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# Non-digital Travellers – Five Need-Based Personas to Understand Their Drivers and Needs

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**Abstract.** Many people believe that low digital skills are only a problem of the elderly. However, the group of analogue or non-digital travellers is much larger and much more diverse than that. In the Netherlands alone, it is estimated that a group of 3–4 million people is not digitally able enough to make use of digital services. This is due to several reasons. In order to make use of digital mobility services, users need to be able and willing to use digital services. In transport, especially for demand responsive transport (DRT) services, the lack of digital skills can create a barrier for people to make use of the service. Based on insights from literature and interviews about digital skills, we have categorized the different groups of non-digital travellers, and created five need-based personas. On the basis of this, we formulated user requirements and design recommendations for mobility services, and for DRT services specifically.

## 1 Introduction

We live in an increasingly digital world, where an increasing number of services and routines are becoming “digital by default”, including mobility services, like on-demand or demand responsive transport (DRT) services. If the rise of a digital infrastructure in public transport is accompanied by a disappearance of physical accessibility, the travellers’ dependency on information technologies (IT) in transport increases. For travellers that do not want to or cannot cope with the digital transformations, this results in an increase of digital inequality, or even digital exclusion (Durand et al. 2019). This “digital barrier” can cause mobility poverty for this group, which might result in exclusion from the society (Durand et al. 2019; Sampimon 2020a).

### 1.1 Non-digital Travellers: A ‘Forgotten and Unseen’ Group

Many people associate low digital skills with elderly and because of this, they expect that this problem will solve itself in a few years’ time. However, the group of analogue or non-digital travellers is much larger and much more diverse than that. Although the Netherlands ranks among the EU top in digital skills (CBS 2020a), 46% of individuals reported in 2019 that they have low (16%) or basic (30%) overall digital skills (Eurostat 2020). The average for individuals of the European Union (28 countries) with low or basic overall digital skills is even higher with 52% (26% and 26%, respectively). In the

Netherlands alone, it is estimated that the group lacking sufficient digital skills to make use of digital services consists of 3–4 million people.

### ***The Digital Divide***

The majority of people benefit from their digital skills. However, a rather large group of people benefits less and others not at all. This phenomenon of inequality is referred to as the digital divide (Van Dijk 2005). If public transport companies want to design inclusive services, the needs of these users have to be considered. However, there is not a clear view of who these non-digital travellers actually are; let alone, how to design for them. It seems that the transport industry has no clear sight of the travellers that might be affected by these digital transformations. The group that is often associated with low digital literacy is elderly. On the other hand, we see a hugely increasing number of elderly active on social media for instance (CBS 2020b), rising from 40% in 2014 up to 76% in 2019. According to a study by Durand et al. (2019), other factors are also associated with lower digital skills, such as a lower education degree, a lower income, being long-term unemployed, or low-literacy. Hence, since low digital literacy is not only associated with elderly, the digital divide will not be resolved over time. Therefore, it is of utmost importance to include and design for low digitally skilled in public services also in the future, including transport and mobility services.

## **1.2 Demand Responsive Transport (DRT) Services**

Whereas fixed line transit (FLT) runs according to a fixed schedule and route, demand responsive transport (DRT) services operate on demand, and therefore, only when and where needed, making the service more efficient. 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; best explained as a combination between bus and taxi (Mageean and Nelson 2003). Due to the proliferation of internet and GPS-enabled smartphones, operators are able to operate in real-time and on a large scale (Alonso-González et al. 2018). Additionally, the smartphone app 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 (the ability to use) these resources experience a – sometimes impregnable – threshold to make use of the service, leading to an increased risk of mobility poverty amongst the ‘low digital skilled’ (Sampimon 2020a). Hence, besides the benefits that the digitization of DRT services might bring to a majority of users, it also increases the digital divide by possibly excluding a large user group from using public transportation.

Likewise, Jittrapirom et al. (2019) presented the user perspective of 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 this service 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”* (Jittrapirom et al. 2019; p.6).

### ***User Experience of DRT Services in the Netherlands***

At the time of this study, there are 37 DRT services active in the Netherlands, operating under the umbrella of eight different operators. These services 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 has been implemented. It has been identified that there are several problems playing a role in these dropping rates (OV Loket 2019). In an earlier study by Sampimon (2020a), based on user interviews, online reviews and literature review, it was concluded that the majority of users find the implementation of DRT services a deterioration of the user experience compared to FLT services. Four of the main reasons for this are:

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

These issues are often acceptable to travellers with access to the digital possibilities that are provided in smartphone apps from DRT operators. Journeys can be booked by means of the app, and real time travel information can be accessed via the same app. For non-digital travellers, however, who are lacking these possibilities, this makes their user experience of DRT services even worse.

For example, mobile phone users and smartphone users are able to perform the actions while travelling and let them plan and book their journey at the last moment, whereas the alternative physical resources, such as the landline and the desktop computer, are fixed in one place. Physical service desks are, except for one example, never incorporated in Dutch DRT services. This implies that the physical accessibility of the actions is limited, which drastically affects the spontaneity of the travel behaviour of non-digital travellers.

Consequently, 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.

### **1.3 Aim of This Study**

The aim of this study is to contribute to defining and visualising this non-digital user group and getting an understanding of their needs and requirements, for digital services in general and specifically related to DRT services. The outcome can serve as an inspiration for the rapidly digitising mobility industry as a whole with the aim to help designing mobility services with the needs of non-digital travellers in mind.

## 2 Methods

First, the non-digital user is identified based on earlier studies, including the share in the population and their needs and requirements in the context of products and services. Secondly, the identified users were invited to take part in in-depth interviews to explore and discuss their travel and planning behaviour and digital skills.

The insights from the literature exploration, including the earlier benchmark of DRT services from Sampimon (2020a), and the user interviews, serve as input for the creation of the need-based personas and requirements for designing (DRT) transport services that are accessible to non-digital users.

### 2.1 The Digital Divide in Public Transport

The ladder model (Van Dijk 2005) explains how the digital divide applies to public transport and how it is recognized. Figure 1 shows the different levels of the extent to which an individual has access to digital possibilities and resources that lead to opportunities and tangible outcomes. Durand et al. (2019) adapted the model and added public transport related examples to it, such as journey planning. The third and highest level in the digital divide consists of users who actually enjoy tangible benefits from using the app, such as saving travel time. Everyone that is not on the highest step of the ladder has at least one thing in common, namely that they cannot access the tangible benefits from using the digital service. 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 level digital divide. Finally, an individual lacking the required materials (e.g., who does not have access to a smartphone) is located in the first level digital divide.

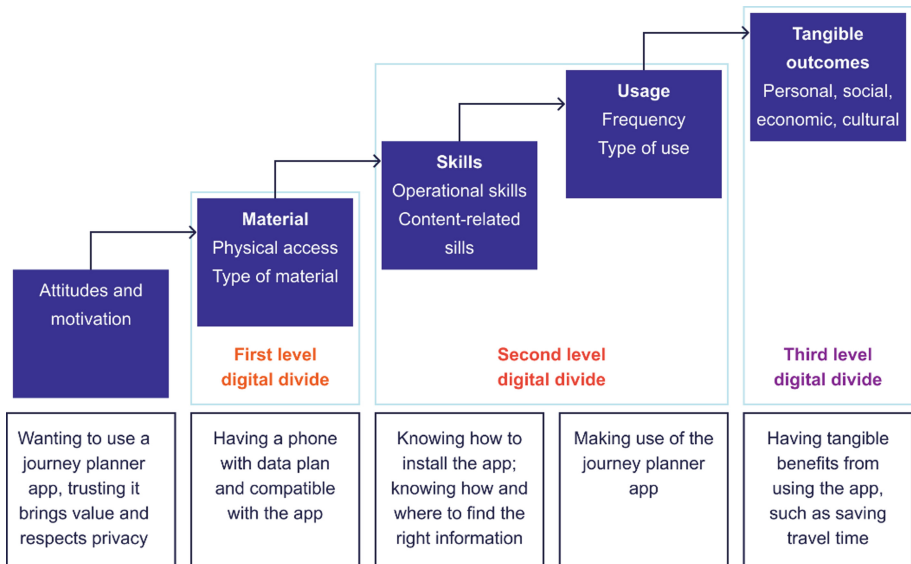


Fig. 1. The digital divide (Van Dijk 2005), adapted by Durand et al. (2019)

## 2.2 The Characteristics of Non-digital Travellers

The following characteristics are often related to low digital literacy (Durand et al. 2019; Stichting Lezen en Schrijven 2017a):

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

Low literates experience difficulties in developing digital skills because of language barriers, similarly to people with a migration background. People with a low income simply do not have access to material (and maintenance) because of financial reasons, but they also struggle to find the time to develop skills on a regular basis. People with low education degrees and long-term unemployed people are obstructed from developing skills and have limited motives to develop digital skills and therefore, are examples of lacking motivation (Van Dijk 2005). These insights give a better understanding of some factors that are causing digital barriers and the characteristics of the non-digital traveller. These characteristics have been used to recruit participants for in-depth interviews, to learn more about their needs and requirements.

## 2.3 Empathise with Users: Interviews About Travel Planning and Digital Skills

According to IDEO (2015), designers should immerse themselves in the context and speak with the target group to be able to design a desirable and fitting solution. The main goal of the interviews therefore is to empathise with the user groups. To get a deeper understanding of both conscious and unconscious behaviour of the interview participants, context mapping was applied. Context mapping is a design method that helps to inform designers about personal daily life experiences (Van Boeijen et al. 2020). Through, among other things, preparatory assignments before the interview, this method helps participants to be more aware of their experiences and to make intangible matters more tangible (Sanders and Stappers, 2008). The objectives of the interviews are to: 1) discover user perceptions towards DRT services; 2) reveal the user group's behaviour in the context of planning and travelling, which includes their preferred information sources, and 3) to explore how digital skills and access to the possibilities affect the use of public transport and how this is perceived.

Prompted by the characteristics of non-digital travellers described in Sect. 2.2, 12 participants were recruited for the interviews (see Table 1). For the recruitment of low literates, an organisation called 'Digi-Taalhuis' was approached. 'Digi-Taalhuis' is a volunteer organization that aims to help citizens improve their basic skills (language, digital skills, and math), in order to increase their level of self-reliance. Three volunteer ambassadors from Digi-Taalhuis (P10–12) were willing to participate (for a small fee) to represent the group of low literates. During the recruitment process of participants, a new group of non-digital travellers was discovered who are not yet described in earlier studies.

This group of -mainly young- users is characterized by their fundamental reluctance to use digital services (participants P7–9).

**Table 1.** Characteristics of interview participants

Participant	Gender	Age	Smartphone user	Target characteristic	Interview (via phone/physically)
P1	Female	50–65	Yes	Basic digital skills	Physically
P2	Male	50–65	Yes	Low digital skills	Physically
P3	Female	65+	Yes	Low digital skills	Via phone
P4	Female	65+	No	Low digital skills	Via phone
P5	Female	65+	Yes	Low digital skills	Via phone
P6	Female	50–65	Yes	Low digital skills	Physically
P7	Male	18–30	Yes, without data plan	Reluctant	Via phone
P8	Female	18–30	Yes, only banking and parking	Reluctant	Physically
P9	Male	18–30	Yes, only banking and parking	Reluctant	Physically
P10	Male	–	Yes, limited	Low literate	Physically
P11	Female	–	No	Low literate	Physically
P12	Male	–	Yes, limited	Low literate	Physically

For a context mapping session, it is preferred to observe participants and have a physical interview session. In times of the COVID-19 pandemic, observing the participants proved to be difficult due to social distancing measures and travel restrictions. Since the target group has low digital skills, a videoconferencing session was also not found to be a suitable alternative. Therefore, in case the interview could not take place at location, it was performed via telephone (landline) connection. This has resulted in slight differences in research setups of the interviews: sometimes at home via phone and sometimes at location (indicated in Table 1). Also, new insights arose throughout the interviews, leading to slight differences in the following interview sessions. Therefore, a semi-structured interview set-up was used. In this study, the outcomes of the context mapping interviews are used to develop personas.

#### 2.4 Data Analysis: Creating Need-Based Personas

The insights from the different sources – such as desk research and user interviews – will be combined in the form of need-based personas, in order to provide a clear overview of the different types of non-digital travellers based on their needs instead of their demographic characteristics. 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 the designer and other stakeholders to engage with the potential user groups and get inspiration for the design (Schneider and Stickdorn 2011). The goal is to make an engaging profile including the motives to barely or not at all use digital technologies and the specific needs of non-digital travellers (Schneider and Stickdorn 2011; Koos service design, n.d.).

First, a  $2 \times 2$  matrix will be created that pairs two different sets of dimensions to distinguish several archetypical personas, or ‘archetypes’. These dimensions are identified from the user interviews. Next, these archetypes are subdivided into the different need-based personas and described in more detail.

The outcomes (matrix and personas) will be presented and discussed in the following section.

### 3 Findings and Interpretation

In this section, the  $2 \times 2$  matrix and need-based personas will be described, followed by design guidelines for DRT services and digital (mobility) services in general.

#### 3.1 Can and Want Matrix: Four Archetypes

In order to use digital mobility services, users need to be 1) *able* and 2) *willing* to use digital services. In order to visualise this, a  $2 \times 2$  “can & want matrix” was created (see Fig. 2). The Y-axis represents the ability to develop digital skills and understanding. The willingness to use (digital) technology is represented on the X-axis. Each quadrant represents an archetypical user group.

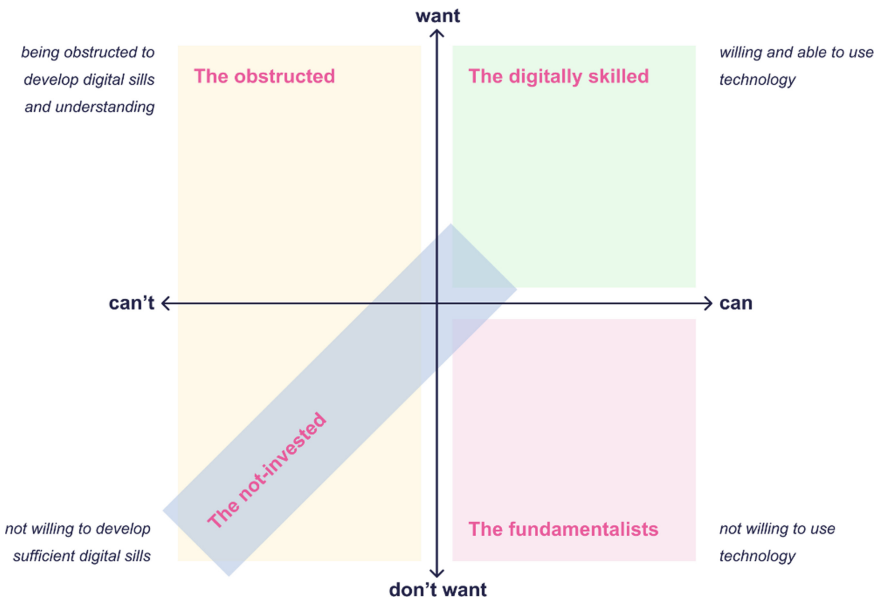


Fig. 2. The can & want matrix of digital possibilities and its four archetypical user groups

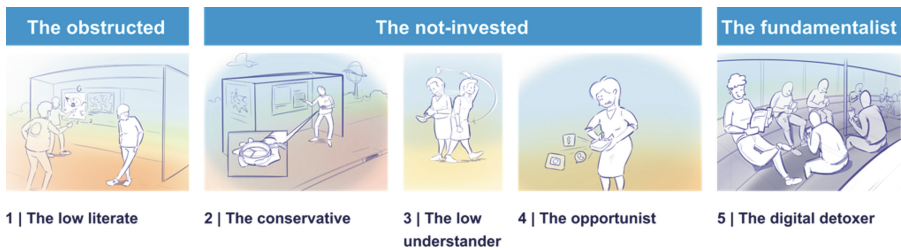
This leads to a differentiation of users. It consists of four core categories of users, called ‘archetypes’, which can be subdivided in different personas. Three of these archetypes are easily recognizable and visible: the obstructed, the digital skilled and the fundamentalist.

- The *obstructed* archetype (left in Fig. 2) consists of people that experience a barrier to developing digital skills nor understanding caused by a disability (e.g., low literacy or mental disorders, although the latter was out of scope for this study), which mostly derived from participants P10–12.
- The *digital skilled* archetype (top-right quadrant) consists of people that are willing and able to use digital technologies. They hardly experience any problems in accessing and using new digital services and are therefore out of scope of this study.
- The *fundamentalist* archetype (bottom-right quadrant) is defined by deliberately choosing not to use digital resources, which derived from participants P7–9.

However, the fourth archetype, derived from participants P1–6, is placed across the matrix and cannot clearly be fixed to one of the quadrants. This archetypal user group is defined by the people that have not invested in developing digital skills and therefore, they severely lack digital skills and understanding. The problem of this group of users, called “*the not-invested*”, is that it might *seem* that they are digitally able; although in fact, they are not digitally able enough to keep up with the different developments.

### 3.2 Subdividing the Archetypes into Five Non-digital User Groups

Six different personas can be distinguished within the four archetypal user groups from the can & want matrix; five of which are non-digital users: the low literates, the conservatives, the low understanders and opportunists and finally, the digital detoxers (see Fig. 3). These five non-digital user types are briefly elaborated below and described in more detail and illustrated with a story in Sect. (3.3).

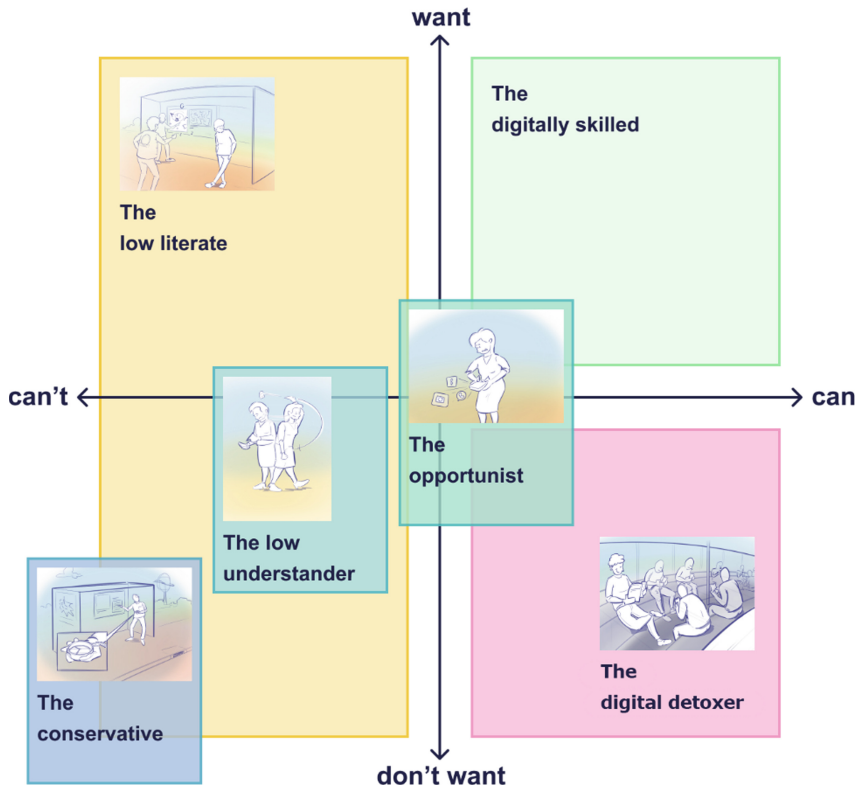


**Fig. 3.** Subdivision of the three archetypes into five need-based personas

The five types of non-digital users can be categorized in three archetypes: (A) the obstructed, (B) the not-invested, and (C) the fundamentalist:

- A. The obstructed: Being obstructed to develop digital skills and understanding.
  - 1. *The low literate*: Apart from whether they want to use it or not, low literates lack digital skills because they have difficulties reading.
- B. The not-invested: Not willing to develop (sufficient) digital skills and therefore, severely lagging behind in digital skills and understanding.
  - 2. *The conservative*: Not willing to develop digital skills.
  - 3. *The low understander*: Often uses digital products and services, but has difficulties understanding them and therefore rather avoids them.
  - 4. *The opportunist*: Can be very invested in their smartphone and using apps such as social media and messaging apps and their camera a lot. However, their knowledge is mainly situated in recreational apps, rather than functional apps, and might depend on help from family or friends.
- C. The fundamentalist: Fundamentally against the use of a smartphone.
  - 5. *The digital detoxer*: Deliberately choosing not to use a smartphone or data plan 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.

Referring back to the ladder model of Van Dijk, it seems that some people have chosen to never step onto the ladder of developing digital skills 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 IT systems for work, is digitally skilled in performing the work-related tasks, but 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 halfway 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. These are not part of the intended target group and therefore not taken into account in this study.



**Fig. 4.** The can & want matrix; an overview of the personas placed in the field of willingness over capabilities to use digital technologies

### 3.3 Five Need-Based Personas

In this section, each of the five non-digital personas from Fig. 4 is illustrated by a drawing and a story in the form of a quote. This quote-story includes the motives, needs and requirements of the specific character, thereby allowing the reader to empathise as if it were told by the actual user. These quotes are not taken literally from the interviews, but compiled (by the authors) based on the literature exploration and the interviews.

#### 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, 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 already 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, but if it involves text, it does help when texts are supported by visuals and photos of the actual situation, rather than just icons (Fig. 5)".*

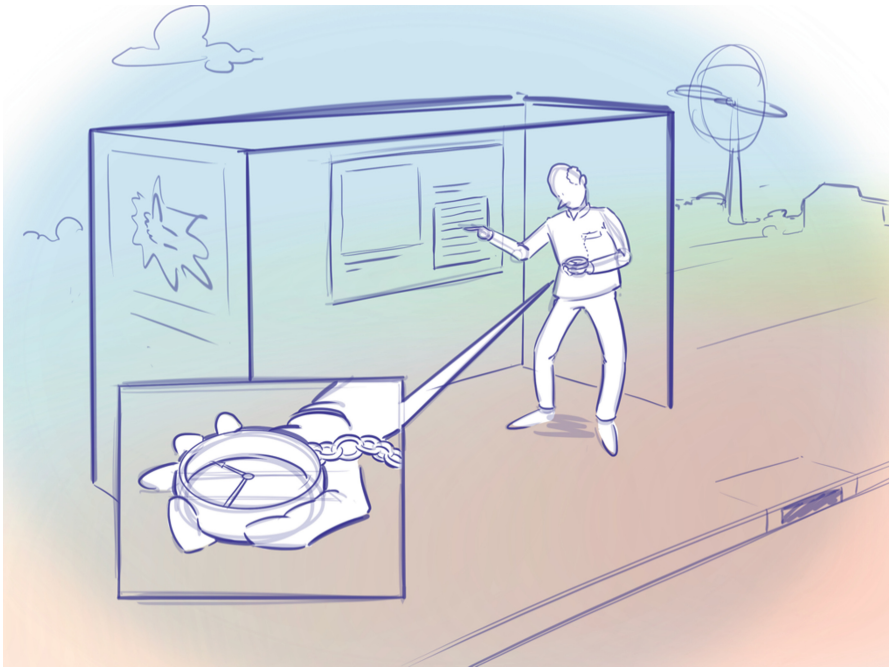


**Fig. 5.** Persona: The Low Literate

### **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 analogue 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 (Fig. 6)".*



**Fig. 6.** Persona: The Conservative

### **The Low Understander**

*“I have 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 fulfil 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 (Fig. 7).”*



**Fig. 7.** Persona: The Low Understander

### **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 recommends 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 that I am not able to cope with, I get irritated. I would try it myself first, but give up easily (Fig. 8)”.*

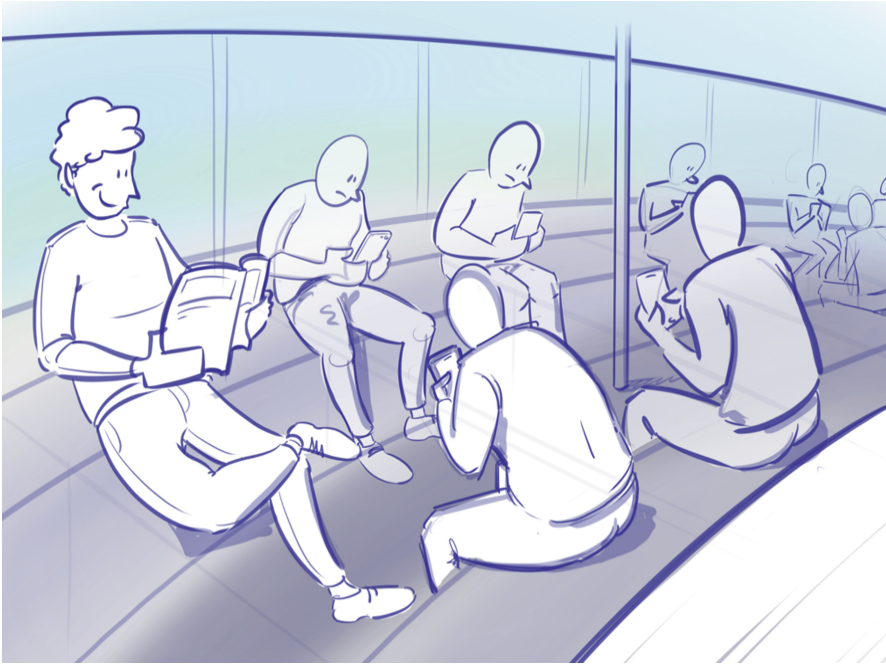


**Fig. 8.** Persona: The Opportunist

### **The Digital Detoxer**

*“I use a mobile phone to stay connected. Additionally, I perform quite a few tasks online. 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 such 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 (Fig. 9).”*



**Fig. 9.** Persona: The Digital Detoxer

### 3.4 Goals for More Inclusive DRT Services

In order to provide a DRT service for non-digital travellers that is (more) acceptable and pleasant, the service should meet the following three conditions:

- 1) **Comprehensible information:** The non-digital user is aware of the existence and functionality of a DRT service before the journey and encouraged to make a reservation;
- 2) **Enhance certainty:** The non-digital user is certain about the departure and arrival times while travelling by providing real time route and time schedule information;
- 3) **Facilitate spontaneity:** The non-digital user is able to travel spontaneously.

### 3.5 Design Guidelines for DRT Services

Sampimon (2020b) describes a process for designing a Demand Responsive Transport service for non-digital travellers based on these three principles. Based on the DRT benchmark study (Sampimon 2020a) and user interviews, a set of guidelines can be drawn up that support achieving the previously described goals.

With regards to communication, it is recommended to explain the reason for implementing the new service. Transparency seems to be appreciated. Also, when introducing such service, the focus should be on the service itself, instead of focusing on the digital app. Communicating the beneficial features of the app on posters are perceived as noise

and instead, they can be communicated within the app itself. In this way, non-digital users feel addressed, and information about digital features reach the people that actually use it. Also, when using a step-by-step explanation of the service, it is important that this is supported with real pictures instead of icons, supported by short readable sentences. Every piece of information should logically follow up on each other, with having clear visual dividers between them.

	<i>The obstructed</i>	<i>The not-invested</i>	<i>The fundamentalist</i>
Avoid too much text [level <A2]	!!		
Avoid the need to type	!!	+	
Avoid digital interfaces with layers of information, such as jumbles of questions and passwords	!!	!!	
Avoid long screen times	+	+	!!
Provide personal and verbal interactions	!!	++	+
Provide human interaction (via telephone or in real life)	!!	++	+
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 possible other relevant announcements	!!	++	
Use a non-computer like form style	++	++	
Provide instructions and feedback; Avoid red lights and colours	!!	!!	
Clarify the possibilities	+	++	
Payment by OV-chipcard	++	++	
The OV-chipcard may be incorporated in the design, but should not involve the requirement to include 'travel subscriptions'	++	+	
Payment by bank card	++	+	
Provide an equal offline possibility next to the online possibility		++	+
Avoid the need to have a personal smartphone/data plan to use the service	+	++	!!

\* A travel subscription or travel product is a certain feature that an individual can upload to their OV-chipcard in the Netherlands, such as discounts (e.g. for students or elderly), or access to specific services (e.g. use of OV-bike).

**Fig. 10.** Design guidelines for the different archetype users obstructed, not-invested and fundamentalist. Legend: light (+) = considerably improves the user experience for this group; medium (++) = significantly improves the user experience for this group; dark (!! ) = without this, the service is unusable for this group.

Regarding the second goal (to enhance certainty), it is important to aim for providing offline alternatives to the app features. For example: provide real-time departure times at the bus stop, which includes a confirmation that the bus is actually coming to that specific bus stop. Secondly, do not only provide an app, but also a telephone number with personnel to make reservations. In the Netherlands, 0900-phone numbers (not toll-free) are intended for serious information and business services and were therefore preferred by participants because they are perceived as trustworthy. Also, because these numbers are easier to remember and recognizable.

### 3.6 Design Guidelines for Digital (Mobility) Services

Based on literature and outcomes of the interviews, some general design guidelines for digital (mobility) services were distilled and are summarized in Fig. 10. The impact on the user experience is indicated by the colour: the darker the colour, the more crucial this is to the user experience of this group (*note: this has not been validated but composed on the basis of the persona descriptions and interviews*). The classification in this table was made on the basis of the archetypical user groups: the obstructed (consisting of low-literates), the not-invested (consisting of conservatives, low-understanders and opportunists) and the fundamentalist (consisting of digital detoxers).

Even if smartphone apps are part of the service, considering these guidelines could increase the chance that low digital literates that own a smartphone will adopt the app. This concerns accessibility rules of copy and graphic design and interface design (in case digital features are part of the service), communication about the (new) service, payment, and ethics.

## 4 Discussion and Conclusions

### 4.1 Discussion and Limitations

The created personas are based upon earlier literature studies and 12 in-depth interviews. Although this is a relatively small number of participants, the diversity is large, so this gives insights into the needs and desires of this group. When performing qualitative research, such as context mapping, the number of participating users is usually small; 3 to 20 people (Van Boeijen et al. 2020), partly due to the fact that context mapping studies can be quite time consuming.

The majority of interviewed participants with low to basic digital skills are elderly females. It is assumed but not validated whether this is representative for this group although according to CBS (CBS Statline, 2013a), there is a preponderance of women among people over 65 years old (CBS Statline, 2013). The group of mentally obstructed or mentally disabled users was not part of the scope of this study and therefore not approached for an interview. Although they can be regarded as part of the Obstructed category, it can be questioned whether they would be able to travel with public transport independently.

Slight differences occurred to the interview set-up and questions due to the gathering of insights during the interviewing sessions and due to changing COVID restrictions and

personal preferences in the middle of the COVID pandemic. Hence, some interviews took place at location but where this was not possible, participants were interviewed via the phone. However, the aim of the interviews was to gather rich, qualitative insights from the different types of non-digital users, to create personas that help to empathise and inspire, and that goal has been accomplished.

## 4.2 Conclusions

DRT services are often introduced as an efficient and thus more sustainable option to provide transport and to save costs. Nevertheless, public transport has its social function and therefore, it could be argued that investing in services that are accessible also for less digitally skilled people is socially responsible. Otherwise, this “digital barrier” can cause mobility poverty for this group, which might result in exclusion from the society (Durand et al. 2019; Sampimon 2020a).

Low digital skills are often associated with advanced age. This research has shown that the group of non-digital users is much larger and much more diverse. The use of need-based personas allows designers and other stakeholders to engage with the potential user groups and get inspiration for the design. The five need-based personas created in this study can help to empathise with the non-digital travellers when designing new (digital) mobility services.

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