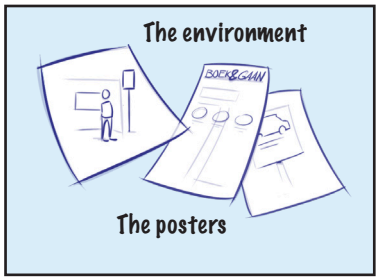
9



Let the participant perform a task with the device.

Figure 7.1: A visual script for the final evaluation tests.

4

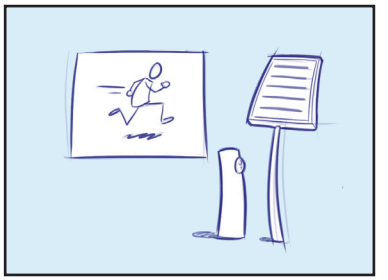


Let the participant explore the functionality through the images of the environment, bus signs and posters.

5

Keep track of the performed actions and mentioned thoughts and ask what is liked and disliked about DRT.

6



Mention that that they missed the bus, but that there is a reservation button and DRIPs. What does the participant think?

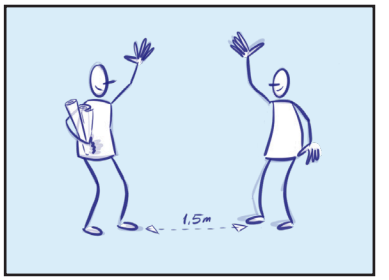
10

Keep track of the performed actions and mentioned thoughts.

11

Ask the final questions about the effectiveness and comprehensibility of the concept.

12



Wrap up the session with a thanks and waving good bye at a proper distance.

7.1.2 Prototypes and tools

For the final tests there has been made an interface with arduino, allowing to realistically imitate the functionality and interactions. The prints of the environment explain the context. The poster and leaflet explain the functionality of the service and the device works as is explained in chapter 6.

7.1.3 Participants

The participants were recruited from the personal circles of the designer and from the community center where weekly meetings are organised for people in the neighbourhood, which attracts mainly elderly. The overview of participants and characteristics are shown in appendix G.

Figure 7.2: A birdseye picture of all the tools used for the evaluation test


1
Volgende halte:
+
-
2
Actuele vertrek tijd:
Boek tenminste
30 minuten voor
vertrek

7.2 Results

The results are categorized per design. First, the results of the poster and leaflets are presented, followed by the results about the functionality of the B&G device and finally, the results of the B&G's interface evaluation.

7.2.1 The poster and leaflet

Clarity of the poster and leaflet

The colours and font size are clear and the participants mentioned that the composition is easy to read, also for the vision impaired participants. The instructions of the functionality of the DRT service is understandable to all participants, although the instructions of the B&G device and the reservation pole lack some information.

It is not clear when to use the reservation pole; i.e. if you use it when you already made the reservation or anytime.

> "The functionality of the reservation pole is not clear. What does it do? Only possible when you made a reservation already?"

It says that you have to ask the bus driver, but it is not clear why. The poster does not show any interaction with the device and therefore, is the functionality perceived as confusing. The participants do not know when they get to use it and why they should use it. Also, it is not clear why it is only for the return journey. The leaflet however, does explain the interaction, thus gives a better view of the use. But, one essential part of the usage is missing; it does not explain that the bus has a fixed schedule and that the device automatically updates the time.

Finally, the working hours of the service are not shown in the poster and leaflet.

Use of language

The poster uses "U" in the title and descriptions. It is obvious that it is about this area. Moreover, all the bus stations are shown too. Therefore, the title could be shortened.

> "Na 19:00 met de bus? Eerst boeken!"

One participant mentioned that she expects the list of bus stations in alphabetical order.

7.2.2 The functionality of the Boek&Gaan device

Easy planning and leaving whenever you want

Participants find it less effort and have the perception that it is easier to plan the journey. They mentioned that they do not feel restricted to the fixed time because they can also cancel it easily. Also, it is appreciated to see the actual departure times in a glance. One participant however, mentioned that he would rather approach the call centre than learn such a device. Another participant mentioned that he does see the value of the device, but is afraid of 'having another device to carry'.

> "If you understand how it works, it is convenient because it lets you leave whenever you want."
>
> "With the device it is easier to plan."
>
> "I'd prefer this device over calling with the call centre or using an app. This requires less effort."

Many reservation possibilities

Two elderly mentioned that they find the device in combination with DRT complicated. They are not familiar with it and find it a deterioration. "Wat een gedoe." Adding two other devices - the B&G device and the reservation pole - to the reservation possibilities is perceived to be confusing. Three other participants had similar thoughts.

Using it for the return journey only

Four participants mentioned that they find it confusing that it is only for the return journey. Also, they find it useful for the outward journey too, whereas the other participants found it acceptable.

> "I don't understand why it is for the return journey only. That is complicated and I'd prefer to keep it. (...) I think that paying 15 euros is reasonable."

Where to get on the bus

Also, it is not clear yet where users get to hop on the bus again. It is explained in the leaflet, but users expect otherwise. They mentioned that the device could determine the closest bus station based on GPS coordinates and hop on the bus there. Also, the device should indicate this on the device.

> "I would like to know where I have to hop on the bus. How do I know this?"

Adding a keycord

Another comment was that elderly people often walk with a walking stick. When stepping in and out of the bus, they always need both their hands and therefore, she suggested adding a keycord to it, to easily wrap it around your neck. This also helps not to lose the device.

7.2.3 The usability of the interface

How to choose the departure time

It is not clear how to choose the departure time; the participant expects a fully flexible schedule and therefore, expects the possibility to choose a departure time. The countdown time is not understood, whereas maintaining the actual departure time makes more sense to the participants.

Readability

The text is clearly visible for the vision impaired.

Use of language

"De volgende halte" (The next station) and "Actuele vertrektijd" (Actual departing time) is ambiguous. Besides, actuele vertrektijd seems to be a difficult word and two participants expect that it is about the current time rather than the actual departure time. Instead, participants suggested "Ik wil naar" (I want to go to) and "Bus vertrekt om" (The bus departures at).

Tiny buttons

One participant has rheumatism and therefore, it is difficult to use a small device. The buttons are rather big and therefore, she was able to use them. The Switch however, is small and not accessible.

Feedback and use cues

Two participants mentioned that they expect that the device makes a sound or lights up when the bus is coming additionally to the LED underneath the "Geboekt" text.

From the device itself, it is not clear that I can hold my OV-chipcard against it to pay the deposit.

7.3 Final conclusions

7.3.1 Conclusions about the results of the user experience evaluation

Although the concent of the leaflet and poster contain some textual flaws and unnecessary information, the graphic design appeal to the users. The format in which short bits of text are richly supported by pictures, with a clear reading direction from why to how, a large font size and contrasting colours, is a huge improvement regarding the readability for any type of user and particularly the non-digital user.

Regarding the flaws, some bits of information about the usage of the B&G is missing in the leaflet. It is not clearly communicated how the departure time works. They expect that the schedule is fully flexible and therefore, they can choose it themselves. But, that is not the case. It could be made clear in the instructions communicating that the departure times are scheduled and that the user can only book in between for example an hour and half an hour upfront. Another option is to allow the user to choose a time, which will be updated to an actual possibility.

Although the leaflet says to hold the OV-chipcard to the device, it lacks in communicating that this is for paying the deposit. Also, it does not show the amount of the deposit.

Another factor that influences the comprehensibility of the poster are the four reservation possibilities. In order to keep the poster and leaflet clear and concise, it is arguable whether the device should be shown on this media and instead show in the bus itself communicating the possibility for more experienced users. Also, the reservation pole does not have to be explained in the leaflet, because it is only relevant when the user misses the bus. Finally, since the users have taken the bus already, they know how to book via the call centre. Therefore, the leaflet that is distributed with the B&G device, it's main purpose is to explain the functionality of and instructions for using the B&G device. The instructions for using the DRT service is not relevant in this case.

Since the device is only provided for the return, the user does not have to buy the device and instead, pays a deposit. This makes it more difficult to understand how to use it and therefore keeping the device would make more sense. Nevertheless, this would require to buy the device which might be a barrier for some users, especially those who are not using the DRT service often.

Furthermore, they did not expect that they had to travel back from the bus station at which they arrived

on the outward journey, which adds another layer of complexity to the overall service. Instead, the device could be GPS enabled and search for the closest bus station. The device would need another display to indicate that station, which does increase the complexity.

7.3.2 Discussion of the final evaluation

For testing the concept, it requires some imagination to experience the concept's added value to a DRT service. There was a clear difference in participants from the community center and participants from the personal circle. The participants of the community center were mainly mentioning that they would not use these kinds of services because they do not have them in the area. They were comparing it with their local busses, which are running on a high frequency. From experience, people that live in low demand areas and are using PT, acknowledge that there is no difference, which makes it easier to evaluate the concept's added value.

Furthermore, these tests have been conducted with participants within reach of the designer. Therefore, the range of participants was limited to elderly. During testing it became apparent that education degrees are highly affecting the results. Highly educated participants picked up the content much quicker and therefore, it is recommended to test with low literates and other people with lower education degrees too.

7.3.3 Conclusions about technical and financial feasibility

So far, the various aspects of the concept is technically feasible. The busses could be equipped with GPS systems and connected to currently existing software. This software allows the operator to send out information about actual arrival and departure times to the DRIPs and reservation devices. The reservation device could be equipped with a SIM card, enabling to make reservations and GPS enabling to register that bus station most nearby.

But, it is arguable whether it is financially feasible to invest in the concept. First of all, they mentioned that buying and even paying a deposit for the reservation device is considered to be a huge barrier for these groups. Also, RET, responsible for the DRT service STOP&GO stressed the fact that DRT services are often deployed for low demand areas and therefore aim to save costs, which contradicts investing in extra equipment without knowing how many more rides it could gain.

Besides, users find it unacceptable to wait at the bus station when they booked with a reservation pole, therefore it is expected not to work in large areas. Furthermore, operating the reservation pole with only one button is not hufterproof. Therefore, it requires an interface. Possibly, the user could make

the reservation by checking in with the OV-chipcard, making it more personal.

Sometimes there is no electricity available at the bus stations in rural areas, which could be an issue to solve with solar panels.

7.3.4 Recommendations and next steps

This project revealed that the mobility industry is insufficiently conscious about the non-digital travellers. There is a substantial amount of people (almost 3,5 mln) in The Netherlands that do not want or can't use a smartphone. Therefore, it is recommended to use the personas as a tool to raise awareness, while getting acquainted with their motives, needs and requirements. They should be used during the research and development process in the public transport industry and if applicable in any other industry.

The reservation pole and B&G device are suitable to develop in the long run. It is recommended to further research the viability of these devices: how many more rides will it provide resulting in profit. Since it concerns a rather small group of potential users, it is doubtful whether it is viable for one PT operator to develop these products. Instead, an external party could develop the products and make it available for all DRT services world wide aiming at a bigger market.

In the short run, the leaflets, posters and DRIPs are more suitable. Providing essential information in each stage of the customer's journey both digital as physical is key for a positive user experience. Both digital as non-digital travellers are helped with a clear poster and leaflet containing short bits of text richly supported by pictures, with a clear reading direction from why to how, a large font size and contrasting colours. Also, the DRIPs take care of a reasonable provision of information enabling the traveller to confirm their trip and see the actual departure time at a glance.

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A - Appendix; Numbers of population share low digital literates

Dutch population

Total Dutch population	**17.13 mln**
16+	**14.4 mln**
16 - 65	**11.2 mln**
65+	**3.2 mln**

Low literate population

Low literates	**2.5 mln**
16 - 65	**1.33 mln** *(11.2% of Dutch population 16 - 65)*
65+	**0.58 mln** *(18% of Dutch population 65+)*

Low digital skilled elderly

Low digital skilled elderly	**2.4 mln**
Low literate	**0.49**
Non low literate	**1.9 mln**

Low digital skilled low literates

Low digital skilled low literates	**1.59 mln**
16 - 65	**1.1 mln** *(80% of LLs 16 - 65)*
65+	**0.49 mln** *(85% of LLs 65+)*

B - Appendix; A collection of empathising stories

A collection of empathising stories from a NOS article

An interviewee of an NOS article from 2017 says: “At home I have an internet connection, but I rather not use it. Especially reading difficult words and filling in forms I find difficult. (...) I am afraid that I have to pay when I fill out wrong information”

(Dutch: “Thuis heb ik internet, maar ik gebruik het liever niet. Vooral het lezen van moeilijke woorden en het invullen van formulieren vind ik lastig. Als ik op een website kom waar ze mijn DigiD nodig hebben, haak ik af. Dat vind ik te moeilijk. Ik ben bang dat ik het verkeerde in vul en straks moet betalen.”

This man has been often ill as a kid. When he returned to school, he was allowed to proceed to the next education level. “Amongst 35 children it did not stand out apparently.”

Meanwhile, he follows reading- and writing classes and he is less ashamed of his deficient. However, he is still not fully able to understand written communication.

Another woman recently started using public transport. However, she is not able to send an e-mail, fill out working hours or bank online. Now and then she sends a message via whatsapp, but she is still afraid that she sends it to the wrong person.

SCP’s Deputy-director Rob Bijl does not find it realistic to expect these people to get digitally active. He states that this kind of people, for example people with mental disabilities, will always exist and that should always be taken into account.
(NOS, 2017)

A collection of empathising stories from Lezenenschrijven

“No one was aware of my low literacy, even not my wife.” This statement of a 67 year old ambassador once had his own construction company with almost 50 people employed. His accountancy was left to an accountant and orders were done by phone. Until he suffered from a burn-out caused by the involving stress. (Lezenenschrijven, 2017c)

C - Appendix; Interview guideline for the in-depth interviews

For the design of this interview guideline, the four levels of knowledge about experience distinguished by Sanders (2016) are used.

1. Introduction [5 min]
Introduce the researcher and the structure of the session.

2. Personal background and context [10 min]
Get to know the participant. Understand his/her background and context.

3. Map exercise [15 min] - PRESENT
The participant has to fill in a timeline of both a working day and a weekend day. Afterwards, the participant has to present him/herself according to the timeline. This forces the participant to immerse in the present.

4. Interview about specific experiences [25 min] - PAST & FUTURE

5. Wrap up and greetings [5 min]

D - Appendix; An overview of the recruited participants for the in-depth interviews

Participant 1 (medium invested)

Age: 58

Gender: Female

Profession: General practitioner

Residence: The Hague

Smartphone user: Yes

Participant 2 (not invested)

Age: 65

Gender: Male

Profession: Retired

Residence: The Hague

Smartphone user: Yes

Participant 3 (not invested)

Age: 75

Gender: Female

Profession: Retired

Residence: Amsterdam

Smartphone user: Yes

Participant 4 (not invested)

Age: 88

Gender: Female

Profession: Retired

Residence: Amsterdam

Smartphone user: No

Participant 5 (not invested)

Age: ?

Gender: Female

Profession: Retired

Residence: Zwolle

Smartphone user: Yes

Participant 6 (not invested)

Age: 65

Gender: Female

Profession: Kindergarten teacher

Residence: Breda

Smartphone user: Yes

Participant 7 (digital detoxer)

Age: 17

Gender: Male

Education: Currently in high school

Residence: Friesland

Smartphone user: Yes, but without data plan

Participant 8 (digital detoxer)

Age: 26

Gender: Female

Education: Currently finishing a masters degree

Residence: Amsterdam

Smartphone user: Yes, but only for online banking and paying parking fees

Participant 9 (digital detoxer)

Age: 27

Gender: Male

Education: Currently finishing a masters degree

Residence: Amsterdam

Smartphone user: Yes, but mainly used for a car parking app and a banking app

Participant 10 (low literate ambassador)

Age: ?

Gender: Male

Profession: ?

Residence: ?

Smartphone user: Yes, but limited

Participant 11 (low literate ambassador)

Age: ?

Gender: Female

Profession: ?

Residence: ?

Smartphone user: No

Participant 12 (low literacy ambassador)

Age: ?

Gender: Male

Profession: ?

Residence: ?

Smartphone user: Yes, but limited

D - Appendix; Data analysis approach

For obtaining and processing the data the qualitative research approach of Baarda et al., 2010 is taken. The steps are briefly described below.

Obtaining the data

As it is explained in the previous chapter, an qualitative research approach is taken. This refers to the interviews with the potential user. The user interviews took place via phone, both parties sitting at home, being recorded in the background.

Preparing the data

In order to analyze the data, the text documents of transcriptions are processed to a workable format. First, the irrelevant text is deleted until quotes that say something about either the service or about the person are left. Second, the text is divided into pieces that are referred to as statements. Third, the statements are labeled with a short phrase that briefly describes its content.

Working the data

The label phrases are written down concisely on post-its. Now, the labels can be ordered in a spacious way in order to find relations between the quotes. The action of clustering is performed per phase. The derived relations are presented in clusters that have a specific meaning related to the research questions.

Defining the clusters

The cluster derived from the process are mainly concise phrases. Those phrases are ambiguous in themselves and need an explanation backed up by quotes in order to effectively explain the meaning. Each cluster will be defined by a description. These definitions are described in the section interview results.

E - Appendix; Brainstorm approach

Focus and methodology

The brainstorm is performed and facilitated via the online platform Miro.com. This online platform allows the users to write and move sticky notes, which is a suitable tool for facilitating a brainstorm involving creative facilitation methods, such as brainwriting and clustering (Tassoul, 2009).

For the brainstorm, there have been set several design objectives:

1. How to raise awareness without requiring a personal device?
2. How to enable a user to plan their journey while travelling without requiring a personal device?
3. How to enable a user to make a reservation while travelling without requiring a personal device?
4. How to provide a confirmation to the user without requiring a personal device?
5. How to enable the user to find the way to the bus station without requiring a personal device?

F - Appendix; The critical usage scenarios

Whereas the problem statement and a corresponding design goal is to keep focus during the design process, the objective of this section is to represent the research data in a tangible and workable format; the scenarios. Based on real stories, possible conditions and characteristics of the personas, some scenarios are created. This allows to immerse in the problem during brainstorms and assessing ideas.

Not being aware of the requirements in time and not having a mobile or smartphone available

1. *Frequently, she uses the bus and knows the route by heart.*
2. *She is not aware of the future implementation of DRT services*
3. *At some point she is waiting and no bus is coming*
4. *She is frustrated to find out that he had to make a reservation.*
5. *She is angry that she has to wait for a long time and eventually the bus does not come at all.*

Ignoring the online warning/pop up and low understanding of digital systems

He looks up the route on the 9292 app.
He notices that he has to download an app.
He decides to ignore it, because he doesn't care about new apps and therefore, thinks that it does not apply to him.
Getting there, he finds out that there is no bus coming because he had to make a reservation.
He does not relate it to the pop up in 9292, so he is confused and stranded.

Complex instructions and low understanding of digital systems

1. *She finds out that she has to make a reservation.*
2. *But she does not understand why nor how to use it.*
3. *The explanation is overwhelming and unknown words such as online travel planner and travel product are used.*
4. *It is not clear where to find information besides on the internet.*
5. *She is annoyed and has to find an alternative.*

Planning the whole day because she does not have a mobile or smartphone available

The user has made a reservation for the onward and backward journey before leaving her house.
On the way back, it turns out that her appointment takes more time than expected and therefore, she procrastinates a bit.
Eventually, she has to hurry to get to the bus station on time.
She is stressed and does not have an alternative when she misses the bus.

Being uncertain about the journey and not having a mobile or smartphone available

1. *He reserved the bus via the call centre.*
2. *He waits at the bus station for a while. He received a time range, but now he is already waiting for 20 minutes.*
3. *He has no idea whether the bus is actually coming and he believes that he made a mistake.*
4. *He gets confused and feels uncertain about it: maybe he reserved for the wrong time or was he late.*
5. *Also, he has no resource to consult this information and has no possibility to reserve another bus.*
6. *He got stranded, without an alternative and is confused.*

Downloading apps, complex forms, making accounts and low understanding of digital systems

1. *He needs to make a reservation and tries it online. He has to fill in several forms and feels overwhelmed by the jumble of words and questions.*
2. *At some point he gets stressed and gives it up.*
3. *He looks for an alternative and feels annoyed that it has to be that difficult.*

G - Appendix; An overview of the recruited participants for the final evaluation

Participant 1 (conservative)

Age: 78

Gender: Female

Profession: Retired

Residence: The Hague

Smartphone user: No

Participant 2 (conservative)

Age: 91

Gender: Female

Profession: Retired

Residence: The Hague

Smartphone user: No

Participant 3 (Non Dutch speaking and digital detoxer)

Age: 29

Gender: Female

Profession: Unemployed

Residence: The Hague

Smartphone user: Yes

Participant 4 (Low understander)

Age: 60

Gender: Female

Profession: Employed

Residence: The Hague

Smartphone user: Yes

Participant 5 (Opportunist and vision impaired)

Age: 75

Gender: Male

Profession: Employed

Residence: The Hague

Smartphone user: Yes

Participant 6 (Low understander)

Age: 59

Gender: Male

Profession: Employed

Residence: The Hague

Smartphone user: Yes

Participant 7 (Opportunist)

Age: 59

Gender: Female

Profession: Employed

Residence: The Hague

Smartphone user: Yes

Participant 8, 9, 10, 11 (N.D.)

Age: N.D.

Gender: Mixed

Profession: N.D.

Residence: N.D.

Smartphone user: N.D.

H - Appendix; List of locations related to the user group

The user group could be approached with flyers, leaflets and posters at locations that are often related to the vulnerable users. This is the outcome of a brainstorm:

- *At the supermarket*
- *At the eatery or other entertainment venue*
- *At a cultural institution*
- *Medical places, such as the the dentist*
- *Waiting rooms of the general practice*
- *At the community center*
- *At organised events, such as bridge*
- *Care homes/ nursing homes*
- *At tea houses*
- *At religious places*
- *At the library*
- *At care farms*
- *At the UWV*