Bachelor's Thesis Computing Science

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Evaluating and improving the accessibility of the NS ticket machine for illiterate users

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Abstract

1.9 million people in the Netherlands have difficulty reading and writing. However, research into the accessibility of ATMs and kiosk machines with regard to illiteracy is scarce. Existing research into accessibility for illiterate people shows that a combination of audio and icons can create a more accessible user interface for illiterate people. To increase accessibility, it is also important to reduce the complexity of interactions with such a machine. This research focuses specifically on the accessibility of NS ticket machines that are placed at train stations to buy tickets. With the help of users and experts, the problems faced by illiterate people in using an NS ticket machine were addressed and requirements for a better machine were established. These were used to design solutions that were implemented in a mock-up. This mock-up was evaluated by users and experts in several iterations. These evaluations show that we have been able to improve the accessibility of the NS ticket machine.

Contents

Chapter 1

Introduction

In any society, it is important to include all people. Extra effort might be required to include people with a disability. In multiple countries, new laws are being proposed to force companies to make their products as accessible as possible for people with a disability [4, 6]. This also includes software, something that becomes evermore important in a world that goes more and more digital. Most of the research into the accessibility of software focuses on auditive or visual disabilities. Little research has yet been conducted into illiteracy, whilst 1,9 million people in the Netherlands are illiterate [28]. Especially the accessibility of kiosk machines, like ATMs and ticket machines, is not well-researched with regard to illiteracy.

One place where kiosk machines have a prominent place is in train stations. The ticket machines of the Dutch Railways (NS) are used to buy tickets and other products related to travelling by train. Being able to use these machines is an important part of being able to travel by train.

The research question that is answered in this thesis is: How can the accessibility of the NS ticket machine be improved for illiterate users? To answer this question, we first answer the question: What is the state of the accessibility of the current NS ticket machine? Furthermore, we search for the requirements of an improved NS ticket machine, what solutions can be found for those requirements and to what extent those solutions work.

The research was conducted in two phases. In the first phase, we looked at the current state of the machine. We did that by first analysing the machine and then evaluating that machine according to heuristics that have illiteracy in mind.

In the second phase, we attempted to improve the machine through several iterations of the interaction design method by Sharp, Preece and Rogers [30]. This method uses four stages to reach a good design. These stages

are iterated several times. Stage one is "establishing requirements". In that stage, we talked with users to identify problems and establish requirements. This was part of the usability test sessions. The second stage is "designing alternatives". In this stage, we created solutions for the requirements. Stage three is "prototyping". We implemented the solutions from stage two into a mock-up that we made in PowerPoint. The last stage, stage four, is "evaluating". As another part of the usability test sessions, users evaluated the solutions that we implemented.

For this second phase, we needed to talk to users. Since the target group is illiterate, they can not be expected to fill in a survey. Therefore, it is important to talk to them face to face. We did this by organising five usability test sessions. However, because it is not feasible to test with a large group of illiterate users, we also did two usability inspections with experts in the field of user interface design. The usability test sessions and the usability inspections were used as input for both establishing requirements and evaluating. They also gave inspiration for designing solutions. After each session, we designed solutions for the identified problems and requirements and implemented them in a mock-up. Finally, the next session was both the evaluation of the solutions and the input for the requirements of the next iteration.

In the next chapters, we will first discuss related work (chapter 2). After that, we will analyse the ticket machine by walking through several tasks (chapter 3). Then we will evaluate it according to heuristics (chapter 4). Furthermore, we will discuss the usability test sessions and inspections (chapter 6). Finally, we will discuss the findings and draw our conclusions (chapter 7).

Larger versions of all the screens of the ticket machine can be found in appendix A.3.

Chapter 2

Related Work

In this chapter, we will look at some of the research that has already been done in the area of our study. First, we will look at illiteracy and then at accessibility in general. After that, we will zoom in on accessibility for illiterate users and look at several solutions that research has focused on. Moreover, we will have a closer look at the specific problems of kiosk machines. Finally, we will have a look at research done about public transport payments.

2.1 Illiteracy

Approximately 1.9 million people in the Netherlands have difficulty reading and writing [28]. This is a form of illiteracy. Illiteracy can be divided into two kinds. There is technological illiteracy and written language illiteracy [15].

Technological illiteracy, also called digital illiteracy, is difficulty navigating digital applications. Around 20% of the Dutch people have low digital skills. This is more common for elderly people [24].

There are different levels of written language illiteracy. Around 300'000 people have a reading level lower than the end level of elementary school. The other part of the Dutch illiterate population has a reading level higher than elementary school, but still lower than the Dutch VMBO. Being illiterate has a large impact on one's life. People with written language illiteracy are less likely to find a job and have difficulty participating in society [28]. They also have less digital skills [18]. In this thesis, we focus on written language illiteracy, but in the related work, we will also discuss some solutions regarding digital illiteracy.

2.2 Accessibility

Not only illiterate people have difficulty with technology. For people with visual or auditory disabilities, special designs are needed to make websites accessible. Therefore, the Dutch government has made legislation that forces certain applications, especially government websites, to follow accessibility guidelines [4]. Furthermore, in 2025 a European law will come into force that requires companies to make certain technological products and digital services easily accessible, such as ATMs, ticket machines and websites of public transport services [6].

It is thus not surprising that some developers work towards making software more accessible. Most of their work is with regard to auditory or visual disabilities. According to one paper, around 7% of the developers focused on cognitive disabilities [3]. The same tendency to focus on visual disability can also be seen in research. A research gap has been noted regarding cognitive and hearing impairments [26]. The specific problem of illiteracy is even less often researched [15]. The research that has been done mostly focuses on (web) applications. There is very little research into the accessibility of ATMs and kiosk machines with regard to illiteracy [16].

Several papers focus on training to make people more digitally literate [12, 9], but fewer papers focus on making user interfaces more suitable for people with less digital literacy. The studies that have been done propose making menus less cluttered [9], using larger components and descriptive texts [8].

There are a few papers that discuss suggestions to make applications more accessible for written language illiteracy [32, 15, 7, 17, 22]. The most commonly discussed topics are the use of images and audio. The use of a text-free interface and the use of icons and symbols are also mentioned frequently [16].

2.3 Icons and images

Using icons and images is one of the ways to make interfaces more accessible for illiterate users. One paper discusses an ATM with an icon-based interface. In that paper, it was concluded that few icons are consistently correctly interpreted by users. To evaluate the usefulness of the design the researchers of that same paper measured the amount of time needed to navigate the ATM. An icon-based interface did not give significant benefits. Instead, both literate and illiterate people found it easier to navigate the text-only interface than the icon-only interface [32]. In a similar vein, research also showed that replacing all words with pictures is not effective either [15]. However, according to one paper, illiterate people had a preference for an image of a banknote instead of an amount on the screen. That same paper also suggested the use of animations to show how to perform

certain actions, like inserting a debit card [7].

2.4 Audio

Another tool to make interfaces more accessible for illiterate users is the use of audio. One paper concluded that an email user interface that used icons combined with audio could be used by illiterate users without training or help. There was audio in the background that guided the user through the application. This helped the users tremendously [17]. The importance of audio guidance is supported by another study that showed that voice feedback in one's own language makes illiterate people more eager to use an application and makes it fun for them to use it [22].

2.5 Text-free interface

A text-free interface focuses on making a user interface that does not need any text to guide the user to the right actions. Not all research agrees that text-free user interfaces work for illiterate people. One paper explicitly recommends using text in applications [20]. However, this seems to depend on the design of the text-free user interface. According to other research, illiterate users specifically asked for the text-free interface [22].

To make a useful text-free interface, it is important to combine icons and audio, but also to avoid complex tasks [13]. Illiterate people are often only able to focus on one object or action at a time [17]. Therefore, it is also important to reduce the number of menu options [22].

Something else that seems to help is dedicated physical buttons for certain actions, like on a remote control, since most illiterate people have no difficulty using remote controls [7]. Buttons can not only be used to navigate (previous, next, etc.) but also to ask for help. A help button encourages users to explore the application. In the explanations that the help button provides, it is useful to use metaphors [22].

2.6 Kiosk interfaces

A kiosk machine is a computer terminal in a public area that users can use to get certain information or a specific product without any human assistance [19]. The ATM is one of the most used examples of a kiosk machine [5]. Designing user interfaces for kiosk machines comes with its own challenges. It is important that users can access the machine without prior training [29]. The public is also often very diverse, so many people need to be able to use the machine [21]. The placement of a machine is also very important. If they are hidden away, people do not see it and will not use it [19]. However, users

want privacy when using the machine [21]. Especially the use of audio can be difficult. In some places, like churches, headphones might be a good solution, and in noisier places, the audio will probably mix with the background [21].

2.7 Public Transport Payments

There is a trend towards cashless payments in public transport. There are many advantages to that but there are also concerns about accessibility for certain groups of people, including those who are digitally illiterate [2]. With that in mind, buses in London have the policy that bus drivers should be lenient when people are unable to pay cashless and are perceived to be vulnerable [27].

Research has been done into the impact of digitalisation of Dutch public transport. 39 people with a higher risk of digital exclusion were interviewed. A minority of respondents said that they had trouble with NS ticket machines. They indicated that they missed the intuition to use it and they would find it beneficial to get more guidance through the system and to receive auditive explanations. According to the researchers, illiteracy is a contributing factor in the difficulties of using such a machine [10]. Based on these interviews, other research has been done to find solutions to help those people who have a higher risk of digital exclusion. In that paper, it is recommended to give digital training and use easy language in the interface. They also highlight the importance of having an analogue alternative [11]. At the moment, this is not the case on all stations, since only certain train stations have a counter where tickets can be bought [1].

2.8 Conclusion

The research that has already been done shows that illiteracy is a common problem and has a large impact on one's life. However, it receives little attention when making software accessible. Existing research focuses on images, icons, audio and text-free interfaces. Images and icons are most useful when they are used in combination with text and if users know what the icons mean. Audio is tremendously helpful, whereas the research disagrees on the usefulness of a text-free interface. However, researchers agree that it is important to avoid complex tasks. These are useful points when we start to design solutions to improve the machine.

When focusing on the NS ticket machine, we can conclude that, since it is a kiosk machine, it is important to think about its location and accessibility when first used. Some users reported having trouble with it, which is problematic when not all train stations have an alternative. This means that improving the machine is important.

Chapter 3

Analysing the ticket machine

In this chapter, we have a closer look at the NS ticket machine as it currently is. We first look at a general overview of paying for train tickets. After that, we give a short overview of the tasks that we decided to focus on and then we walk through every task in detail.

3.1 Paying for the train

There are multiple ways to pay for travel by train in the Netherlands. First of all, it is possible to buy a so-called "OV-chipkaart" (public transport smart card). On this card, a traveller loads money and/or a subscription. Every time they want to travel, they check in and out with their OV-chipkaart and money will automatically be deducted from their card. The traveller can choose whether the card should be valid in the first or second class of the train. The second option is to check in and out with a debit card. This has been possible since the summer of 2023. However, with a debit card, it is not possible to travel with a subscription and only in second class. The third option is to buy a ticket. All of these things can be bought at a ticket machine. These kiosk machines stand at every train station. They can also be used to load money and products onto an OV-chipkaart.

3.2 Different tasks

Not all the tasks that can be done with the ticket machine can be evaluated in this thesis, so we decided to focus on five different tasks:

1. Buying a return ticket
2. Putting money on the OV-chipkaart
3. Buying a ticket for a bicycle

4. Buying an anonymous OV-chipkaart
5. Loading co-travelling discount for their OV-chipkaart

Buying a ticket and putting money on the OV-chipkaart are both central to the use of the ticket machine and it is most important that those tasks can be executed by a user. Buying an anonymous OV-chipkaart will be done a lot less frequently but is important for a user in order to be able to travel completely independently. Because it is not done frequently, it is important that there is no steep learning curve that users may have forgotten before the next time they use it. The two last tasks are more complicated ones. Focusing on these paths as well will give a more complete view of the ticket machine and also test whether users can do new tasks easily. The rest of this chapter will be focused on the details of these paths.

There are also tasks that we did not include in our research. One can buy a single ticket, but that task does not differ that much from a return ticket. Users can also load other products to their OV-chipkaart, like the student travelling product, or stop these products. Moreover, a user can check his OV-chipkaart travel history or change the standard class that the user can travel with. Other products that can be bought are a child's ticket, a dog ticket, a ticket for certain more expensive trains or certain day tickets.

3.3 Buying a return ticket

The screens visited when buying a return ticket can be seen in figure 3.1. When users walk towards the NS ticket machine, they see the home screen. On the home screen, the user will have the option to buy a single or return ticket. Icons in the form of one or two arrows help the user to choose the right button. Once the user has clicked the button for a return ticket it has to choose the destination. This can be done by selecting the first and second letters of the destination. This gives a list of destinations that start with those letters and the users choosing their destination. In smaller letters, it also explains on that screen that there is a one-euro surcharge for a paper ticket and that the ticket is only valid if the traveller checks in and out with it. Once a destination has been chosen, a screen with several options appears. The user can change the number of tickets, the class in which they travel, whether they travel with a child, a dog, or a bicycle and on which day they want to travel. After choosing the right options, the user pays, either by card or with cash. While the machine prints the ticket, the user sees a screen that shows the transaction is completed and is reminded that they should check in.

Figure 3.1: Buying a return ticket

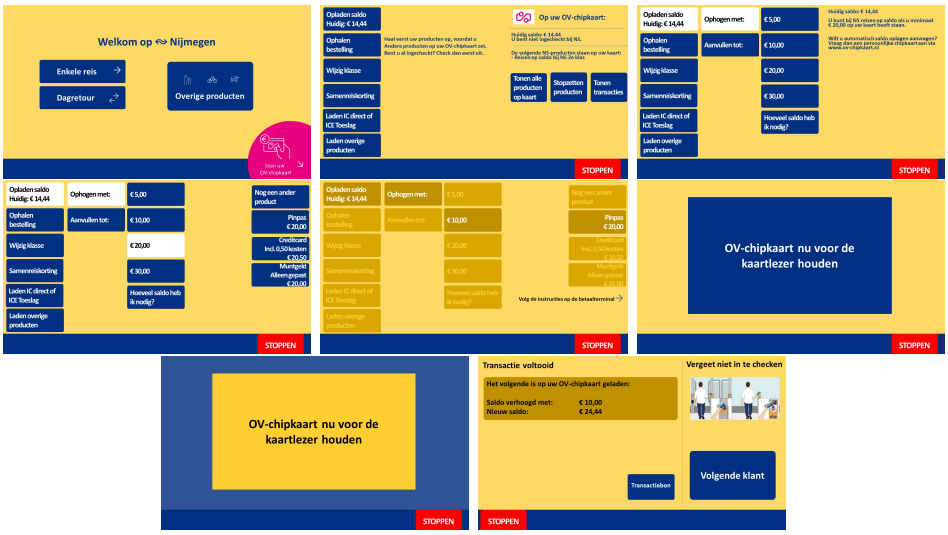

Figure 3.2: Putting money on the OV-chipkaart

3.4 Putting money on the OV-chipkaart

The screens visited when putting money on the OV-chipkaart can be seen in figure 3.2. To put money on the OV-chipkaart the user first has to scan the

OV-chipkaart. Once they have done that a menu appears. It gives the user the option to charge the OV-chipkaart, change classes and several options to load different products. The user has to click the button to charge the OV-chipkaart. Then the user has the choice between increasing the balance by a certain amount or to a certain amount. After choosing the amount to increase with, the user pays either by card or with cash. A flashing screen appears that warns the user to scan the OV-chipkaart again. Once the user has done that, the user is reminded of the new balance on the card and that they should not forget to check in.

3.5 Buying a ticket for a bicycle

There are two paths to buy a ticket for a bicycle. The first and cheapest way is to load the bicycle ticket onto an OV-chipkaart, but it is also possible to buy a paper ticket.

OV-chipkaart

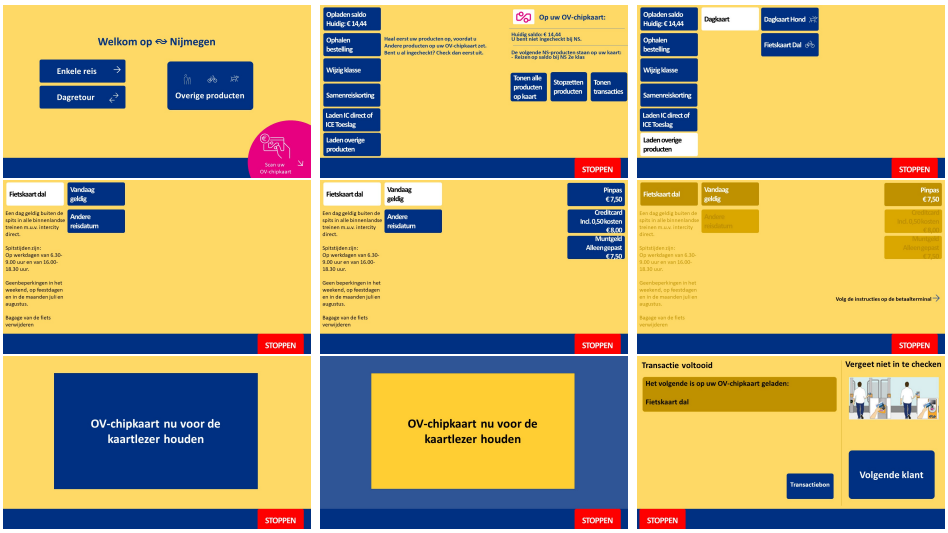

Figure 3.3: Buying a ticket for a bicycle with an OV-chipkaart

The screens visited when buying a ticket for a bicycle with an OV-chipkaart can be seen in figure 3.3. If a user has an OV-chipkaart, they should first scan it. This causes a menu to appear. In this menu, the user can click on “loading other products” which will lead to a choice for a day card for a dog or bicycle. If the user selects the option for a bicycle ticket another screen appears. On it is a lot of text and two buttons. The user can choose whether they want to travel today or on another day and the text explains when the ticket can be used. It is prohibited to take bicycles on trains

during rush hours. Once the user has chosen the day on which they want to travel, they choose their manner of payment and pay. After that, a flashing screen appears to remind them to scan their OV-chipkaart. After the user has done that, the user is reminded that they have loaded a bicycle ticket onto their OV-chipkaart and that they should not forget to check in.

Paper ticket

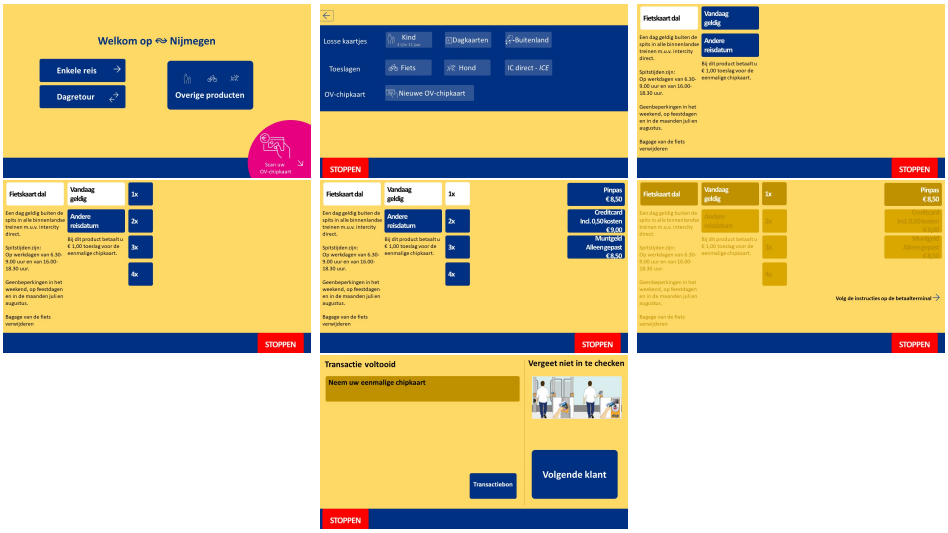

Figure 3.4: Buying a paper ticket for a bicycle

The screens visited when buying a paper ticket for a bicycle can be seen in figure 3.4. If the user does not have an OV-chipkaart, they can select that they want to buy an "other product". This button has also an icon of a bicycle on it. This leads to a screen with several options including buying a bicycle ticket, which is again illustrated with a bicycle icon. If the user clicks that button, a screen appears that is very similar to the OV-chipkaart one. There is still text with information about rush hours and two buttons that can be used to choose a date. The only difference is that the text includes the information that the user will pay a one-euro surcharge for choosing a paper ticket. If the user has chosen the day on which to travel, they get to option of how many tickets they want to buy. After that, they choose a manner of payment. Once they have paid a screen appears that the transaction is completed and the ticket is printed.

3.6 Buying an anonymous OV-chipkaart

The screens visited when buying an anonymous OV-chipkaart can be seen in figure 3.5. To buy an anonymous OV-chipkaart the user has to click on

Figure 3.5: Buying an anonymous OV-chipkaart

the button "Other products". After that, the user can select to buy a new OV-chipkaart. On this screen, there are multiple icons to guide the user. Then the user can select whether they want any other products on that card and whether they want to add money to the card. After that, the user has to pay, either by card or with cash. The user is encouraged to take the card and reminded not to forget to check in.

3.7 Loading a co-travelling discount

The screens visited when loading a co-travelling discount can be seen in figure 3.6. When a traveller has a subscription with NS, it is possible to travel with a friend, who gets a co-travelling discount. The friend has to load this onto his OV-chipkaart. To do this, the user has to scan their OV-chipkaart which once again causes a menu to appear. In this menu, the user can choose the "co-travelling discount". After that, a screen appears that explains what the travelling discount is and how it works. It also gives the option to choose first or second class. Once the user has selected the class in which they want to travel, they have to choose whether they want to travel today or tomorrow. Then they have to select whether they want it once or twice. The text explains that the user should select twice if they travel back together as well. After that, they get the option to add money to their card, but if the user does not want that, the user can confirm that they want to load the discount onto their card and is asked to scan their OV-chipkaart again. If they do that, they get a screen that reminds them that they have loaded the co-travelling discount and reminds them that they should check

in.

Figure 3.6: Loading a co-travelling discount

3.8 Conclusion

In this chapter, we have looked at the different tasks that can be performed with the ticket machine after which we discussed several of them in detail. This is a good foundation to evaluate the usability and accessibility of the machine in the next chapter.

Chapter 4

Evaluating the ticket machine

In this chapter, we will evaluate the current ticket machine. The goal is to get a better overview of how accessible and usable it is for illiterate people. A good way to do this is by using heuristic evaluation. This is a form of evaluation where evaluators look at a machine and try to find where the problems are. Ideally, this would be done using certain guidelines [23]. Important work in this area has been done by Nielsen and Moloch, who created a set of guidelines for this purpose [23]. However, those guidelines were not made specifically for illiterate users. A set of guidelines for that purpose was proposed by Guimarães e.a. [14] based on the heuristics of Nielsen [23] and Don Norman [25]. These are focused on online platforms, but not specifically for kiosk machines. To make them more applicable to this project, we have added two extra guidelines from another study that focuses specifically on smartphone applications [31]. We will discuss every guideline separately and evaluate the entire machine according to that guideline.

4.1 Keep a minimalistic and simple design

It is important for illiterate users that the design of screens is simple and minimalistic, since illiterate users have difficulty scanning a lot of information. It is therefore also important that the most important elements are easy to distinguish from less important elements [14].

A place where this does not work in the ticket machine is choosing whether to load money onto a new OV-chipkaart. This screen can be seen in figure 4.1. The option on top is to add no money to the card, whilst this is not an option many people would choose. The option to load twenty euros to

the card is not easily distinguishable, whilst we would assume it to be one of the most needed options for people travelling by train.

Figure 4.1: Loading money on a new OV-chipkaart

4.2 Limit on-screen information to its essential

The design should only have visual elements that are useful. If there are many options, the user will be overwhelmed [14].

Figure 4.2: Start screen

In the ticket machine, this guideline has been obeyed in varying degrees. On the start screen (figure 4.2), there are very few buttons that are all very useful. However, there are also places where this principle has not been abode by. Especially the screen once the OV-chipkaart has been scanned has a lot of buttons. This screen can be seen in figure 4.3. This makes it confusing and hard to find the right button.

4.3 Use visual cues

Visual cues that can be used to help illiterate users are diverse. Examples can be bold text, underlining, and the use of symbols [14].

The most important form of visual cues that the ticket machine uses are the symbols. However, they are not used consistently on all the screens. There is very little use of colour, bolding or highlighting.

Figure 4.3: OV-chipkaart menu

4.4 Aim for recognition rather than recall

Users must recognise the steps that they need to take, instead of needing to memorise them [14].

The ticket machine uses symbols at a few places, which helps illiterate users to recognise the buttons, but there are still many places where not every user would intuitively know what button to click, especially if they are not able to read the texts. For example, it is not obvious that the bicycle ticket can be found under the button "loading other products" in the OV-chipkaart menu (figure 4.3).

4.5 Use clear, concise, direct and obvious language

Illiterate people struggle even more with texts if there are many difficult words in that text. A good way to measure how difficult words are, is by using the CEFR framework. Generally, texts that can be classified as B1 are seen as being simple and direct [14].

Most of the texts in the ticket machine are on level B1, but the frequently used words "transactie" (transaction) and "retour" (return) are not. Also, the phrasing "eenmalige chipkaart" (one-use smart card) for the paper ticket can be confusing.

4.6 Limit information to its essential

This guideline is closely related to the first and second ones. Not only the elements should be useful, but the information should also be concise and to the point. The goal of this is to not overwhelm the user [14].

The ticket machine does this quite well. There are two points where the information can be overwhelming. These are the conditions for both the bicycle ticket and the co-travelling discount. In both cases, the text is quite a lot, but it is also relatively concise. The text can be seen on the screen in

figure 4.4. The problem is also that the conditions of when users are allowed to travel with that ticket are difficult.

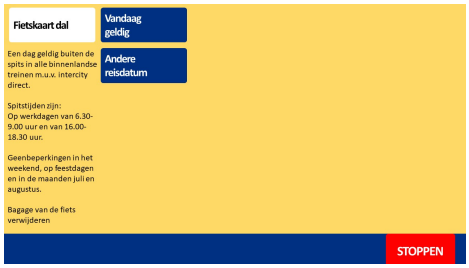

Figure 4.4: Bicycle ticket

4.7 Use simple navigation

In general, it is easier for illiterate users to have all the options on one screen, instead of having hierarchical menus. A kiosk machine does not have menus as a website does, but it is possible to hide certain options behind other buttons [14].

An example of this on the ticket machine is the start screen, which can be seen in figure 4.2. If the user wants to buy a bicycle ticket, they first need to click the button “other products”. However, this does make the start screen a lot more simple, so it can not directly be seen as a negative. The symbol for a bike on the “other products” button also gives a good indication of where the user should go. A place where this is more problematic is when trying to load the bicycle ticket onto an OV-chipkaart. Then the option for the bicycle ticket is under the button “loading other products” in the OV-chipkaart menu (figure 4.3) which can be harder to find.

4.8 Offer visibility of system status

It is useful for users to see at any moment where in the system they are [14].

For this ticket machine, this mostly means knowing what they are doing on the machine at that moment. The ticket machine has implemented this quite well. For most of the screens, on the left top corner, there is a white box that tells the current product they are involved in. Some examples of this can be found in figure 4.5.

4.9 Optimise search task

Searching can be very hard for illiterate people because they more easily make spelling errors. This can cause problems with searching [14].

Figure 4.5: Top left corner of several screens

Figure 4.6: Searching for destination

The only place in the ticket machine where searching plays a role is when searching for the destination of a ticket. The screen for this can be seen in figure 4.6. The machine requires the user to select the first two letters of the destination. If those are wrong, for example because the user does not know how to spell a station name, the right station will not come up. Even when a different part of the name is used (for example "pr" for Arnhem Presikhaaf), the user will not always get the destination they were looking for. This makes the search task very hard for illiterate users.

4.10 Consider user's lack of memory and writing abilities

It is important to remind people of what they are doing. This is closely related to the guideline of offering visibility of system status. However, it is also good to balance this with the guidelines that say that information should be limited to its essentials [14].

A good way in which the ticket machine does this is by repeating the information about the surcharge for paper tickets. An example of this can be seen in figure 4.7.

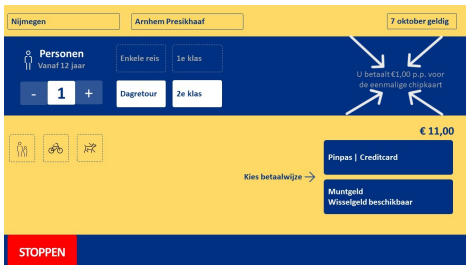

Figure 4.7: Surcharge

4.11 Provide simple and clear error message

When a user makes a mistake, the error message must be clear [14].

This does not apply to the ticket machine because there are no error messages. However, closely related is the ability to recover from mistakes. This is something that the ticket machine does not do very well. For example, the user can not easily scan their OV-chipkaart for a bicycle ticket once they have chosen a paper ticket.

4.12 Offer help and documentation

Of course, users should be able to use the machine, but it is also important that users can get help if they need it [14].

This is not implemented in the ticket machine, but there are options outside of the machine. There is a phone number on a sticker next to the machine that can be called for help. There are also explanations on the NS website for different tasks. Finally, on some larger stations, there are NS employees at service desks that can help.

4.13 Utilise multiple modes of interaction

Texts, images, and audio can all be used for interaction between the user and the machine. The last two modes are more important for illiterate users, who often struggle with texts [31].

The ticket machine uses images and symbols sporadically and does not use audio at all. This is something where the machine is seriously lacking.

4.14 Leverage numerical literacy

Most illiterate people have less difficulty using numbers than using words. This means that it is important to use numbers instead of spelling them out

in words [31].

The machine does this well. They never use the word instead of the number.

4.15 Conclusion

We have seen that the machine receives mixed evaluations if we apply relevant heuristics. Some things are implemented quite well already, but there are also some areas for improvement. We see opportunities to use more symbols and colour, be more minimalistic, simplify the navigation, improve searching and use more modes of interaction, most importantly audio. We plan to improve these areas in our design iterations.

Chapter 5

Usability tests

After doing our analysis and evaluation of the ticket machine, we have conducted several formative usability tests. This was an iterative process where updates to the machine were made after each test. This chapter will elaborate on these tests. We will first discuss the method, the participants, the apparatus, and the procedure. After that, we will discuss the seven iterations of the usability tests.

5.1 Method and design of the study

The usability tests were formative and also informal. They were led by one person and mostly done individually. The goal of these usability tests was to get input for the design process by measuring the difficulty of using the ticket machine. After each session, conclusions were reached and the mock-up was adapted according to these conclusions.

5.2 Participants

6 participants participated in the usability study. For the sake of anonymity, we will call them P1, P2, P3, P4, P5 and P6. This group of participants can be divided into two categories: people with a history of illiteracy and people with expertise in user interface design.

4 participants (P1, P2, P4 and P5) had a history of illiteracy. We recruited them through two advocacy groups for illiterate people: stichting ABC and Taalhuis Nijmegen. All of them were in their sixties. They grew up illiterate, but learned to read at a later stage in life. They all still have difficulty reading more complicated texts and do not have many digital skills. P1 and P2 were asked twice so that they could also review the changed machine.

Two participants had expertise in user interface designs. We recruited them through Radboud University's iHub. They were not specialized in illiteracy, so we discussed a set of heuristics before the usability test. This way they knew what to focus on.

All of the participants spoke Dutch.

5.3 Apparatus

The usability study was done using an iPad Air 2 with the PowerPoint application installed on it. The mock-up ticket machine was made in PowerPoint. The first mock-up contained 54 slides. The buttons had links on them to different slides. For voice recordings in later iterations, we recorded our own voice and used timers on the PowerPoint slides to go to the next slides. The icons used in the mock-up came from NS and the PowerPoint symbol library.

Moreover, a notebook was used to make notes about the study. An information letter and consent form were written in simple language to make it understandable to all users. Finally, a chocolate bar was given at the end of the study as a sign of gratitude for participation.

5.4 Procedure

The usability study took place between 8 November 2023 and 7 February 2024. All the sessions were between 60 and 90 minutes long. Most of the sessions were scheduled individually, but P4 and P5 preferred doing it together, so that session was scheduled with two participants.

The session started with greeting the participant and going through the information form. We gave the participants the option of reading it themselves or for us to read it aloud. After this, the consent form was signed. Both the information form and the consent form can be found in appendix A.4.

For the participants with expertise regarding user interface design, we discussed the heuristics mentioned in chapter 5 before asking any questions.

The first questions we asked were general questions about age, history of illiteracy, travel with public transport and experience with the ticket machine.

After that, the participants were asked to perform 5 different tasks:

1. You are standing at station Nijmegen Central and are trying to buy a return ticket to Arnhem Presikhaaf. You want to travel on Saturday 7 October.

2. You try to load 20 euros onto your OV-chipkaart.
3. You want to take your bicycle onto the train. You use the OV-chipkaart to check in, so it might be useful to load the bicycle ticket onto the OV-chipkaart.
4. You want to buy an OV-chipkaart. It is useful to put enough money on the card to travel by train.
5. You travel with a friend to and back from Zwolle. Your friend has an NS subscription, so you can travel with a discount if you travel together with him. You have to put this co-travelling discount on your OV-chipkaart. You can assume that you have enough money on the card to travel.

Once they had performed the task, they were asked to reflect on how difficult they found the task. They were also asked to give a grade between 1 and 10 with regard to difficulty. At first, we also planned to ask for a grade with regard to the help needed and the time needed, but this turned out to be too confusing. Furthermore, we discussed any advice they might have on what could be changed. We also asked some questions specific to the scenario to see whether they understood the information that was provided by the machine.

From the fourth iteration onwards, the first task could be performed with audio and without. At first, we tried reviewing the audio after the other tasks. However, the participants had already done the task once, so they did not need the audio as much. This made us realise that there is no use in reviewing the task both with and without audio because the path gets easier once they have done it once, so we only reviewed the first task with audio.

After discussing all the scenarios, we asked for a general opinion, whether they would use it in the future and whether they have any other questions or remarks.

In some of the usability studies participants made remarks that had no direct connection with the goal of the usability studies, but might be interesting for future research. We have collected these remarks in the appendix.

5.5 First iteration

P1, the first person for the usability study, had struggled with illiteracy most of his adulthood. He learned to read and write when he was in his forties and currently advises companies on accessibility for illiterate users. He occasionally travels by train and then uses an OV-chipkaart with a subscription that automatically loads money onto the card, so he does not have

to use the ticket machine. He tried to use it once but the sun was shining straight on it, so he could not see anything. If he used it, he would make sure to take a lot of time for it so that he would not have to rush.

Buying a return ticket

Figure 5.1: Searching for destination

The first step when buying a return ticket is to search for the destination. This screen can be seen in figure 5.1. This proved to be difficult for the participant. At first, he tried to search for the last letters ("AF"), and then on "PR", which are the first letters of "Presikhaaf", but the station is officially called "Arnhem Presikhaaf", so he should have searched on "AR". Once he had done that, the only problem he encountered was that it was hard for him to find the place to change the date of travelling since the button said "today valid" with no indication that it could be pushed to change the date. The screen where this is done can be found in figure 5.2.

Figure 5.2: Selecting date

He gave this a 7 with regard to difficulty. He advised implementing the possibility of recording the destination instead of having to type it and implementing a reading-aloud function. The information that should have been provided about the surcharge and the need to check in were both not clear and the description "eenmalige chipkaart" (one-off smartcard) was also not clear, so he recommended changing those.

Figure 5.3: OV-chipkaart menu

Loading money onto the OV-chipkaart

The participant did not know how to navigate the menu that appeared when scanning the OV-chipkaart. This menu can be seen in figure 5.3. There were too many options there and a lot of text without any icons. After some pointing by us, he did manage to find the option to load money onto the card and finished the task. Flashing the screen to remind him to scan the card again helped, but he was confused about why he should scan his card twice. He was also confused as to why there would be no change when paying cash. He thought it would be possible to put all that money onto the card.

He gave it a 7 if he would do it more often and without any stress, but if he did it for the first time it would be a 5. His advice on the menu would be to put more focus on loading money and less on the products.

Buying a bicycle ticket

Figure 5.4: Starting screen

As explained earlier, there are two ways to buy a bicycle ticket. The participant immediately chose the paper ticket path by clicking the “other products” button on the start screen which can be seen in figure 5.4. He had to search quite a bit but was able to buy the ticket. He found the description of the rush hours very confusing and was not able to tell us when the ticket was valid. One of the problems was the use of digital times which was not

easy to understand for him and for many of the illiterate people he knows. He was also confused as to what "1x,2x,3x,4x" meant and thought it might mean to number of bicycles or the number of times one can travel with one ticket. This can be seen in figure 5.5.

Figure 5.5: Searching for destination

He gave the path a 5. When he was told that it had also been possible to load the ticket onto the OV-chipkaart and that it would have saved 1 euro, he gave it a 4. He recommended using the bike symbol more on the OV-chipkaart screens.

Buying an OV-chipkaart

Figure 5.6: Other products

The participant struggled a bit as to where he should go from the starting screen which can be seen in figure 5.4. He chose to go to "other products" but there were too many options on that screen for him to choose from. This screen can be seen in figure 5.6. With a little reading aloud by us, he was able to select the right option. He easily found a way to not buy any other products but did not know how much money he should put into the card. In his opinion, it should not be possible to load no money onto the card since one can not use it for travel then. This is especially the case for the anonymous card because it is not possible to load any subscriptions onto the card. The price of the card, €7,50, was not clear to him until he had to pay it. This should be brought into view more clearly.

He gave this path a 3.

Co-travelling discount

It was difficult to clearly explain the concept altogether. Once he understood it, he had difficulty realising that he should scan his OV-chipkaart. He found the option but got stuck on having to decide whether he wanted “1x” or “2x” on the screen which can be seen in figure 5.7. He decided on 2x because he would travel with a friend, so there would be two people, which gave the right answer with the wrong reasons.

Figure 5.7: Searching for destination

He gave it a 5. He advised changing “1x” and “2x” to “single” or “return”. He also advised us to make it possible to do this online since that would make it less stressful to do this.

5.5.1 Conclusions

The average grade the participant gave was a 5. This indicates the difficulty of the machine. He had not been able to finish the tasks on his own. There are multiple reasons for this. Even though there are symbols in some places, in many places the only way to find the right option is by reading the text. This is very difficult for illiterate users. An important way in which this can be improved is by using audio guidance. However, this can mean that it takes the user longer to complete the task. It is therefore also important that other changes be made to improve the accessibility of the machine.

Searching for a destination was a major problem. A good way to improve this would be to avoid spelling words. This can be done by using a map or giving the ability to record their destination. This does not mean that the option to type the destination should be deleted. Other users might prefer that. However, when searching for the second part of a destination name, the right name should be given as an option, so searching for “Presikhaaf” should return “Arnhem Presikhaaf”.

Another problem that the user had, was the abundance of options at many points. Especially the OV-chipkaart screen (figure 5.3) was very difficult to navigate. Here, the lack of symbols makes it even more difficult. Possible

solutions might be changing the layout of the screen, removing options on the screen, or adding extra symbols.

Another problem is the description of the rush hours. This is difficult to understand for people who have difficulty reading and is completely impossible for illiterate people. This can be solved by using easier language and providing visual aids.

5.5.2 Updates on the machine

Based on the conclusions, we already changed some simpler things, but we wanted more data before making any major changes.

Buying a return ticket

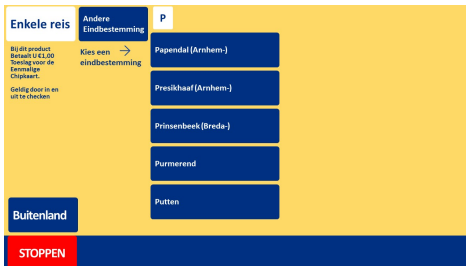

Figure 5.8: Searching for P

Firstly, searching for "PR" should also yield Arnhem Presikhaaf, so we added that option. The result can be seen in figure 5.8.

Figure 5.9: Changing date - old and new

Secondly, it was not clear that one had to click on the date to change it, so we changed the button to say: "Change date". The resulting screen can be seen in figure 5.9.

Lastly, the warning that the user has to check in with this ticket was not clear enough so we added an extra warning with a red line around it, which makes it clear that it is important. This can be seen in figure 5.10.

Figure 5.10: Check in warning - old and new

Buying bicycle ticket

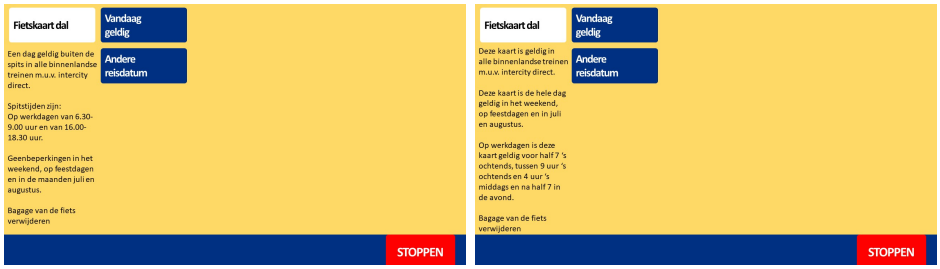

Figure 5.11: Description of rush hours - old and new

The description of rush hours was not clear at all. We restructured the information and used analogue times to explain it. The result can be seen in figure 5.11.

Figure 5.12: Amount of tickets - old and new

Secondly, the use of 1x, 2x, etc was not clear, so we changed it to explicitly mention the product: 1 ticket, 2 tickets, etc. The new screen can be seen in figure 5.12.

Buying anonymous OV-chipkaart

We added icons to the different money options to make it clear which amounts are suitable for different manners of transport. This can be seen

Figure 5.13: Money options - old and new

in figure 5.13.

Co-travelling discount

Figure 5.14: Single ticket or return - old and new

The use of 1x or 2x was not clear, so it was changed to “heenweg” (single ticket) or “retour” (return ticket). This can be seen in figure 5.14.

5.6 Second iteration

Our second usability study was with P2, who was a man in his sixties. He was unable to read or write until his 45th and he can now read and write with some difficulty. He occasionally travels by train, but he always asks someone else to buy a ticket for him. He tried using the ticket machine once but he was not able to use it.

Buying a return ticket

The participant was able to find the button to buy a return ticket on the starting screen (figure 5.4) but had a lot of difficulty with selecting the destination which is done on the screen seen in figure 5.1. He first tried “Arnhem Centraal” and needed quite a bit of guidance to find Arnhem Presikhaaf. He found it hard to find the button to change the date (figure 5.9). He would have appreciated a phone number that he could call for help.

Several difficult words were used that he misread or did not understand. This included “eenmalige chipkaart”. He did not know that it meant the ticket that he was buying. He also did not know what the word “inchecken” meant because he was not used to travelling by train.

He gave the entire experience a 3 but gave several hints for things that could be changed. He would like more icons that would have guided him more easily. A function to let the text be read aloud would also be useful. The most important thing that should be changed is the way that one searches for the destination. Several ways that it could be improved according to him would be by making it possible to record the destination or to make a map that one can click on.

Loading money onto the OV-chipkaart

This scenario went a lot easier for the participant. He found it obvious that he should scan his OV-chipkaart and the euro sign in front of the balance made it visible to him that he should click on that button to load money onto the card. This button can be seen on the screen in figure 5.3. He still had to look quite a long time at all the buttons because reading the text was difficult for him.

He would give this a 5 but said that he would give it a lot higher if there were more icons to guide the way.

Buying a bicycle ticket

The icon of the bike in several places made this easier, for example on the starting screen (figure 5.4). The participant immediately went for the path to buy a separate ticket. He already knew that one is not allowed to travel with a bike in rush hours, but he also understood the text quite well. This is the text that is also seen in figure 5.11. However, he found the hours a bit confusing and recommended a visual representation for that.

He gave this path a 7, but he did not see that he had to pay a surcharge for the separate ticket. He also did not realise that it was also possible to load the ticket onto the OV-chipkaart. He suggested solving this by adding icons of a bicycle in several places.

Buying an OV-chipkaart

The participant hesitated before he chose “other products” on the starting screen (figure 5.4). He missed an icon for an OV-chipkaart there. He also had difficulty with the different products to add to the card. This screen can be seen in figure 5.15. For example, he did not know that a railrunner was. Once he realised that the first option was just a plain card, he chose

Figure 5.15: Products when buying OV-chipkaart

that. It was also not entirely obvious to him how much money he should put on the card which is done on the screen seen in figure 5.13.

He gave this path a 6. He mentioned that there was quite a bit of text on there, which was not always easy to read. He recommended checking all the language to make it b1 level.

Co-travelling discount

The participant almost forgot to scan his OV-chipkaart. Once he had done that, he had difficulty finding the button for the discount. Eventually, he found it based on the fact that it was a very long word. He also struggled to select whether he wanted to add any money to the card because he found it difficult to understand the text.

He gave it a 7 but did recommend using more icons.

5.6.1 Conclusions

Even though the average grade (5,6) this participant gave was higher than the previous participant, he still struggled a lot with the tasks. He had the same problems with selecting the destination and being confused by the many options. This participant had more noticeable difficulty with reading the texts. Especially longer words were difficult.

It also turns out to be a recurring problem that users have difficulty loading the bicycle ticket onto the OV-chipkaart. They are more easily guided towards a paper ticket, which costs more money. At other places, the participants also easily forgot to scan their OV-chipkaart, so that might need to be emphasised more.

5.6.2 Updates on the machine

After this iteration, we had little time, so we only added some symbols on two screens. When buying a ticket, we added the symbols for a single and return ticket and a calendar to the button to change the date. The result can

be seen in figure 5.16. For the OV-chipkaart menu, we added the symbols for a bicycle and a dog to the button to load other products. This can be seen in figure 5.17.

Figure 5.16: Added symbols for buying a ticket - old and new

Figure 5.17: Added symbols for loading other products - old and new

5.7 Third iteration

P3, the third person we did the usability study with, is an expert in the area of user interface design. Before the interview, we discussed the guidelines as mentioned in chapter 4. This helped her to focus on problems related to illiteracy.

Buying a return ticket

The participant ran through the entire path and the first thing that she noticed was the button to change the date on the screen seen in figure 5.9. There was no mention of the current date of travelling, which can be confusing. She also missed confirmation that one is doing the right thing.

She gave this path a 7. For the information about the surcharge, she recommended putting a money symbol in front of it. She also recommended adding ways to ask for help, for example by reading the information aloud or making a sequence of panels that show how it should be done.

Loading money onto the OV-chipkaart

The participant noticed that people might forget that they have to scan their OV-chipkaart and recommended making an extra button on the welcome screen saying "I have an OV-chipkaart". She also thought that it would be hard to find the button to add money because the balance was also mentioned on the same button (figure 5.3).

She gave this path a 6. She recommended separating the amount of money on the card from the button to charge extra money.

Buying a bicycle ticket

The participant thought that it would be difficult for people to first choose to scan the OV-chipkaart. It would be good to make an option for users to select the OV-chipkaart even when they first selected the paper ticket. The icons on several screens make it easy to choose the bicycle ticket. Once that has been selected, it was not entirely clear when one is allowed to travel with the bike.

She gave this path a 4. She thought that it might be a good idea to only mention those times that apply to the selected days and to make the times visual, for example by using a clock.

Buying an OV-chipkaart

When the participant reviewed this task, her main criticism of this path was the fact that it is not entirely clear how much money should be on the OV-chipkaart.

She gave it a 7.

Co-travelling discount

The participant thought the screen with the different options after scanning the OV-chipkaart was not very well-designed (figure 5.3). There are many options and few symbols. It would be good to give it a more logical layout and add more symbols.

She gave this path a 7.

5.7.1 Conclusions

This participant was significantly more optimistic in her grades, with an average of 6,2. There were still many things that could be improved. One of the most important problems is scanning the OV-chipkaart. It is not very clear in the current state that it should be scanned first and there are no ways to scan the OV-chipkaart further down the path.

Another problem that persists is the layout of the OV-chipkaart menu screen. This screen can be seen in figure 5.3. This screen has too many options and too few symbols.

5.7.2 Updates on the machine

On several occasions, the participants had difficulty remembering to scan their OV-chipkaart when wanting to buy a bicycle card. We changed two things to solve that problem. First, we added a starting screen that asks to scan the OV-chipkaart or press a button if they do not have a card. This screen can be seen in figure 5.18. This way, a user is less likely to forget to scan the card.

Figure 5.18: New starting screen

Secondly, we added a screen where the user can choose to load the bicycle ticket onto the OV-chipkaart in the path to buy a paper ticket. This gives users the possibility to fix a mistake further down the path. This screen can be seen in figure 5.19.

Figure 5.19: Choosing between OV-chipkaart and paper card

A second problem is the screen that is shown when the OV-chipkaart is scanned (figure 5.3). There are too many options there that confuse the user and there are very few symbols. We changed it to look like the "other products" screen (figure 5.6) since users easily navigated that. The resulting screen can be seen in figure 5.20.

Lastly, we put the date for the ticket next to the button to change it on the

return ticket screen, which can be seen in figure 5.21.

Figure 5.20: OV-chipkaart screen - old and new

Figure 5.21: Date next to changing date button - old and new

Audio

Many of the participants mentioned the possibility of having the information on the screen read aloud. We created an extra prototype with audio that was able to guide the user through buying a return ticket since that is one of the difficult paths for users that cannot be easily fixed. We chose not to add audio to every path since using the audio version would be a longer process for the user. We find it important that the user is also mostly able to use the machine without audio.

From the usability studies, it is clear that illiterate users have difficulty finding the buttons. To help them, the button that the audio talks about is lit up. This way, users will not have to search as long for the buttons. A video of the mock-up can be found here: `https://youtu.be/LlQOQjCrbWo`.

5.8 Fourth iteration

For the fourth usability study, we interviewed two people, P4 and P5. They were both in their sixties and grew up illiterate. They both learned to read and write at an older age, which they can now do with some fluency. They both regularly travel by public transport, but neither uses the ticket machine. One of them uses her debit card to check in and out and the

other one does use an OV-chipkaart, but he got a subscription that allows for automatically charging. In the rare case that he needs to use the ticket machine, his wife helps him.

Buying a return ticket

Finding the destination turned out to be difficult for both of the participants. They first tried to select Arnhem Centraal and had difficulty spelling Arnhem. This is done on the screen in figure 5.1. When they needed to change the date, they had to search for the button and did not immediately know how to exit the screen, which can be seen in figure 5.22. Other than that, they were able to complete the transaction on their own. However, they did not notice the surcharge.

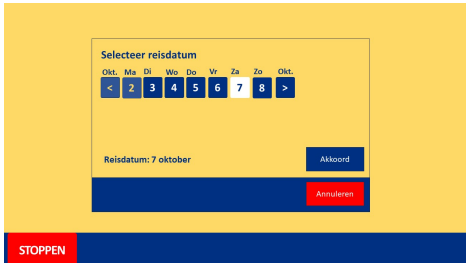

Figure 5.22: Selecting a date

They gave it a 7. They advised using icons for the payment methods.

Loading money onto the OV-chipkaart

The participants easily knew that they had to scan their OV-chipkaart. They found it difficult to find the button to load money, but did find it eventually. This is on the redesigned OV-chipkaart menu (figure 5.20).

They gave it an 8 and did not have any advice for change.

Buying a bicycle ticket

The participants chose to scan their OV-chipkaart and easily found the button for the bicycle on the OV-chipkaart menu (figure 5.20). They did not read the text about when to travel on the screen found in figure 5.11, but when pointed out they found it a clear text, but that it should be on the screen earlier and more prominently.

They gave it an 8.

Buying an OV-chipkaart

Because of the new starting screen (figure 5.18), the participants first wanted to scan their (yet-to-buy) OV-chipkaart. Once they realised that it was not an option, they easily found the button to buy a new OV-chipkaart. They had difficulty choosing the option without any extra products on the screen seen in figure 5.15.

They gave it a 7.

Co-travelling discount

The participants easily found their way to the button for the co-travelling discount. On that screen, there was quite a bit of text to read and they struggled with the amount of money they wanted to load on the card, which is done on the screen in figure 5.7.

They gave it a 7.

Audio function for buying ticket

Because this was a prototype, the testing went quite chaotic. It showed the importance of a pause button. The participants did not always listen to the entire recording, but it did give them help in selecting the right buttons. They thought that it was very good that the text could be read aloud, but that the speed could be lowered a bit.

They gave it a 7.

5.8.1 Conclusion

The average grade that these participants gave was higher than a 7. This indicates that they found it easier to use the machine and that the changes worked. They did not struggle to load the bicycle card onto the OV-chipkaart, so those solutions worked.

However, there were still a few places where they had trouble. Searching for the destination is still difficult. Since all the usability studies show this, it is important to give another option apart from typing the destination.

There were several places where the participants had difficulty finding the right buttons. Sometimes, adding a symbol might be all needed to make the button more visible, but it might also be good to work with different colours and move buttons to a more sensible place.

At two places, the participants had difficulty choosing the right options. When buying an OV-chipkaart they had to choose which product they wanted to buy: Only an OV-chipkaart or to load another product on it.

They were confused because they did not know all of the products. It might be better to give this option at a different place so that users that do not need it, are not confused by it. The second place is when loading the co-travelling discount. The user has to select whether they want to load any money onto the card. This came unexpectedly to the participants. Because it is better to have as few options as possible (see heuristics 1 from chapter 4), it might be better to separate those two tasks and delete the option to load money at the same time as loading the co-travelling discount.

Finally, the audio was received very well. However, to be able to test it effectively, there must be a possibility to pause or stop the audio.

5.8.2 Updates on the machine

For searching the destination, we thought of multiple options. We could make a map where the user could select the station or we could make it possible to use one's voice to record the destination. A map sounded interesting, but we doubted that users could find their destination easily on a map. Recording the destination with one's voice might be a better option. This does not involve any spelling and therefore makes it easier for illiterate users, so we implemented that into the mock-up. This can be seen in figure 5.23.

To make the buttons noticeable, we changed the colour of all the buttons that expressed the sentiment of agreeing with something to green which can be seen in figures 5.23, 5.24 and 5.27. There were also several places where a symbol could be added: the payment methods, when changing classes (both visible in figure 5.25), and for a single or return ticket when loading a co-travelling discount which can be seen in figure 5.27. Finally, we moved the balance closer to the button for charging the OV-chipkaart. This makes the button easier to find. This can also be seen in figure 5.26.

Even though the description for the rush hours is quite clear, making a visual representation would make it easier to understand it. Using the colours red and green makes it immediately clear when travelling is allowed and when it is not allowed. How to represent the time does not have an obvious solution. Usually, time is represented by a clock, but the rush hour times are in both halves of the day. This makes it necessary to use two clocks, one for the mornings and one for the afternoons. We used symbols to indicate which clock represented which part of the day. All of this can be seen in figure 5.28.

A good way to decrease the confusion when buying the OV-chipkaart is to remove the different products. An easy way to do this can be seen in figure 5.29 when charging money to the OV-chipkaart. When choosing the payment method, it is also possible to add another product to the card. We

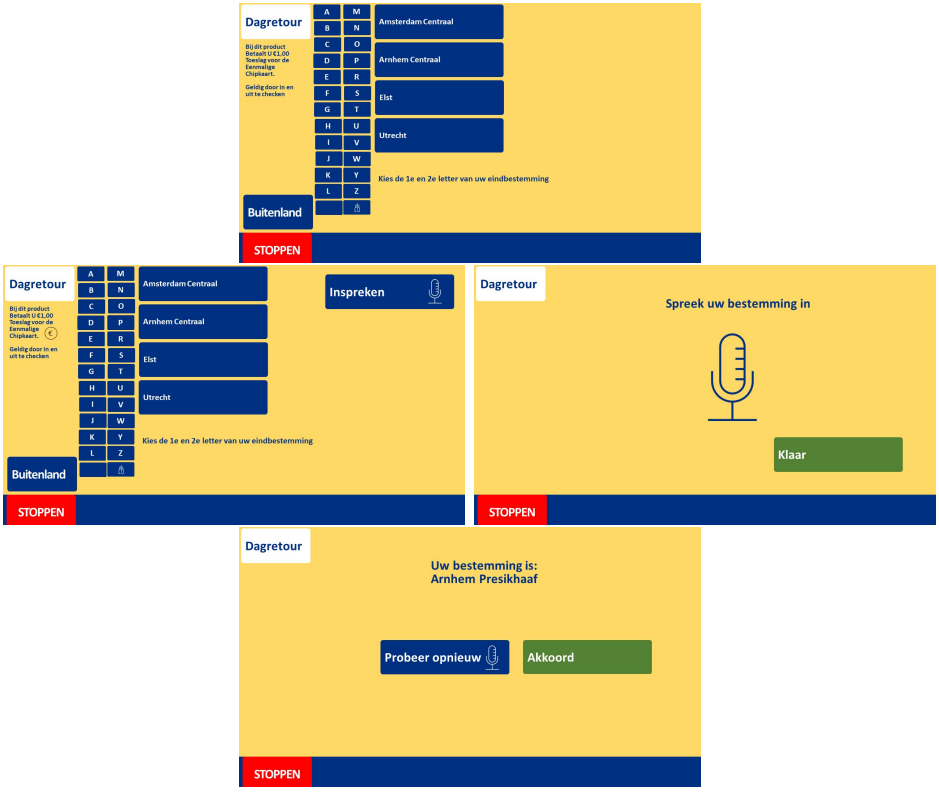

Figure 5.23: Entering destination - old (first row) and new (second and third row)

Figure 5.24: Agree button is green - old and new

used this design for the buying of the OV-chipkaart as well. This can be seen in figure 5.30.

For the co-travelling discount, a good way to make the path easier is by removing the option to charge money at the same time. The user can put the co-travelling discount on the card and when that is done, he can still load money on it. The resulting screen can be seen in figure 5.27.

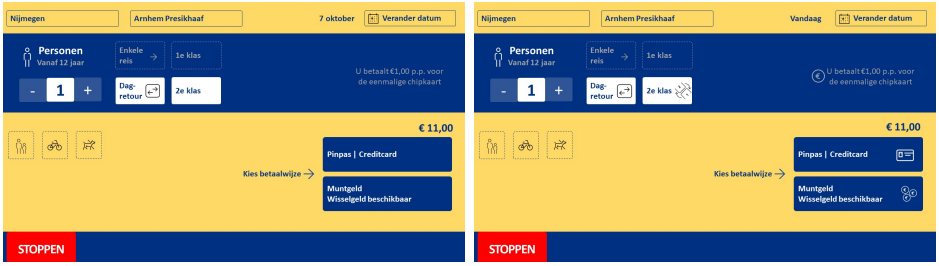

Figure 5.25: Symbols for payment methods and changing classes - old and new

Figure 5.26: Balance closer to button for charging - old and new

Figure 5.27: Loading co-travelling discount - old and new

Figure 5.28: Explaining rush hours - old and new

For the audio, we added the stop button since it was difficult to find a way to pause the audio in the mock-up. This can be seen in figure 5.31.

Figure 5.29: Paying for money on OV-chipkaart

Figure 5.30: Loading other products on new OV-chipkaart - old and new

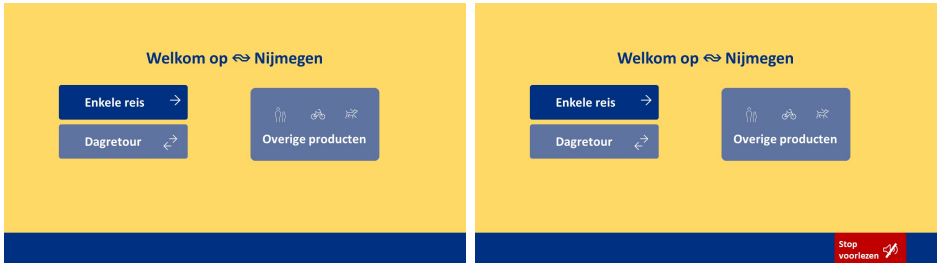

Figure 5.31: Stop button for the audio - old and new

5.9 Fifth iteration

Our fifth usability study was done with P6, an expert in the area of user interface design. Before the study, we discussed the guidelines as mentioned in chapter 4. This helped her to focus on problems related to illiteracy. Because we had limited time for this study, we reviewed the first task only without the audio.

Buying a return ticket

The participant missed the icon for not having an OV-chipkaart on the starting screen (figure 5.18). She also found it difficult to recognise the symbols for the single and return tickets. She suggested putting a box around them. On the screen to choose the destination (figure 5.32) she

did not notice the button to record. Once she pushed it, she did not get the feeling that the recording started. She suggested using an animation for it. She also suggested changing "your destination is" to "this is what I understood". She did not recognise the symbol for a class change as such on the page with many options. This screen can be found in figure 5.25. Because illiterate people often recognise numbers more easily than words, she recommended using the date of today instead of the word "today". When selecting a different day, she did not easily see the month on the screen, as seen in figure 5.24. Once she had paid, she found it confusing that the information about checking in was shown twice. This can be seen in figure 5.10.

In total, she gave it a 4.

Loading money onto the OV-chipkaart

The participant recommended using extra space around symbols in general, especially for the one that indicates the charging of the card on the OV-chipkaart menu (figure 5.20). This makes the symbol stand out more. She had difficulty distinguishing between "ophogen met" (charging with a certain amount) and "aanvullen tot" (charging to a certain amount). This can be seen in figure 5.32. Lastly, she missed a symbol for the warning to scan the card on the screen seen in figure 5.33.

Figure 5.32: Choosing money to load on OV-chipkaart

Figure 5.33: Warning to scan OV-chipkaart

She gave it a 5 because she found it just not good enough.

Buying a bicycle ticket

The participant missed a symbol for a bicycle on all the screens related to buying the ticket. Adding these would remind users of what they are doing. There is some important information that needs to be brought to the user on the screen that shows for options to buy a bicycle ticket. This screen can be seen in figure 5.28. She recommended using a symbol for luggage to help convey that message. She did not find the times for rush hours clear. She recommended using a timeline instead of a clock and using the entire screen so that the information can be displayed more clearly. Because most illiterate people recognise numbers more easily, she recommended adding the date to the button for "today". This can make it easier to choose the right date.

In total, she gave this a 6, mostly because the conditions for travelling are still too difficult to understand.

Buying an OV-chipkaart

The first problem occurred before even touching a button. The participant pointed out that it might be difficult for users to choose between having or not having an OV-chipkaart if they want to buy one, so it might be useful to add the button to buy the card to the starting screen (figure 5.18). She also missed the symbol for the OV-chipkaart on the button for "overige producten" (other products) that is seen on the screen that shows if the user does not have an OV-chipkaart (figure 5.4). She struggled with the concept of the OV-chipkaart because it is easily confused with an "eenmalige chipkaart" (a ticket). The word "inclusief" might be difficult to understand, so she advised changing it to a plus sign on the screen seen in figure 5.13. She found the wording "een product laden" on the screen seen in figure 5.30 confusing as well. She recommended changing it to "nog een ander product".

Overall, she found it relatively confusing and gave it a 5.

Co-travelling discount

The participant had the same advice for this task as she had for buying a bicycle ticket, namely to repeat the symbol on all the screens and to add the date to "today" and "tomorrow". Additionally, she was quite thrown off by the "akkoord" (okay) button. This might partly have to do with the fact that the button is green, so she advised turning the colour to blue. This screen can be found in figure 5.27.

The conditions for travelling are still difficult to understand, so she gave it a 5.

5.9.1 Conclusions

This participant was a lot more negative about the ticket machine. Many factors contributed to that, but the most important was that she found some of the wording confusing and did not understand all of the symbols and missed symbols in other places.

The wording can easily be changed in many places and makes it clear that it is important to scan all the words to see whether they are b1-level. In the places where a date is described (like "today" or "tomorrow"), adding the actual date will make it more clear that it is a date and also help people who find it easier to process numbers instead of words. The only place where the wording is confusing and can not easily be fixed is when loading money onto the OV-chipkaart. This can be seen in figure 5.32. There, the user has the option to increase by a certain amount ("ophogen") or to a certain amount ("aanvullen"). There are no symbols that clearly indicate one or the other and also no other clear words since it is also a concept that is a little vague. The fact that "ophogen" is automatically chosen, makes this less of a problem. If the user does not understand the other option, they can simply select the right amount and continue. Giving the option for "aanvullen" is very useful for users who have difficulty with mathematics, so removing that option is also not a good idea. The best way is probably the way it is now, even if it is not ideal.

The symbols are harder to change. Not everything has a clear symbol connected to it. The symbol for changing classes is so confusing that it might be better to not use it, but that means that the users are forced to read the text to understand what is going on. Other symbols can be changed a little to make them more understandable.

The colour of the "akkoord" button when loading the co-travelling discount is green. This is different from the colours of the other buttons. In some contexts, this makes it more clear, like when agreeing to select a certain date. However, because there is very little choice when agreeing to the co-travelling discount, the green colour makes it only more confusing. It would be better if the button was blue, since then consistency would remain.

When the machine is recording the user's voice for the destination, it is not clearly indicated at the moment. The participant suggested using an animation to make it clear. Another good way is by adding audio feedback so that a sound is heard when the recording starts.

The visual representation of the rush hours is not at all clear. This participant had the idea to use a timeline. This removes the problem of having to distinguish between morning and afternoon, since it is simply one long line. It is also similar to the representation that weather apps frequently use, so

the layout might be familiar to many users.

There were also two times when the participant did not think that the buttons were in a clear place. First of all, when selecting the destination, the button to record the destination is not clear because of the many buttons for all the different letters that are also on that screen. The best way to solve this is by adding a separate page where the user has to choose whether they want to type their destination or record it. The other place where the button is not obvious is when buying an OV-chipkaart. First, the user has to choose that they do not have an OV-chipkaart and then select other products, only then they can choose the option to buy a new OV-chipkaart. The participant thought that having to select "no OV-chipkaart" would be confusing. The previous usability study shows that this is a possibility, but that the user can easily recover from that mistake because they are not able to find the OV-chipkaart that they should scan. What can make the path easier, is adding the OV-chipkaart symbol to the button "other products". This makes it easier to find the button.

5.9.2 Updates on the machine

We changed several words to make them level b1. A list of these can be found in the appendix. We also replaced the word "inclusief" with the symbol "+". Furthermore, we added the dates where possible by the words "today" and "tomorrow".

For the symbols, we added ones for the button "no OV-chipkaart", for screen warning to scan the OV-chipkaart (see figure 5.36), on all the screens related to the bicycle ticket (see figure 5.34) and the screens related to the co-travelling discount (see figure 5.35).

Figure 5.34: Symbol for no OV-chipkaart - old and new

We also added a symbol for an OV-chipkaart to the button "Other products". The symbol for class change was deleted because it was confusing and the symbols for single and return tickets were changed by putting them in a box. This makes them more clear. All of this can be seen in figure 5.37.

Figure 5.35: Symbol for bicycle ticket - old and new

Figure 5.36: Symbol for co-travelling ticket - old and new

Figure 5.37: Extra symbol for extra products and symbols single and return ticket changed - old and new

Finally, we changed some other small things. We changed the colour of the "akkoord" button back to blue, which can be seen in figure 5.35.

To make it more clear when the machine is recording, we added an animation. A video of this can be seen here: `https://youtu.be/uAbVBfV2tC0`. We changed the representation of the rush hours from two clocks to a timeline. This can be seen in figure 5.38.

We changed the placement of the month when selecting the date so that it would be more clear what month it is. The result can be seen in figure 5.39.

Finally, we added an extra page when selecting the date so that the user has to choose whether they want to type or record. This screen can be seen in figure 5.40.

Figure 5.38: Visual representation of rush hours - old and new

Figure 5.39: Selecting date - old and new

Figure 5.40: Choosing between typing and recording

5.10 Sixth iteration

The person that we interviewed for the sixth iteration is the same person that we interviewed for the first iteration, P1. We invited him back to review the changes to the ticket machine.

Buying a return ticket - audio

The option that the machine would read aloud was very well received by the participant. He felt a lot more confident in what he was doing. He thought the audio was clear and calm. The only problem he had was with the screen that has many options to change something about the ticket (figure 5.21). There is a lot of information on that screen, so the audio was also very long. He listened to all of it before he made the next step, but he had already

forgotten what the first buttons meant. He recommended making it clear that the user can press the button he wants at any time.

He gave it an 8. He thought that the description “papieren kaartje” was a bit difficult, so he recommended changing that to “treinkaartje”.

Loading money onto the OV-chipkaart

The participant was able to do this task independently. The only place he was confused was with the difference between “aanvullen” and “ophogen”. This can be seen in figure 5.32. He was able to use them in the right manner but got confused about what the task was.

He gave this task a 7 and recommended implementing the reading function for this as well since it would have made him more confident that he was doing the right things. He also recommended making the button to get a receipt bigger, because he had to search for it.

Buying a bicycle ticket

The participant did this task smoothly. He scanned the OV-chipkaart immediately and found the visual representation of the rush hours as seen in figure 5.38 very clear.

He gave it an 8 and his only recommendation was for the visual representation of the rush hours. He recommended making a little separation between the morning and afternoon part of the timeline so that it would be clearer which 1 o’clock is meant.

Buying an OV-chipkaart

Most of this task went smoothly for the participant. However, he got confused when choosing the amount of money he wanted on his card on the screen seen in figure 5.13. He managed to find the right amount, but he was very confused as to why it should be possible to buy a card without any money on it.

He gave it a 6.

Co-travelling discount

The participant had a lot of difficulty understanding the concept of the co-travelling discount, so it took a long time to explain the task. However, he managed to complete the task completely independently and smoothly.

He gave it an 8.

5.10.1 Conclusions

This usability study went a lot better for this participant than the previous time. The average grade was 7,4 which is more than 2 points higher than the previous time (5), so there has been a lot of improvement.

Especially the audio was very well received. Adding audio to all the paths would make it most likely possible for illiterate users to use the machine independently. The only thing that could be added to improve it is an explanation that it is possible to select the button directly.

The button for a receipt is not very noticeable at the moment. The participant suggested making it bigger, but we think that it is more important to add a symbol. This would make the button more noticeable than making it bigger would.

The problems with selecting the amount of money to load on a new chipkaart are not as easy to solve. The participant has a good point that it does not make a lot of sense to buy a card without any money on it. However, in some special cases, a user might want that, for example when they want to load a railrunner onto it. The best solution is to re-order the options. The no-money option can be put at the end and by formatting all the other options in the same way, the options will be clearer.

This leaves a few small problems. The wording "papieren kaartje" (paper ticket) is not very clear and should be changed to "treinkaartje" (train ticket). And the timeline should be formatted a little differently.

5.10.2 Updates on the machine

We added an explanation to the audio that it is possible to push any button directly and a warning when there is a lot of information coming. A video of this can be found here: `https://youtu.be/bosR_gpZPhk`.

Figure 5.41: Payment succeeded screen - old and new

We changed the wording "papieren kaartje" to "treinkaartje" and added a symbol to the button for the receipt. The resulting screen can be seen in figure 5.41.

We added a separation between the morning and the afternoon in the visual representation of the rush hours so that it would be clearer. This can be seen in figure 5.42.

Lastly, we changed the order and formatting of the amount of money to load on a new chipkaart, so that it would be easier to choose the right option. The result can be seen in figure 5.43.

Figure 5.42: Visual representation of rush hours - old and new

Figure 5.43: Loading money on new OV-chipkaart - old and new

5.11 Seventh iteration

The person that we interviewed for the seventh iteration is the same person that we interviewed for the second iteration, P2. We invited him back to review the changes to the ticket machine.

Buying a return ticket - audio

The participant was extremely happy with the read-aloud option. He found it very clear and loved the fact that the buttons light up. He also thought that he would learn to use the machine by listening to the audio.

He gave it a 10. He recommended using the same setup for different languages as well. This way people who do not know Dutch can use it as well.

Loading money onto the OV-chipkaart

The participant managed to do this path flawlessly. He only hesitated for a second when choosing whether to increase by or to a certain amount, but he found the right option. This happened on the screen seen in figure 5.32.

He gave the path a 9.

Buying a bicycle ticket

This path did not go as smoothly as the previous two. The participant did not realise that he could scan his OV-chipkaart, and when he had to choose between a paper ticket and the OV-chipkaart on the screen seen in figure 5.20, he was confused at first. He chose the OV-chipkaart though and managed to complete the task.

He gave the path an 8.

Buying an OV-chipkaart

The participant struggled with this path. He had difficulty finding the button "overige producten" on the "no OV-chipkaart" screen (figure 5.4) and struggled with the amount of money he had to load onto the new card on the screen in figure 5.13. He also did not see that buying the card would cost money.

He gave this path a 7, but he would have given it a 9 if there had been an audio option.

Co-travelling discount

Most of this task went very smoothly. He only struggled to read the text "1e klas" and "2e klas" thinking that it said 1 or 2 tickets ("kaartjes"). This can be seen in figure 5.44.

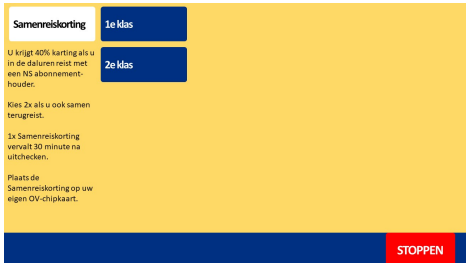

Figure 5.44: Choosing class with co-travelling discount

He gave this path an 8 mentioning that he thought it would be very easy to memorise if done only once or twice.

5.11.1 Conclusions

The average that this participant gave was 8,4. This is almost 3 points higher than the previous time. He was very happy with the audio. The tasks that he still struggled with would go perfectly if audio was available for them, but even without audio, he managed to do most of them. He still struggled with choosing the amount of money to load onto a new card and choosing between first class and second class. These problems cannot easily be solved anymore, but using it a few times would allow him to learn to use the machine. With this result, there are not many things that can be changed anymore, which is a good reason to make this the final iteration.

Chapter 6

Discussion and conclusions

In this chapter, we will discuss the findings, both from the evaluation of the current machine and from the design iterations. These findings will be compared to related work. After that, some recommendations follow from these findings, first for NS, but also for other kiosk machines that can benefit from this. Finally, we will discuss our research's limitations and ideas for future research on this topic.

6.1 Findings

Our research question was: How can the accessibility of the NS ticket machine be improved for illiterate users? We answered that question in two phases. First, we looked at the current machine and evaluated that to see how accessible it is to illiterate users. After that, we performed multiple interaction design iterations where we used usability studies to get requirements and designed solutions for these requirements.

6.1.1 Evaluation of the current machine

In the evaluation of the current ticket machine, we looked at the machine through the eyes of a set of heuristics. The ticket machine performed well in some aspects, and not too well in other ones. It does a good job offering the visibility of the system status and most screens have a relatively minimalistic design. There are a few pages however that have too many options. In some places, it shows good visual clues by using symbols. However, there are also a lot of symbols lacking. The machine does not use any other visual clues. Using colour and bold text could help. In other ways, the machine does not use options either. It almost only uses text for interaction and not any audio and barely any images. This is problematic in a lot of places, but it makes

searching especially difficult. Any user who has difficulty spelling will find it hard to find the right destination.

In conclusion, the NS ticket machine has some good aspects, but according to these heuristics, it is most certainly not accessible enough for illiterate users. The user tests also show that the accessibility is not yet good enough.

6.1.2 Design iterations

Every design iteration had four phases. First, the requirements were established, and then solutions were designed for those requirements. Those solutions were implemented in a mock-up and they were evaluated in the next usability study. We will discuss the findings of every phase of the study.

Requirements

The usability studies showed many issues. Some of them occurred with multiple participants and they showed the requirements that needed to be established.

P1, P2, P4 and P5 all had difficulty searching for the destination because they did not know exactly how to spell it. Therefore, one of the requirements would be having a search method that does not involve spelling.

P1 had difficulty navigating the OV chipkaart menu (figure 5.3) every time he came across it, whereas P2 only had trouble when searching for the co-travelling button. P3 also mentioned how confusing that screen was. They all required a screen that was clearer and easier to navigate.

The description of the rush hours when buying a bicycle ticket turned out to be difficult for almost all participants. P1 did not understand it at all. After changing it, participants P2, P3, P4 and P5 could understand it, but only barely and they all recommended making a visual representation of it. The first rendering of it still turned out to be too difficult according to P6.

P1 and P2 both forgot to scan their OV-chipkaart at one time or another and P3 warned for this as well. Especially when buying a bicycle ticket, they did not realise that they could scan their OV-chipkaart and therefore bought a paper ticket, which cost them extra money.

P2, P4 and P5 were all very confused when buying OV-chipkaart because of the different products that could be bought with the OV-chipkaart. These same participants also had difficulty choosing the “no-money” option when loading the co-travelling discount.

All of these issues show requirements that are met when those parts of the machine are improved.

Solutions

Several of the requirements that were discussed in the previous section would be implemented if some person would slowly walk the participant through the machine. The best way to achieve this is by using audio. We combined this with buttons that lit up to make it even clearer where the participant should focus their attention.

Another solution that helped several of the problems is to make the layout simpler. Where possible, we removed options and redesigned some screens so that there were fewer buttons and information on that screen.

Using many more symbols also helped to guide the users in their tasks. They more easily recognised what the buttons meant and needed less time to make the right decision.

Mock-up

Once the solutions had been designed, they needed to be implemented into the PowerPoint that was used as a mock-up. For the audio recordings, we recorded our own voice. This mostly worked very well. In some interviews, it was a bit of a struggle that the mock-up did not allow for any button clicks that were not thought out beforehand. This meant that we had to explain that this was not the right way to complete the task. Other than that, it was a very useful mock-up.

Evaluation

The solutions made it indeed easier for illiterate users to complete their tasks. This can be seen in the higher grades that they gave. An overview of all the grades given can be found in figure 6.1. Especially the audio made it a lot easier for users. They felt a lot more calm and were more confident in their actions. Without audio, they managed better, but some points still remain a struggle. They could more easily learn to do the tasks, but if no audio would be available it would be very important that there are people on train stations to help them.

6.1.3 Conclusion

With all these findings, we can answer our research question. The most important ways in which the accessibility can be improved are by adding audio and symbols and by reducing the number of options on the screen.

Iteration	Return ticket	Loading money	Bicycle ticket	Buy card	Co-travelling
1	7	5	4	3	5
2	3	5	7	6	7
3	7	6	4	7	7
4	7	8	8	7	7
5	4	5	6	5	5
6	8	7	8	6	8
7	10	9	8	7	8

Table 6.1: Grades from the different iterations

6.2 Comparison with related work

When we compare our findings with the findings of related work, we find that our research supports most of their conclusions. Durand, Zijlstra and Hamersma [10] mention that some people have trouble using the ticket machine and that illiteracy makes it harder. Our research highlights this conclusion. The participants all had difficulty with the tasks, especially before any changes were made.

The audio was an important way to make the machine easier to use. This supports what is also said by Jan, Maqsood e.a. [17], who highlight the importance of audio in applications. P7 also showed a lot of happiness when using the machine, which is in line with the findings of Medhi, Sagar and Toyama [22] where it is mentioned that participants are a lot more eager and enthusiastic to use an application if there is audio in their own language. They also mention that illiterate users are helped by reducing the number of options on a screen, which we also found in our study to be helpful.

In our study, we found that symbols helped. There was only one symbol that was not easily recognised. So we did not encounter the problems that are described by Thatcher e.a [32]. In their research, only seven of the fifteen symbols were frequently recognised.

Finally, as is also mentioned by Durand [11], even though we have made many good adjustments to the machine, it is still very important to have an analogue alternative.

6.3 Recommendations

From our findings, we have some recommendations for NS and also some recommendations for other kiosk machines.

6.3.1 NS

Of course, we would recommend implementing the changes that we made to the ticket machine, starting with the audio. Next to that, there are also some other points that the NS could focus on. Some of their concepts, especially the co-travelling discount, were very difficult to explain. The same was true for the need to check in after buying a paper ticket. It would be good for NS to either change these concepts or explain them clearly to users.

Another recommendation for NS would be to keep personnel at their train stations. Even if the machine was more accessible, there will always be people that struggle to use it. Being able to ask a person for help would lower the pressure on these people.

6.3.2 Other kiosk machines

Even though our research only focused on the ticket machine, other kiosk machines can learn three important concepts from it.

Firstly, the importance of audio. Adding audio to the machine made it much more enjoyable to use and also gave users a lot more confidence. Highlighting the buttons at the time that the audio talks about them, helps this even more. This is something that could be implemented in many other machines as well.

Secondly, use symbols wherever possible. Having a symbol in place makes it easier and faster for the users to recognize the right buttons and gives them more confidence in their actions.

Thirdly, less is more. A screen with many options or much information easily gets confusing for an illiterate user. It is better to have as few options at the same time as possible.

6.4 Limitations and future research

Our research has not been without its limitations. We used a mock-up for all our usability studies and even though we tried to make it as realistic as possible, it is not the same as a real ticket machine. We did not implement any part of the paying process, and all our usability studies were in a safer environment, where no other people were waiting to use the machine. We would recommend a follow-up study that researched whether participants are able to confidently use the adapted machine in a situation with more pressure.

We also noticed that some icons could more easily be recognised than others. We would recommend further research into which icons work best.

Our study did not have many participants. We would recommend a study with more participants, including illiterate people but also literate people. This way, it can also be tested what impact the adaptions that help illiterate people have on literate people.

Lastly, this study has only been focused on the ticket machine. However, participants mentioned that it was not the only reason that they had difficulty travelling with public transport. They also had difficulty getting the right travel information. Another study that focused on that part of public transport would also be recommended.

In this study, we have shown multiple ways to improve the ticket machine and we hope that this will be an inspiration for future research.

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Appendix A.1

Difficult words

Original word	translation	Changed word in Dutch	translation
dagretour	day return	heen en terug	back and forth
eenmalige chipkaart	one-off smart card	papieren kaartje	paper ticket
transactie	transaction	betaling	payment
m.u.v.	with exception of	behalve	except
vervalt na	expires after	is geldig tot	is valid until

Table 6.2: Difficult words

Appendix A.2

In our user studies, some participants made remarks that are interesting, but not in the scope of our research. We gathered them here.

Pressure on stations

P1, P2, P4 and P5 mentioned that they would not want to use the ticket machines at stations because there are other people nearby or even waiting. They are or used to be very ashamed of their illiteracy and did not want other people to see them struggling.

Position of machines

P1 had once looked at a ticket machine, but because of the amount of sunlight shining on the machine, he was not able to read anything on it.

P2 mentioned that he feels very vulnerable when handling money. He would not find it safe to pay if there were other people nearby who might look at his payment information. He recommended marking a certain area around the machine outside of which people have to wait.

Travel information

P2 told us that he does not travel by train independently because he is not able to read the travel information in time. The display in the train moves too fast for him to read the destinations and the displays on stations are difficult for him to understand as well. He does not use the app for the same reason.

Paying with debit card

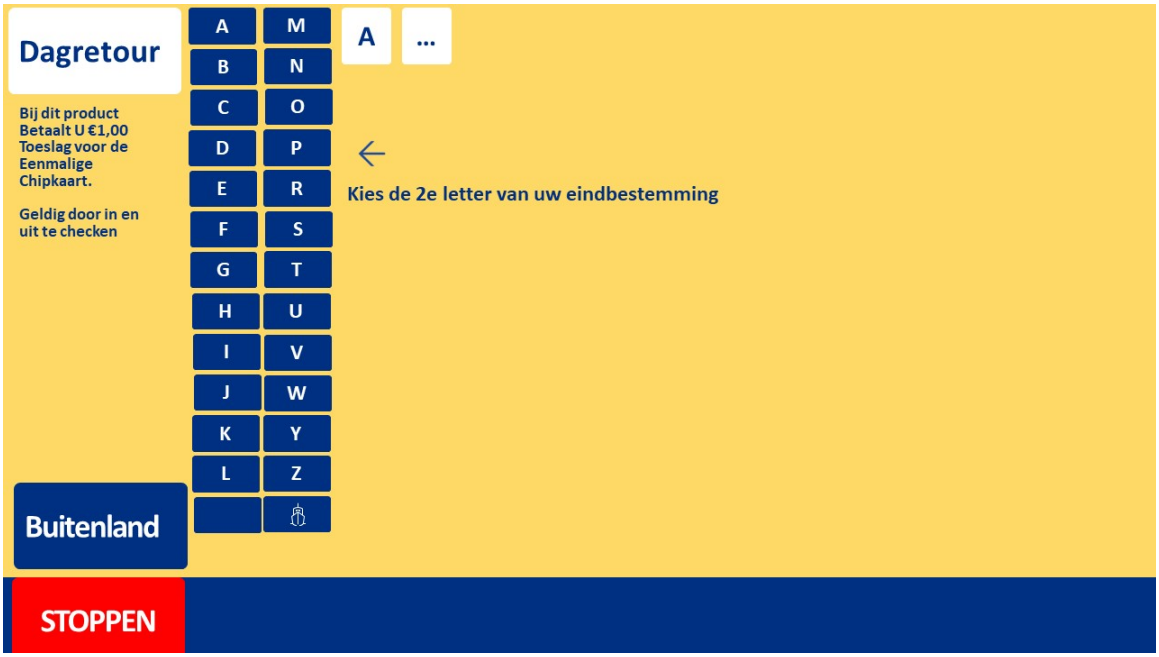
As mentioned in chapter 3, since the summer of 2023 it is also possible to check in with a debit card. When talking with P2, we mentioned this. He

did not know that it was a possibility but would prefer it over using an OV-chipkaart. He recommended a marketing campaign to promote these options because he thinks that it will make travelling by public transport more attractive to illiterate people.

Appendix A.3

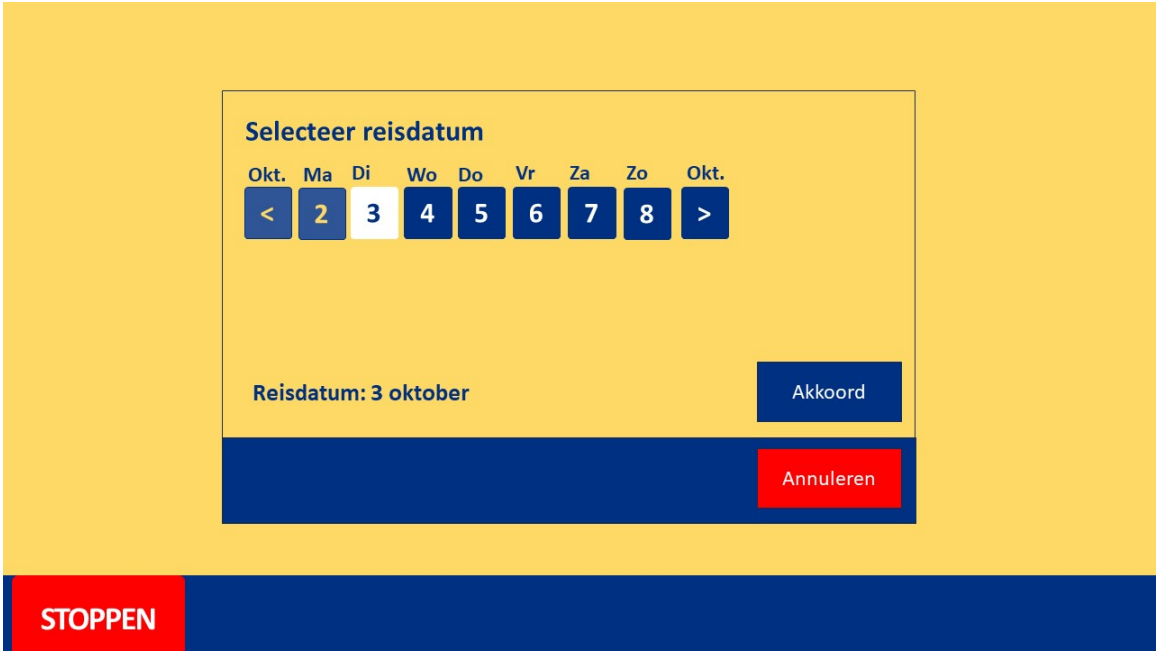
Screens from buying a return ticket

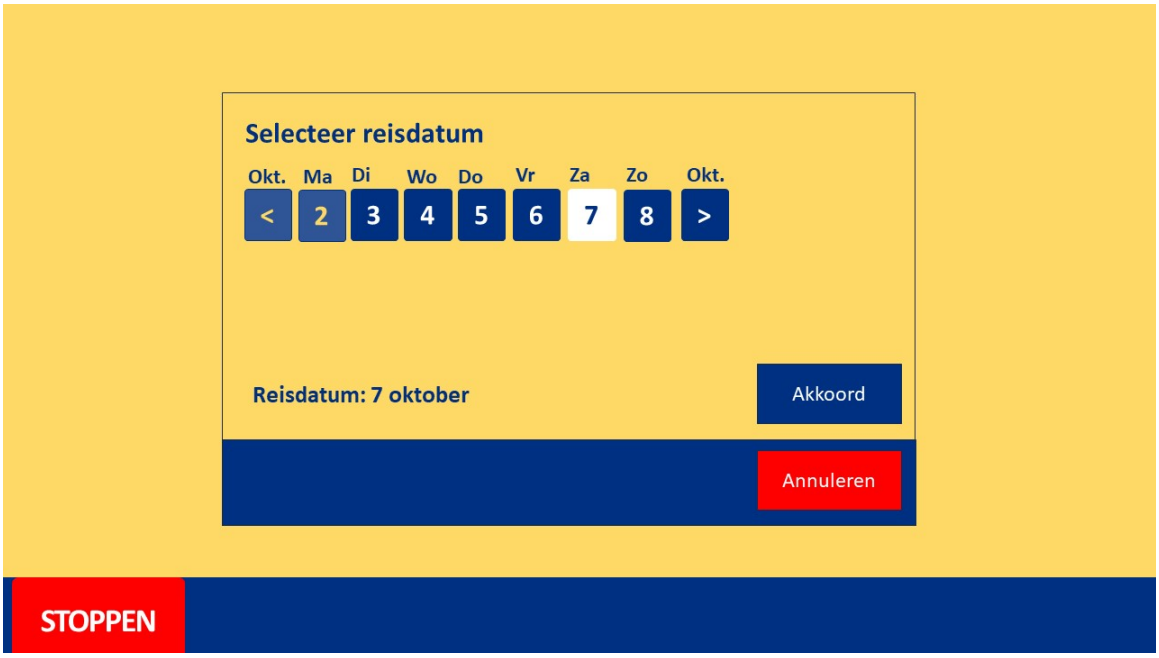

Dagretour
Bij dit product Betaalt U €1,00 Toeslag voor de Eenmalige Chipkaart.
Geldig door in en uit te checken
A M
B N
C O
D P
E R
F S
G T
H U
I V
J W
K Y
L Z
Amsterdam Centraal
Arnhem Centraal
Elst
Utrecht
Kies de 1e en 2e letter van uw eindbestemming
Buitenland
STOPPEN


Dagretour
Bij dit product Betaalt U €1,00 Toeslag voor de Eenmalige Chipkaart.
Geldig door in en uit te checken
A M
B N
C O
D P
E R
F S
G T
H U
I V
J W
K Y
L Z
A
...
Kies de 2e letter van uw eindbestemming
Buitenland
STOPPEN

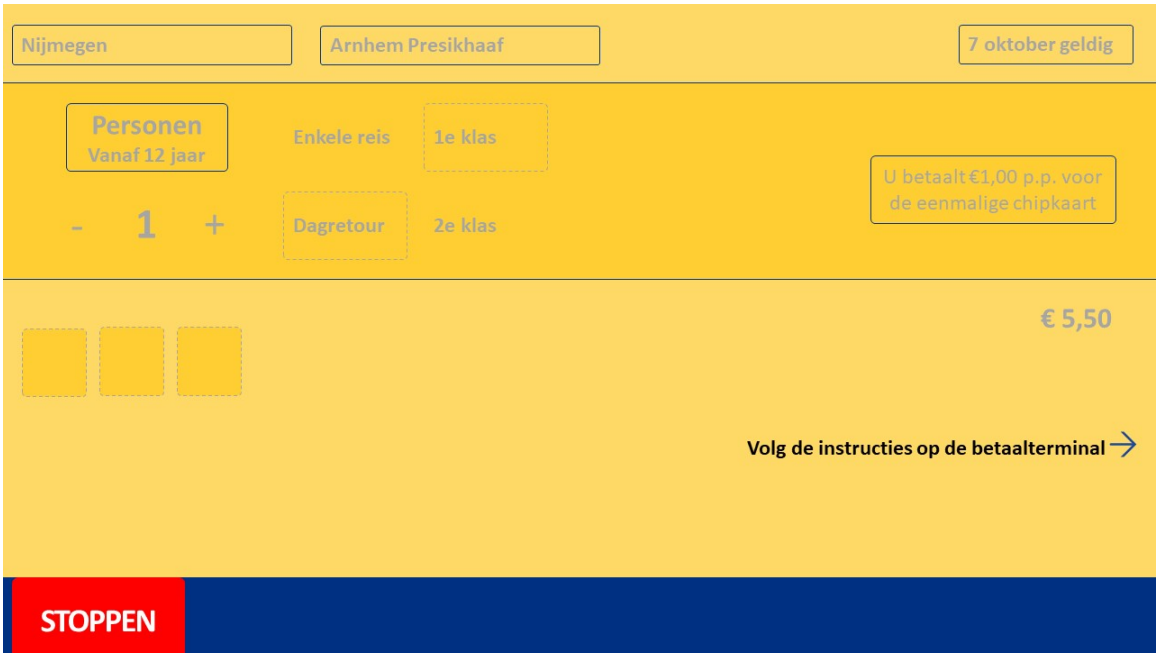

Dagretour
Andere Eindbestemming
A
R
Bij dit product Betaalt U €1,00 Toeslag voor de Eenmalige Chipkaart.
Geldig door in en uit te checken
Kies een eindbestemming
Arkel
Arnhem Centraal
Arnemuiden
Arnhem Burgers Zoo
Arnhem Openlmsm
Arnhem Papendal
Arnhem Presikhaaf
Buitenland
STOPPEN

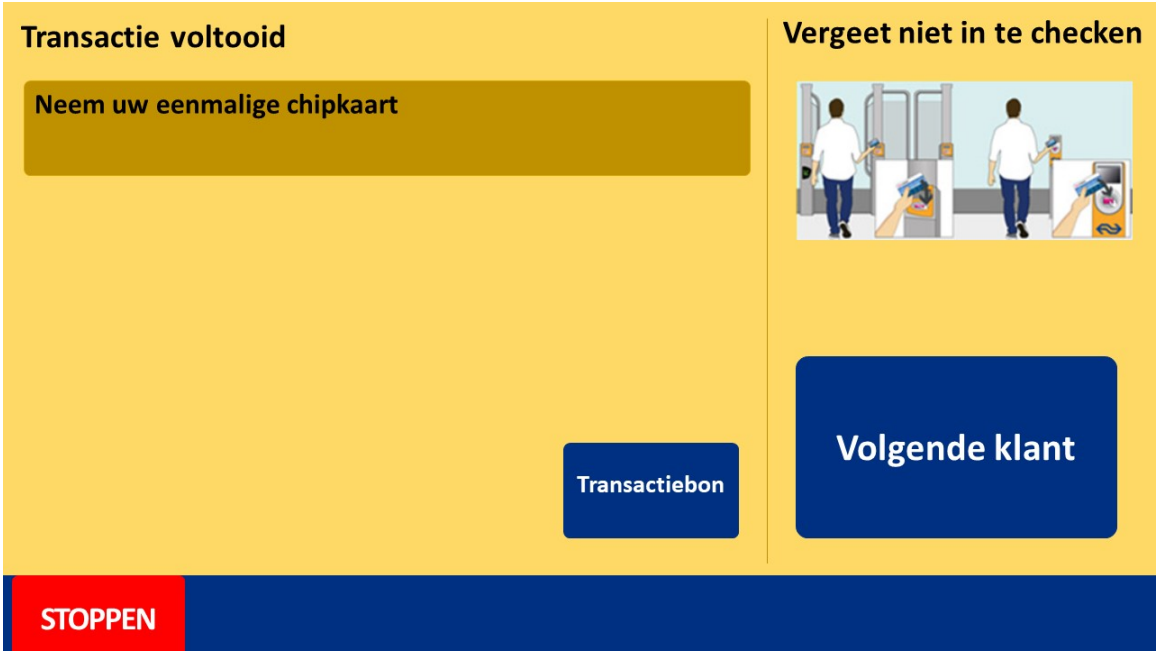

Nijmegen
Arnhem Presikhaaf
Vandaag geldig
Personen
Vanaf 12 jaar
Enkele reis
1e klas
U betaalt €1,00 p.p. voor de eenmalige chipkaart
-
1
+
Dagretour
2e klas
€ 11,00
Kies betaalwijze
Pinpas | Creditcard
Muntgeld
Wisselgeld beschikbaar
STOPPEN


Selecteer reisdatum
Okt. Ma Di Wo Do Vr Za Zo Okt.
< 2 3 4 5 6 7 8 >
Reisdatum: 3 oktober
Akkoord
Annuleren
STOPPEN

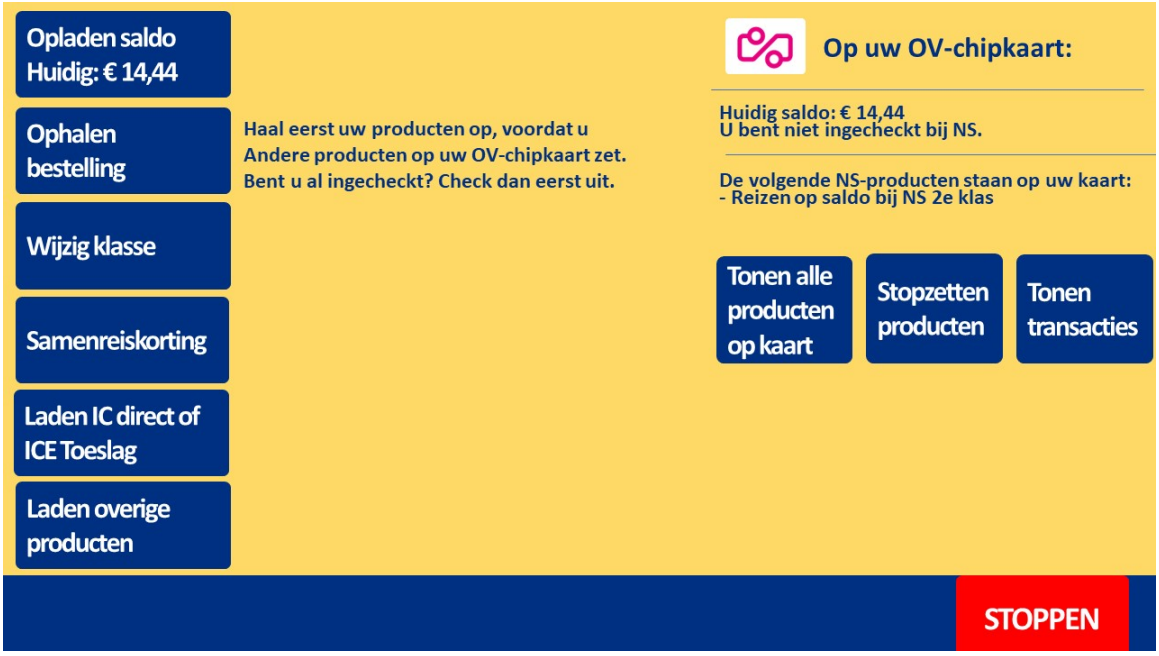

Selecteer reisdatum
Okt. Ma Di Wo Do Vr Za Zo Okt.
< 2 3 4 5 6 7 8 >
Reisdatum: 7 oktober
Akkoord
Annuleren
STOPPEN


Nijmegen
Arnhem Presikhaaf
7 oktober geldig
Personen
Vanaf 12 jaar
Enkele reis
1e klas
-
1
+
Dagretour
2e klas
U betaalt €1,00 p.p. voor de eenmalige chipkaart
€ 11,00
Kies betaalwijze
Pinpas | Creditcard
Muntgeld
Wisselgeld beschikbaar
STOPPEN


Nijmegen
Arnhem Presikhaaf
7 oktober geldig
Personen
Vanaf 12 jaar
Enkele reis
1e klas
-
1
+
Dagretour
2e klas
U betaalt €1,00 p.p. voor de eenmalige chipkaart
€ 5,50
Volg de instructies op de betaalterminal
STOPPEN



Screens from putting money on the OV-chipkaart


Opladen saldo
Huidig: € 14,44
Ophalen bestelling
Wijzig klasse
Samenreiskorting
Laden IC direct of ICE Toeslag
Laden overige producten
Haal eerst uw producten op, voordat u
Andere producten op uw OV-chipkaart zet.
Bent u al ingecheckt? Check dan eerst uit.
Op uw OV-chipkaart:
Huidig saldo: € 14,44
U bent niet ingecheckt bij NS.
De volgende NS-producten staan op uw kaart:
- Reizen op saldo bij NS 2e klas
Tonen alle producten op kaart
Stopzetten producten
Tonen transacties
STOPPEN

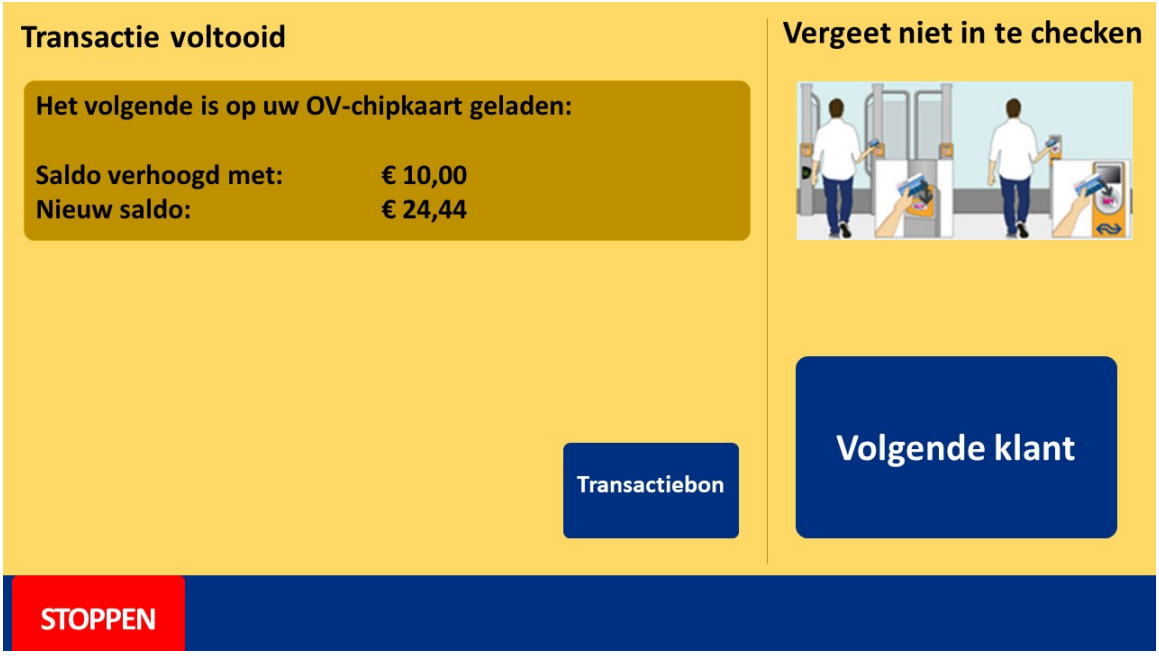

Opladen saldo
Huidig: € 14,44
Ophalen bestelling
Wijzig klasse
Samenreiskorting
Laden IC direct of ICE Toeslag
Laden overige producten
Ophogen met:
Aanvullen tot:
€ 5,00
€ 10,00
€ 20,00
€ 30,00
Hoeveel saldo heb ik nodig?
Huidig saldo: € 14,44
U kunt bij NS reizen op saldo als u minimaal € 20,00 op uw kaart heeft staan.
Wilt u automatisch saldo oplagen aanvragen? Vraag dan een persoonlijke chipkaart aan via www.ov-chipkaart.nl
STOPPEN


Opladen saldo
Huidig: € 14,44
Ophalen bestelling
Wijzig klasse
Samenreiskorting
Laden IC direct of ICE Toeslag
Laden overige producten
Ophogen met:
Aanvullen tot:
€ 5,00
€ 10,00
€ 20,00
€ 30,00
Hoeveel saldo heb ik nodig?
Nog een ander product
Pinpas € 20,00
Creditcard Incl. 0,50 kosten € 20,50
Muntgeld Alleen gepast € 20,00
STOPPEN

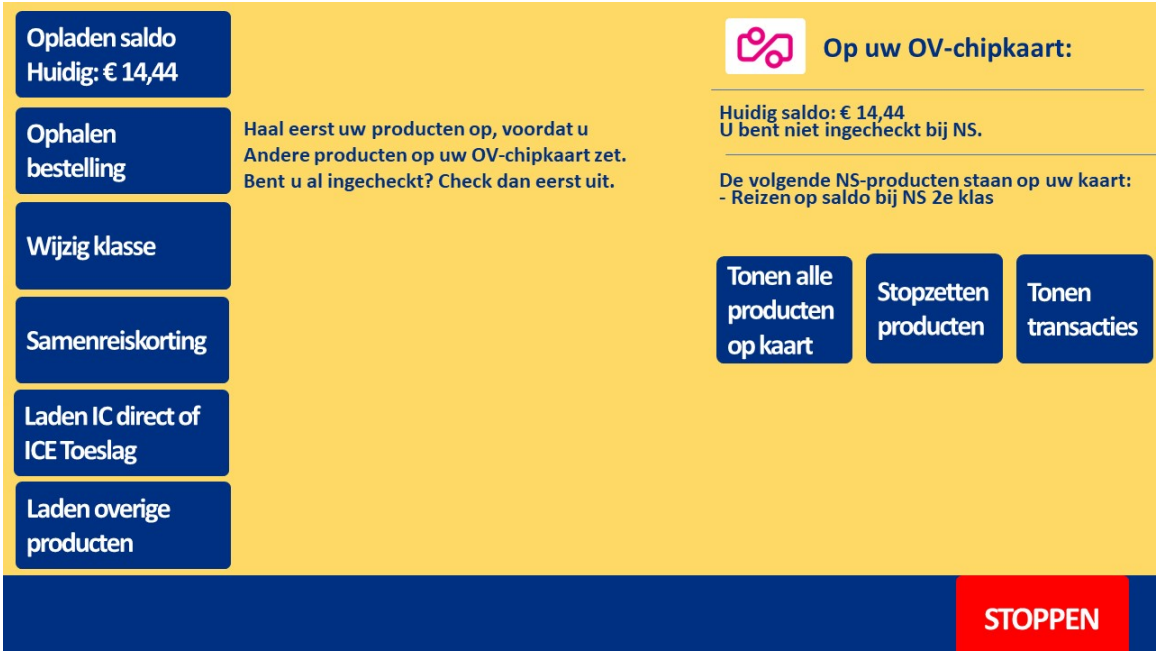

Opladen saldo
Huidig: € 14,44
Ophalen bestelling
Wijzig klasse
Samenreiskorting
Laden IC direct of ICE Toeslag
Laden overige producten
Ophogen met:
Aanvullen tot:
€ 5,00
€ 10,00
€ 20,00
€ 30,00
Hoeveel saldo heb ik nodig?
Nog een ander product
Pinpas € 20,00
Creditcard Incl. 0,50 kosten € 20,50
Muntgeld Alleen gepast € 20,00
Volg de instructies op de betaalterminal
STOPPEN

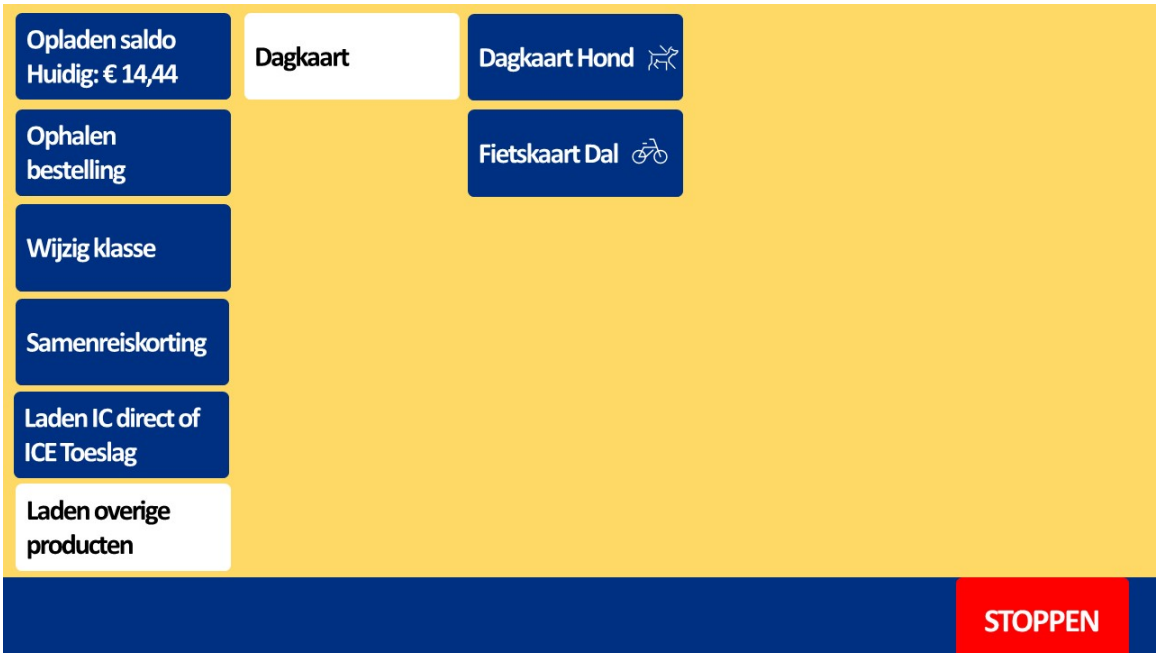

OV-chipkaart nu voor de kaartlezer houden
STOPPEN

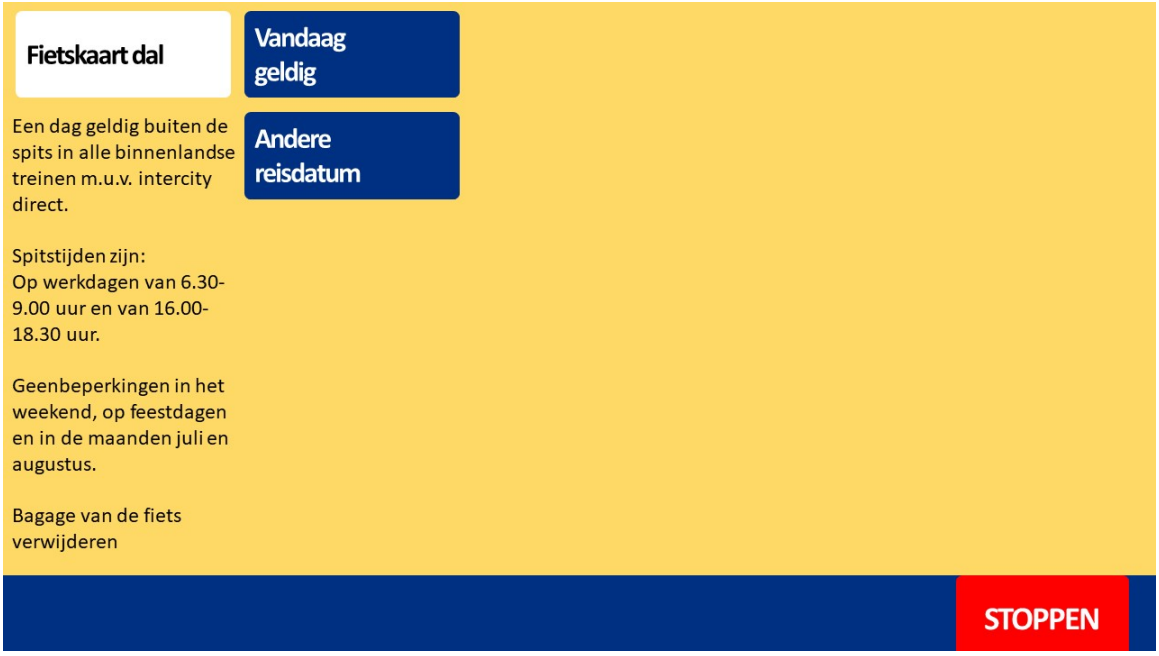

OV-chipkaart nu voor de kaartlezer houden
STOPPEN

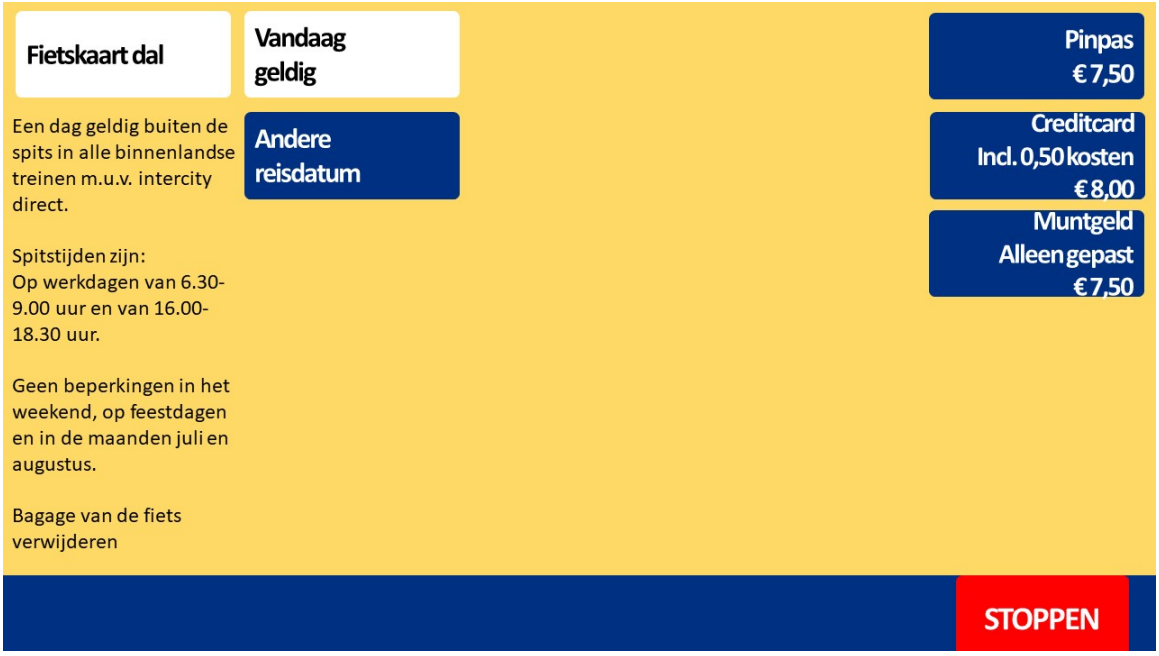


Screens from buying a ticket for a bicycle with an OV-chipkaart


Opladen saldo
Huidig: € 14,44
Ophalen bestelling
Wijzig klasse
Samenreiskorting
Laden IC direct of ICE Toeslag
Laden overige producten
Haal eerst uw producten op, voordat u
Andere producten op uw OV-chipkaart zet.
Bent u al ingecheckt? Check dan eerst uit.
Op uw OV-chipkaart:
Huidig saldo: € 14,44
U bent niet ingecheckt bij NS.
De volgende NS-producten staan op uw kaart:
- Reizen op saldo bij NS 2e klas
Tonen alle producten op kaart
Stopzetten producten
Tonen transacties
STOPPEN


Opladen saldo
Huidig: € 14,44
Ophalen bestelling
Wijzig klasse
Samenreiskorting
Laden IC direct of ICE Toeslag
Laden overige producten
Dagkaart
Dagkaart Hond
Fietskaart Dal
STOPPEN


Fietskaart dal
Vandaag geldig
Andere reisdatum
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geenbeperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
STOPPEN


Fietskaart dal
Vandaag geldig
Andere reisdatum
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geen beperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
Pinpas
€ 7,50
Creditcard
Incl. 0,50 kosten
€ 8,00
Muntgeld
Alleen gepast
€ 7,50
STOPPEN


Fietskaart dal
Vandaag geldig
Andere reisdatum
Pinpas € 7,50
Creditcard Incl. 0,50 kosten € 8,00
Muntgeld Alleen gepast € 7,50
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geenbeperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
Volg de instructies op de betaalterminal
STOPPEN


OV-chipkaart nu voor de kaartlezer houden
STOPPEN

OV-chipkaart nu voor de kaartlezer houden

STOPPEN

Transactie voltooid

Het volgende is op uw OV-chipkaart geladen:

Fietskaart dal

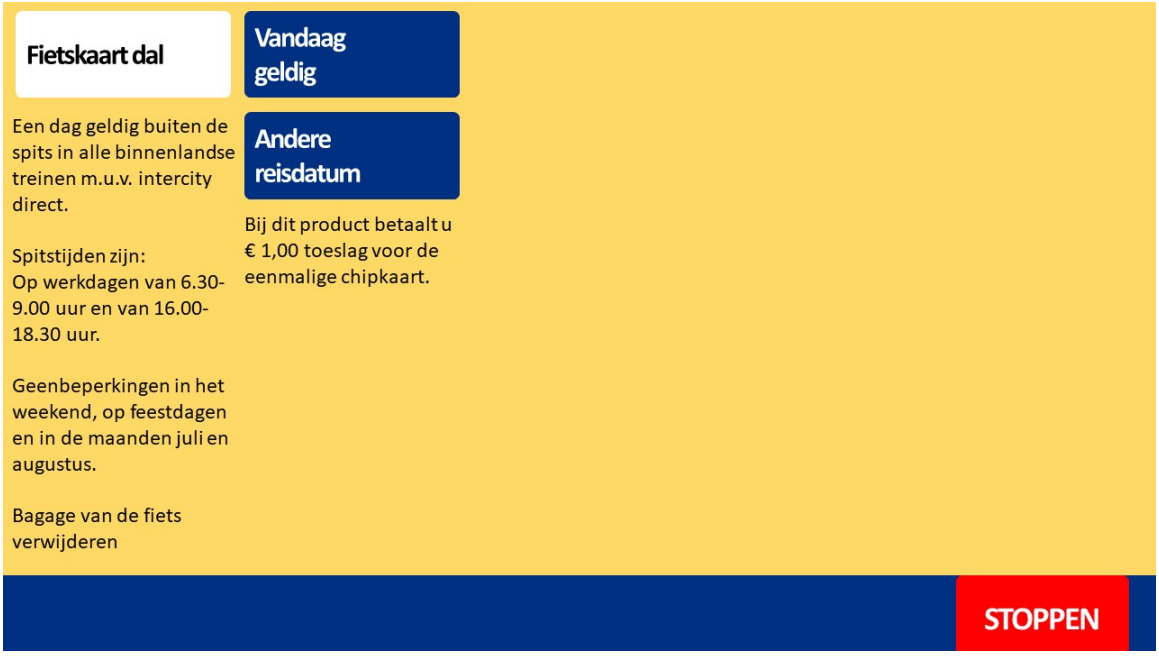
Transactiebon

Vergeet niet in te checken

Volgende klant

STOPPEN

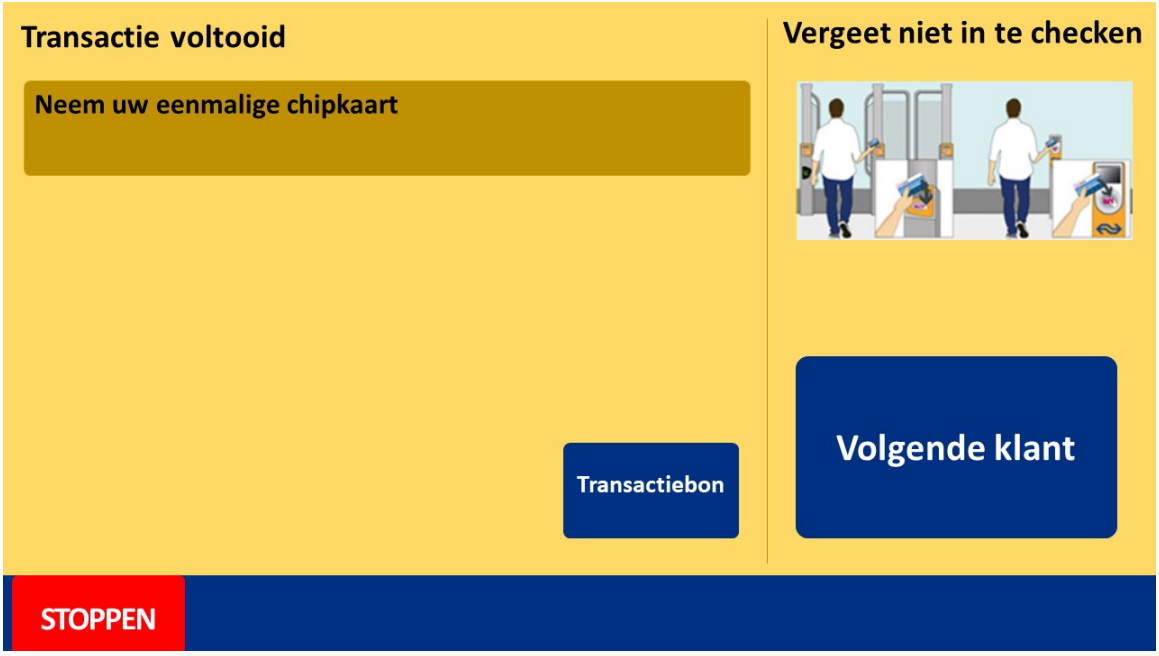
Screens from buying a paper ticket for a bicycle


Fietskaart dal
Vandaag geldig
Andere reisdatum
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geenbeperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
Bij dit product betaalt u € 1,00 toeslag voor de eenmalige chipkaart.
STOPPEN


Fietskaart dal
Vandaag geldig
Andere reisdatum
1x
2x
3x
4x
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geenbeperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
Bij dit product betaalt u € 1,00 toeslag voor de eenmalige chipkaart.
STOPPEN


Fietskaart dal
Vandaag geldig
1x
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geenbeperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
Andere reisdatum
2x
Bij dit product betaalt u € 1,00 toeslag voor de eenmalige chipkaart.
3x
4x
Pinpas € 8,50
Creditcard Incl. 0,50 kosten € 9,00
Muntgeld Alleen gepast € 8,50
STOPPEN


Fietskaart dal
Vandaag geldig
1x
Een dag geldig buiten de spits in alle binnenlandse treinen m.u.v. intercity direct.
Spitstijden zijn:
Op werkdagen van 6.30-9.00 uur en van 16.00-18.30 uur.
Geenbeperkingen in het weekend, op feestdagen en in de maanden juli en augustus.
Bagage van de fiets verwijderen
Andere reisdatum
2x
Bij dit product betaalt u € 1,00 toeslag voor de eenmalige chipkaart.
3x
4x
Pinpas € 8,50
Creditcard Incl. 0,50 kosten € 9,00
Muntgeld Alleen gepast € 8,50
Volg de instructies op de betaalterminal
STOPPEN



Screens from buying an anonymous OV-chipkaart

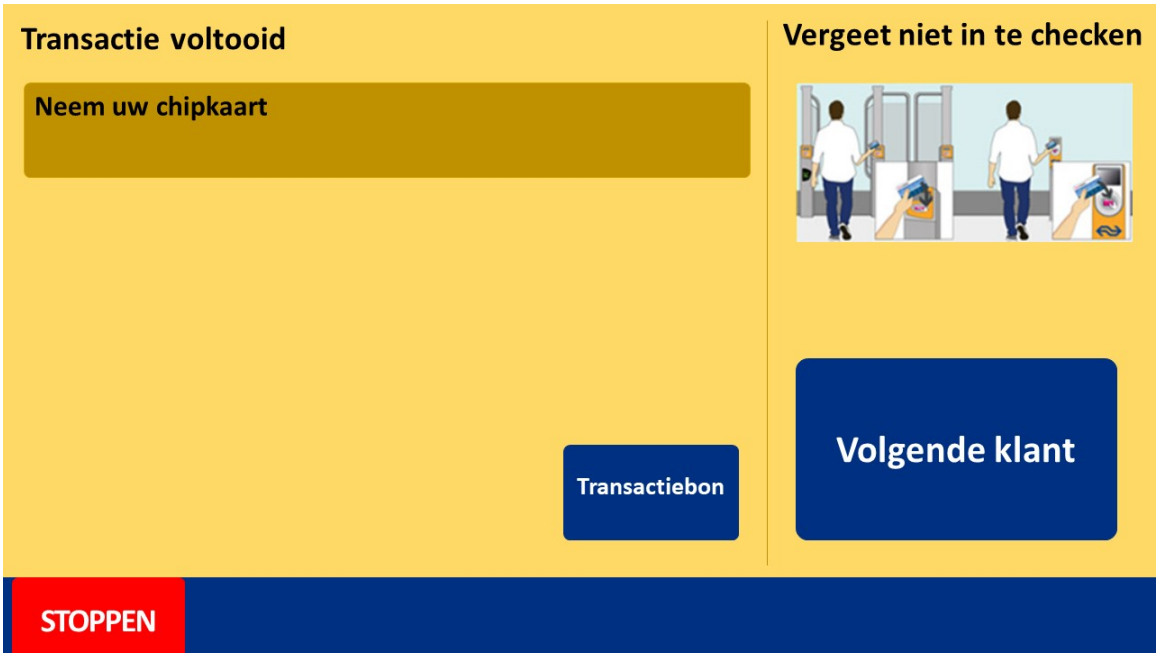

Losse kaartjes
Kind
4 t/m 11 jaar
Dagkaarten
Buitenland
Toeslagen
Fiets
Hond
IC direct - ICE
OV-chipkaart
Nieuwe OV-chipkaart
STOPPEN


Kopen OV-chipkaart
OV-chipkaart met Railrunner
OV-chipkaart met Dagkaart
OV-chipkaart met Samenreiskorting
Wat is de OV-chipkaart?
De OV-chipkaart is 5 jaar te gebruiken en kost eenmalig € 7,50.
Geldig in al het openbaar vervoer in Nederland.
U betaalt uw reis door in en uit te checken.
Wilt u altijd voldoende saldo op uw OV-chipkaart? Vraag dan via ov-chipkaart.nl automatisch opladen aan. Dit kan alleen op een persoonlijke OV-chipkaart.
STOPPEN

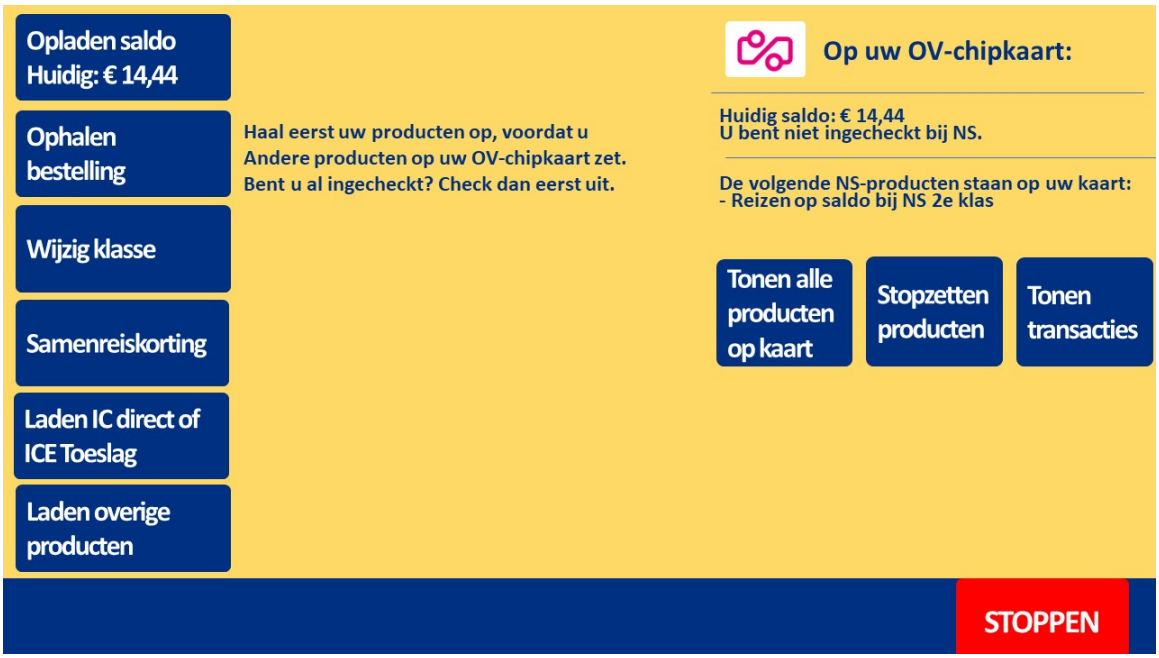

Kopen OV-chipkaart
Deze kaart is direct geschikt voor reizen op saldo bij NS.
Ik wil geen saldo bijladen
Inclusief € 4,00 saldo
Inclusief € 10,00 saldo
Inclusief € 20,00 saldo
Hoeveel saldo heb ik nodig?
U kunt bij NS reizen op saldo als u minimaal € 20,00 op uw kaart heeft staan.
Wilt u altijd voldoende saldo op uw OV-chipkaart? Vraag dan via ov-chipkaart.nl automatisch opladen aan. Dit kan alleen op een persoonlijke OV-chipkaart.
STOPPEN


Kopen OV-chipkaart
Deze kaart is direct geschikt voor reizen op saldo bij NS.
Ik wil geen saldo bijladen
Inclusief € 4,00 saldo
Inclusief € 10,00 saldo
Inclusief € 20,00 saldo
Hoeveel saldo heb ik nodig?
Pinpas € 27,50
Creditcard Incl. 0,50 kosten € 28,00
Muntgeld Alleen gepast € 27,50
STOPPEN


Kopen
OV-chipkaart
Deze kaart is direct geschikt voor reizen op saldo bij NS.
Ik wil geen saldo bijladen
Inclusief € 4,00 saldo
Inclusief € 10,00 saldo
Inclusief € 20,00 saldo
Hoeveel saldo heb ik nodig?
Pinpas
€ 27,50
Creditcard
Incl. 0,50 kosten
€ 28,00
Muntgeld
Alleen gepast
€ 27,50
Volg de instructies op de betaalterminal
STOPPEN


Transactie voltooid
Neem uw chipkaart
Transactiebon
Vergeet niet in te checken
Volgende klant
STOPPEN

Screens from loading a co-travelling discount




Samenreiskorting
1e klas
2e klas
U krijgt 40% karting als u in de daluren reist met een NS abonnement-houder.
Kies 2x als u ook samen terugreist.
1x Samenreiskorting vervalt 30 minute na uitchecken.
Plaats de Samenreiskorting op uw eigen OV-chipkaart.
STOPPEN


Samenreiskorting
1e klas
Vandaag geldig
2e klas
Morgen geldig
U krijgt 40% karting als u in de daluren reist met een NS abonnement-houder.
Kies 2x als u ook samen terugreist.
1x Samenreiskorting vervalt 30 minute na uitchecken.
Plaats de Samenreiskorting op uw eigen OV-chipkaart.
STOPPEN


Samenreiskorting
1e klas
Vandaag geldig
1x
U krijgt 40% karting als u in de daluren reist met een NS abonnement-houder.
2e klas
Andere reisdatum
2x
Kies 2x als u ook samen terugreist.
1x Samenreiskorting vervalt 30 minute na uitchecken.
Plaats de Samenreiskorting op uw eigen OV-chipkaart.
STOPPEN


Samenreiskorting
1e klas
Vandaag geldig
1x
Ik wil geen saldo bijladen
U krijgt 40% karting als u in de daluren reist met een NS abonnement-houder.
2e klas
Andere reisdatum
2x
Inclusief € 4,00 saldo
Kies 2x als u ook samen terugreist.
Inclusief € 10,00 saldo
1x Samenreiskorting vervalt 30 minute na uitchecken.
Inclusief € 20,00 saldo
Plaats de Samenreiskorting op uw eigen OV-chipkaart.
Hoeveel saldo heb ik nodig?
STOPPEN


Samenreiskorting
1e klas
Vandaag geldig
1x
Ik wil geen saldo bijladen
Akkoord
U krijgt 40% karting als u in de daluren reist met een NS abonnement-houder.
Kies 2x als u ook samen terugreist.
1x Samenreiskorting vervalt 30 minute na uitchecken.
Plaats de Samenreiskorting op uw eigen OV-chipkaart.
2e klas
Andere reisdatum
2x
Inclusief € 4,00 saldo
Inclusief € 10,00 saldo
Inclusief € 20,00 saldo
Hoeveel saldo heb ik nodig?
STOPPEN


OV-chipkaart nu voor de kaartlezer houden
STOPPEN

OV-chipkaart nu voor de kaartlezer houden

STOPPEN

Transactie voltooid

Het volgende is op uw OV-chipkaart geladen:

Samenreiskorting

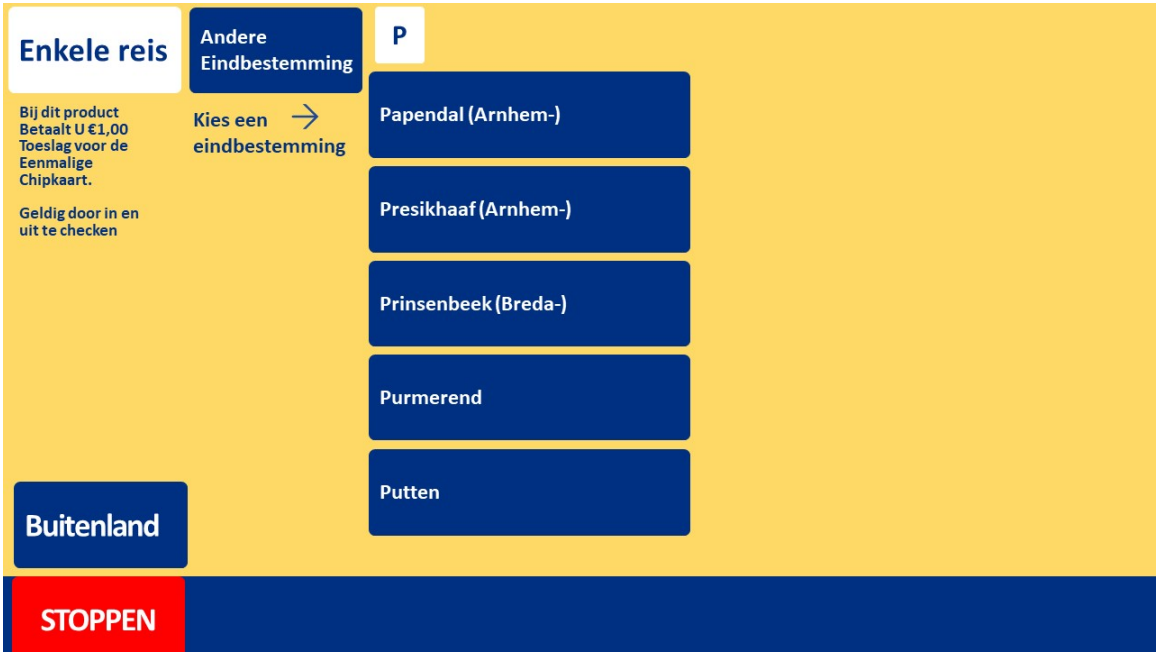
Transactiebon

Vergeet niet in te checken

Volgende klant

STOPPEN

Screens from changes of the first iteration



Transactie voltooid

Neem uw eenmalige chipkaart

Let op:
Ook met dit kaartje moet u inchecken

Transactiebon

Vergeet niet in te checken

Volgende klant

STOPPEN

Fietskaart dal

Vandaag geldig

Andere reisdatum

Deze kaart is geldig in alle binnenlandse treinen m.u.v. intercity direct.

Deze kaart is de hele dag geldig in het weekend, op feestdagen en in juli en augustus.

Op werkdagen is deze kaart geldig voor half 7 's ochtends, tussen 9 uur 's ochtends en 4 uur 's middags en na half 7 in de avond.

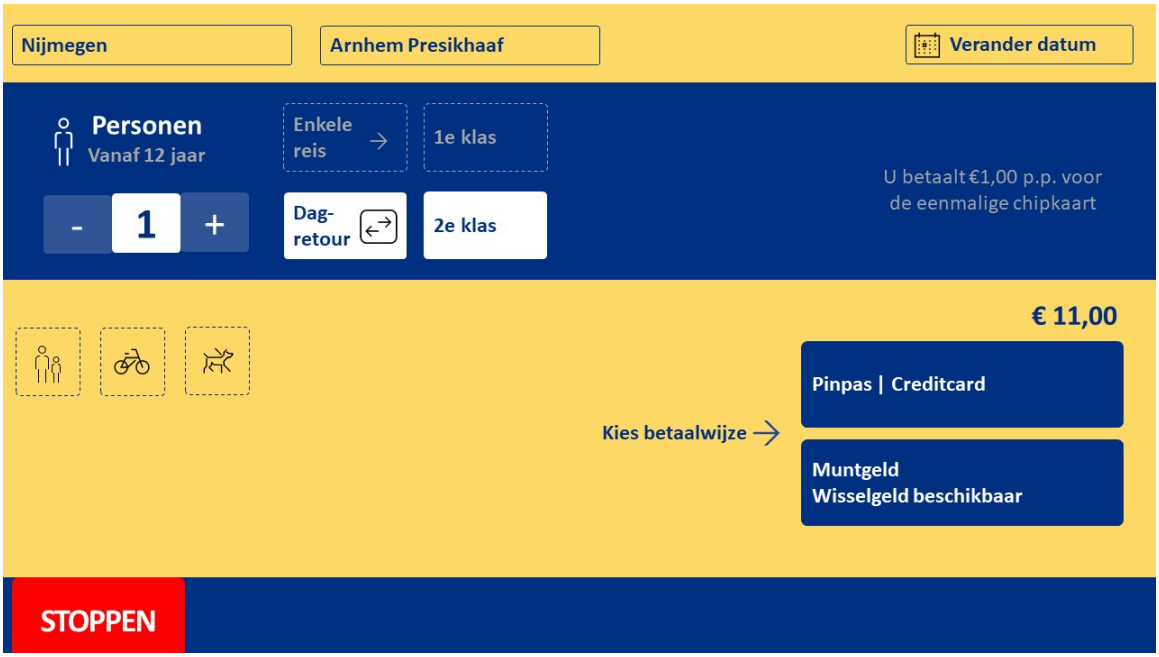
Bagage van de fiets verwijderen

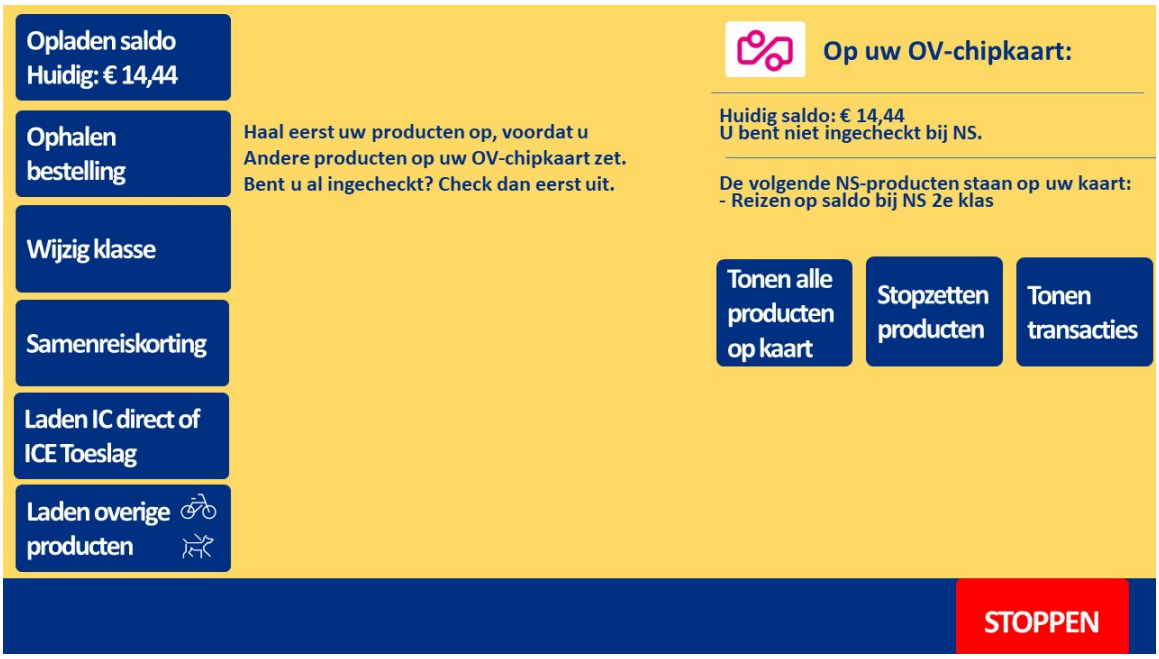
STOPPEN


Fietskaart dal
Vandaag geldig
1 kaartje
Pinpas € 8,50
Deze kaart is geldig in alle binnenlandse treinen m.u.v. intercity direct.
Andere reisdatum
2 kaartjes
Creditcard Incl. 0,50 kosten € 9,00
Deze kaart is de hele dag geldig in het weekend, op feestdagen en in juli en augustus.
Bij dit product betaalt u € 1,00 toeslag voor de eenmalige chipkaart.
3 kaartjes
Muntgeld Alleen gepast € 8,50
Op werkdagen is deze kaart geldig voor half 7 's ochtends, tussen 9 uur 's ochtends en 4 uur 's middags en na half 7 in de avond.
4 kaartjes
Bagage van de fiets verwijderen
STOPPEN


Kopen OV-chipkaart
Ik wil geen saldo bijladen
U kunt bij NS reizen op saldo als u minimaal € 20,00 op uw kaart heeft staan.
Deze kaart is direct geschikt voor reizen op saldo bij NS.
Inclusief € 4,00 saldo
Wilt u altijd voldoende saldo op uw OV-chipkaart? Vraag dan via ov-chipkaart.nl automatisch opladen aan. Dit kan alleen op een persoonlijke OV-chipkaart.
Inclusief € 20,00 saldo
Hoeveel saldo heb ik nodig?
Ander saldo
STOPPEN

Screens from changes of the second iteration

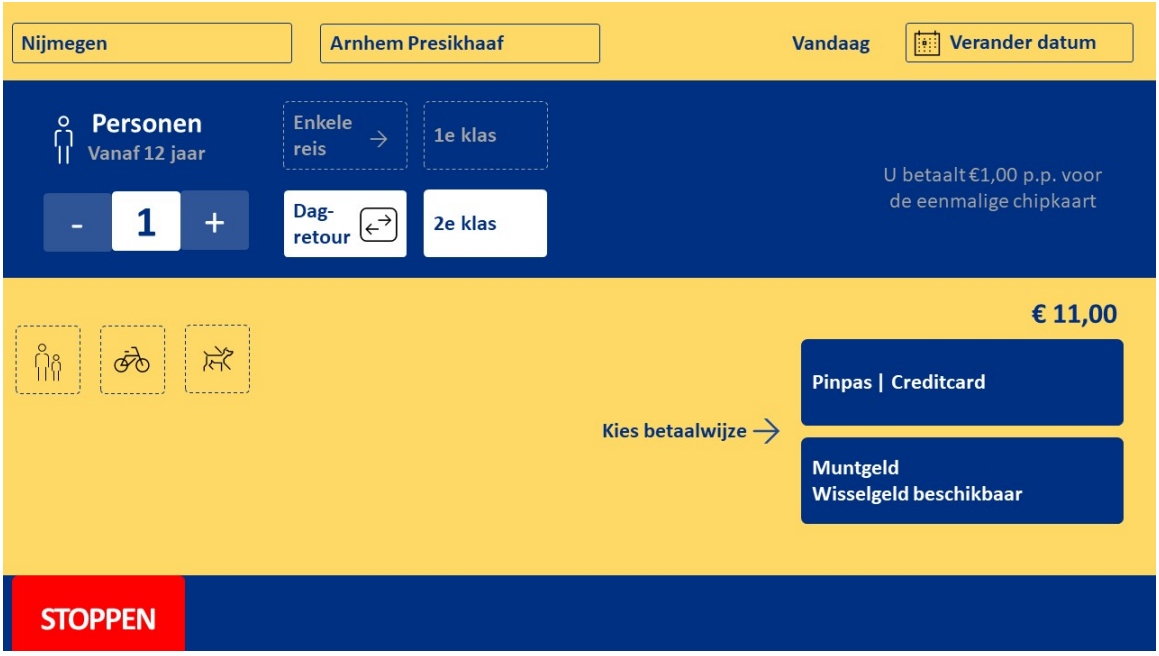




Screens from changes of the third iteration

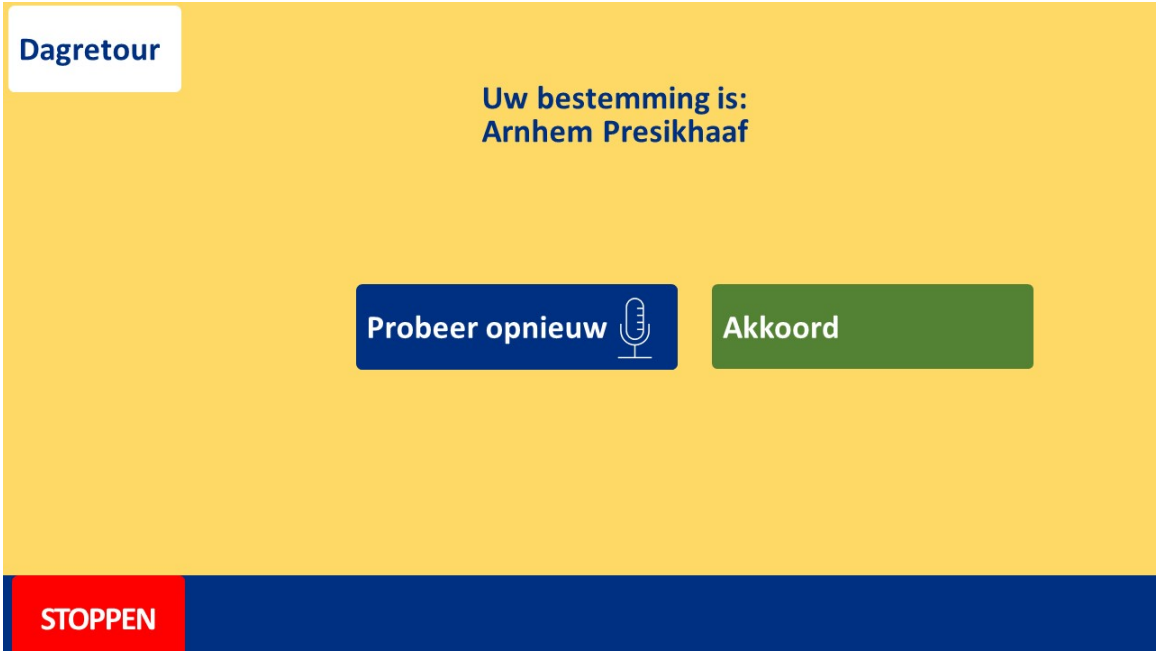

Fietskaart dal
Voor het kopen van een papieren kaartje betaalt u € 1,00 toeslag.
U betaalt die toeslag niet met een OV-chipkaart.
Papieren kaartje
OV-chipkaart
STOPPEN

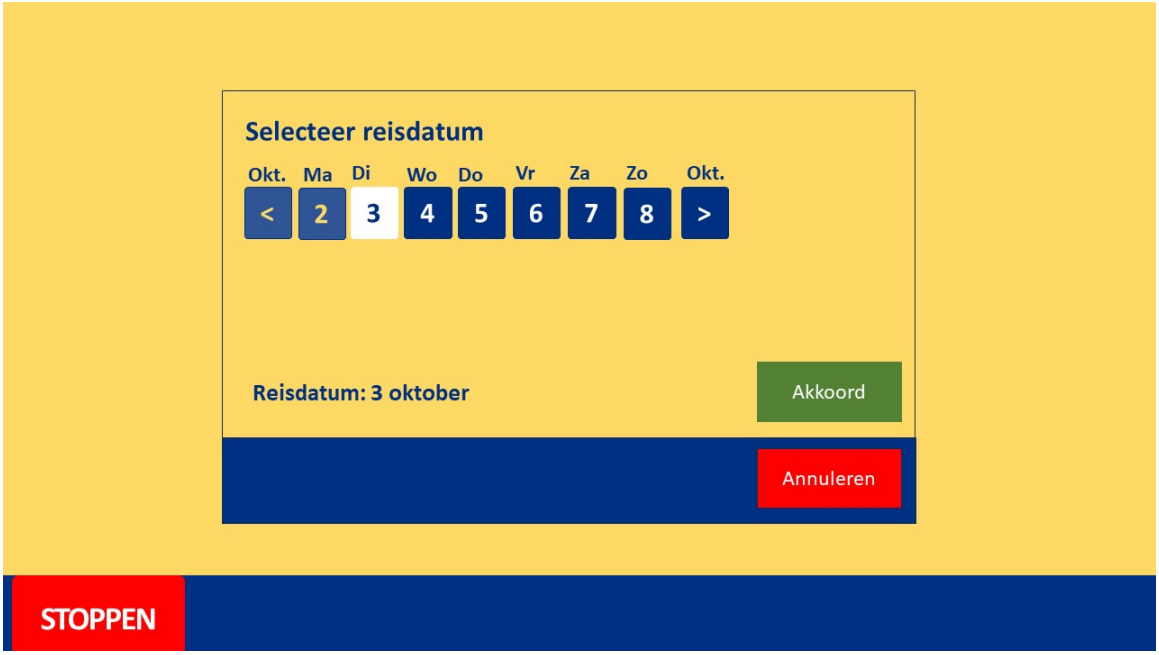

Saldo: € 14,44
Opladen saldo
Producten
Ophalen bestelling
Stopzetten producten
Toon alle producten
Toeslagen
Fiets
Hond
IC direct - ICE
Overige
Wijzigen klasse
Samenreiskorting
STOPPEN

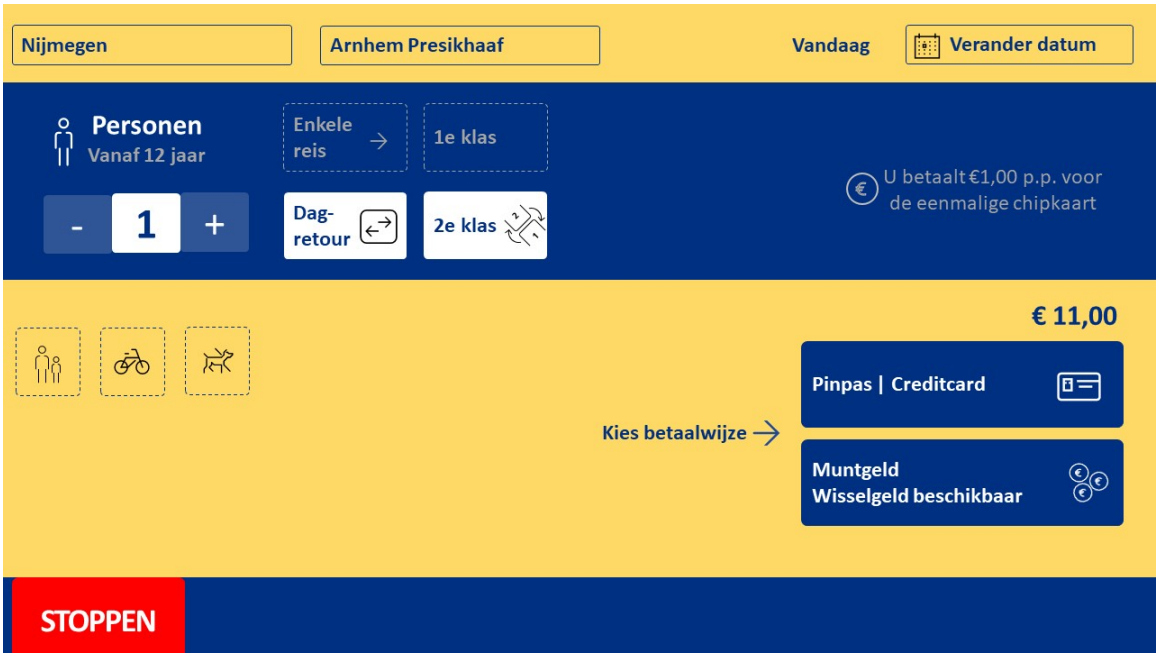


Screens from changes of the fourth iteration


Dagretour
Spreek uw bestemming in
Klaar
STOPPEN


Dagretour
Uw bestemming is:
Arnhem Presikhaaf
Probeer opnieuw
Akkoord
STOPPEN


Selecteer reisdatum
Okt. Ma Di Wo Do Vr Za Zo Okt.
< 2 3 4 5 6 7 8 >
Reisdatum: 3 oktober
Akkoord
Annuleren
STOPPEN


Nijmegen
Arnhem Presikhaaf
Vandaag
Verander datum
Personen
Vanaf 12 jaar
Enkele reis
1e klas
- 1 +
Dag-retour
2e klas
U betaalt €1,00 p.p. voor de eenmalige chipkaart
€ 11,00
Kies betaalwijze
Pinpas | Creditcard
Muntgeld
Wisselgeld beschikbaar
STOPPEN


Saldo: € 14,44
Opladen saldo
Producten
Ophalen bestelling
Stopzetten producten
Toon alle producten
Toeslagen
Fiets
Hond
IC direct - ICE
Overige
Wijzigen klasse
Samenreiskorting
STOPPEN


Samenreiskorting
1e klas
Vandaag geldig
Enkele reis
Akkoord
U krijgt 40% korting als u in de daluren reist met een NS abonnement-houder.
2e klas
Morgen geldig
Retour
Plaats de Samenreiskorting op uw eigen OV-chipkaart.
Samenreiskorting vervalt 30 minuten na uitchecken.
Wanneer zijn de daluren?
STOPPEN


Fietskaart dal
Vandaag geldig
Andere reisdatum
Deze kaart is geldig in alle **binnenlandse treinen** m.u.v. intercity direct.
Bagage van de fiets verwijderen.
Deze kaart is alleen geldig in de **daluren**.
Wanneer zijn de daluren?
Deze kaart is de hele dag geldig in het weekend, op feestdagen en in juli en augustus.
Op werkdagen is deze kaart geldig voor half 7 ‘s ochtends, tussen 9 uur ‘s ochtends en 4 uur ‘s middags, en na half 7 in de avond.
STOPPEN


Kopen OV-chipkaart
Deze kaart is direct geschikt voor reizen op saldo bij NS.
Ik wil geen saldo bijladen
Inclusief € 4,00 saldo (voor bus)
Inclusief € 20,00 saldo (voor trein)
Hoeveel saldo heb ik nodig?
Ander saldo
Een product laden
Pinpas | Creditcard € 28,00
Muntgeld Alleen gepast € 27,50
STOPPEN

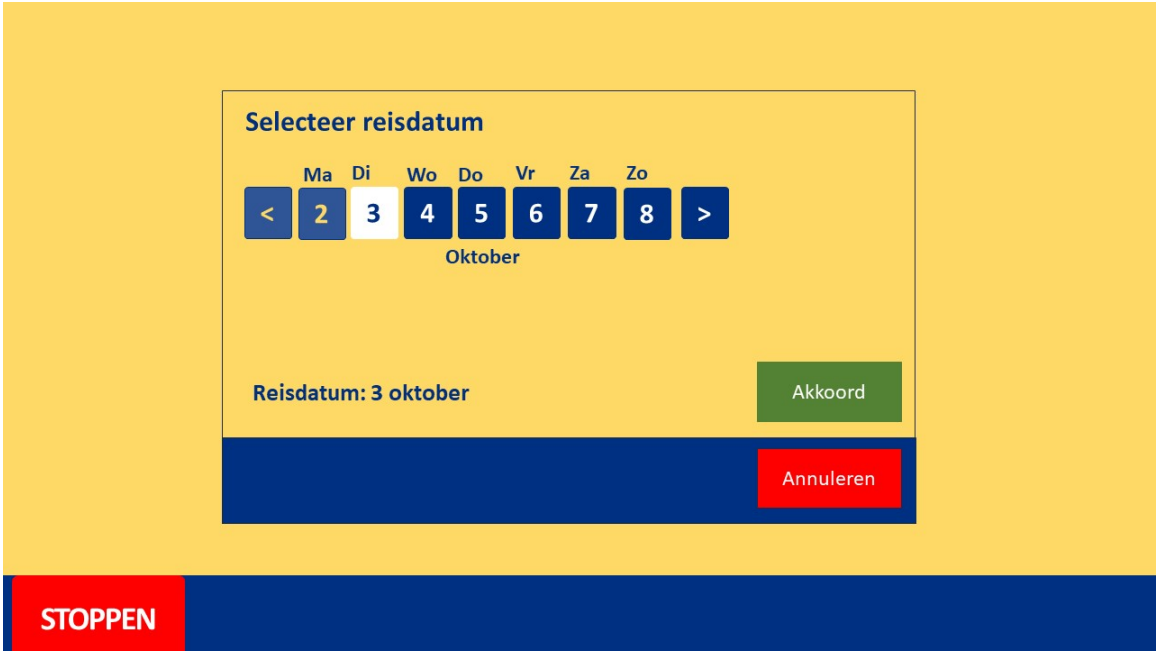
Screens from changes of the fifth iteration


Fietskaart dal
Vandaag geldig
(3 oktober)
Andere reisdatum
Deze kaart is geldig in alle **binnenlandse treinen** behalve intercity direct.
Bagage van de fiets verwijderen.
Deze kaart is alleen geldig in de **daluren**.
Wanneer zijn de daluren?
STOPPEN


Samenreis-korting
1e klas
2e klas
Vandaag geldig
(3 oktober)
Morgen geldig
(4 oktober)
Enkele reis
Retour
Akkoord
U krijgt 40% korting als u in de **daluren** reist met een NS abonnement-houder.
Plaats de Samenreiskorting op uw **eigen** OV-chipkaart.
Samenreiskorting **is geldig tot** 30 minuten na uitchecken.
Wanneer zijn de daluren?
STOPPEN


Welkom op Nijmegen
Enkele reis
Heen en terug
Overige producten


Fietskaart dal
Vandaag geldig
(3 oktober)
Andere reisdatum
Deze kaart is geldig in alle **binnenlandse treinen** behalve intercity direct.
Bagage van de fiets verwijderen.
Deze kaart is alleen geldig in de **daluren**.
Wanneer zijn de daluren?
Deze kaart is de hele dag geldig in het weekend, op feestdagen en in juli en augustus.
Op werkdagen is deze kaart geldig voor half 7 ‘s ochtends, tussen 9 uur ‘s ochtends en 4 uur ‘s middags, en na half 7 in de avond.
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11
STOPPEN


Selecteer reisdatum
Ma Di Wo Do Vr Za Zo
< 2 3 4 5 6 7 8 >
Oktober
Reisdatum: 3 oktober
Akkoord
Annuleren
STOPPEN


Heen en terug
Bij dit product Betaalt U €1,00 Toeslag voor het papieren kaartje.
Geldig door in en uit te checken
Voer uw bestemming in:
Inspreken
Typen
STOPPEN

Screens from changes of the sixth iteration


Kopen
OV-chipkaart
Deze kaart is direct geschikt voor reizen op saldo bij NS.
+ € 4,00 saldo
+ € 20,00 saldo
+ ander saldo
Ik wil geen saldo bijladen
Hoeveel saldo heb ik nodig?
U kunt bij NS reizen op saldo als u minimaal € 20,00 op uw kaart heeft staan.
Wilt u altijd voldoende saldo op uw OV-chipkaart? Vraag dan via ov-chipkaart.nl automatisch opladen aan. Dit kan alleen op een persoonlijke OV-chipkaart.
STOPPEN

Appendix A.4

Documents for interviews

1. Information form for illiterate participants
2. Consent form for illiterate participants
3. Information form for experts
4. Consent form for experts

Radboud University

Informatie over het onderzoek

Toegankelijkheid van NS kaartautomaten voor laaggeletterden

Inleiding
Wij willen u uitnodigen om mee te doen met een onderzoek. Dit onderzoek is deel van een scriptie over NS-kaartautomaten. Als u wilt meedoen, zullen wij u vragen een toestemmingsformulier te ondertekenen. Voordat u beslist of u wilt meedoen, willen wij informatie geven over het onderzoek. Lees de informatie alstublieft rustig door. Als iets niet duidelijk is of als u meer informatie wilt, kunt u vragen stellen aan de onderzoeker.

Doel van het onderzoek
In dit onderzoek willen wij onderzoeken in welke mate de NS kaartautomaat makkelijk te gebruiken is voor mensen die moeite hebben met lezen. Dit onderzoek is onderdeel van een bachelorscriptie. De gegevens worden gebruikt om de kaartautomaat te verbeteren voor mensen die moeite hebben met lezen.

Wat wordt er van u verwacht?
In dit onderzoek zal u gevraagd worden meerdere taken uit te voeren met de NS kaartautomaat. U wordt gevraagd om een kaartje te kopen, een anonieme ov-chipkaart te kopen, geld op te laden op de ov-chipkaart, een fietsdalkaart te kopen en samenreiskorting aan te zetten. U gebruikt hiervoor een iPad van de onderzoeker. Hierop is een testversie te vinden van de kaartautomaat.

Vrijwillig meedoen
U doet vrijwillig mee aan dit onderzoek. Dit betekent dat u op elk moment kunt stoppen met het onderzoek en uw toestemming kunt terugtrekken. Hiervoor hoeft u niet te vertellen waarom u wilt stoppen. Dit kan tot een maand nadat u hebt mee gedaan. Uw persoonlijke gegevens en uw gegevens voor het onderzoek worden dan verwijderd. Hiervoor kunt u mailen naar esther.kinderman@ru.nl of bellen naar [telefoonnummer].

Welke gegevens worden verzameld?
Tijdens dit onderzoek verzamelen wij gegevens over uw gebruik van de kaartautomaat. Dit gaat over uw mening en opmerkingen over de automaat en hoe goed het u lukt om de taken uit te voeren. Wij verzamelen ook gegevens over hoeveel moeite u heeft met lezen en schrijven.

Wat gebruikt er met mijn gegevens?
Uw gegevens voor het onderzoek wordt gebruikt voor de bachelorscriptie. De resultaten van dit onderzoek worden gepresenteerd. Dit gebeurt op een manier dat het niet uit te vinden is dat die gegevens bij u vandaan komen.

Het toestemmingsformulier dat u ondertekend wordt tot 10 jaar na het onderzoek bewaard. De onderzoeksgegevens worden ook 10 jaar bewaard, maar op een manier dat het niet uit te vinden is dat die gegevens bij u vandaan komen.

Om het onderzoek uit te voeren, is het nodig om uw persoonlijke gegevens te verzamelen, gebruiken en op te slaan. Het toestemmingsformulier geeft aan om welke persoonlijke gegevens dat gaat.
Alle persoonlijke gegevens en gegevens voor het onderzoek worden veilig opgeslagen volgende de richtlijnen van de Radboud Universiteit.

Meer informatie?
Als u vragen hebt of meer informatie wilt over het onderzoek, kunt u mailen naar esther.kinderman@ru.nl of bellen naar [telefoonnummer].

Als u klachten heeft over het onderzoek, kunt u contact met mij opnemen of met mijn scriptiebegeleider: hanna.schraffenberger@ru.nl.

Toestemmingsformulier
Als u wilt meedoen aan dit onderzoek, wil ik u vragen het toestemmingsformulier te ondertekenen. Met deze toestemming laat u weten dat u de informatie begrijpt en in stemt om mee te doen met dit onderzoek.

Met vriendelijke groet,
Esther Kinderman
esther.kinderman@ru.nl
[telefoonnummer]

Radboud University

TOESTEMMINGSFORMULIER

Voor deelname aan het scriptieonderzoek: *toegankelijkheid van NS kaartautomaten voor laaggeletterden*

Verklaring van de deelnemer

Het doel van het onderzoek is duidelijk voor mij.
Ik ben tenminste 18 jaar oud.
Ik heb de mogelijkheid gekregen om vragen te stellen over het onderzoek.
Ik neem vrijwillig deel aan het onderzoek.
Ik begrijp dat ik op elk moment in het onderzoek mag stoppen als ik dat wil.
Ik begrijp dat ik mijn gegevens mag laten verwijderen tot een maand na het onderzoek.
Ik begrijp dat in dit onderzoek gegevens worden verzameld.
Ik begrijp hoe deze gegevens opgeslagen worden.
Ik begrijp hoe deze gegevens zullen worden gebruikt.
Ik stem ermee in om deel te nemen aan het onderzoek zoals dat beschreven is in het informatiedocument.

Daarnaast stem ik ermee in dat:	
Ja	**Nee**
☐	☐ de volgende categorieën persoonlijke gegevens verwerkt worden: naam, leeftijd en telefoonnummer
☐	☐ gegevens verwerkt worden over de moeite die u heeft (gehad) met lezen en schrijven

Naam: .....

Handtekening: ..... Datum: .....

Verklaring van de onderzoeker

Ik verklaar dat ik de deelnemer op een goede manier over het onderzoek heb verteld en dat ik mij houd aan de richtlijnen voor onderzoek zoals die beschreven zijn in het protocol van de Ethische Toetsingscommissie.

Naam: .....

Handtekening: ..... Datum: .....

Radboud University

Informatie over het onderzoek - Expert

Toegankelijkheid van NS kaartautomaten voor laaggeletterden

Inleiding
Wij willen u uitnodigen om mee te doen met een onderzoek. Dit onderzoek is deel van een scriptie over NS-kaartautomaten. Als u wilt meedoen, zullen wij u vragen een toestemmingsformulier te ondertekenen. Voordat u beslist of u wilt meedoen, willen wij informatie geven over het onderzoek. Lees de informatie alstublieft rustig door. Als iets niet duidelijk is of als u meer informatie wilt, kunt u vragen stellen aan de onderzoeker.

Doel van het onderzoek
In dit onderzoek willen wij onderzoeken in welke mate de NS kaartautomaat makkelijk te gebruiken is voor mensen die moeite hebben met lezen. Dit onderzoek is onderdeel van een bachelorscriptie. De gegevens worden gebruikt om de kaartautomaat te verbeteren voor mensen die moeite hebben met lezen.

Wat wordt er van u verwacht?
In dit onderzoek zal u gevraagd worden meerdere taken uit te voeren met de NS kaartautomaat en deze te evalueren aan de hand van gegeven richtlijnen. U wordt gevraagd om een kaartje te kopen, een anonieme ov-chipkaart te kopen, geld op te laden op de ov-chipkaart, een fietsdalkaart te kopen en samenreiskorting aan te zetten. U gebruikt hiervoor een iPad van de onderzoeker. Hierop is een testversie te vinden van de kaartautomaat.

Vrijwillig meedoen
U doet vrijwillig mee aan dit onderzoek. Dit betekent dat u op elk moment kunt stoppen met het onderzoek en uw toestemming kunt terugtrekken. Hiervoor hoeft u niet te vertellen waarom u wilt stoppen. Dit kan tot een maand nadat u hebt mee gedaan. Uw persoonlijke gegevens en uw gegevens voor het onderzoek worden dan verwijderd. Hiervoor kunt u mailen naar esther.kinderman@ru.nl of bellen naar [telefoonnummer].

Welke gegevens worden verzameld?
Tijdens dit onderzoek verzamelen wij gegevens over uw gebruik van de kaartautomaat. Dit gaat over uw mening en opmerkingen over de automaat en hoe goed het u lukt om de taken uit te voeren.

Wat gebruikt er met mijn gegevens?
Uw gegevens voor het onderzoek wordt gebruikt voor de bachelorscriptie. De resultaten van dit onderzoek worden gepresenteerd. Dit gebeurt op een manier dat het niet uit te vinden is dat die gegevens bij u vandaan komen.

Het toestemmingsformulier dat u ondertekend wordt tot 10 jaar na het onderzoek bewaard. De onderzoeksgegevens worden ook 10 jaar bewaard, maar op een manier dat het niet uit te vinden is dat die gegevens bij u vandaan komen.

Om het onderzoek uit te voeren, is het nodig om uw persoonlijke gegevens te verzamelen, gebruiken en op te slaan. Het toestemmingsformulier geeft aan om welke persoonlijke gegevens dat gaat.
Alle persoonlijke gegevens en gegevens voor het onderzoek worden veilig opgeslagen volgende de richtlijnen van de Radboud Universiteit.

Meer informatie?
Als u vragen hebt of meer informatie wilt over het onderzoek, kunt u mailen naar esther.kinderman@ru.nl of bellen naar [telefoonnummer].

Als u klachten heeft over het onderzoek, kunt u contact met mij opnemen of met mijn scriptiebegeleider: hanna.schraffenberger@ru.nl.

Toestemmingsformulier
Als u wilt meedoen aan dit onderzoek, wil ik u vragen het toestemmingsformulier te ondertekenen. Met deze toestemming laat u weten dat u de informatie begrijpt en in stemt om mee te doen met dit onderzoek.

Met vriendelijke groet,
Esther Kinderman
esther.kinderman@ru.nl
[telefoonnummer]

Radboud University

TOESTEMMINGSFORMULIER - Expert

Voor deelname aan het scriptieonderzoek: *toegankelijkheid van NS kaartautomaten voor laaggeletterden*

Verklaring van de deelnemer

Het doel van het onderzoek is duidelijk voor mij.
Ik ben tenminste 18 jaar oud.
Ik heb de mogelijkheid gekregen om vragen te stellen over het onderzoek.
Ik neem vrijwillig deel aan het onderzoek.
Ik begrijp dat ik op elk moment in het onderzoek mag stoppen als ik dat wil.
Ik begrijp dat ik mijn gegevens mag laten verwijderen tot een maand na het onderzoek.
Ik begrijp dat in dit onderzoek gegevens worden verzameld.
Ik begrijp hoe deze gegevens opgeslagen worden.
Ik begrijp hoe deze gegevens zullen worden gebruikt.
Ik stem ermee in om deel te nemen aan het onderzoek zoals dat beschreven is in het informatiedocument.

Daarnaast stem ik ermee in dat:	
Ja	**Nee**
☐	☐ de volgende categorieën persoonlijke gegevens verwerkt worden: naam, leeftijd en telefoonnummer

Naam: .....

Handtekening: ..... Datum: .....

Verklaring van de onderzoeker

Ik verklaar dat ik de deelnemer op een goede manier over het onderzoek heb verteld en dat ik mij houd aan de richtlijnen voor onderzoek zoals die beschreven zijn in het protocol van de Ethische Toetsingscommissie.

Naam: .....

Handtekening: ..... Datum: .....