Check-in / Check-out

Design of a user-centered, open payment border for the OV-chipkaart

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OV-chipkaart Graduation Lab

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Challenge the future

Check-in / Check-out

Design of a user-centered, open payment border for the OV-chipkaart

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Contents

Summary

This thesis is part of my graduation project at the OV-chipkaart Graduation Lab of the Faculty of Industrial Design Engineering at the Delft University of Technology. The aim of the Graduation Lab is to improve electronic ticketing for travellers using Dutch public transport in a 3 to 10 year time-span. This work is supported by the Ministry of Infrastructure and the Environment, provinces (IPO), city regions (SkVV), Dutch Railways (NS), Rotterdam public transport (RET), and consumer organisation Rover.

OV-chipkaart system

The analysis of the OV-chipkaart system has made clear there are many aspects to the development of such a vast system. The technology and business aspects have been dominant in the development of this particular system. Travellers are expected to follow and adapt to the system instead of making use of the strengths of technology.

The system is built on some fundamental principles like a decentralized system and fare calculation at the end of the trip. These principles determine the usage to a large extent and are hard to change.

Technology-based Self-service bring potentially advantages like availability and speed. With the introduction of the OV-chipkaart these systems have become more important when using public transport, but lack coherence across the entire OV-chipkaart service.

Problems

Travellers are facing problems when they interact with the OV-chipkaart in the public transport domain.

Recognition of 'OV-chipkaart moments'
The location of validators is different for many train stations. Most travellers are scanning the station for validators and regularly forget when they are distracted. Not only the location is important for the findability, the appearance of the equipment is in competition with other services and equipment.

Coherence of services and equipment
Many travellers use more than just validators. For adding credit or resolving errors, they use other equipment or service channels. The current equipment is in most cases not coherent and are not presented as a product family, working together to achieve a common goal. The interaction starts over again with each touchpoint making it an unpleasant and time consuming experience for travellers.

Consistency of equipment appearance and messaging
The equipment in the travel domain comes from various suppliers and have differnt appearances. All transport operators maintain their own equipment or have it done by their suppliers. Operators use different messages for similar or the same tasks. Travellers have to learn these difference or they just skip the text and try to grasp the meaning of light and audio signals. This is undesirable.

Proposal: the payment border

The payment border is a zone in which travellers have to perform an action to acquire a valid ticket for their trip by public transport. Validation also means making the transition from an unpaid to a paid area.

The concept is a collection of various touchpoints which contribute to an overall interaction for all travellers which guide them in passing the payment border.

The payment zone contains three stage: wayfinding & recognition; information & support; validation.

The wayfinding & recognition stage is facilitated by the vertical and horizontal parts of the portal. The border is clearly visible from a distance, it is easier for travellers to locate and recognize where they have to validate their OV-chipkaart. The dimensions and angles of the validator have been altered for an optimal validation. The various messages on the display have been made more coherent. The information & support stage is now integrated in the payment border zone: a information panel is added and the information and SOS post is now located near the border.

The aim of the redesigned touchpoints was to create an overall coherent validation interaction. All different touchpoints are now (re)designed and linked to facilitate this coherent interaction. With this result it should now be clear for travellers where to validate and what to do. By applying this payment border to all stations it should bring recognition with travellers. The design does not only facilitates 'normal' validation but also anticipates on unusual situations like an unexpected OV-chipkaart failure.

Conclusions

With the introduction of the OV-chipkaart new touchpoints were added to travel domains, rules and actions changed. New interactions were formed, but were never designed. Travellers are facing many problems when they interact with the OV-chipkaart system.

The payment border concept brings clarity in the required actions. Travellers are supported by a seamless link between all the touchpoints in the payment border. Both the successful and failing validation actions are supported by the touchpoints.

Based on the feedback from the evaluation study, it is expected that the introduction of the payment border concept will increase the usability of the OV-chipkaart.

Implementation and further development should be done by a central, independent organisation. This organisation should also develop future concepts when technology platforms or the needs of travellers change.

List of Abbreviations

AVM   Add-Value Machine
CBO   Central Back Office
CH   Clearing House
CICO   Check-in, Check-out
CPS   Central Processing Server
DPS   Depot Processing Server
NAL   National Action List
OVC   OV-chipkaart
POST   Point of Sales Terminal
PS   Permanent Structure
PTO   Public Transport Operator
PUD   Pick-Up Device
PVU   Personal Validation Unit
RSB   Routing, Signing & Branding
SDOA   Specification Document Open Architecture
SPS   Station Processing Server
TLS   Trans Link Systems
TVM   Ticket Vending Machine
VAL   Validation machine
VCF   Validator Concentration Feature

List of Definitions

Payment border. The payment border is a zone in which travellers have to perform an action with their card to acquire a valid ticket for their trip by public transport. Validation also means making the transition from an unpaid to a paid area when crossing the payment border.

User/traveller. This research is concerned with the end-user or traveller. In most cases the term 'user' refers to a person performing actions with a card not related to travelling, for example: purchasing or bill payment. We will explicitly describe any other (professional) users if the report refers to them.

Concession. A region wherein one operator has the time-limited monopoly on providing a certain transport service. Granted by an OV-authority and usually acquired through a public tendering process.

Subscription or season ticket. A ticket that is bought in advance of travelling and pays for (part of) future journeys taking place in a particular time frame. Often used by frequent travellers to enjoy discounts.

OV-chipkaart system. The usage of the term system is reference to the collection of computer systems and hardware elements that are required to make travelling with the OV-chipkaart possible.

Credit balance (auto) top-up. Travellers can purchase credit to store on their card, allowing them to pay for tickets. This can be done at machines or an OV-chipkaart can be linked to a bank account and automatically top-up if the balance drops below a predetermined threshold.

"Ik heb nooit problemen met de OV-chipkaart.
Ik kan alleen die schermpjes moeilijk lezen..."

"I don't have any problems. I find it hard to read the messages."
- quote from evaluation with travellers -
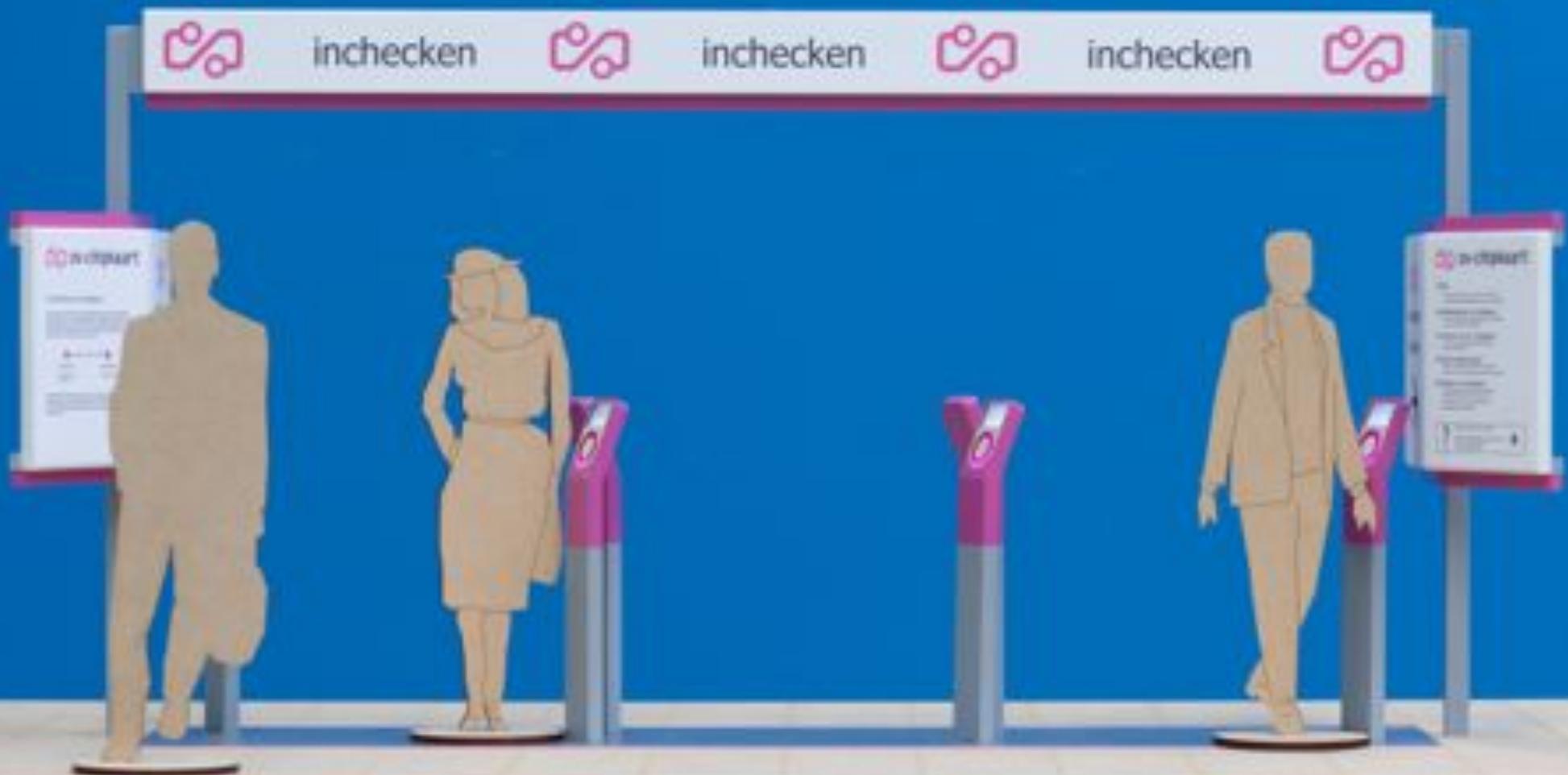
1 Introduction

This project aims at improving the usability of the OV-chipkaart. This chapter describes the background of the project and the starting points.

1.1 Project assignment: the payment border

1.1.1 Problem definition

Electronic ticketing offers big advantages for transport operators and great potential for users, travellers who use the public transport in the Netherlands. The OV-chipkaart system has the potential to make it 'easier' and quicker to travel by public transport; not standing in line for ticket machines for every journey. Although the aim was to make the card 'fairer and smarter', the experience does not match the expectations that travellers currently have. This problem has various origins.

One origin is that with the introduction of the system, travellers were faced with an increase in the number of rules and required knowledge and actions to use the system. In parallel to this, travellers tend to be directed to Internet and Technology-Based Self-Service (TBSS) more and more in case of errors or just standard services. They experience a lack of support in using the self-service touchpoints of the OV-chipkaart platform.

1.1.2 Project brief

The goal of this project was to improve the interactions with self-service OV-chipkaart touchpoints in the travel domain of public transport from a user perspective. The travel domain is divided in three contexts: train stations; bus, trams and their stops; metro stations. The design should support travellers in using the OV-chipkaart in the three contexts, while taking into account the economical and technological feasibility.

The needs of travellers in the domain are analysed and new ideas were explored and evaluated through user involvement.

1.1.3 Research questions

- What is the gap between the traveller's needs and the functions of the touchpoints offered in the current situation?
    - What are the functions of the touchpoints in the travel domain?
    - What are the needs of travellers when using the OV-chipkaart?
    - What is the most important touchpoint in the travel domain?
- Which solutions will support travellers the best?

1.1.4 Starting principles

Most issues are unnoticed until travellers discover a problem, main problem is they have less credit than they expected. In the coming years it is not very likely that more service staff can be found in the public transport domain. We can expect self-service touchpoints will be increasingly important to solve problems.

I think it is important that travellers should get a fluent check in and out. They should be able to identify and solve problems with the card on the spot, without the help of the Internet or smartphone. For smart card related problems a smart card reader is essential to retrieve the status of the card. The card also holds the last and most actual transaction data. Compared to the online overview which can be delayed 60 days or longer, travellers can have more real-time information with their card

The OV-chipkaart platform allows users to travel with missing check outs or products. OV-chipkaart touchpoints in the travel domain could be designed in such way these missing transactions are reduced to a minimum.

1.2 OV-chipkaart background

Since 2005 the OV-chipkaart system is in use for the public transport of the Netherlands. The OV-chipkaart is a smart card, based on RFID technology.

The system seems to function from a technical and business perspective, but many travellers are unsatisfied with the use and service of the new system. In 2011 the predecessor and alternative to the OV-chipkaart, a national ticket for all public transport except trains called the 'strippenkaart', was decommissioned, but many usability issues with the OV-chipkaart remain.

1.2.1 Stakeholders

The OV-chipkaart platform is used by travellers, public transport operators and Translink Systems (TLS). Operators are responsible for the touchpoints and their infrastructure, TLS manages the central server and facilitates services for operators and travellers. All parties have to agree to implement changes to the system.

1.3 OV-chipkaart Graduation Lab

This work is part of the OV-chipkaart Graduation Lab of the Faculty of Industrial Design Engineering at the Delft University of Technology. The goal of this project is to create and evaluate design solutions that increase the usability of the OV-chipkaart.

Based on this analysis three focus areas were defined, one of which was the starting point for this project: support in the travel domain. Figure 1 shows the customer journey steps as defined in the Analysis report (Joppien, Niermeijer and Niks, 2013).

1.3.1 Mission of the OV-chipkaart Graduation Lab

In the near future Dutch travellers abroad will brag about how easy and convenient their OV-chipkaart is.

1.3.2 Participating organisations

The OV-chipkaart Graduation Lab is a collaboration of the:

- Faculty of Industrial Design Engineering of TU Delft
- Dutch ministry of Infrastructure and Environment (IenM),
- Association of Dutch Provinces (IPO)
- Cooperating of Dutch City Regions on transportation and traffic (SkVV)
- Dutch National Railways (NS)
- Rotterdam Municipal Transport (RET)
- Dutch Travellers Association (ROVER)
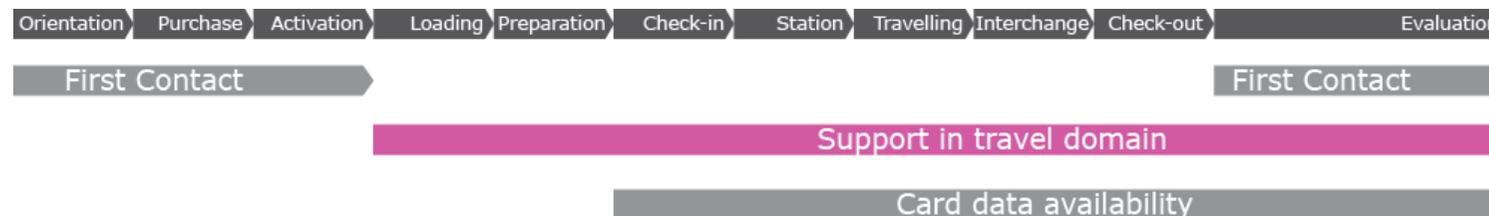
Figure 1: Customer journey steps of the OV-chipkaart according Joppien, Niermeijer & Niks (2013). This report adresses the support in the travel domain.

1.3.3 Approach: User Centred-Design

The project follows a user-centred approach, also referred to as human-centred. The standard Human-centred design for interactive systems (ISO 9241-210, 2010) states: 'Human-centred design is an approach to interactive system development that focuses specifically on making systems usable. It is a multi-disciplinary activity.'

The standard describes 6 key principles that will ensure a design is user centered:

1. The design is based upon an explicit understanding of users, tasks and environments.
2. Users are involved throughout design and development.
3. The design is driven and refined by user-centered evaluation.
4. The process is iterative.
5. The design addresses the whole user experience.
6. The design team includes multidisciplinary skills and perspectives.

Figure 2: Technology, Business and Human, as visualised by IDEO (2009). The product is the 'sweet spot' and a balanced combination of Technology, Business and Human factors.

In order to come to a good overall user-centred product or service, it is important to take into account the business and technology side as well. Human-centred design, as described by IDEO (2009), puts focus on what is desirable for the users, but also investigating what is technically feasible and commercially viable for the organisation involved. As Figure 2 illustrates, the three circles overlap with each other and form the 'sweet spot' where business considerations, user needs and wants, and technological requirements are equally taken into account.

Graduation Lab
Reports

Check in / Check out
Report

"Improving system adoption
of the OV-chipkaart"
Johanna Joppien

analysis report
Joppien, Niermeijer, Niks

"Making the invisible
visible"
Thijs Niks

project
assignment

recap
analysis report

results

user groups

€
technology and
business

literature review

domain
observations

user
observation

results

travel context

touchpoints

check-in/check-out
flow

chapter 1

Introduction

chapter 2

OV-chipkaart concept
and context

chapter 3

Analysis: travel context
and touchpoint usage

1.4   Process description and reading guide

This report starts with one of the conclusions from the analysis report, this project assignment is formulated in chapter 1. The second chapter is a recap of the most important parts of the analysis report. This results in information about user groups, technology and business aspects and literature review. Chapter 3 describes the domain and user observations, the travel context and touchpoints usage are described. With the results of the research a design assignment is formulated and the payment border concept is explained in chapter 4. Concept development is described in chapter 5. In chapter 6 the design is evaluated with feedback from experts and users. With the feedback adjustments were made to the design, this resulted in a final design. The final design, the conclusions and recommendations can be found in chapter 7.

design
assignment

criteria

concept
development

expert feedback

user feedback

adjusted
final design

recommendations

chapter 4

chapter 5

chapter 6

chapter 7

Design assignment:
the payment border

Concept
development

Evaluation
of the concept

Conclusions
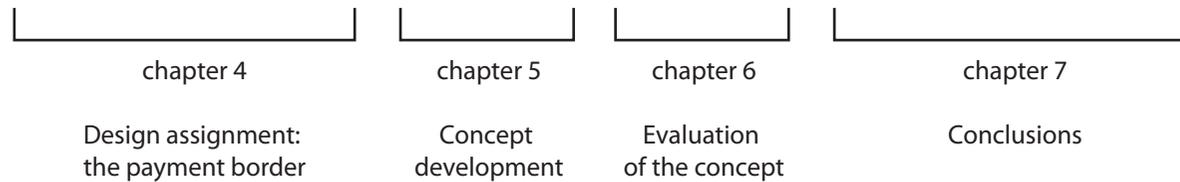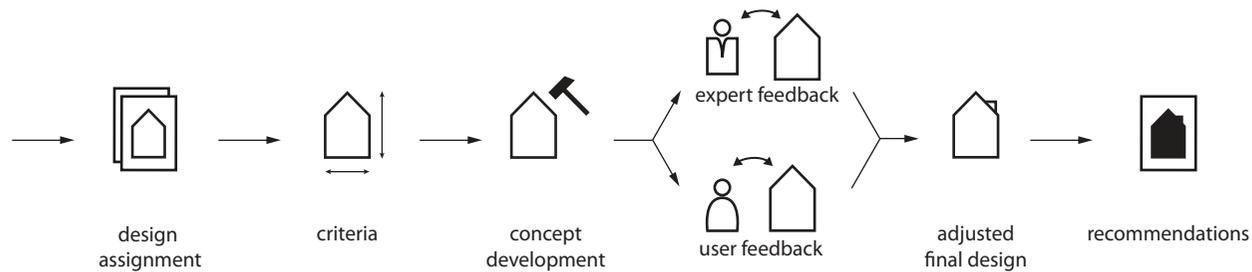
"Ik ben altijd op zoek naar die palen."

"I am always looking for those poles."
- quote from evaluation with travellers -

2 OV-chipkaart concept and context

The OV-chipkaart system is a complex infrastructure with many interfaces for travellers as well as for public transport operators. This chapter describes the overall OV-chipkaart concept, OV-chipkaart usage and the technical and business context.

2.1 The OV-chipkaart concept

The OV-chipkaart is a distance-based fare collecting system. The system is based on a smart card with an RFID chip, containing all necessary data to communicate with equipment in vehicles and stations.

One single card for all transport operators
The smart card can be used with every transport operator. This potentially eliminates the need of buying a ticket for every trip or every few trips, like the previous paper ticket, the *strippenkaart*.

Check in and check out
Travellers register their OV-chipkaart each time with a validator when entering a vehicle or station to 'check in'. When disembarking a vehicle, exiting a station or switching operators, travellers have to register the card again with a validation device to check out, at which point the system calculates the fare based on the distance travelled. This check out allows distance-based fares instead of zone-based fares and it generates traveller behaviour data for transport operators. Figure 3 shows the difference in specification of the travel destination between a paper ticket and the OV-chipkaart.Compared to the previous zone-based system, check in/check out requires an extra action from travellers and makes fare calculation unpredictable, but it is also considered to be fairer. Zone-based ticketing, on the other hand, was also hard to fully understand for many travellers and considered less fair. With this new electronic check in/check out policy, operators are

also able to use price differentiation to increase their efficiency. This business data has the potential to help to adjust the travel schedule better for the needs of travellers.

Initial fee
Since the fare is calculated at the end of a trip, there is an incentive for travellers to not check out and thus dodge paying. To prevent this, an initial fee is taken from the card at check in. The excess part of the initial fee is returned at check out if the traveller travelled for a lower fare, or extra money is deducted if the traveller travelled for a higher fare. The initial fee differs per operator and modality, but is usually 4 euro for regional buses, trams and metro; 10 euro for regional trains; and 20 euro for national trains. In the future, this initial fee could be determined per service line, if regional governments allow it. Forgetting to check out will usually result in paying more for a trip than is necessary.

Other services
Some systems also use the OV-chipkaart infrastructure for authentication of users. Examples are the OV-fiets, Greenwheels and MyWheels. This provides an easy and seamless payment experience, although these services are not connected to the backbone of the system.
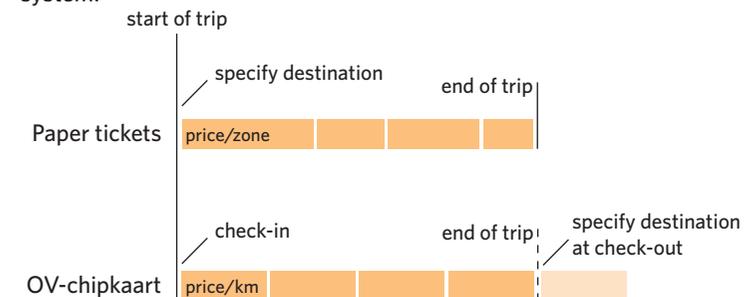

Figure 3: Difference in specification of the travel destination. With the OV-chipkaart the destination is determined at check-out.

Data paths behind het OV-chipkaart

The OV-chipkaart system consists of several data processing parts called levels (TLS, 2003). These levels have different functional tasks corresponding with the physical location of the respective computer systems. Figure 4 gives an overview of these levels.

Level 0
The zero level consists of the payment and identification cards issued by the public transport operators (PTOs). Currently, three types of cards are in use: disposable, anonymous, and personal. All cards contain RFID chips to store information about credit balance, season tickets, and recent check-in and check-out actions.

Level 1
The first level consists of station access gates, station or vehicle validators (VAL), mobile validators used by conductors (Personal Validation Unit, PVU), and point of sales terminals (POST) at sales desks. These touchpoints the user encounters. Validators and gates need to contain all necessary information about fare prices, subscription information, network topology, and blocked cards. Gates and validators only see one side of transactions: the traveller either checks-in or checks-out.

Level 2
Information collected by level 1 machines, such as gates, validators, POSTs, is sent to level 2 equipment. Stations are outfitted with Station Processing Servers (SPS) and receive data from connected level 1 machines every 15 minutes. Moving vehicles with validators on board have a Validator Concentration Feature (VCF) which collects the data and sends it to the Depot Processing Server (DPS) when the vehicle is parked at the depot or a bus station.

Level 3
Every public transport operator has a Central Processing Server (CPS) at level 3 to collect all information from level 2. This CPS stores all transactions made with the OV-chipkaart at one operator and thus contains information about start and end points of a trip, and credit balance changes. The data collected at level 3 is used by transport operators to verify the financial transactions with TLS and to use for business intelligence.

Level 4
The last level of the system is called the Central Back Office (CBO), currently operated in the Netherlands by Trans Link Systems. This is where all transactions with all cards are stored and analysed in order to fulfil the Clearing House function. The CBO also keeps a list of all active and blocked cards, and manages auto top-up.
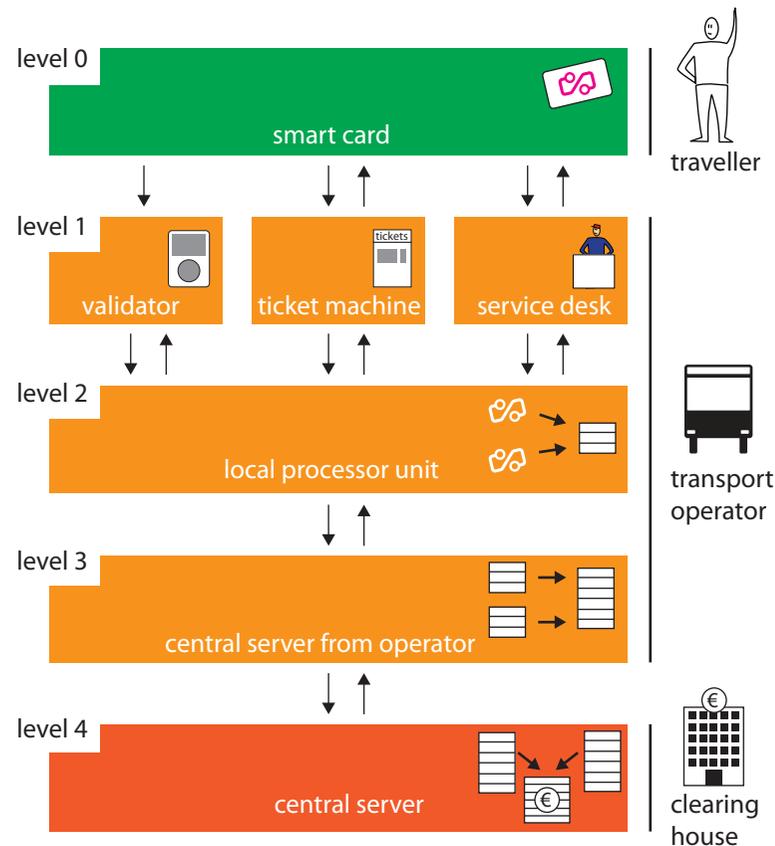

Figure 4: Simplified version of data levels of the OV-chipkaart system.

2.2 OV-chipkaart usage

Only the front end (level 0 and 1) of the OV-chipkaart platform is used by travellers. For the usage it is important to understand which characteristics are important to determine which people will experience the most problems. The customer journey describes the various steps travellers go through when using the OV-chipkaart.

2.2.1 Characteristics of travellers

In the analysis report (Joppien, Niermeijer & Niks, 2013) three dimensions were identified to categorize travellers:

   1. Level of technology understanding.

   2. Frequency of travelling

   3. The number of operators used when travelling

The dimensions can be put on three scales (see Figure 5). The plane created by setting a dot on the scale gives the relative user group size.

1. Level of technology understanding
Are users familiar with Technology Based Self-Service (TBSS) and Internet and are they able to adapt to new technology quickly? Age can be an indicator but not necessarily. Elderly did not grow up with TBSS and had to learn these systems on later age. The chance they have a low technology understanding is bigger.

2. Frequency of travelling
How often does a user travel by public transport? This says something about the experience level one has. With doing actions repeatedly users build up skills. These skills can be performed almost effortless (Rasmussen, 1983).

3. The number of operators used when travelling
The various transport operators can use different equipment, products and rules. Users who make use of multiple operators are more familiar with the various validators and are more experienced in finding out what to do.

The combination of these three factors results in different user groups. An example: infrequent travellers with low understanding of technology and travelling with multiple operators are likely to have the most problems. This group did not develop the skills to deal with the different situations. They also do not have the chance to learn because the intervals are too big.

Frequent travellers with a high understanding of technology, travelling with one operator are likely to experience the least problems.
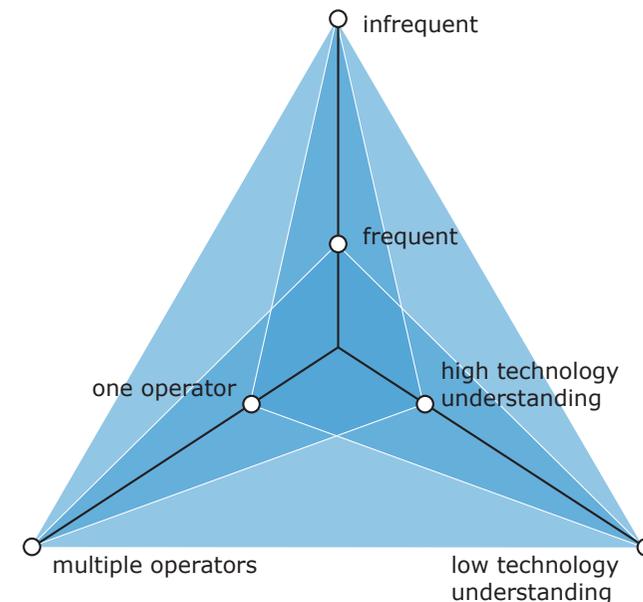

Figure 5:   User group segmentation. The combination of the three dimenions results in different user groups.

Goals of travellers

Users execute actions to achieve certain goals. Operating validators is never a main goal. Multiple sub goals have to be achieved in order to reach this main goal. The main purpose of a validator is to check in and check out. The actual function is different according to the goals of travellers. Five different goals why travellers use validators in the current situation:

- Check in and start a trip
- Check out and end a trip, calculate the fare
- Transfer to other train
- Read message again
  - Read credit
  - Read error
  - Check validity status in case of doubts
- Enter train or metro station to:
  - Start a trip
  - Bring someone to the platform
  - Visit a shop in the station building
  - Pass the station to the other side

2.2.2 Customer journey

During the analysis a customer journey map was created with 4 phases divided in a total of 11 steps (see Figure 6). These steps are based on the main activities when using the OV-chipkaart.

Purchase

In the purchase phase travellers come in contact with the OV-chipkaart for the first time. They will orientate on the possibilities to buy a specific (season) ticket. The purchase step is acquiring a personal or anonymous card at a ticket machine, service desk or online.

Pre-travel experience

The pre-travel experience is about getting ready for a journey. When travelling for the first time with the NS or a new season ticket, these travel products have to be activated at a ticket machine or service desk. In the loading step credit is added to the card. This step is recurrent when auto top-up is not enabled. The preparation step is done just before every journey; checking the route, time schedule and travel products or credit.

Travel experience

The check-in and check-out steps are the validation actions and are required for every trip. After check-in at train station most travellers have to wait for a some moments at the train to arrive. This 'station' step is important because travellers can still decide to cancel their trip or go back to OV-chipkaart related equipment. In the travel step travellers can come in contact with a conductors or a driver from a vehicle. During the interchange step travellers change vehicles or change operators and thus check out and check in again.

Post-travel experience

In the last phase, travellers evalute their trip and perfom tasks like adding value, check the status of the card online or make an invoice.

€ Purchase   🏠 Pre-travel experience   🚌 Travel experience   Post-travel experience

| Orientation | Purchase | Activation | Loading | Preparation | Check-in | Station | Travelling | Interchange | Check-out | Evaluation |

Figure 6: Customer journey with 4 main phases and 11 steps, a single jounrey from beginning till the end.

2.3 Identifying technical and business context

Many OV-chipkaart issues have their origin in the principles of the OV-chipkaart platform and policy context of governments and operators. These key characteristics and determining contexts are described in system characteristics and the context of OV-chpikaart regulation.

2.3.1 System characteristics

'Offline' equipment communication
The delay from level 0 to level 4 depends on the transport operator and modality; train, bus, bus or metro. Data from the card (level 0) to the central server (level 4) is not synced real time, but once every 15 minutes (train and metro) or once a day (bus and tram are parked in a depot). Therefor the system can be considered as offline. Most transactions are handled within 24 hours, but it can run up to 60 days or longer (personal communications, TLS). This can result in incomplete travel data presented by websites and service desks when travellers check their travel log or ask for help. Direct and successful problem solving of the last 10 transactions is possible with information from the card only. Travellers have to go to a service desk or use Technology-based Self-service.

Decentralized system
The biggest part of the system is decentralized; transport operators own level 1, 2 and 3 equipment and are responsible for maintenance and keeping it operational. Setting the tariffs and calculating the fares are done by transport operators.

Improvements to the system with regard to equipment can only be made by transport operators or the suppliers of the equipment. National changes have to be approved by all operators and executed by multiple suppliers. The consensus and execution process can take several years, even for very small changes.

Fare calculation at end of trip
With the OV-chipkaart the fare payment or 'financial transaction' is done twice a journey. With paper tickets the payment was done prior to a trip. Fare calculation with the OV-chipkaart is done at the check out action. This is an important factor for the moment of solving problems and correcting mistakes. Most travellers have already left the travel domain and take these problems home, literally. They then have to find information with the help of the Internet, a call center or have to go back to a station or service desk.

2.3.2 Context of OV-chipkaart regulation

Many travel products
The ticketing system in the Netherlands knows a large variety in subscriptions. This is historically grown. A part of these subscriptions are subsidies from governments to subsidize different user groups dependent on age (children, elderly) or occupation (high school students, students). Other subscriptions are created by transport operators to spread travellers during the day/week (off-peak hours discount) or commercial offers; trying to attract more travellers to their public transport. More products mean more possibilities and complications.

Technology-based Self-service systems
Technology based self-service systems are technological interfaces allowing customers to use services independent of involvement of direct service employees. An important result of the implementation of the OV-chipkaart system is the increasing use of these technology based self-service systems. After the purchase of an OV-chipkaart almost all actions with an OV-chipkaart have to be done with self-service systems; adding value, pick-up products, check in and check out. Paper tickets and subscriptions are validated manually only.

Replacement instead of addition
The OV-chipkaart system is designed to completely replace the old fare collection systems. The 'strippenkaart', single journey tickets and paper subscriptions are all transformed in the OV-chipkaart. Travellers have to use the OV-chipkaart when they want to make use of subscriptions or pay a reasonable price for single journey tickets. Because of a lack of alternatives people feel forced to use the OV-chipkaart. This reduced adoptation speed during the implementation phase.

Privacy versus open travel data
All OV-chipkaart transactions are stored in order to calculate fare distribution among the operators and give feedback to travellers. These data are carefully protected to prevent misuse and privacy conflicts. Operators cannot use travel data from each other, limiting the possibilities to help customers with OV-chipkaart related problems.

2.4 Technology based self-service

Self-service technologies replace the personal interaction by enabling the customer to carry out a certain service without the direct involvement of an employee of the company. Technology-Based Self-Services (TBSS) are increasingly used by companies in order to serve individual customer needs better and to increase their brand value, differentiate from competitors and to save costs. Since a growing number of users nowadays interact with such Self-Service-Technologies (SST) extensive research has been done on the perceived service quality (Curran et al., 2003; Dabholkar, 1996; Meuter et al., 2000; Reinders et al. 2007; Reinders et al. 2008). SST can be applied in multiple ways, such as automated teller machines, package tracking services, or the OV-chipkaart. According to Meuter et al. (2000) these technologies are a critical component of customer-firm interactions and will be increasingly important for long-term business success. The technology replaces the interaction with a company's employee, which makes this new interaction a crucial part of the resulting customer satisfaction. Each interaction that takes place between the company and the customer is a chance for the company to sell itself and to satisfy the customer, no matter whether this interaction is real (between two people) or virtual (human-machine-interaction). According to Bitner et al., Parasuraman proposed in 1996 to extend the Service Marketing Triangle (Figure 7) with a fourth dimension 'Technology' to a Service Marketing Pyramid (Figure 8).

If well designed, SSTs deliver advantages to the company and its customers as well. Reinders et al. (2007) summarized the advantages for the company and the customer as researched in multiple studies (Curran et al., 2003; Dabholkar, 1996; Meuter et al., (2003). According to them, the main advantages for the company are: the speed of delivering a certain service, preciseness and level of customization, cost savings, competitive advantage, constant quality, and more flexibility in time and space where the service is available. The biggest advantages for the customer are: ease of use, time saving, availability, feeling of independency, more control, and cost savings.

Sometimes customers are forced to use Technology-Based Self-Services, if there is no other option to fall back on other available services. In the case of the OV-chipkaart, this is the case at smaller train stations or bus stations where no service personnel are present
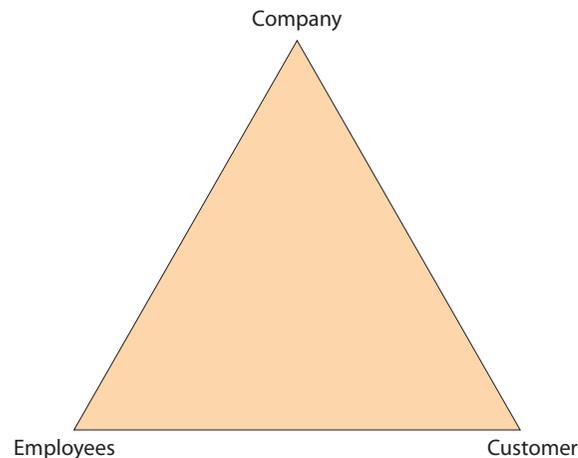

Figure 7:   Service Marketing Triangle
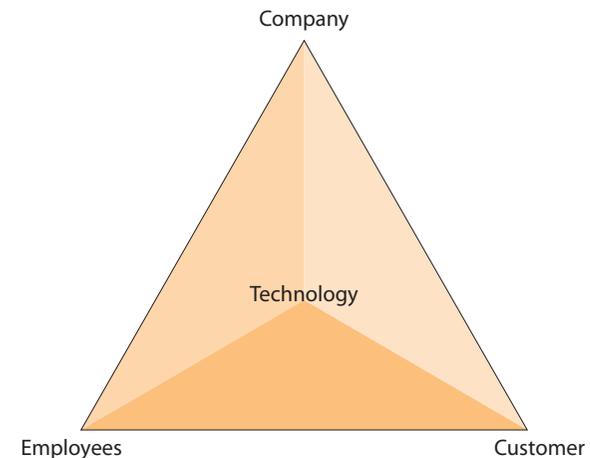
Figure 8:   Service Marketing Pyramid, the dimension 'Technology' is placed prominently in the middle.

or at times when the service desks are closed. Reinders (2008) states that a limited choice of service delivery may result in negative effects and goes on in saying that 'imposing an innovation on consumers results in resistance towards the innovation'. Furthermore literature points out, that previous experiences with TBSS have a positive effect on the attitude towards new technologies and their usage. According to a study by Langeard from 1981, which Meuter et al. (2000) refer to in their article, customers who are more willing to use SST tend to be 'younger, single, better educated and have a lower income'.

In order to use a SST successfully, it is crucial for companies to understand which factors cause dis/satisfaction. The research of Meuter et al. (2000) identifies three factors that trigger satisfaction and four factors, which trigger dissatisfaction. According to them, the most important factor of satisfaction is that customers evaluate the TBSS as 'better than the alternative'. This means, that customers appreciate the availability, the ease of use, the time and money saving factors. These factors correspond with the mentioned findings of Reinders et al. (2007). The most important factor for dissatisfaction is technology failure. This factor includes situations in which the user is prevented from using the TBSS. Solving the problem, by following a different approach, will incur a cost for the service provider. However, a successful problem recovery in such a situation is satisfying to customers (Meuter et al., 2000 referring to Tax et al., 1998).

In case customers do not have an alternative to the SST and are forced into TBSS their attitude towards the service provider is negative and their evaluation is likely to be affected as well (Reinders et al. 2008). However, according to Chang (2006) their feeling of having no choice of freedom is somehow recovering when they are provided with a recovery option in case of service failure. The study of Reinders et al. (2008) further points out that the evaluation gets more positive, when users of the TBSS in case of service failure are provided with a 'fall-back' option in the form of an employee. Finally, it can be stated that users with more experience of TBSS are generally more positive towards the TBSS. However, they are not towards the service provider.

Concluding, the TBSS theory predicts that people will enjoy using SST if it offers ease-of-use and saves time and money. SST will help companies to reach different users, offer a better product and at lower costs. Forcing users to adapt to SST might cause dissatisfaction and a negative attitude.

2.5 Conclusion

The analysis of the OV-chipkaart system has made clear there are many aspects to the development of such a vast system. The technology and business aspects have been dominant in the development of this particular system. Travellers are expected to follow and adapt to the system instead of making use of the strengths of technology.

The system is built on some principles like a decentralized system and face calculation at the end of the trip. These principles determine the usage to a large extent and are hard to change.

Technology-based Self-service bring potentially advantages like availability and speed. With the introduction of the OV-chipkaart these systems have become more important when using public transport, but lack coherence across the entire OV-chipkaart service.

Tijdens het geluidssignaal sluiten de deuren automatisch!

<< CHECK UIT

"Reist u op saldo, vergeet dat niet uit te chcken."

"Are you travelling 'on credit', do not forget to check out."
- audio message in a tram -

3 Analysis: travel context and touchpoint usage

To gain insights into the problems travellers are facing, it is important to understand the context of the journey. This chapter describes the travel domains and the touchpoints; products and staff travellers come in contact with during their travel.

3.1 Describing the travel domain

The definition of 'travel domain' in the public transport is very broad. From earlier research it has become clear that each travel modality has its own specific context of use. The contexts are characteristic for the available touchpoints and needs of travellers. I will discuss four modalities: train, bus, tram and metro. I considered the bus and tram into one context, as in both in trams and buses OV-chipkaart equipment is placed inside the vehicle.

3.1.1 Train

The NS stations characterize the train domain. These stations are the start and end of every trip. Six types of stations can be identified based on 12 criteria (Van Hagen en De Bruyn, 2002). The number of travellers starting or ending a journey or just passing at a station is an important factor. For example, a station in the region near a small village with little travellers (type 6) is much smaller and has fewer facilities than a station in the centre of a city with many travellers (type 1). All stations have at least one NS ticket machine, an info/SOS-pole and a validator. Bigger stations also have service staff and service desks.

Although the definitions of the different types have been made very clear (Van Hagen en De Bruyn, 2002), it is hard to map the current stations according the categorization (personal communication, NS).

Train stations are categorized in 5 different zones (see Figure 9)

- 'Omgevingsdomein'; areas outside the station building, direct surroundings.
- 'Ontvangstdomein'; zone between entrance and travel domain, travellers can find time schedules, ticket facilities and often convenient stores.
- 'Reisdomein'; the last zone before entering a train.
- 'Verblijfsdomein'; zone for information, waiting and shopping.
- 'Loopverbindingszone'; this zone intersects most of the other zones and is meant as a walkway from the entrance to the train.

According the definition of the NS, the travel domain is just one part of stations. Gates and validators mostly define the borders (see Figure 10). I consider the entrance domain as a part of the travel domain of a train journey: travellers are already busy with their destination and need to possess a valid ticket.

Validators are present in two forms: gates and validators. This results in a semi-open system. The biggest stations (82 of the 402 in total) will be closed off with gates in the near future, smaller stations will only have validators and remain open. Transfer stations, with other operators of train or metro, can have validators or gates. The location of validators differs per station from the main entrance to the platform and every possible location in between. At stations where gates are planned validators are placed on a row on diamond plate. Ticket machines and service desks are located just outside the paid zone. Figure 9 gives a schematic overview of the train domain, showing three different border types.

NS stations act as an important transfer hub to other trains, both national and regional, and other modalities or transport options: tram, bus, metro, taxi, car and bicycle.
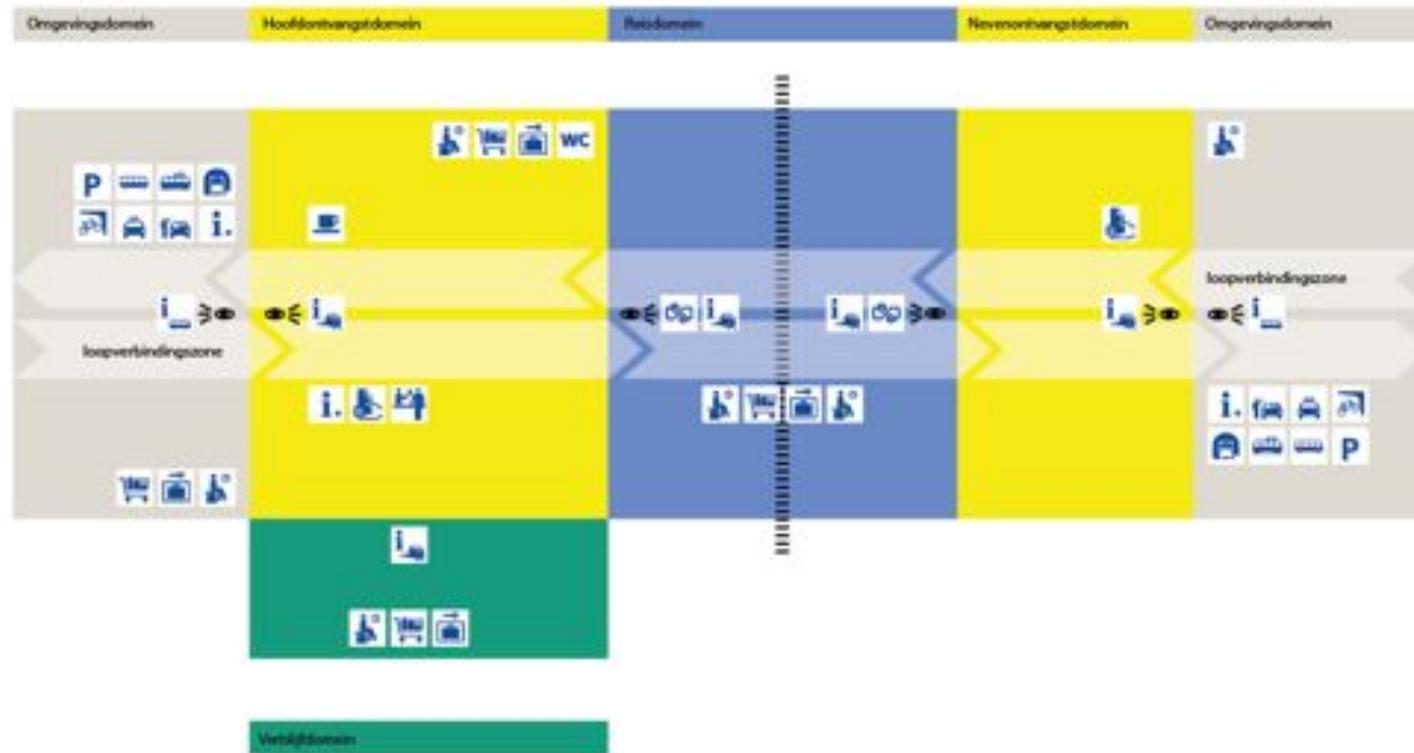
Figure 9:   Overview of different domains in a train station. (Spoorbouwmeester, 2010)

train domain

unpaid | paid

SOS

SOS and info post

one- or two-way gates

check in and out just after entering a station

vechicle at a distance from validators

'border' of validators

check in and out before or after entering a station

'fuzzy' border

validators spread along a path

TVM outside payment border
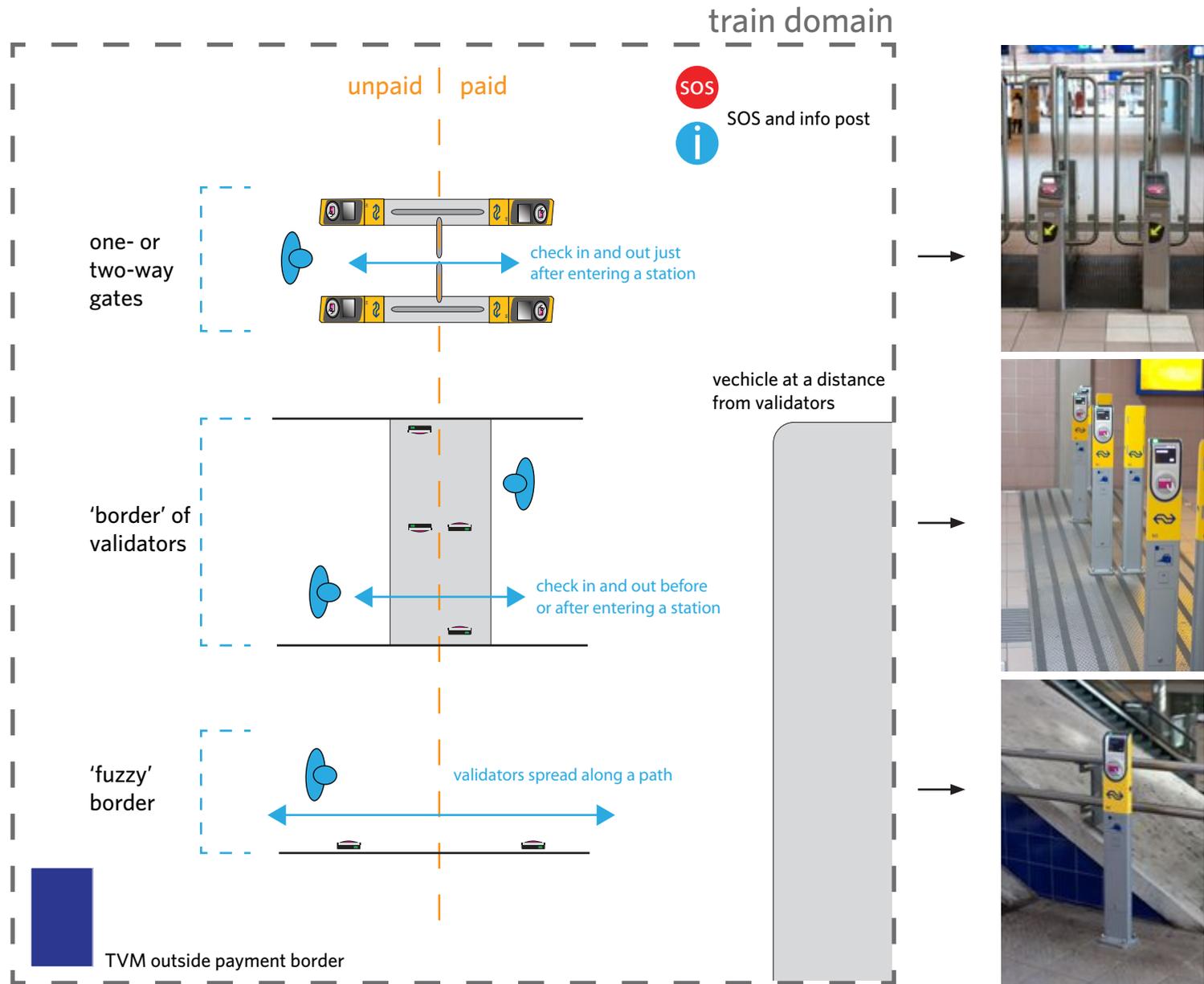
Figure 10: Schematic overview of train domain. The train domain is characterized by different arrangments of validation equipment, resulting in different border types: gates, line of validators and a 'fuzzy' border.

3.1.2 Bus and tram

A trip by bus or tram starts at a bus or tram stop. The stop can be a raised platform or just a part of the sidewalk. A sign indicates there is a bus or tram stop. Most stops have a little shelter (Abri) with commercial ads and information from transport operators. Validators are placed inside the vehicles; it is an open system without gates. The 'payment border' is just behind the door of the vehicle (see Figure 11).

Bus
Busses normally have one validator at the entrance and two near each exit. Some busses have a basic pick-up-device in the centre of the bus. Travellers feel or are obliged to enter the bus at the front entrance. The driver sells disposable OV-chipkaart tickets and answers questions.

Tram
Trams are similar to busses but normally have more doors and travellers are not obliged to enter at the front entrance. Amsterdam has the exception that travellers have to enter the tram in the centre or the front; a conductor checks if everybody did check in. It is also possible to buy a disposable ticket at this counter.

Utrecht has one tram service where the validators are placed at the platform. In the tram there is no OV-chipkaart equipment available. In all cases conductors or 'controleurs' can ask for a valid ticket, give information and answer questions. They are not always present.

bus and tram domain

abri

check out when leaving
bus or tram

information
panel

check in at entering
bus or tram

bus stop sign

interaction
driver - traveller- cico

unpaid   paid
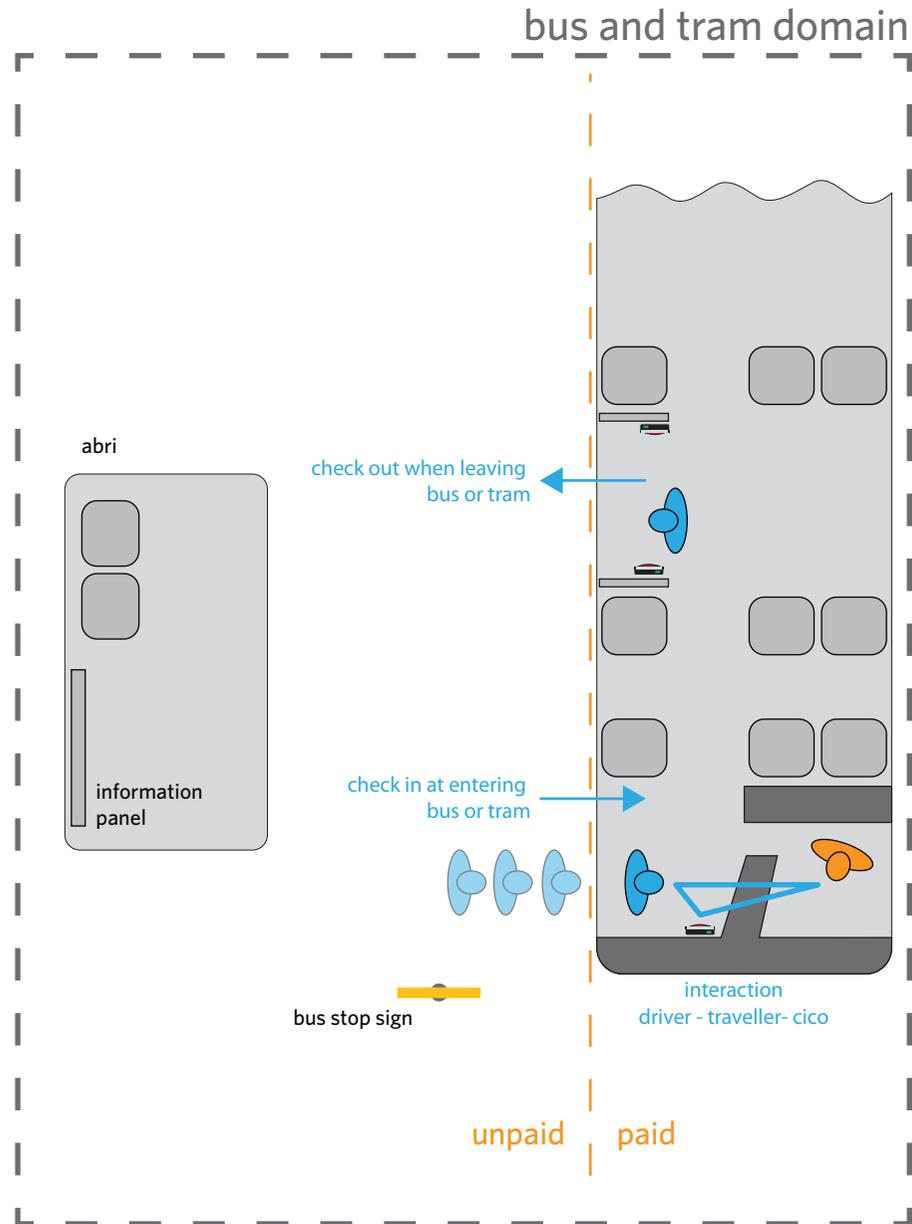
Figure 11:   Schematic overview of bus and tram domain. Busses and trams have a clear layout.

3.1.3 Metro

The metro can be considered as a mix of the train and bus/tram domain. Metro stations are larger than bus stops and are closed off by gates. Some stations have the same facilities as train stations like little shops and service staff; others have few or no facilities, like a bus stop. All stations have ticket and add value machines. The payment border is clear and visible: a line of gates (see Figure 12). Some stations have validators on platforms for use in case of a transfer to a train. Figure 13 gives a schematic overview of the metro domain.

Figure 12:   A line of gates in Rotterdam Central metro station, a clear payment border.

metro domain

unpaid | paid

SOS

SOS and info pole

i

one- or two-way gates

vechicle at a distance
from validators

check in and out just
after entering a station

TVM outside payment border
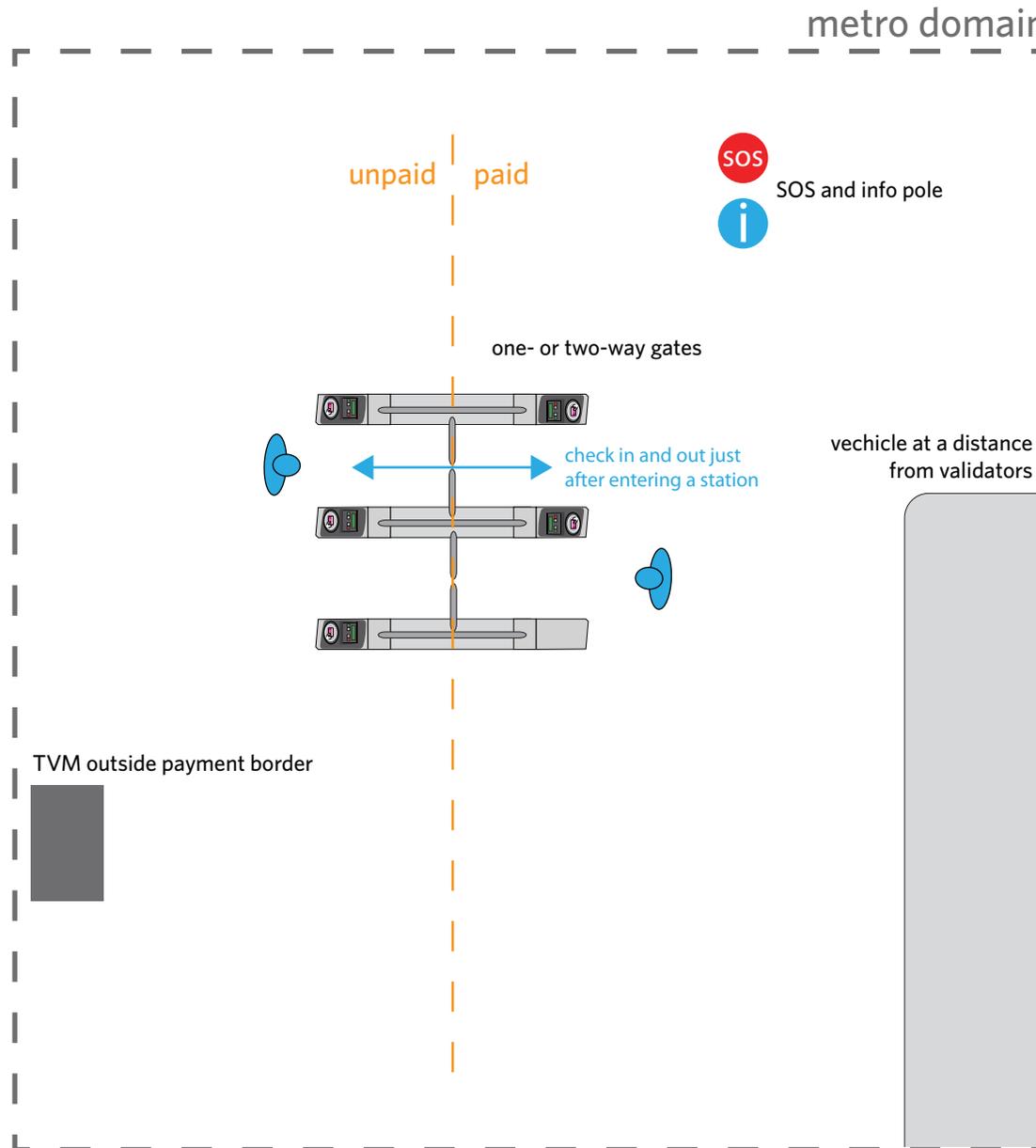
Figure 13:   Schematic overview of metro domain. Entrances of metro
stations are compact and have a clear payment border.

3.1.4　Comparison of the three contexts

The three described contexts can be compared on different aspects when it comes to OV-chipkaart equipment:

- The location of the payment border is different for the three domains: entering a vehicle, passing a gate line, entering a building or passing a virtual payment border.
- The locations of these borders are constant and recognizable for bus, tram and metro. The border in the train domain is at various locations within a station building or in near surroundings.
- In the metro and train domain more self-service systems can be found near the payment border.
- The metro domain is the most consistent in sequence of touchpoints; almost every station has the same set of touchpoints which follow in the same sequence from the entrance till the vehicle. The bus and tram domain is the second consitent. The train domain is constant in the concept, but the implementation comes in different forms. Train stations can have very different layouts and available touchpoints.

The train domain is unclear for travellers because of the various locations of validation equipment. During a transfer from one train operator to another, a virtual payment border is crossed within the travel domain (Figure 14). A comparison of the check-in and check-out moments is visualised in Figure 15.

Figure 14:　Validators from three different train operators at a train station. This is an invisible payment border.

Conceptual check-in and check-out model of travellers
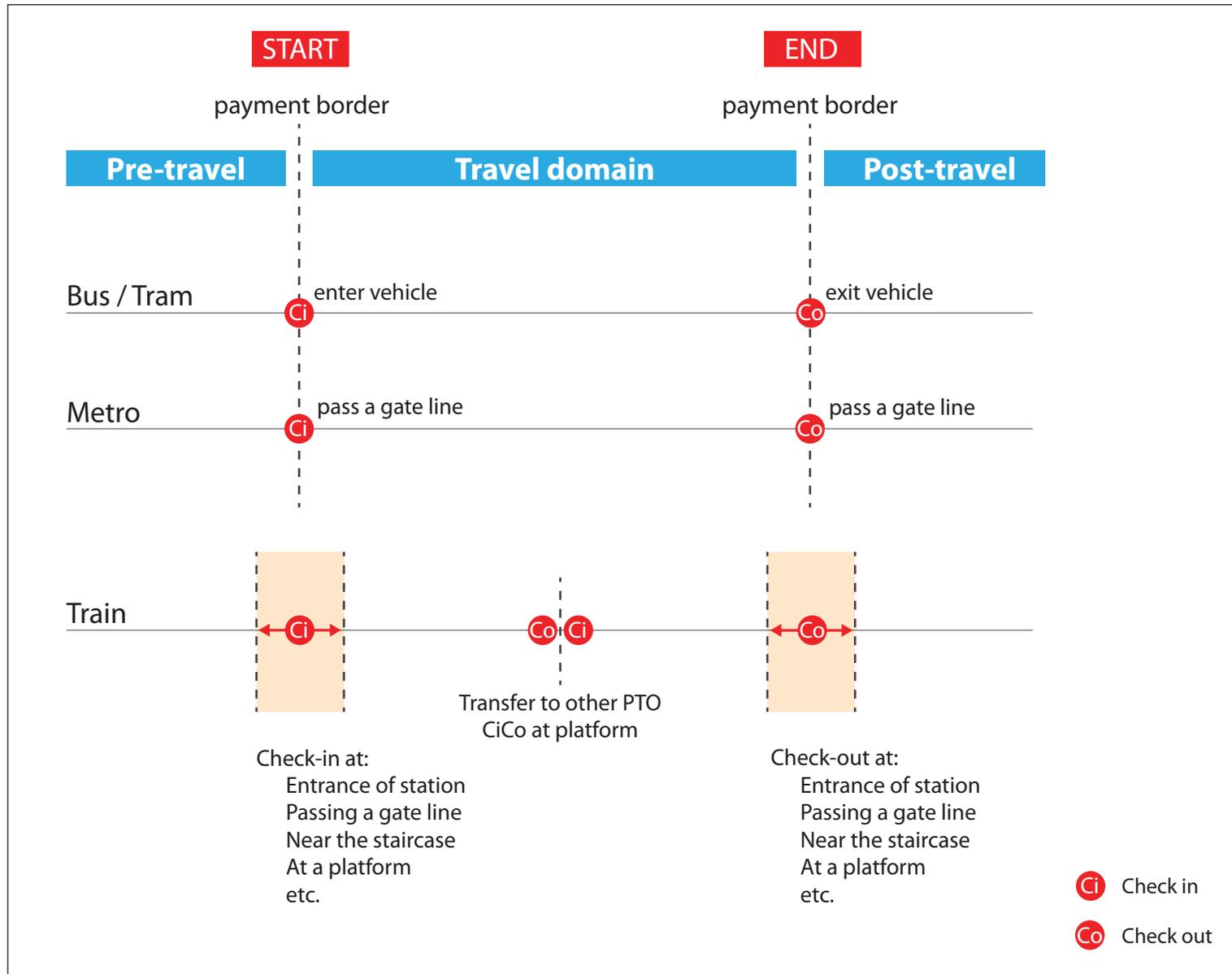
Figure 15: The conceptual model of the current payment border. Bus, tram and metro domains are very clear, the train domain is unclear for travellers.

3.2 Analysis of touchpoints: functions and appearances

All contact points and interactions with the OV-chipkaart system are defined as touchpoints and can either be physical or non-physical. Touchpoints of the OV-chipkaart can be found at various locations or near the travel domain.

I will discuss most common types of touchpoints; both Technology-based Self-Service (TBSS) and non-TBSS. Figure 16 shows three touchpoint categories, TBSS touchpoints are depicted individually.

More elaborate information about the touchpoints can be found in Appendix A - 'Touchpoint analysis'.

Technology-based Self-service
- Validator
- Gate
- Pick-up device (PUD) and Add Value Machine light (AVM light)
- Add Value Machine (AVM) and Ticket Vending Machine (TVM)
- SOS and Information post

Employees
- Ticket desk
- Service desk
- Bus and tram driver
- Conductor

Other
- Signs
- Information panels
- Audio messages

validator   gate   Add Value Machine light and Pick-up device   Ticket Vending Machine and Add Value Machine   SOS and information post   employees   other

Technology-based Self-service
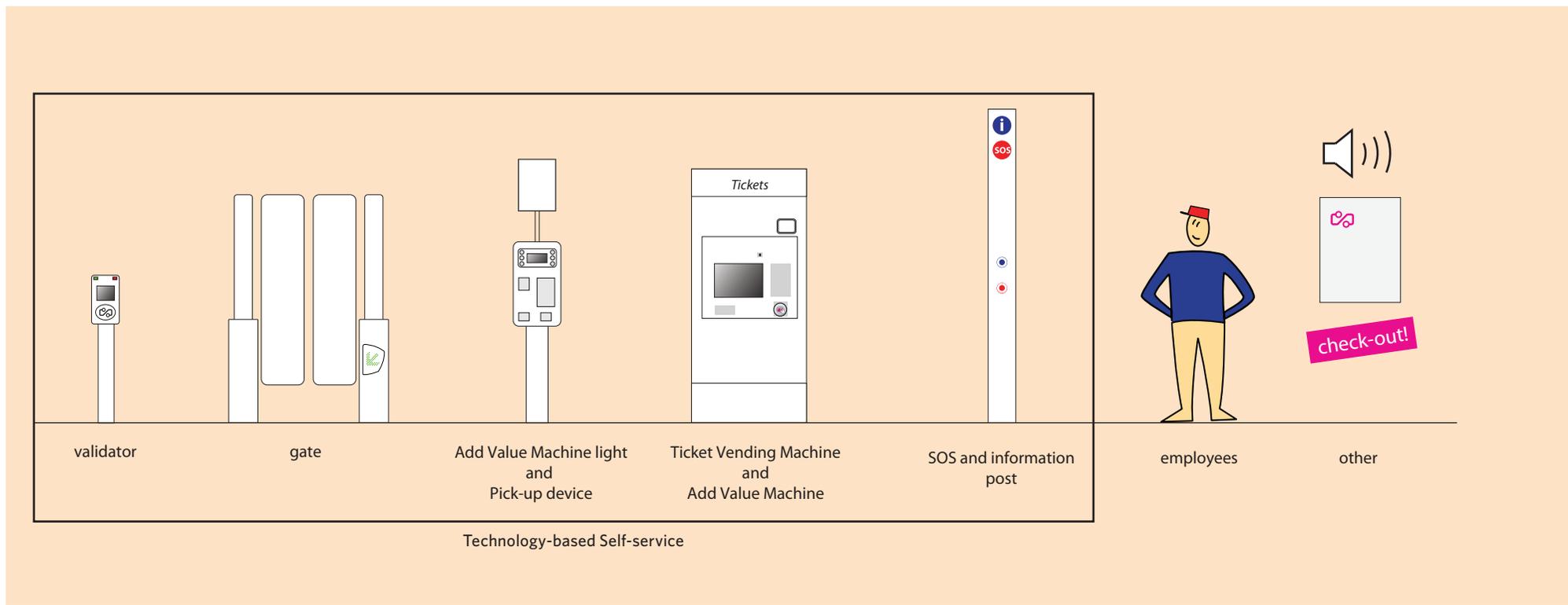
Figure 16:   Overview of touchpoint categories; Technology-based Self-service, employees and other.

3.2.1   Technology-based Self-service

Self-service technologies replace the personal interaction by enabling customers to carry out a certain service without the direct involvement of an employee of the company. These technologies can be found more and more in the public transport domains.

Validator

The purpose of a validator is to calculate the fare. At check in it will check which products are on the card and it deducts a deposit. At check out the validator calculates the fare based on the distance travelled. Error messages at check out are rare; the card met all conditions at check in already. Validators will mainly indicate when a card cannot be read well enough.

Location
The location of validation equipment for almost all modalities is constant except for the train domain. Gates or validators are placed near the entrance, the passenger tunnel, the staircase or on the platforms. Travellers have to scan the station for validation equipment from the entrance till the train and vice versa. Regular travellers are trained to look for equipment instead of performing a skill: presenting their card at the right moment.

Operating validators
The interaction with a validator consists of only one active action from the user: presenting the card to the validator. After this action travellers get feedback about the status of the card, they read the message and pass on. This is a description of the ideal situation.

There are no use cues for holding a smart card in front of a reader. Travellers are dependent on feedback of the validator to understand whether their action was correct. There are no buttons to interact with the validator after the feedback is given. The only option is to present the card a second time, repeating the same action, starting the interaction from scratch. Figure 18 shows this simple interaction flow.

The duration of the messages are especially important for user groups with little experience in using the OV-chipkaart and public transport. Frequent travellers also experience a lack of time to read the messages.

Feedback
Validators give feedback via various indicators: audio, light and display. These three indicators work redundant from each other and (should) respond at the same time. Timing and duration are additional variables when looking at the combination of the indicators.

The terminology and even language differ per validator supplier and can differ per transport operator. The type of display is a major factor when it comes to the ability to show the amount and types of text. Most displays only show letters with a fixed-width, simple LCD displays only show capital letters. Figure 17 shows two different validators, each validator has its own interaction character.

Figure 17:   Two validators with different appearances and different displays. Resulting in different feedback and overall interaction.

Main user issues

- Location of validator in train domain is not clear. Validators can be found at different types of locations or at multiple locations at the same station.
- Validators give status of card only and stop there. No suggestions for further actions are given.
- Users try to achieve multiple goals at one device. Check in, check out, transfer, read message again.
- Travellers forget to check out. There are very few indicators present to remind travellers to check out.
- Unclear and inconsistent feedback among the different suppliers of validation equipment.
    - Little time to read messages (2 seconds) and time limit is independent from length of message.

- Multiple fonts are used which are hard to read.
- Red and green signal lights are placed inconsequently. Hard to differentiate for colorblind travellers.
- Low contrast of LCD character displays.
- Different beep sounds.

audio signal
light signals
display

RFID reader

optional pole

validator

present card

OK   NOT OK

try again   seek help at other channel

fix at other TBSS   mobile phone, Internet, service staff, ticket desk
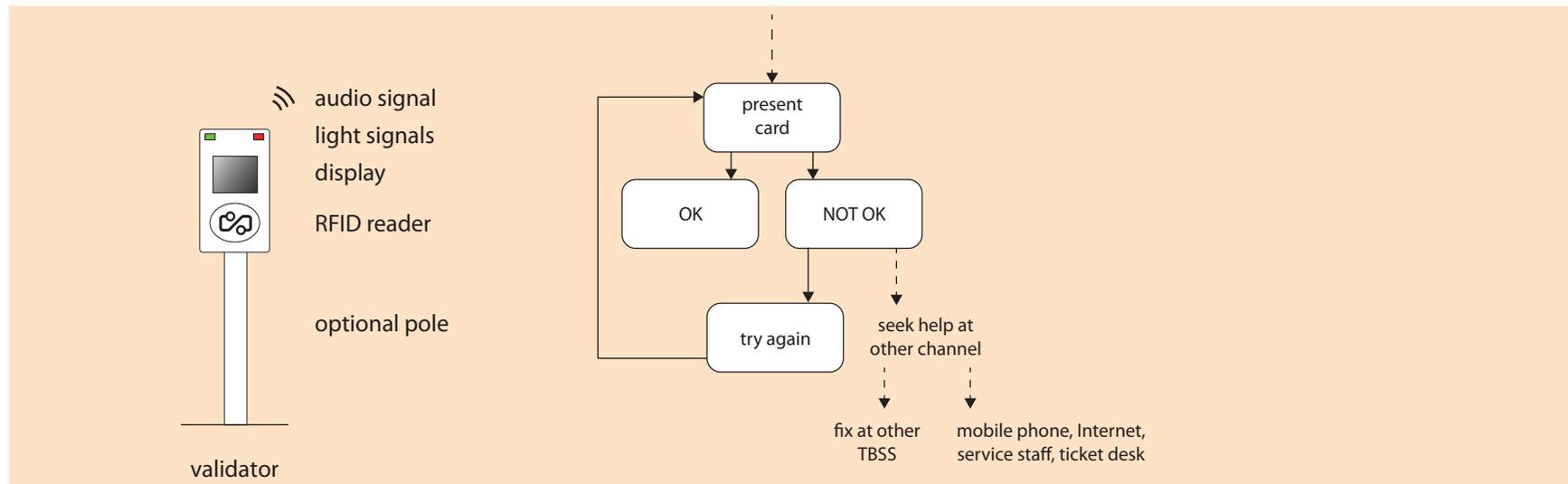
Figure 18: Schematic overview of a validator and available actions. In case of an error there is very little extra information for the user.

Gate

The purpose of a gate is essentially identical to a validator but has an extra function: closing off an area by doors. This makes the location of gates more critical and often bound to the entrance of the station.

Location
Gates are very present. Most gates have 2 meter high doors and are very prominently placed in a hall, passage or entrance. The location is strongly to related to an entrance of a station, tunnel or platform. The decision is made on the space available and whether certain facilities will be closed off or not.

Feedback
Gates give feedback via various indicators: audio, light, display and doors. These four indicators work redundant from each other and (should) work at the same time. Timing and duration are additional variables when looking at the combination of the indicators. The most important feedback of gates are the doors. The doors are in front of the user and very prominent. Other signals come from the sight of the user and are smaller in size. Figure 19 shows a schematic overview of a gate and available actions.
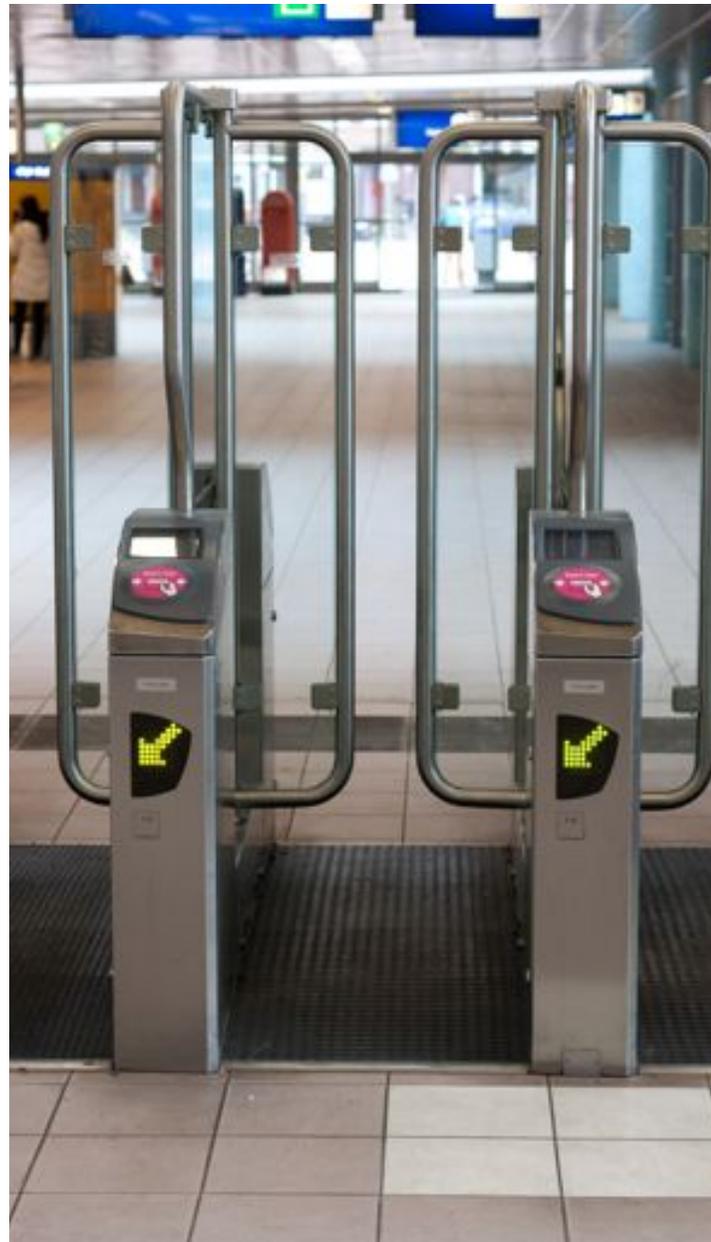
Main user issues

- Gates are used to try to achieve multiple goals. Check in, check out, transfer, read message again, enter and exit station building. These goals can come in conflict.
- The doors can close suddenly when more people use it short after each other and the card of the second user is not validated correctly.
- The duration of the open doors is especially important for user groups with little experience in using gates.

- The direction of two-way gates can switch instantly. When approaching users have to look at the other side to see oncoming travellers.
- The sensors in the gate also respond to objects like suitcases, bicycles and children trolleys. Creating unexpected and irrelevant errors for the user.

Pick-up Device and Add Value Machine light

Pick-up devices (PUD) got their name from the main function: picking up products and activations bought or selected via the Internet. With AVM light devices it is also possible to add value to an OV-chipkaart by paying with a debit card. The functionality is basically the same as an AVM, but with a smaller footprint and a smaller screen with tangible buttons to the sides.

Location
Pick-up devices can be found near or in the travel domain: a platform, a bus stop or in a bus. Devices in the bus are only accessible with a valid ticket and are generally operated when the bus is driving. AVM light devices can be found in convenience stores, tobacco shops and super markets. Some counters also sell anonymous smart cards without credit.

Operating PUD and AVM light equipment
PUD and AVM light equipment is characterized by small displays and few buttons. Transaction or product overviews can only be given by using multiple 'pages'.

Main user issues

- Equipment comes from multiple suppliers with different options and services.
- Travellers have no other option for help. Employees of shops are not trained and paid to give information.
- Employees of shops have no control over the system when a payment by cash has to be cancelled or there is a failure in the system.
- Information on the display and receipt is not clear: abbreviations, short phrases, etc.

- The components in AVM equipment seem to be arranged from a technical architecture perspective instead of a logical one, which would follow the actions of users.
- Because of the difference in services, users have to consult the OV-chipkaart website to be sure what services they can expect at a certain location.
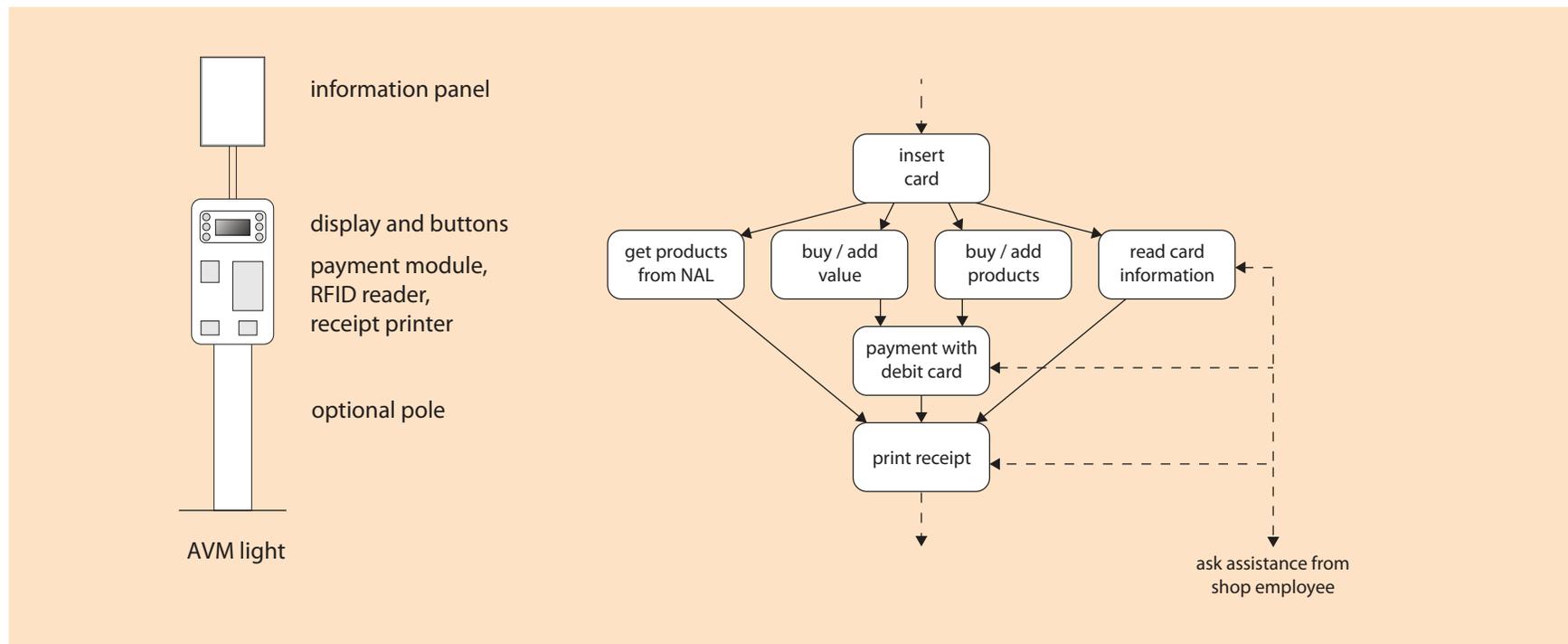
Figure 20: Schematic overview of an AVM light and available actions.

AVM and TVM

Add Value Machines (AVM) and Ticket Vending Machines (TVM) are used both in the train and metro domain. The main difference is the possibility to buy paper tickets or disposable smart cards at a TVM. Anonymous smart cards can be bought at TVMs as well. Travellers can use various payment options: various debit cards, coins or bills. At some locations, like Schiphol station and Amsterdam Central station, credit cards can also be used.

Location
AVM and TVM equipment is located just outside the metro and train travel domains: near gates, platforms or entrances. They are usually highly visible because of the dimensions and striking colors.

Operating AVM and TVM equipment
Add value and ticket machines are operated by touchscreens. These displays are comparable to midsize computer displays. Almost all actions are done via this touchscreen. Other buttons, slots and input options are related to the payment and the output of tickets.

The NS has an extra option for 'help on distance'. Travellers can call a free telephone number which is indicated at the outside of the machine, service employees can answer questions and have the ability to take over the control of the machine.

Main user issues

- AVM and TVM are seen as sales channels, not as service channels. Both by travellers and transport operators. Travellers do not always consider using the machines because they do not know the full potential.
- AVM and TVM start with a standard screen, they do not respond to the actual needs of travellers like service employees would do.
- Overall interaction of different AVM and TVM is very distinctive: positive and negative.

- Not all travel product and travel data is visible at machines of other operators.
- Help on distance sign is not noticed by travellers.
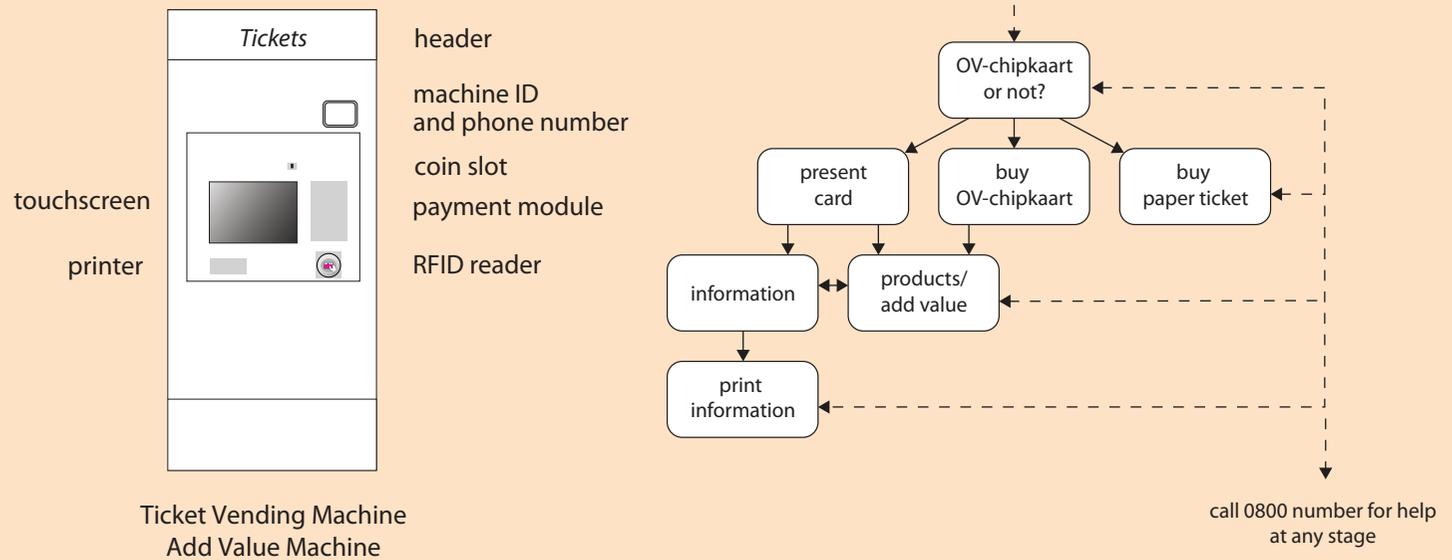
Figure 21:   Schematic overview of a ticket machine and available actions.

SOS and information post

SOS and information posts have two functions combined in one. It generally consists of a post with an SOS button, an information button, two loudspeakers and some explaining text. The SOS part is directly connected to emergency services. This post is at the border of technology based self-service because it is actually a communication device to contact a call center. Figure 17 gives a schematic overview of the SOS and information post.

Location
These posts can be found in metro and train domain. In case of gates they are placed inside and outside the paid area. At smaller unmanned stations in the train and metro domain these are placed at platforms.

Operating SOS and information post
Most posts have two buttons: one for information and one to call for help in case of emergencies. Once the button is pressed, travellers are connected to a service center or a security center and the overhead camera is activated. There is a microphone and an audio speaker built-in. The loudness of the audio is independent of the location and context. Only the service employee is able to end the call.

Main user issues

- Travellers are still hesitant to use the post to call for help or information. The red SOS sign deters travellers from using the information function. Communicating with a service desk in public is a second issue. (personal communications, Raja Schmidt - NS)

- Travellers with OV-chipkaart problems cannot be helped right away. Service staff on distance cannot read the status and information of the card. Travellers are redirected to the nearest service desk or, in case of an NS post, to a TVM and then asked to call a service number.
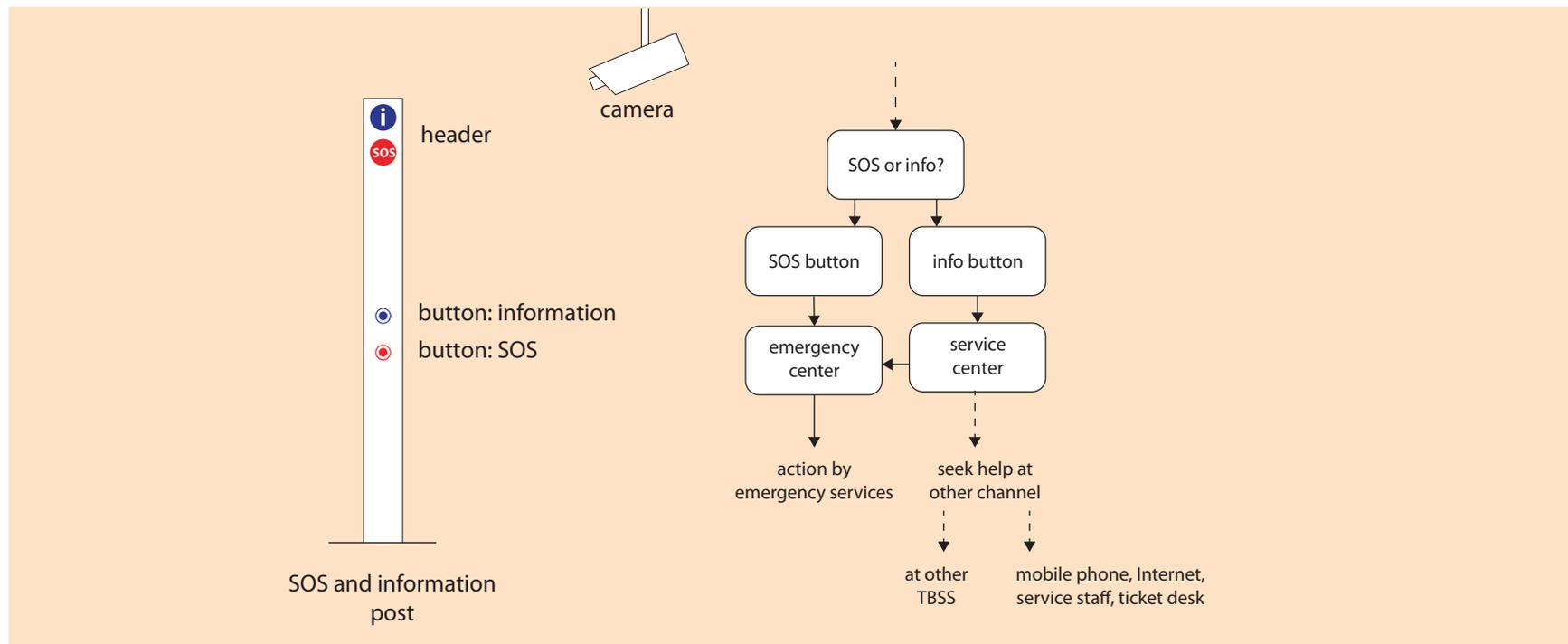
Figure 22: Schematic overview of a SOS and information post and available actions.

3.2.2 Service employees and other personnel

Travellers could come in contact with various employees. These employees all operate in different contexts like a service desk at a station, in a vehicle or behind the steering wheel. Although they all can be approached to help with OV-chipkaart issues, their main job description and associated responsibilities and abilities are very divers.

The most important quality of personnel is the ability to respond to the direct needs of travellers. There are only a few actions (questions) by travellers to go to a servie employee.

Ticket desk

Ticket desks can be found at bus, train or metro stations. Employees at the ticket desk are able to read the OV-chipkaart and see what is stored in the card. They give advice in case of severe problems. This results in paper forms, a phone number or the address of a website. Small problems can be corrected directly.

Ticket desks are usually located in a separate closed off room near a main entrance of a station. The threshold for simple questions is higher than the information desk. Travellers can expect to stand in a queue.

Information desk

The information desk can be found in the NS travel domain at big stations. Employees can give information about the time table and the status of the OV-chipkaart. They use a personal validation unit (PVU) and are not able to look for extensive information. They will redirect travellers to a ticket machine or a ticket desk. Although the abilities of service employees to solve problems are very limited, travellers find their help useful and the threshold to walk up to their booth is low.

Driver

The main task of a bus and tram driver is to bring travellers from A to B. Their second task is to audit the check in action of travelers and sell disposable tickets. The driver is able to answer the most common questions about the OV-chipkaart, but is not able to look at the transactions stored at the card and solve problems.

Conductor

One important task of a conductor is 'ticket collection'. With the OV-chipkaart this means 'checking the status' of the OV-chipkaart. These employees can only see data stored on the OV-chipkaart; they use a PVU for this. The abilities of conductors to solve problems are limited and they can only refer travellers to a service desk, call center or the Internet.

Main user issues

- Most employees can only give advice to travellers when it comes to severe problems with the OV-chipkaart or bought products. They refer to websites or call center to solve the problem.
- The different types of employees have different mandates, this is not always clear to travellers.

- Most travellers feel insecure when a conductor enters a compartment, they are asking themselves: 'Did I check in?'. This feeling of insecurity is justified because a conductor can give a fine or ask travellers to leave the train if their ticket is not valid.
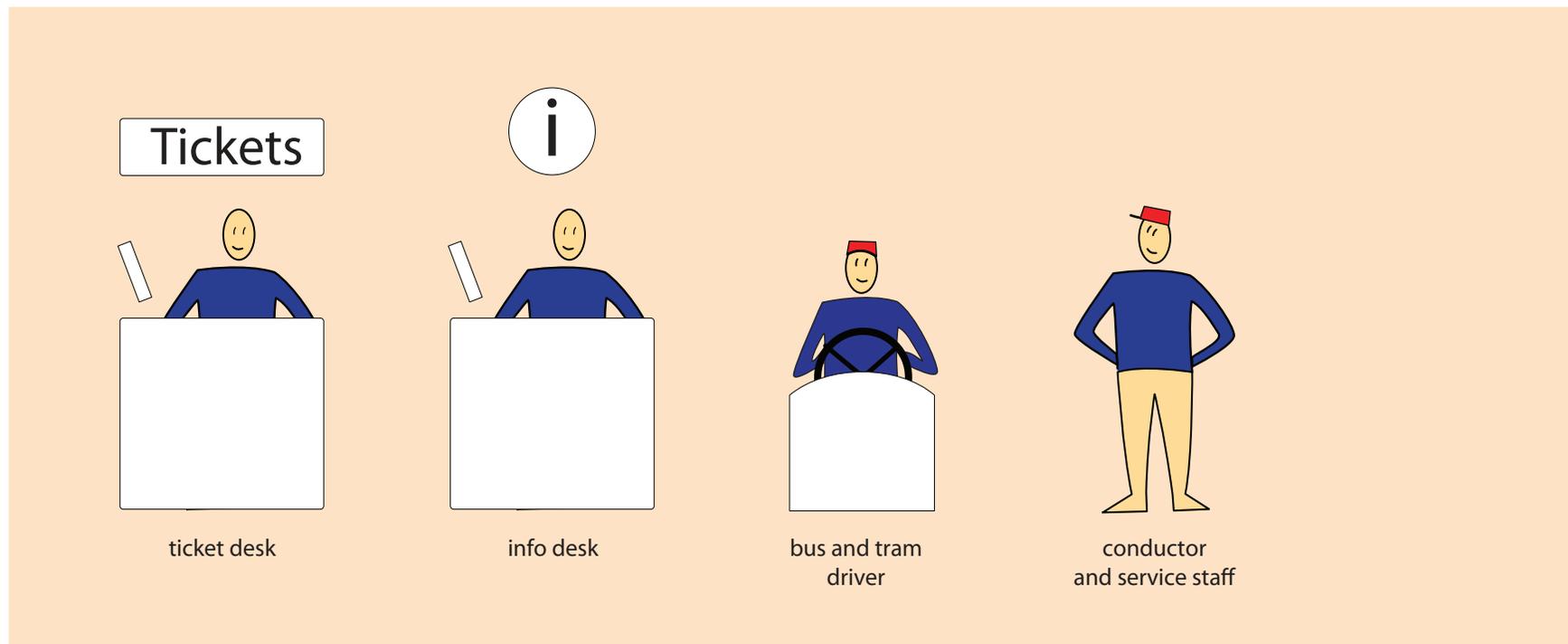
Figure 23: Overview of different employees.

3.2.3   Other touchpoints

Other touchpoints with the OV-chipkaart is printed information appearing on different media. An other remarkable medium is the spoken audio message in trains, trams an metros. Almost all messages are linked with the check in and check out process.

Stickers and signs

Stickers are placed at doors near validators to remember travellers to check out. Other stickers are meant to guide travellers to the correct spot to tap the RFID reader. One unified symbol is created to be used at all smart card readers except smart card readers with a slot.

Informing panels and brochures

Some posters can be found at platforms and station areas; the content is usually about product offers. Brochures can be found near ticket or information desks, they give information on the card, system and the usage. Not all use case scenarios are addressed; there are some crucial rules left out, like time limitations and the possibility that a card gets blocked.

Audio messages

In almost all modalities audio message are used to remind travellers to check out when leaving the vehicle or the station. Especially the bi-lingual messages in the train get longer and longer: place of arrival, reminder to take your luggage, optional transfer platforms and delays and... a reminder to check out.

- Most signs are used to remember travellers to check in or check out. The design of the check in and check out zones is apparently not enough to guide travellers to the desired action.
- Near the check in and check out zones very little information is given about the OV-chipkaart system or information about how to solve problems.

- The OV-chipkaart stickers are not placed at all equipment.
- Signs are used for routing or reminders, little information or explanation is given on the system or problem solving.

OV-chipkaart hier inchecken of uit checken voor NS

check-out!

"Do not forget to check out!"

stickers and signs   check out / in sign   informing posters and brochures   audio messages
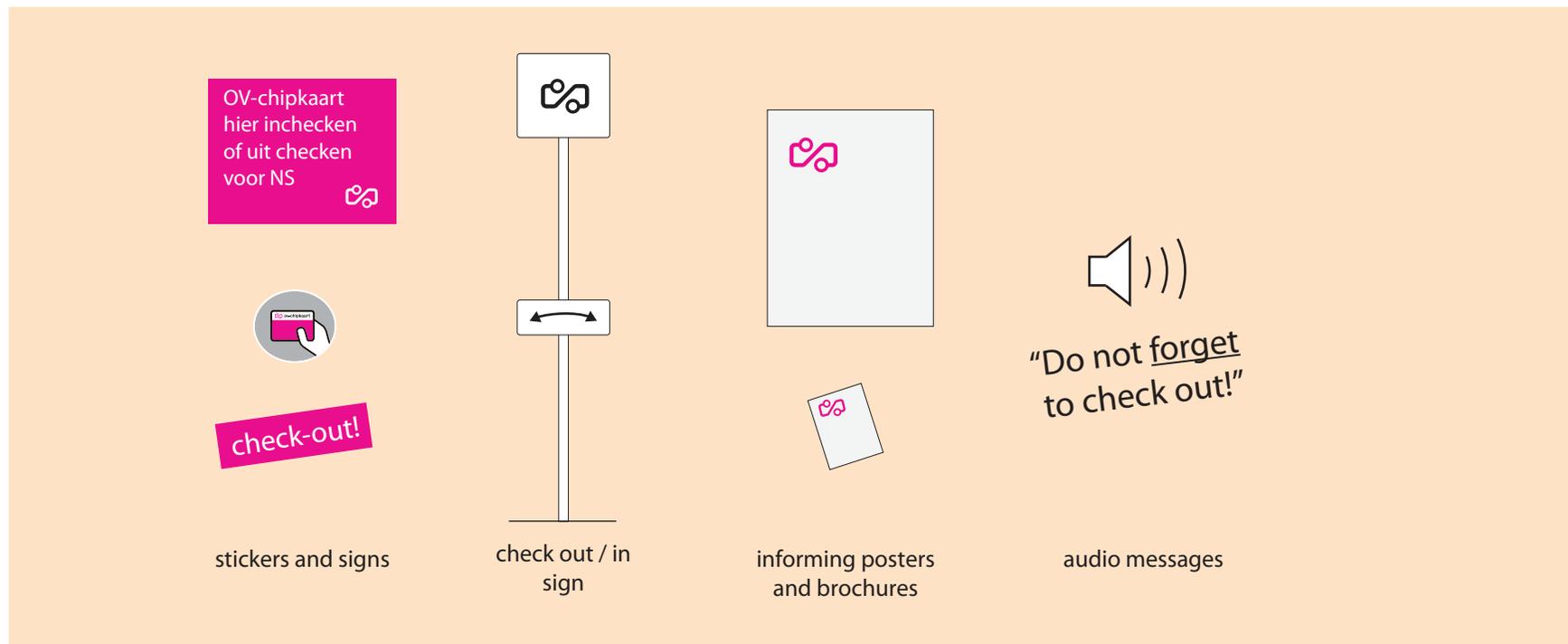
Figure 24: Overview of various other touchpoints.

3.3 User observations in the travel domain

During the analysis of the travel domains also user observations were performed. Observations were done in three different domains: metro, bus/tram and train domain.

The main goal was to understand what people are actually doing when they check in or out. The important thing is to see what the use is in the specific contexts; which factors are important for the interaction with OV-chipkaart equipment?

Method

Travellers were shadowed from just before check-in till just after check out. When possible this was recorded on video and when possible travellers were asked about remarkable events that just happened. The focus was on the check-in and check-out action. Travellers were also observed during their journey to see what they do with their OV-chipkaart. Multiple train stations were visited: types 1, 3 and 6 (Van Hagen en De Bruyn, 2002) during peak and off-peak hours. Metro stations, bus stops and tram stops were visited in city centres and rural areas.

3.3.1 Observations in the bus and tram domain

The interactions with validators in busses and trams are charaterized by entering and leaving vehicles. Travellers are multitasking and have little attention for OV-chipkaart actions. When an OV-chipkaart refuses to work travellers buy paper tickets in the bus or just take a seat without bothering in case of the tram. Specific elements of a journey by bus and tram are divided in three phases: 'check-in', 'travel' and 'check-out' (see Figure 25).

Figure 25: Three phases in a trip and the most remarkable issues.

Check-in

Travellers waiting in line to board the bus during peak-hour.

Travellers have to wait for other passengers till they can use validation equipment. With the introduction of TBSS the validation action shifted from the bus driver to travellers. Travellers are now waiting on other travellers instead of the bus driver, they are impatient. The user who is actual checking in feels this pressure and the urge to validate as quickly as possible. Not only other travellers are waiting till the validation is finished, also the bus driver is waiting.

Travel

A traveller holding her OV-chipkaart in her mouth to avoid to forget checking out.

Most travellers in bus and tram hold their card in their hand or pocket, ready to check out. Two factors are important: the duration of the trip and the frequency of the specific route. First comes the frequency of the route; travellers who take a specific bus service for the first time are more likely to hold the card in their hand. They are occupied with taking the correct bus stop and paying attention to the route. At longer trips travellers tend to put the card in their wallet or a pocket of a jacket or bag.

Check-out

A traveller waits for feedback from het validator at check out while the door is still open and the driver is waiting for her to disembark.

Checking out is similar to checking in when it comes to the pressure of waiting passengers and bus driver. Travellers check out while the bus is still driving or just before leaving the bus because other passengers were in front of them. Generally travellers want to get more feedback from the validator: confirmation of the check-out action, the price of the trip and the credit on the card after check-out.

3.3.2   Observations in the train domain

The speed with which travellers pass a validator in the train domain is much higher than in a vehicle or a closed gate. Travellers can have their own pace. For most travellers the pace is relatively high, for all sorts of reasons: out of routine; in a hurry to catch a train; peer pressure in a crowded corridor. The effect is dat most travellers are not really aware of their actions and the feedback of the validator.

Important OV-chipkaart moments in the train domain are the 'check-in', 'check-out' and actions at the 'ticket machine' (see Figure 26).

Figure 26:   Three moments in a trip and the most remarkable issues.
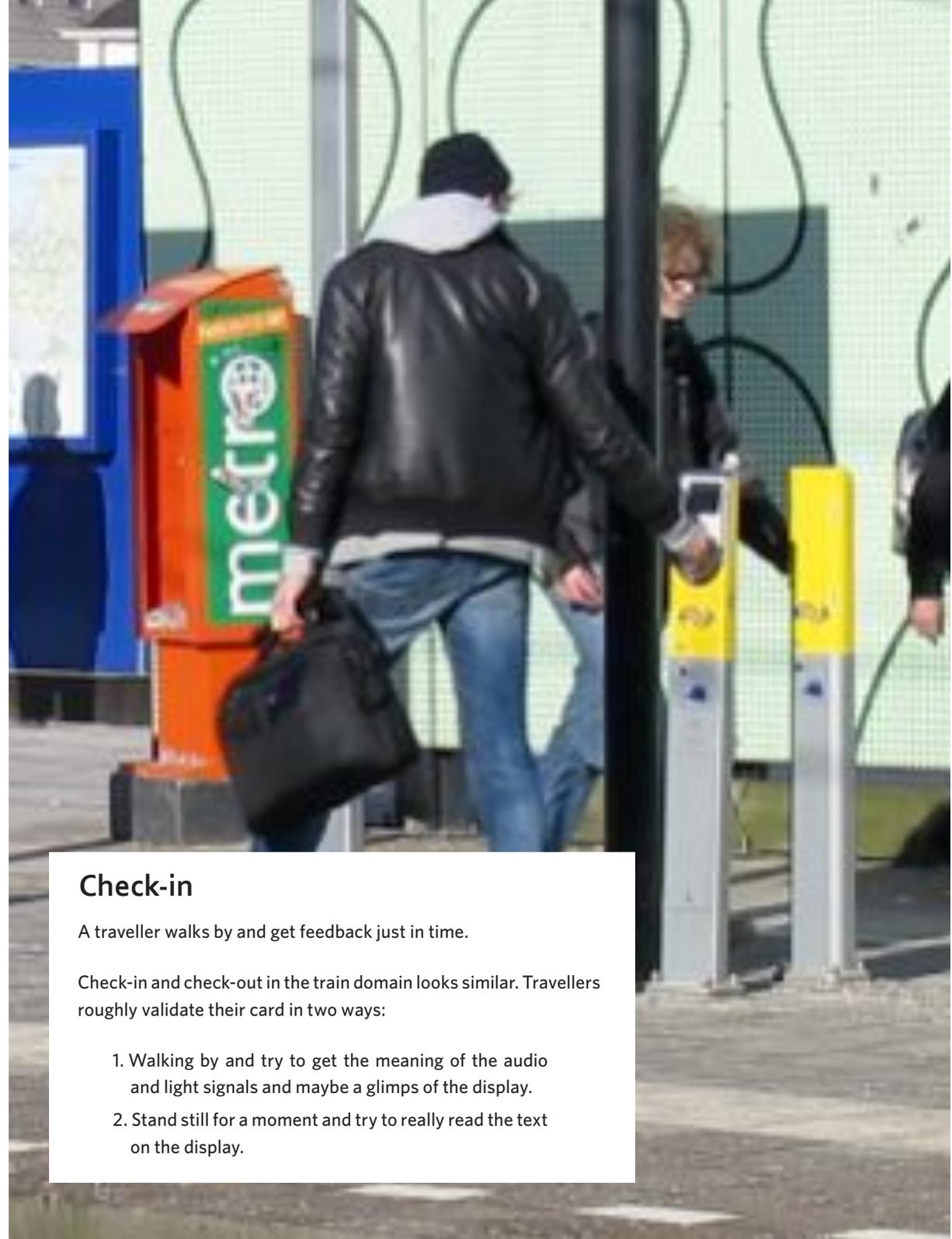
Check-in

A traveller walks by and get feedback just in time.

Check-in and check-out in the train domain looks similar. Travellers roughly validate their card in two ways:

1. Walking by and try to get the meaning of the audio and light signals and maybe a glimps of the display.
2. Stand still for a moment and try to really read the text on the display.
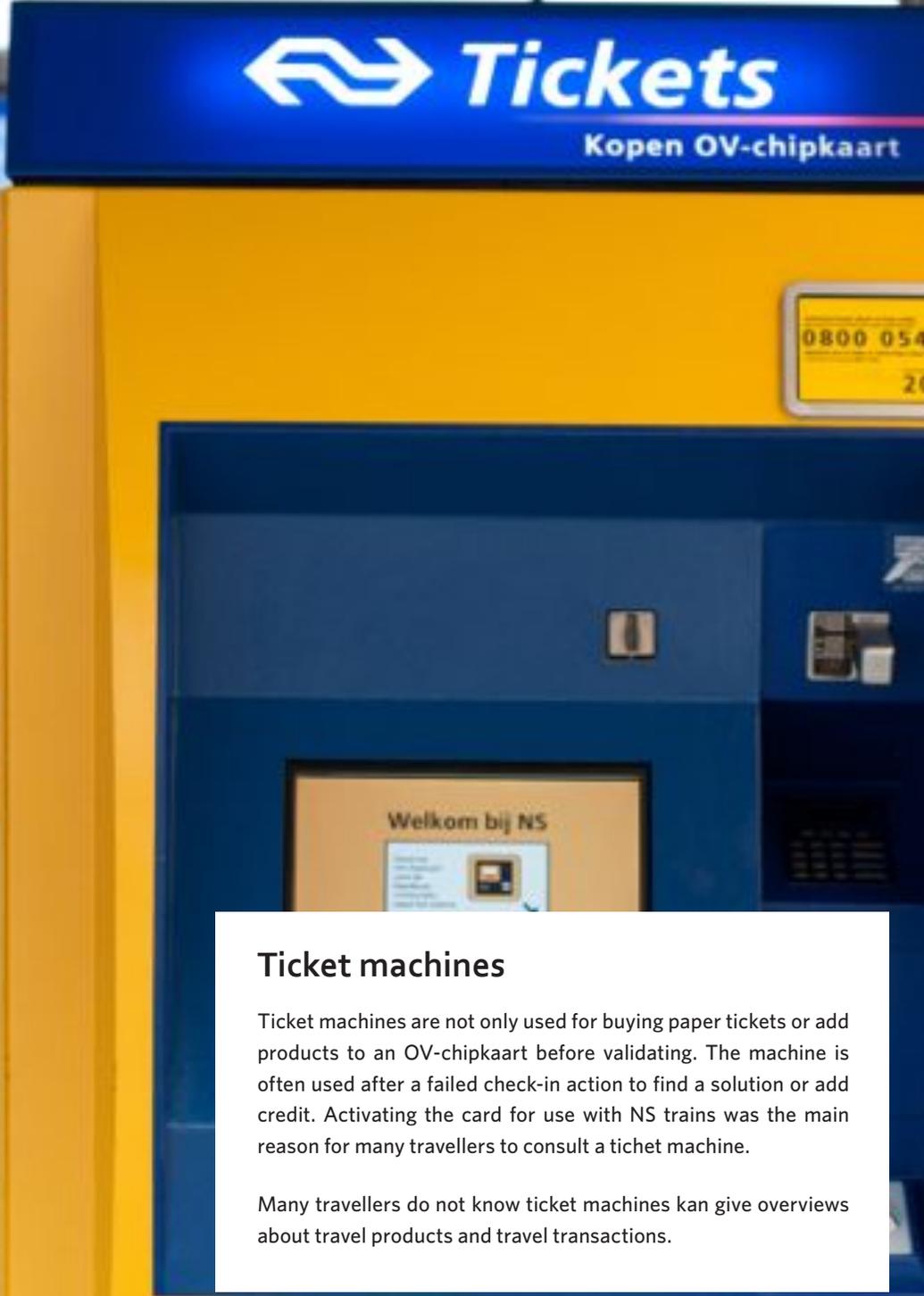
Ticket machines

Ticket machines are not only used for buying paper tickets or add products to an OV-chipkaart before validating. The machine is often used after a failed check-in action to find a solution or add credit. Activating the card for use with NS trains was the main reason for many travellers to consult a tichet machine.

Many travellers do not know ticket machines kan give overviews about travel products and travel transactions.

Check-out

A traveller bends over to have a better look at the display.

As with the bus, travellers want to get more feedback at check-out. Reflections of the sun or other lights in the area make it difficult to read the information on the display. Travellers try to cover the validator or bend over to establish a better viewing angle.

3.3.3 Observations in the metro domain

In contrast to the train domain these gates are all closed. The check-in and check-out flow is dictated by these gates. It is clear for travellers they have to do something with their OV-chipkaart.

This is something what happens many times: people tap their card on their left-hand side. The door of the next gate opens, travellers then have to understand what is going on and respond to this unexpected situation. Some people change gates, others do not understand what is going on and the gate closes again. Figure 27 shows the sequence of such a situation.

Special situations occur when travellers bring all kinds of objects or fellow travellers to the metro domain. Some examples are given on the opposite page.

A traveller checks in on the left-hand side.

"Check-in OK", the traveller walks up to the doors.

Traveller realizes the doors stay closed and the next gate is opened.

The traveller passes the gate.

Figure 27:   A traveller checked in at the wrong gate, she did not understand which RFID reader belonged to the gate.

1. gate closes

1. in front of sensors

2. gate blocks

3. does not understand

(un)expected behaviour of travellers and gates

There can be a huge gap between the intended usage of a product by designers and the real usage by travellers. In case of gates this is very visible. The examples on this page show that people can encounter very special situations when carrying or bringing all sorts of products to the metro domain. Also passing a gate with children can cause a problematic experience.

2. this man had to check-out again

1. woman thinks she can pass

2. no clear feedback from gate

3. baby carriage got stuck

4. man has to rescue the baby

3.4 Personal check-in and check-out actions

During a six month period I filmed all my personal actions with validators and gates. The goal was to map all different validators and evaluate the feedback behind a desk, out of the context. Almost all different validator types were evaluated in different travel domains.

It became clear there are big differences. Graphical displays and clearly defined audio signals are the best. The different displays and feedback signals are showed in Figure 28. These pictures do not show the delay of the RFID reader, often an underestimated factor for the validation action.

Figure 28: Screentshots of movie clips of check-in and check-out actions: a variety of display types and feedback signals.

3.5   Check in and Check out flow

Journeys can start at the homes of travellers, at their work, in a city center or just in front of a station. The focus of this project is on trips, starting just before check in and ending with a check out. I expect travellers already have bought a card or added credit to it when starting the trip.

A trip consists roughly of various steps and are visualized in Figure 29.

- Way finding and routing
- Wating at bus or tram stop
- Validate – check in
- Problem solving
- Waiting at a platform
- Travel (and transfer)
- Validate – check out

Way finding and routing
Way finding and routing come mainly into play with finding the right platform with the right vehicle to the desired destination. In the train domain this is an important step for the OV-chipkaart. Travellers have to look for OV-chipkaart equipment; they have to scan the area and identify the equipment.

Waiting at bus and tram stop
Waiting is a common action when taking the bus or tram. Travellers have mostly static information like a poster a map and one or more timetables. More and more cities have dynamic time information at the stop. There are no OV-chipkaart actions involved or offered in this step.

Validate: check in
In the validation phase travellers walk up with a card expecting to pass with a correct action. At check in they expect to pass with a valid ticket. They have to remember the most recent status (products and credit) of the card; there are no possibilities to verify this without the help of external products. Travellers basically have a blank card and are 'asking' the validator: "Can I pass?" The validator indicates whether the action is successful or not.

Problem solving
There are two main error types: the validator detected a smart card but it cannot be read properly, it will indicate, "Try again". In case of mismatching products or credit the validator gives the status of the card: "Not enough credit" or "Card not valid" for example. It does not give extra information what travellers should do to solve these errors. The interaction stops with questions with the users.

Wating at a platform
In case of a trip by train or metro, travellers are waiting for the vehicle to arrive after they checked in. Travellers are asking theirselves: 'Have I checked-in already?' When this happens they have to prioritize again: go back to the station hall, find a validator on the platform, or catch the train or metro without knowing exactly whether they are checked-in or not.

Travel (and transfer)
I consider a journey with a transfer between different modalities as two separate trips. The transfer between two train operators is an exception. In the current situation travellers are asked to check in and out. Single check-in / check-out, as described in 'Enkelvoudig in- en uitchecken in de treinketen', permanente structuur, is highly desirable by travellers.

Validate: check out
In the validation phase travellers walk up with a card expecting to pass with a correct action. At check in they expect to pass with a valid ticket. They have to remember the most recent status (products and credit) of the card; there are no possibilities to verify this without the help of external products. Travellers basically have a blank card and are 'asking' the validator: "Can I pass?" The validator indicates whether the action is successful or not.

DEPART | **ARRIVE**

Way finding | Validate | Problem solving | Platform | Travel | Validate

Scan	Identify	Driver	Status Gate or VAL	Present card	Feedback	Problem solving	Platform	Travel	Check out
From which point do I have to pay?	This is the border	Do I have to communicate with the validator or bus driver?	Which gate in gate line	Location of reader Ergonomics	Speed of feedback <300 ms	Identification Attribution Prioritization Trying Resolve	Verify status of the card Checked in or checked out?	Verify status of card with conductor	Stepping of the bus
Visable from various angles	Validator or gate?		Is gate one or two-way?		Clear distinction check in check out	Diagnosis Full card information	TBSS Card reader	Advice from conductor	Check out reminder
	Validator on the route to vehicle		Validator operational?		Minor error 1 Try again 2 Go on, but... 3 Go back (TBSS)	Static information Link to conceptual model	Card level Card with display		Clear check out
					Big error STOP! Go back (TBSS)	TBSS Card reader Service machine			Card level Card with display
					Advice from driver	Advice from service staff			

Figure 29: The OV-chipkaart is not only about validation; travellers have to think about a lot more when using the OV-chipkaart.

3.5.1 Interaction with a validator - a role play

What would happen when a validator became human? That was the main question when making a small video clip of the difference in interaction between a machine and a human. Two scenarios were played. In the first scenario (see figure above) an actor played a machine-like interaction: formal and consistent in every situation. The validator follows protocols, but the protocol does not say anything about the user interface and interaction.

In the second scenario (see figure below) the responses of the validator were more human-like: more friendly and helpful in case of errors. His actions came from a universal protocol, in which the interaction with travellers is described.

The video of this role play made very clear what the differences are and help to understand the interaction between validators and travellers.

Link to video clip (Dutch): http://bit.do/humanlike

3.6   Conclusions of the analysis

The observations in the travel domains resulted in new insights about the travel domains, the touchpoints and the actions performed by travellers.

3.6.1   Travel domains versus border types

The three travel domains show various differences when it comes to available touchpoints and layout of these elements. More important are the differences in border types; open borders (most train stations), closed borders (gates at train and metro stations) and borders just after entrances of vehicles (busses and trams). A fourth border is used when transfering from one train operator to an other. This fourth type can be described as an open transfer border and is located at a platform in train stations.

The border type categorization is more important than categorization by modality when looking at OV-chipkaart interactions. Because these different border types dictate a specific interaction which depends on the combination of touchpoints and not on the type of modality.

3.6.2   Characteristics of the touchpoints

'Character' of touchpoints
The touchpoints in the travel domains are different in 'character'. Feedback is unclear and ambiguous. English terms and abbreviations are used next to Dutch-English translations.

Interaction resets
The interactions with validators usually stop after one action. For 'normal' use this is acceptable and fast, in case of an error this is not helpful. Travellers have to 'decode' the message and find a solution themselves. Validators are simple devices and seemingly without any link to other touchpoints.

Gates are unfriendly barriers
Gates form an unfriendly barrier with unpredictable behaviour. The basic interaction is comparable with validators, but travellers are confronted with steel doors. These doors dictate the interaction. However, closed gates help travellers to validate and therefor prevent problems when travellers do forget to validate their card.

Passive AVMs and TVMs
AVMs and TVMs are good sources for information of the card but are not pro active helping travellers to solve their problems. The machines are still aimed at selling single journey tickets, products and credit. Travellers start an interaction from scratch even if they just encountered an error at a validator.

3.6.3   Three main problems in the validation interaction

Recognition of 'OV-chipkaart moments'
The location of validators is different for many train stations. Most travellers are scanning the station for validators and regularly forget when they are distracted. Not only the location is important for the findability, the appearance of the equipment is in competition with other services and equipment.

Coherent services and equipment
Many travellers use more than just validators. For adding credit or resolving errors, they use other equipment or service channels. The current equipment is in most cases not coherent and are not presented as a product family, working together to achieve a common goal. The interaction starts over again with each touchpoint making it an unpleasant and time consuming experience for travellers.

Consistency of equipment appearance and messaging
The equipment in the travel domain comes from various suppliers and have different appearances. All transport operators maintain their own equipment or have it done by their suppliers. Operators use different messages for similar tasks. Travellers have to learn these difference or they just skip the text and try to grasp the meaning of light and audio signals.

"Als ik mijn kaart weg stop dan vergeet ik altijd uit te checken."

"I always forget to check out when I stow my card away."
- quote from evaluation with travellers -

4 The core concept: the payment border

The findings of the analysis result in a new design assignment; designing a payment border for public transport operators.

The payment border is a zone in which travellers have to perform an action to acquire a valid ticket for their trip by public transport. This chapter describes three different border types, the problem statement, the scenario of use and the design criteria.

4.1 The core concept

When travellers make use of public transport they have to pay at a certain moment; they make a transition from a unpaid to paid zone. Figure 30 illustrates this border and the associated elements of the interaction. Travellers pass the border to either check-in or check-out (green arrows). At the border (blue dashed line) they perform an action. The result of this action can be positive, check-in or check-out, or negative because of various errors. Travellers are passed (green arrow) or bounced to other touchpoints (red arrows).

This transition consists of three stages. The first stage is about understanding with the travellers they have to do something at a certain location. Travellers also forget to validate their ticket or are not aware they have to do something. They need to be guided towards the moment of validation.

The second stage is the validation action itself. This should be simple action: quick and understandable. When this action is not successfull it should be clear to the traveller where to go.

The third stage is about all supporting touchpoints near the validator. These touchpoints should give information and support.
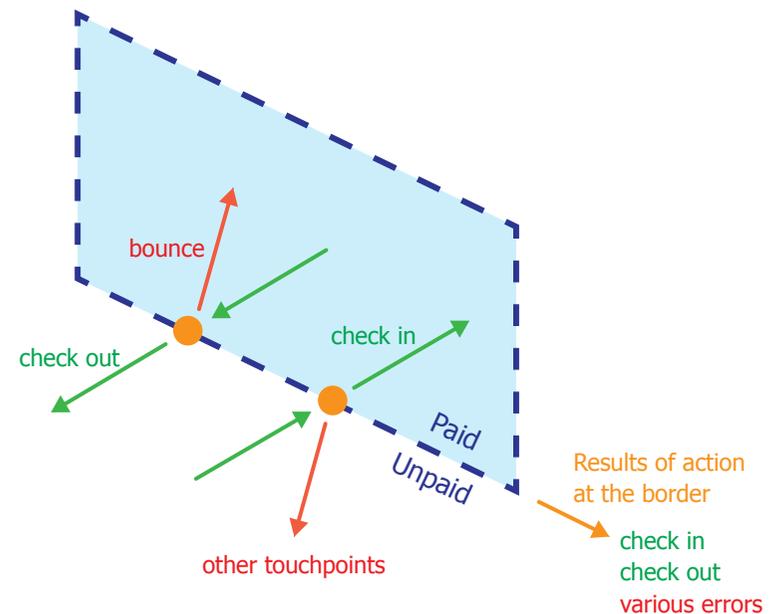

Figure 30: Schematic representation of the transition from the unpoid to the paid side of the payment border.

4.2   Three payment border types

The core concept can be applied to the three different payment border types: payment border in vehicles, closed payment border and the open payment border.

Payment border in vehicles
The location of this payment border is already clearly defined: near the doors of a vehicle. Information and support can be given by the driver of the vehicle. Feedback of the validation action could be better.

Closed payment border
The location of this border is not always clear, but travellers recognize the gates quite quickly or bump into them automatically. Travellers cannot forget to check-in or check-out, that is an advantage of closed doors. The disadvantage of gates is the complexity of the entire gate interaction; the behaviour of a gate is unpredictable and travellers do not always know how to interact with them.

Open payment border
The location of this border type is not always clear to travellers and the border presents itself in various forms. The interaction with the validator is comparable with other validators. The number of supporting touchpoints differs per station and lacks coherence.

4.3   Border type selection: open payment border

The open border type brings the most issues for travellers. Almost all aspects are underdeveloped and should be improved. The most important assignment is to bring coherence in the interaction with this border type.

Although the closed payment border and the payment border in vehicles are defined clearer than the open payment border, there are still flaws in the interaction. Paragraph 4.3.1 and 4.3.2 give possible solutions to help travellers with their interaction with tese border types.

Messaging harmonised with other types of validators.

Extra rim light to attract the attention of travellers when the bus arrives at a bus stop.
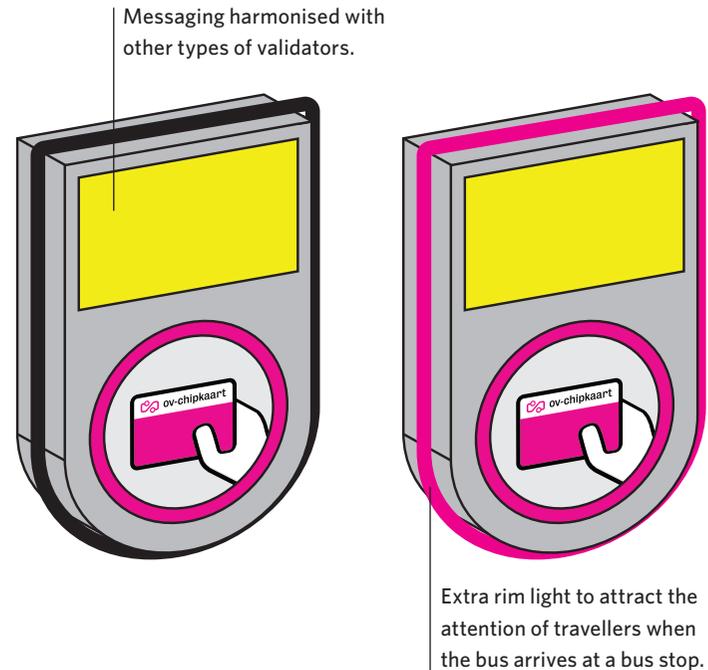
4.3.1   Payment border in vehicles: solutions

The biggest problems in vehicles are clear and uniform messaging and travellers forget to check out. Messaging should be haromnised with other validator types, this is discussed in chapter 5. Extra attention to check-out can be drawn with a dynamic rim light which lights up or flashes when the vehicle arrives at a bus or tram stop.

Extra distance between RFID
reader and display gives travellers
extra time to read messages.

Angle added to establish
clear guidance for travellers.

Eccentric signage to emphasize
the eccentric design

Angle added to establish
clear guidance for travellers.

4.3.2   Closed payment border: solutions

The interaction with gates is dictated by the doors, but in case of errors the display gives feedback to travellers. To gives travellers extra time to read messages the display could be placed near the doors. An other issue is the symetric design of current gate consoles. Some travellers (mostly left-handed) check in at the wrong gate. By placing the front and top plate of the console in an angle this issue can be minimalized.
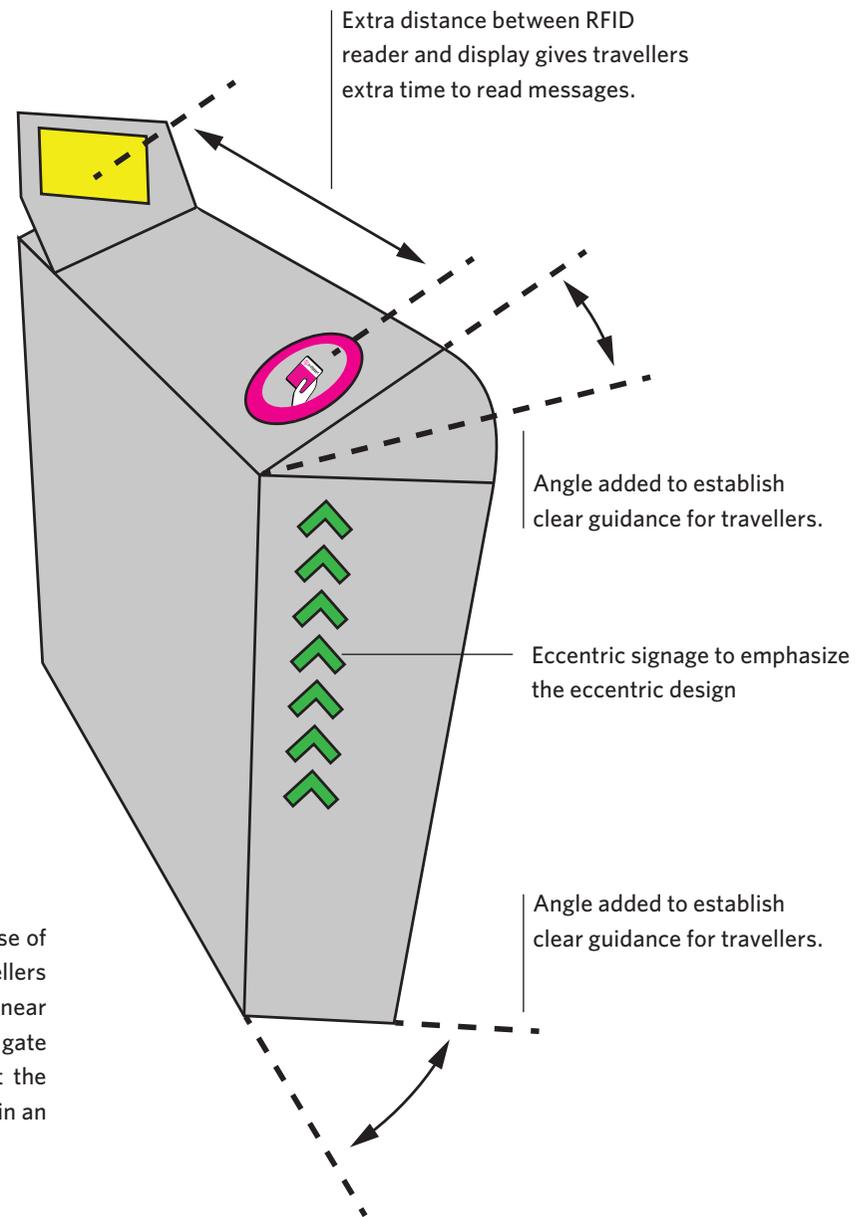
4.4 Open payment border: sequence of use

The payment border facilitates the main function: check-in and check-out. The check-in and -out sequence has three stages:

- Wayfinding & recognition.
- Information & support.
- Validation.

Figure 31 shows the three stage of the open payment border concept and what they should facilitate.

These stages can be followed after each other, but travellers are able to use them in a random order or skip one of the stages when they are already familiar with it. Figure 32 shows an example where the support stage is used after validation. The validation stage which is required at every journey.
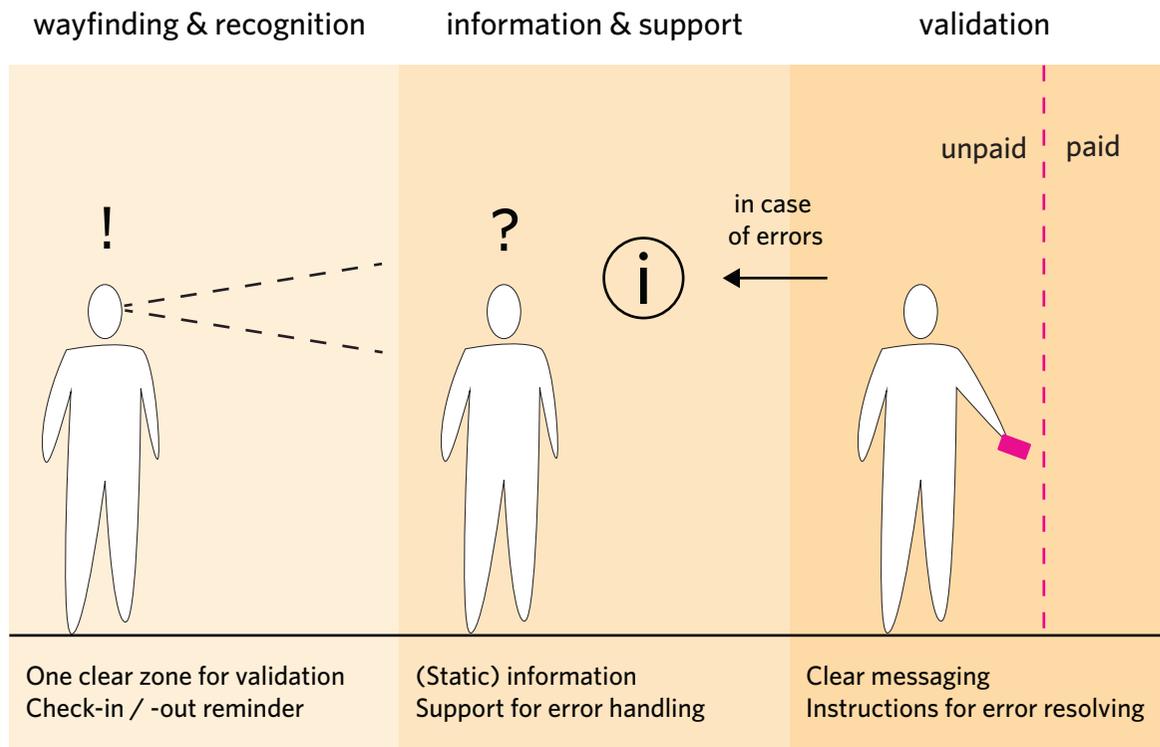
Three stages of the payment border concept and what they should facilitate.

Wayfinding & recognition
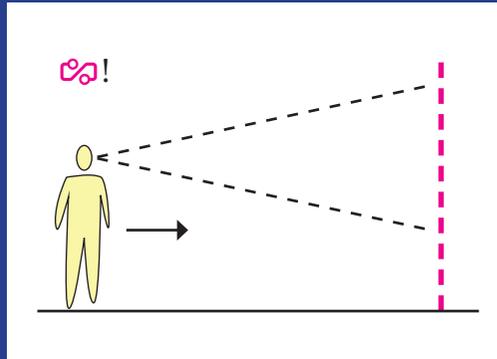
Understand where to use the OV-chipkaart and find information.

Static information

OV-chipkaart

Rule #1

Rule #2

Rule #3
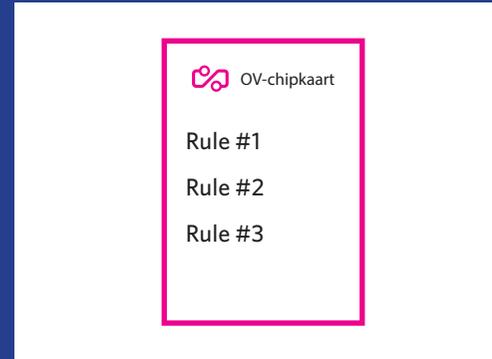
The ability to read about OV-chipkaart rules and how to get support.

Validation

Use the OV-chipkaart and understand the messages. In case of errors an alternative is suggested.

Support - error resolving

Tickets

OV-chipkaart

Rule #1
Rule #2
Rule #3
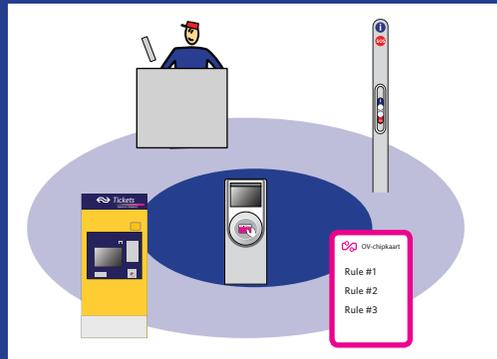
Find a soluation for the problem at other touchpoints near the payment border

Validation (2nd time)
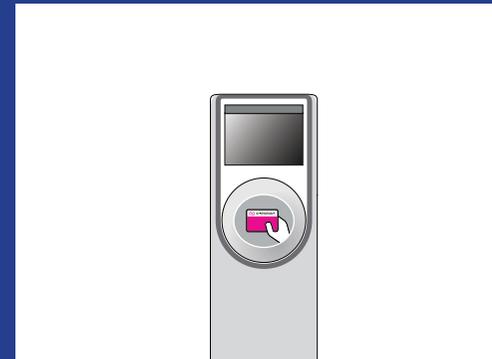
Validate the OV-chipkaart a second time.

Enjoy successful check in!
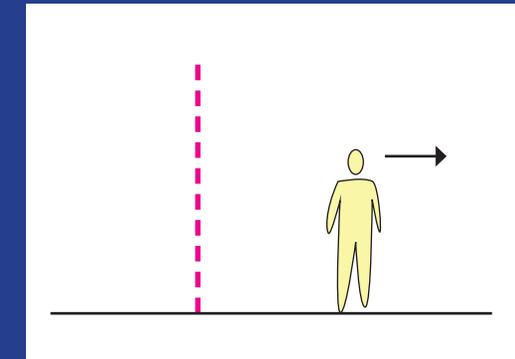
Validation was successful and the traveller can continue his journey.

Figure 32:   Scenario when using all three stages: wayfinding & recognition, information & support and validation.

4.5   Problem statement

The problem statement (Roozenburg & Eekels, 1998)

The problem
There is no clear defined 'open payment border'.

The users; travellers and staff
Everyone who is using public transport is a user (or potential user) of payment systems in the travel domain. Eventually all tickets will carry a RFID chip. Inexperienced travellers with low technology understanding are helped more than others. Average users are helped as well because they do not always understand what is going on.

Self service systems cannot respond to all situations travellers encounter. Service staff will play a role in the payment zone to help travellers with finding a solution for their problems.

Goal of the design
Travellers should be guided in their actions. The design should increase the findability of validators to encourage to check in or check out. The overall experience of validating and problem solving should be fluently.

Conditions
For a clear payment border in train domains it is important that the single check in / check out will be implemented. This is a starting point for the design of a payment border.

4.6   Design criteria

Most important criteria for the design of the open payment border.

The payment border should:

- facilitate clear orientation. Guide travellers to the payment border.
- be recognizable as a location where OV-chipkaart interactions take place.
- have a consistent appearance.
- have a consistent location type at every station.
- facilitate error handling within the payment zone.
- consistent flow throughout the interaction with the touchpoints.

4.6.1   Guiding principles

Validators should act like a friendly service employee: guiding travellers the right way; thinking along with travellers; giving personalized information based on your specific needs.

Equipment in general should meet the expectations of travellers. Consistent feedback is preferable: meaningful signals and messages. Consistent behaviour of equipment is an important factor for users to predict interactions and thus meet expectations.

"Gewoon in- en uitchecken, hoe moeilijk kan het zijn!?"

"Just check-in and check-out, how difficult can it be!?"
- quote from system engineer working at a transport operator -

5 Concept development and refinement

To come to a final design, the open payment border is designed in multiple steps. The touchpoints are designed separately from each other and combined in an overall concept. This chapter describes the various steps of the concept development.

5.1 Method: solution exploration

The rough concept of a payment border is set. The different elements are designed separately from each other and iteratively evaluated by a walkthrough. Discussions with colleagues further refined the designs and the entire concept. After refinements a selection is made based on the requirements.

5.2 Solution exploration

The payment border concept consist of three stages: wayfinding & recognition, information & support and validation. The main focus in my work is on 'wayfinding & recognition' and 'validation'. The SOS and information post and service staff is important as well, but are not, or not solely Technology-Based Service-systems. The interaction with these touchpoints should be reconsidered in an integral service design.

Wayfinding & recognition | Validation | Information & support

Help via other touchpoints:
Service staff
Smartphone app
Website
Service desk
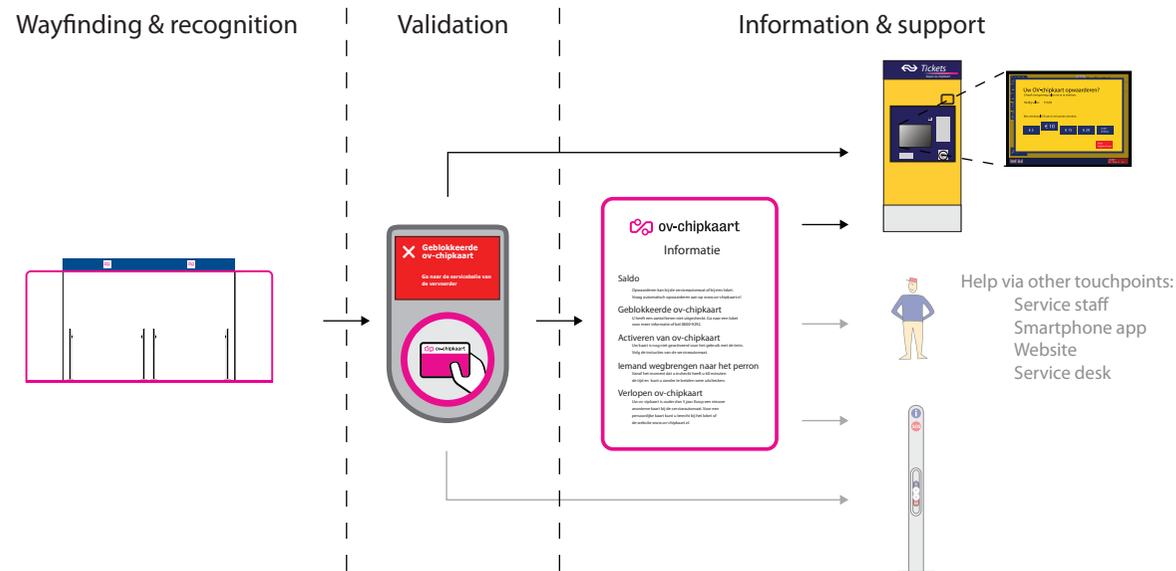
Figure 33: The touchpoints of the open payment border. The development was mostly focussed on the 'wayfinding & recognition' and 'validation' stages.

5.2.1 Wayfinding & recognition

The payment border should easily be seen. The most important factor is the type of location of the payment border. The entrance of a station would be the most obvious place since all travellers have to pass this location and check-in at a station and not at a vehicle.

Single check-in/check-out is the most important condition for a consitent payment border with one type validator only.

The first step of a border was to create a sort of tunnel. By using more vertical surfaces with a minimum height of 2,5m it will stand out among other elements in the entrance area. The size depends on the maximum distance of travellers and the dimensions of the entrance area.

A second version is an asymmetrical design with only one information panel on each side. An extra horizontal element is added to create a portal and add extra vertical surface.

Magenta line to emphasize the border.

OV-chipkaart information

Info and SOS post

Vertical wall space in a 45 degrees angle to create a kind of funnel.

Open structure

A more narrow passage with vertical elements to attract the attention of travellers.

Information panel and information post on the side of the passage.

5.2.2   Validation

Validation is the most important action in the payment border. The main interaction seems very simple but it is a combination of many details. These details were designed seperately and evaluated during the design process.

The most important goal is that user must understand the feedback in a split second. The following aspects are addressed:

- Messages: what information should be communicated.
- Hardware components.
- Timing: does the message comes at the right moment.

OV-chipkaart information is in the background when standing at in front of a validator.

A horizontal banner with OV-chipkaart icons

More closed portal

A more narrow passage with vertical elements to attract the attention of travellers.

Messages

Travellers want to have clear feedback when they present their card to the validator. They expect the validator reads the card. When the card is detected by the validator there are two main possibilities:

- Validation is successfull
    - The user is now checked in or checked out.
- Validation is not successull
    - The communication with the card failed.
    - The card is not valid.

The messages are built with layers of color, symbol, main topic and extra information or suggested user actions (see Figure 34). These layers offer redundancy to help communicate with a large group of users, including low-literate and color blind.

The result is 4 categories of messages: 'standby', 'successfull action', 'error but can by solved quickly' and 'severe error'. Figure 35 shows these categories and further explanation. The messages for check-in, check-out and transfer are depicted seperately. These messages have a different layout to make clear distinction from the other messages.

Standby (steady state)
Black background with white letters. The text tells users they can use the validator. The circle is a symbol for a bus or tram stop.

Check-in
The background is white to create extra contrast with the steady state. The circle and line are colored green, the text 'IN' appears. On the bottom side is room for additional information like travel products.

Check-out
This screen is similar to the check-in screen, but allmost elements are aligned to the right side. This allows travellers to get the meaning of the screen in a split second and is very usefull for frequent travellers.
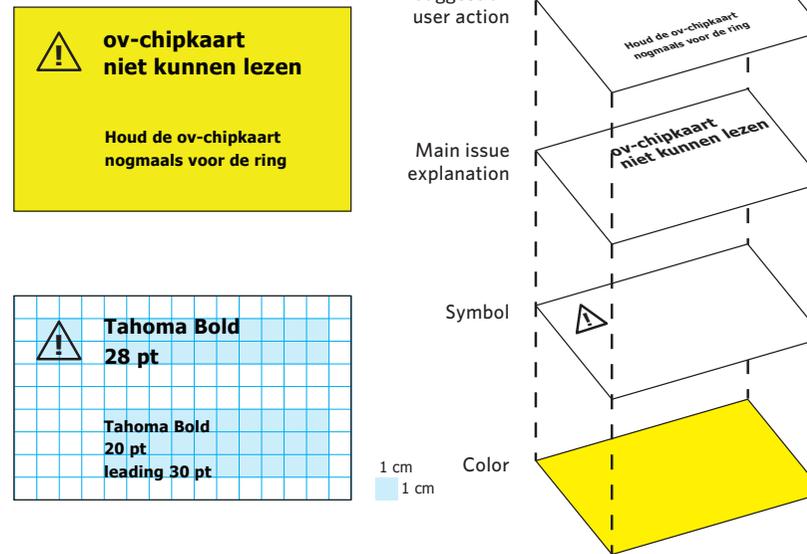
Figure 34:   An example of a messages that is built with layers of information.

Transfer
The transfer screen is a special check-in message which indicates no extra base rate is paid. Two circles and a dashed line symbolise the transfer. The text is centred.

Small error
The combination of the yellow background and the warning symbol stops travellers from passing. The first line of text tells what just happend, the other lines can give a short explanation and instructions.

Big error
The layout is comparable to the screen of a small error, but the background is now red and a cross indicates that the user can not travel with this card anymore.

Name of bus or tram stop in steady state

Landbergstraat

In- en uitchecken

Houd uw ov-chipkaart voor de ring

Instruction for traveller

Symbol and 'check in' text on the left

Name of bus or tram stop

Landbergstraat

In

Symbol and 'check out' text flips to right side

Landbergstraat

Uit

Ritprijs € 3,65
Saldo € 10,35

Price and credit in same corner as 'Uit'

Dashed line to indicate the trip is ongoing

Landbergstraat

Overstap

'Warning' symbol

Status of the card

Saldo te laag

Huidig saldo € 0,00
Minimaal € 10,00 nodig

Ga naar een oplaadpunt

Explanation and instruction

Yellow is perceived as 'warning'

'Stop' Symbol

Geblokkeerde ov-chipkaart

Ga naar de servicebalie van de vervoerder

Red is perceived as 'stop' or 'wrong'

Figure 35: Six differnt messages to display: 'standby', 'check-in', 'check-out', 'transfer', 'error but can be solved quickly', 'severe error'.

Hardware components

The configuration of input and output components in the new concept is comparable to the Thales V4 validator. Figure 36 shows the configuration of the components.

RFID reader
The RFID reader is still placed below the display. The sticker with card symbol (Routing Signing Branding, 2012) indicates where users have to present their card.

Magenta LED ring
A mangenta LED ring is added to emphasize the location of the RFID reader. The light has some other functions: indicating the operational status; confirmation that the card is validated; warning signals in case of an error message.

Graphical TFT display
A graphical TFT display is required. A high resolution display increases the readability of images and text.

No extra light signals
Besides the magenta LED ring there are no extra green or red light signals. The colors are integrated in the message on the display. When choosing for light signals it is important to use a traffic light order (red on top) and preferabily combined with a symbol: e.g., red with cross, green with a checkmark.

Audio speaker
The audio speaker should be on the frontside of the validator to support location of the sound by travellers. This is important when validators are standing side by side or back to back.

No distracting LED lights or text on the body of the validator.

Graphical display wide enough to use bigger texts.

Saldo te laag

Huidig saldo € 0,00
Minimaal € 10,00 nodig

Ga naar een oplaadpunt

Magenta LED ring to highlight the RFID reader and give feedback in case of errors.

ov-chipkaart

The current symbol is recognizable.

The gray line combines the rectengular display with the round light and RFID reader.

Audio speaker in the front panel of the validator to support location of the sound.

Figure 36: Input and output components of a validator. This is comparable to Thales V4 equipment, but with some changes: LED ring added and extra light signals removed.

Body of the validator

The body of the validator can be slim and minimalistic. The main purpose is to hold all other components together. The centerheight of the dispay is raised with 100 millimeter and the angle of the 'head' is set to 20 degrees. This delivers a better viewing angle and thus support users better in reading the messages. Figure 37 shows the dimensions of the new concept and current products of Prodata and Thales.

20°

1240

New concept

45°

940

~5°
(internal)

1140

Prodata   Thales
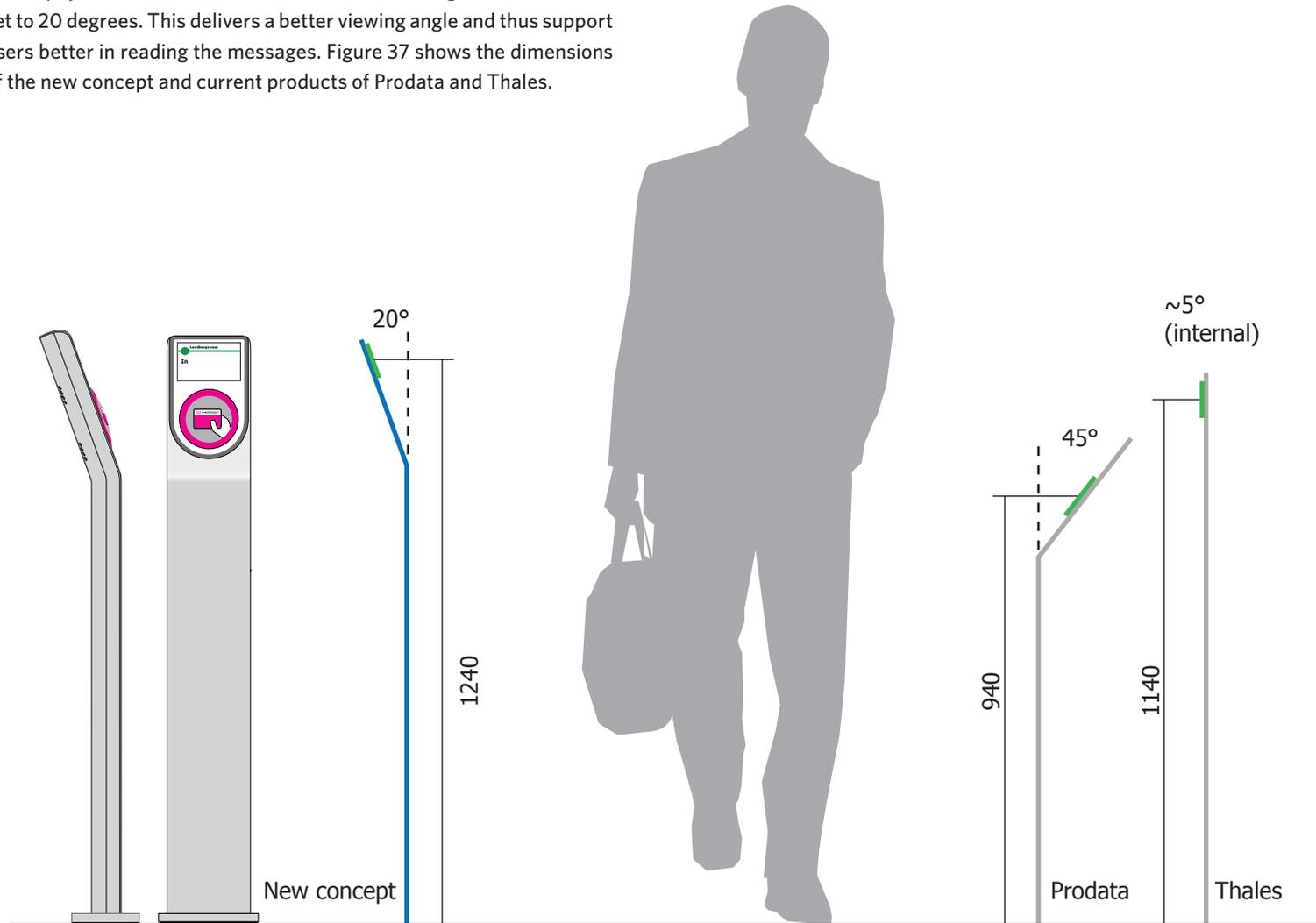
Figure 37: Height and angle of the display in the new concept compared to current equipment.
The new concept is higher and the top part makes an angle of 20 degrees.

5.2.3   Information & support

The basis for the information & support stage are an information panel and the ticket machine. A third touchpoint is the information and SOS post. This touchpoint is not part of this project.

Information panel

The information panel has two functions: supply travellers with information about the OV-chipkaart system in general and guide them to a solution after they encountered an error at a validator (see Figure 38).

The information is structured per topic for easy scanning. Although the validator also guides travellers to find a solution, it is important to have redundant instructions in case travellers have any doubts what to do best.

Ticket machine: service machine

The ticket machine can be more than only a ticket machine. It can supply card specific information and collect service data from the central server. In general a ticket machine can be seen as a service machine: add credit, change travel products or solve problems.

Figure 39 shows a wireframe of a service machine. This is the first screen when tapping the OV-chipkaart at the ticket machine after an 'too little credit' error at a validator. The aim is to make a link between validators and service machines. The error type is stored onto the OV-chipkaart, the service machine can read this data and guides the traveller directly to the correct function. Travellers do not have to search anymore. This results in faster error recovery and an overall faster validation process. Figure 40 on page 72 shows this example in NS ticket machine colors.

ov-chipkaart

Informatie

Saldo

Opwaarderen kan bij de serviceautomaat of bij een loket.
Vraag automatisch opwaarderen aan op www.ov-chipkaart.nl

Geblokkeerde ov-chipkaart
U heeft een aantal keren niet uitgecheckt. Ga naar een loket
voor meer informatie of bel 0800-9292.

Activeren van ov-chipkaart
Uw kaart is nog niet geactiveerd voor het gebruik met de trein.
Volg de instucties van de serviceautomaat.

Iemand wegbrengen naar het perron
Vanaf het moment dat u incheckt heeft u 60 minuten
de tijd en kunt u zonder te betalen weer uitchecken.

Verlopen ov-chipkaart
Uw ov-cipkaart is ouder dan 5 jaar. Koop een nieuwe
anonieme kaart bij de serviceautomaat. Voor een
persoonlijke kaart kunt u terecht bij het loket of
de website www.ov-chipkaart.nl

Figure 38: Poster with information to support travellers in their questions after an error.

explanation
U heeft niet genoeg saldo om in te checken.

main question
Wilt u uw OV-chipkaart opwaarderen?

current credit
Huidig saldo: € 10,00

instruction
Kies minimaal € 10,00 om in te kunnen checken.

highlighted button

button

| € 5 | € 10 | € 15 | € 20 | ander bedrag |

button home

naar beginscherm

language bar

Figure 39: Wireframe of a service machine screen. This is the first screen when tapping the OV-chipkaart at the ticket machine after an 'too little credit' error at a validator.

Figure 40: Ticket machine interface in NS colors.

5.3 Conclusion: final concept

This concept is a collection of various elements which contribute to an overall interaction for all travellers which guide them in passing this open payment border (see Figure 41).

5.3.1 Touchpoints

The wayfinding & recognition stage is facilitated by the vertical and horizontal parts of the portal. The border is clearly visible from a distance, it is easier for travellers to locate and recognize where they have to validate their OV-chipkaart. The dimensions and angles of the validator have been altered for an optimal validation. The various messages on the display have been made more coherent. The information & support stage is now integrated in the payment border zone: a information panel is added and the information and SOS post is now located near the border.

5.3.2 Interactions

The aim of the redesigned touchpoints was to create an overall coherent validation interaction. All different touchpoints are now (re) designed and linked to facilitate this coherent interaction. With this result it should now be clear for travellers where to validate and what to do. By applying this payment border to all stations it should bring recognition with travellers. The design does not only facilitate 'normal' validation but also anticipates on unusual situations like an unexpected OV-chipkaart failure.

72

Figure 41: Final concept of the open payment border. The various components contribute to an overall guiding interaction.

"Als je constant denkt aan het uitchecken,
geeft dat geen ontspannen reizen."

"It is not a relaxt journey when thinking of checking out all the time."
- quote from evaluation with travellers -

6   Evaluation of the concept

The previous chapter described the concept development of the payment border and the various individual touchpoints. This chapter describes the evaluation of the payment border concept and the new validator with experts and travellers. The evaluation with experts was done with interviews using different images of the prototypes. Travellers were asked to come to the Faculty of Industrial Design Engineering. They were asked to interact with a 1:10 scale model of the payment border and a 1:1 scale validator.

As illustrate in the IDEO model (2009) on page 3 a successful product is covered by three factors: business, technology and human. The evaluation of the concept is split into two: travellers and experts. Travellers cover the human aspects; experts cover the business and technology aspects.

6.1   Evaluation with travellers

The goal of the evaluation was to see whether travellers understand the concept and to explore how they would interact with the concept and its components.

6.1.1   Research questions

The main research question is: How do participants interact with the newly designed payment border?

- Is it likely that travellers will remember to check in and check out with the new concept?
- Are the participants able to find solutions for possible problems?
- Are they satisfied with the answers they get?
- How would the participants solve their problems?

- Are they satisfied with this way of problem solving?
- Do they think they would feel more confident by using the information near the payment border?
- What do the participants think of the newly designed validator?
- Do they understand the messages on the display?

6.1.2   Method

The evaluation consisted of three parts. First they were asked to interact with small-scale models of a bus and a row of validators like they can be found in stations. The purpose of these first models was to help participants memorize situations they encountered while using public transport.

In the second part they were asked to do similar tasks with a scale model of the new payment border concept. With both models on the table they could compare the two setups.

In the last part participants were asked to check-in and check-out with a model of the new validator. Timing is essential when evaluating the messages of the validator so the model was made interactive.

See Appendix B for the full research setup.

Stimuli

The scale models of the bus and the current payment border were made from cardboard and are kept on a simple level with little details. The new payment border was also made of cardboard, but had some more details because this concept is new to the participants (see Figure 42).

The validator was made of MDF and holds an RFID reader, a TFT display, a computer and a round light source. The computer registers the RFID card and activates a Flash application. This application changes the content shown on the display. In normal use, a correct check in or check out action, the display resets to the standby screen after 2 seconds. In case of an error the delay is set to 5 seconds.

For comparison purposes a cardboard mock-up validator was placed next to the interactive prototype. Also 12 different messages were printed and were shown to the participants after they interacted with the validator.
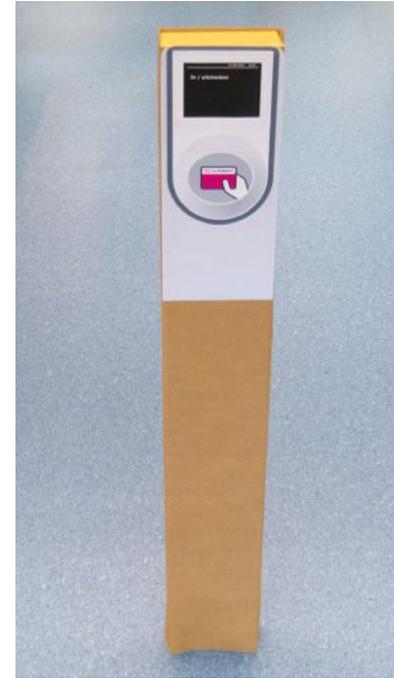

Figure 43:   Cardboard mock-up of a Thales V4 validator was used for comparison purposes.
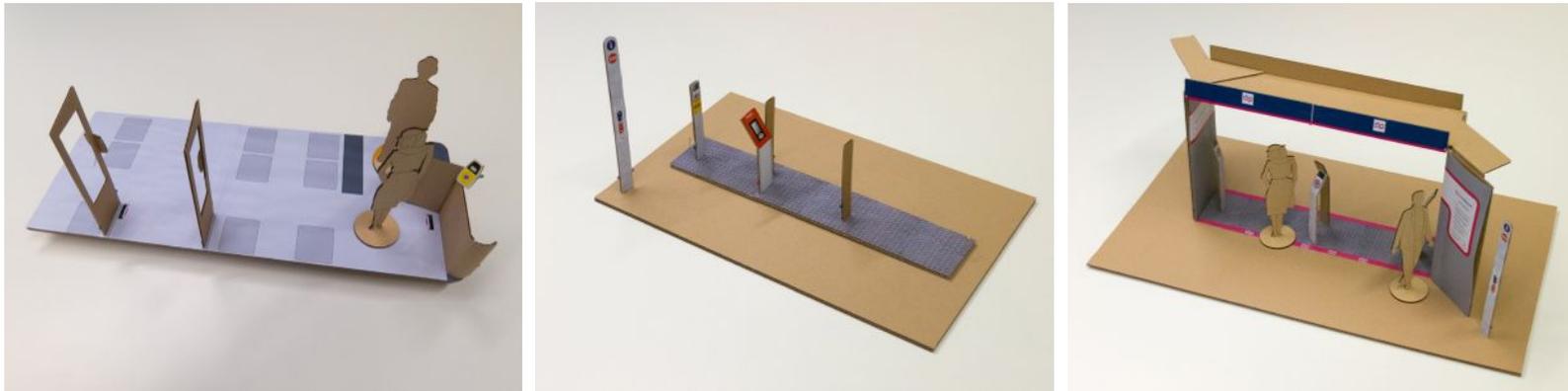
Figure 42:   1:10 scale models made from cardboard used in user evaluation. Left-to-right: a bus, current open payment border and new open payment border concept.

Figure 44: Interactive prototype of a validator, left: the front side, right: the back side showing the different components.

TFT display

LED ring

RFID reader

Audio speaker

Figure 46: Blank RFID card was stickered with blue OV-chipkaart print.

Figure 45: Top part of the prototype. The LED ring switches of when a smart card is read. The LED ring flashes when the user needs to perform an extra or repeated action.

6.1.3 Results

Feedback consisted largely of anecdotes in the current situation. Also when interacting with new concepts they referred to the current touchpoints used in the travel domains. The participants imagined how they would use it within the current set of rules and tariff conditions.

Paraphrases of the user evaluation can be found in Appendix C.

Location of validators
For many participants the location of validators is not clear. They wanted them to be placed at 'logical' locations, but they could not really answer what this place should be. Some participants wanted to have them on platforms, others at the entrance.

> "Maybe they have to place them [validators] on a logical spot, where trains stop for instance."

Open versus closed
4 out of 12 participants mentioned the payment border as an obstruction. They thought the construction was too closed off. They would rather see a more open structure, but still having the same signage. Figure 47 shows a participant talking about open and closed structures.

Figure 47: Participant demonstrating the balance between an open and a closed borders.

Lack of knowledge
During the test participants were making up their own rules or were in doubt if their thoughts were correct. This lack of knowledge caused assumptions which does not necessarily be right.

> "I did not know you can just enter and leave a station without paying. I was afraid the system would deduct money from my card every time I would pass the gates."

Error solving
11 out of 12 participants first try to seek service staff in case of major errors. At unmanned stations they would consider to use the information and SOS post but they were quite hesitant. 4 out of 12 participants knew a ticket machine could also be used to see the latest transactions. They did not consider to go to the ticket machine to solve their problem.

Screen design and necessary information
All participants were positive about the new screen designs. They could all understand the messages imidiately. The three main categories - check-in/-out, small error and big error - were clear as well. Some

Figure 48: Participant gives her opinion about the information in the screen design.

participants mentioned this categorization even before the discussion about the meaning of each type of screen.

> "Yellow means I can try it again, red
> means 'end of story', very clear."

8 out of 12 participants are using automatic top-up. They did not really care about their credit balance. They thought it is unnecessary and distracting text. Participants without automatic top-up depended heavily on this kind of information because they need to know when to add credit.

Validator design
All participants appreciated the new design of the validator. The angle and height were mentioned particularly (see Figure 49). This allowed them to read the the messages without any effort. Some participants even demonstrated how they would bend to have a better look at the display of a Thals V4 validator (see Figure 50).


Figure 49: Participanta appreciates the angle of the validators.

Figure 50: Participants demonstrate how they normally bend to read the display of a Thales V4 validator.

Trust and distrust the system

Participants trust the ov-chipkaart system to a certain level. 9 out of 12 just listen to the sound of a validator when checking in and checking out and hope their action was correct. With the new validator this was not very different but after asking how much the trip costed they could almost all answer it or come close to the actual trip price.

Figure 51 shows how a participant just walks by, listening to the audio and start looking at the validator when an error occurs. She appreciated the few extra seconds when an error message is shown.

When they encounter an error or find out they have little credit left on their card their trust in the system turns to distrust and they are more on their guards.

No hassle

Most participants just want to travel without any hassle and minimalized actions before or after using a public transport service.

"I just want to travel, not search for validators, very annoying."

Validating without looking at the validator.

Already passed the validator.
Looking back to read the message.

Figure 51: Participant demonstrates how she often passes a validator; validating without looking at the display. She only looks back at the validator when an error occurred. She appreciated the few extra seconds when an error message is shown.

Figure 52: Participant demonstrates how some new users scan their OV-chipkaart.

6.2 Evaluation with experts

The experts were consulted to evaluate the business and technology side of the payment border concept.

6.2.1 Research questions

- Are the proposed concepts feasible from a technical point of view?
- What are the consequences of this design from a business point of view?
- What should it take to implement these solutions?
- Which party should take the first step?

6.2.2 Method

A set of slides was presented to the experts to explain the concept and run through the steps of the validation actions. The aim was to find potential implications of the concept.

All contacts of the project partners were visited, except for the Association of Dutch Provinces (IPO). Besides these organisations also some extra organisations were consulted: transport operator HTM; transport operator Arriva (biggest regional train operator); central backoffice Trans Link Systems and an architect from Bureau Spoorbouwmester.

6.2.3 Results

The feedback of the experts range from operational details to management considerations due to the positions of the expert or type of organisation. The results are categorized per remarkable topic.

Single check-in/check-out
The experts see great value for travellers to implement single check-in/check-out, it is an important topic at rail operators. They ask theirselves: who is going to pay for this system change? And in general: what may usability cost? All experts suggests concession grantors should include

extra rules in their contracts with transport operators. The effect of these measures are not clear yet. It is most likely that prices will rise. One governmental organisation mentioned a Dutch expression: wie betaalt, bepaalt (He who pays the piper calls the tune.).

All changes to improve the usability of travellers are welcome, but as one operator told they lack knowledge when it comes to usability. This make it hard to estimate the effect of the solutions from the equipment suppliers.

Location of the payment border
The location of the payment border was for some operators an eye-opener. One operator was thinking out loud: eventually everybody must pass a validator or gate, it seems logical to have one or two entrances for smaller stations and situate a set of validators at these entrances only.

Future concepts
Many experts mentioned 'what if'-scenarios: what if the card disapears and smartphones take over? Some said the use of the OV-chipkaart will be minimized within 5 years time. Others are more nuanced about this topic and see a future where multiple concepts coexist. They think the current system still has many possibilities with potential improvements for travellers. They all agree smartphones will get a more prominent place in the near future.

Ability or need to differentiate
The branding of the various train operators is important to show which train belongs to which company. The same applies for the different validators at transfer station with multiple operators. There are some concerns about the perception of travellers, whether they still make a connection with an operator or with a (general) payment organisation. Train operators do not know what happens with the service concerning payment actions.

Central development organisation

All topics concerning common interests touched the thought a central organisation which would be responsible for the development and harmonizing OV-chipkaart touchpoints. Since all equipment is purchased by the transport organisations, they all realised that this requires changes within their organisations.

Need for quick wins

Their is a strong need for quick wins with the regional transport operators. They are open to improvements or new ideas that are easy and are relatively cheap to implement. This is mainly about the messaging of validators. These operators lack knowledge and have to hire experts in the field of usability.

Open versus closed character

Train operators and related organisations can imagine that the proposed payment border, with a portal, can guide travellers in the use of OV-chipkaart actions. On the other hand they think it can interfere with the current layout of stations. Their ideal picture is a transparant station area with very little signs and obstructing object.

6.3   Conclusions

The conclusions are categorized in usage, technology and business aspects. The usage conclusions mainly come from the travellers in the test, but the experts had some comments too.

The results and conclusions of the evaluations are the main input for the adjusted design which is presented in chapter 7.

6.3.1   Usage

The overall feedback of the participant and expert was positive. Travellers only see potential benefits, some experts have doubts if the implementation of this concept would really improve the interaction significantly.

Wayfinding & recognition

Both travellers and expert had doubts whether the portal was too cramped or not. The vertical surfaces help to locate the payment border but take away the overview of a station area.

Validation

There were no negative comments on the new validator design. The participants really liked the height and angle of the display. They made a suggestion to make the top part magenta if single check-in / check out will be implemented. The magenta color could attract some extra attention.

The participants could understand the messages and liked the minimalistic design. One participant mentioned: less is more. Participants with automatic top-up did not want to see their credit balance,participants with an anonymous card explicitly did want it. Messages could be made card type specific.

Information & support

The information panels are mainly useful for static information. Participants did not know the fundamental rules of the payment system. Problems have to be solved by service staff (preferably) or ticket machines

6.3.2 Technology

The overall feedback concerning technology aspects was positive: everything is possible. Developing active error handling capabilities for ticket machines would be the most radical. Validators and cards should be reprogrammed or even replaced. The implementation of these solutions would take at least 5 years.

An integral approach for the implementing new technology is preferable.

6.3.3 Business

Are the changes worth implementing? What does it cost and who is going to pay? These were the main questions asked by the experts. They stressed that such an integral approach would require a central organisation which would develop and ward this concept. This is the most important hurdle because all involved parties have very different interests.

The implementation would require an integral approach with architects, system engineers, designers, marketeers and so on.

"Heel handig dat je de oplossing gelijk aangereikt krijgt."

"Very useful to get a solution presented directly."
- quote from evaluation with travellers -

7 Conclusions

The previous chapter described the evaluation of the payment border concept. The feedback of travellers and experts were positive, but they also had some comments and suggestions.

This chapter describes the final design, recommendations, conclusions and discussions.

7.1 Final design

Based on the evaluation with travellers and experts the design of the payment border is adjusted. The adjustments do not affect the overall interaction but are aimed at the individual components.

An important question from train operators: how would the payment border concept look like at a small station which only excists of two platforms? Figure 53 shows renders of a small payment border situated at a platform of a small station. The components are the same but there is only one component per type: a single information panel, validator and sign per platform. All elements together contribute to a visual border. The border is more present than just a single validator, but travellers can still pass this border without validating if they want to. The design is made as light and transparent as possible to keep a clear overview of the station.
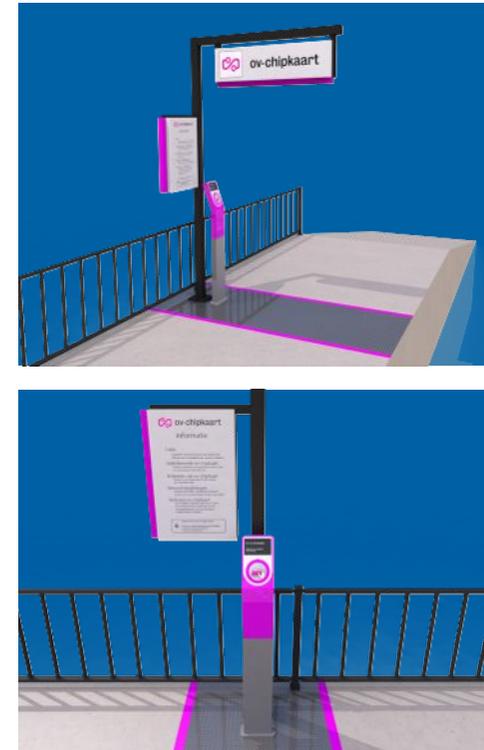
Figure 53: Payment border design for the smallest stations: it contains all elements of the concept, but is considerably smaller.

Separate check-in and check-out side

Magenta accent

Standing version in case a hanging structure is not possible

inchecken

inchecken

inchecken

Suspended panel to create a balance between a closed portal and transparancy

Different flooring to make contrast with the surroundings

Magenta accent

New validator body with magenta top part

Information to help travellers in making decisions

Figure 54: Adjusted payment border design: still a coherent design but more transparent than the initial design.

The core concept is scalable to any size but the design should be adjusted to the context and available space. A 1:10 scale model was made to illustrate how the payment border would look like for a medium sized station. Figure 54 shows the front view of the scale model.

Transparency
The most important adjustments are the 'transparency' and prominent OV-chipkaart branding. Transparency is achieved by removing all closed panels on the sides and the ceiling. These panels are replaced with flat sign above the border and poster sized information panels on the sides. By leaving some extra space between side and ceiling panels the design becomes less cramped. Again a balance between the visual presence of the payment border and openness of a station area.

OV-chipkaart branding
The coloring and OV-chipkaart symbol both contribute to a coherent design. Magenta lines are used in the sides, top panel and flooring (see Figure 55). The top part of the validators is colored magenta to make clear single check-in / check-out is implemented.

Line of sight
Transparency is not only important to keep the current lines of sight in the station area, the most important elements of the payment border stand out a little more. Travellers can make a link between the validator and the information panel directly because of their orientation. The angle of validators match with the angle of the information panels. When an error occurs, the information panels are in the peripheral vision of the travellers (see Figure 56).

Figure 55:   The border is made visual on the floor as well. Magenta strips emphasize the border.

Figure 56:   The information panels can be seen from the validation position.

Validator

The validator and messaging have not changed much after the user evaluation. The top part has become magenta. In this way validators stand out of other objects in the station area (see Figure 57).

The messaging is based on three 4 main screens: standby, validation, small error and big error. Redundancy is key: color, text and form all work together to communicate the message (see Figure 58). A fourth factor is timing. Timing and duration are critical whether a message is perceived by travellers. For validation the duration of the message can still be 2 seconds. Travellers perform a certain action and know (after some experience) what to expect. Errors are almost always unexpected, the duraction of the message should be longer.

1250
750
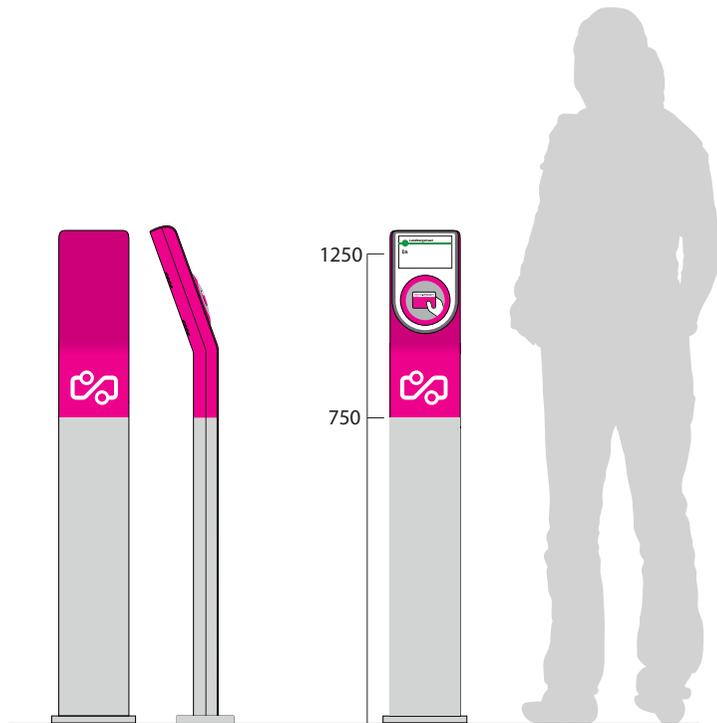
Figure 57:   Validator body with magenta top part.

Centraal Station

In- en uitchecken

Houd uw ov-chipkaart voor de ring

Landbergstraat

In

Centraal Station

Uit

ritprijs   € 3,65

Oude Delft

Overstap

⚠ Meer dan één kaart gedetecteerd

Houd één ov-chipkaart tegelijk voor de ring

✕ Geblokkeerde ov-chipkaart

Ga naar de servicebalie van de vervoerder

Suggestion user action — Houd de ov-chipkaart nogmaals voor de ring

Main issue explanation — ov-chipkaart niet kunnen lezen

Symbol — ⚠

Color

Figure 58:   Messages in 4 categories: standby, validation (3x), small error and big error. The messages consist of multiple 'layers' of information, stacked on top of each other.
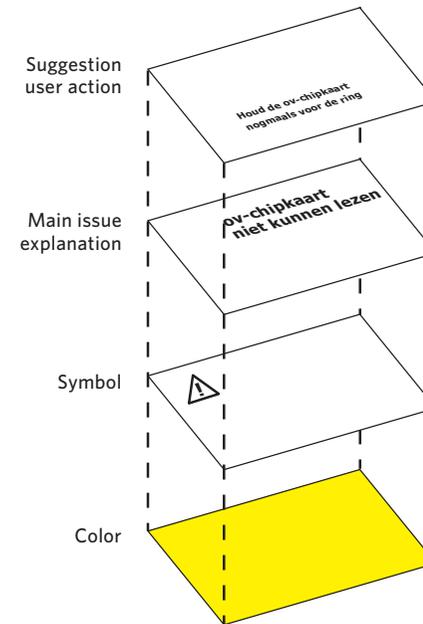
7.2 Recommendations

The core concept is a good start for companies in the public transport sector to design better payment borders. The final design as described in this report can function as an example of how the core concept is applied to a payment border type.

Next steps should not only focus on the implementation of the open payment border. The core concept should also be applied to the closed payment borders and the payment border in vehicles.

I recommend implementing the open payment border concept untill all stations have closed payment borders. It will increases the usability of the OV-chipkaart.

Applying the core concept onto other border types will require a lot of effort. Designers, engineers, scheme developers and marketing departments should constantly think of the three stages and how these could be applied to the context. Since most transport operators experience a lack of knowledge in the field of usability and user experience, it would be wise to join forces.

Close cooperation is not one of the sector's strengths when financial investments come in play. A central, independent organisation is more obvious. This organisation should develop and monitor the total user experience of the OV-chipkaart. The payment border should be one of their projects. The function and role of this organisation is comparable to what Trans Link Systems does for the scheme and technical side of the system.

wayfinding & recognition   information & support   validation

unpaid | paid

in case of errors

One clear zone for validation
Check-in / -out reminder

(Static) information
Support for error handling

Clear messaging
Instructions for error resolving

Figure 59:   Three stages of the payment border core concept and what they should facilitate.
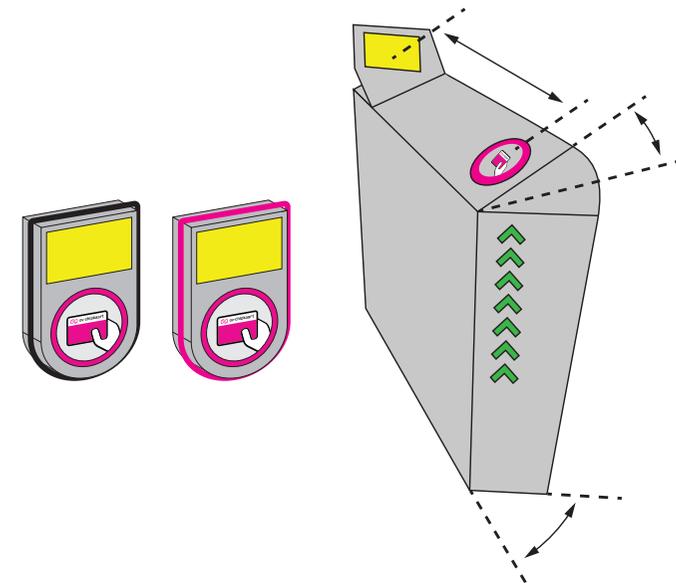

Figure 60:   Ideas for concept development for validators in vehicles and gates.

7.3   Discussions

7.3.1   Shifted role of ticket machines: service machines

From a historical point of view ticket machines are a replacement for ticket desks, selling disposable single journey tickets. The introduction brought cost reduction for transport operators, but also increased availability of sales channels for travellers. These benefits are clear to travellers.

The OV-chipkaart is becoming the most prominent ticket for the use in public transport. Ticket machines have all kind of options to give travellers information about their card, their products and the costs. Ticket machines are becoming ticket and service machines; they should be designed accordingly.

7.3.2   Payment border design in future scenarios

The current payment border concept is based on findings of 2013. Future developments can have an impact on the payment border as it is designed now.

Smart card versus smart phone

The current ov-chipkaart system is built around a smart card. The card is used to store credit and at the same time used as an identifier. There are developments going on to allow people to check-in and check-out without direct financial transaction but settle the costs at the end of a month, 'Reizen op rekening'. It is likely that more and more travellers will use the card as an identifier and track their transactions with a smart phone. The next step could be to check-in and check-out with a smart phone or other mobile device.

What does this mean for the open payment border concept?

Some components may need to change to meet the possibilities of new technologies. The core concept of the open payment border stays the same. Travellers need to know where they have to do a check-in or check-out action. Also the basic rules of the system should be explained near the payment border.

Increasing number of train operators

The open payment border concept is designed with single check-in / check-out in the train domain as an important condition. This concept eliminates the need of validators from different operators. This also eliminates the need of replacing validators when operators change concession, resulting in lower transition costs.

7.4   Conclusions

With the introduction of the OV-chipkaart new touchpoints were added to travel domains, rules and actions changed. New interactions were formed, but were never designed. Travellers are facing many problems when they interact with the OV-chipkaart system.

The payment border concept brings clarity in the required actions. Travellers are supported by a seamless link between all the touchpoints in the payment border. Both the successful and failing validation actions are supported by the touchpoints.

Based on the feedback from the evaluation study, it is expected that the introduction of the payment border concept will increase the usability of the OV-chipkaart.

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Appendices

Appendix A   Touchpoint analysis

audio signal

green and red lights, on top side

TFT screen - Free lay-out

smart card reader

branding

NS

audio signal

red and green lights
LCD screen
2 lines of 16 characters

smart card reader

blinking lights

audio signal

VEOLIA
TRANSPORT

branding

red and green lights

TFT screen - Free lay-out

smart card reader

audio signal

red and green lights

LCD screen
5 lines of 20 characters

smart card reader
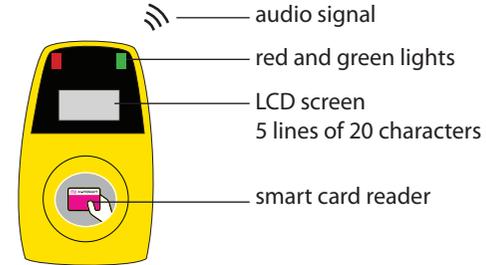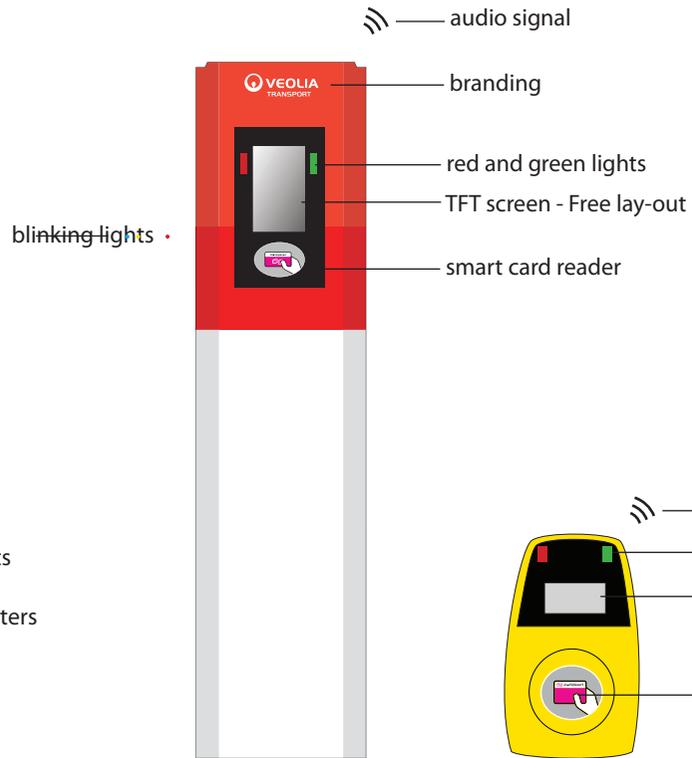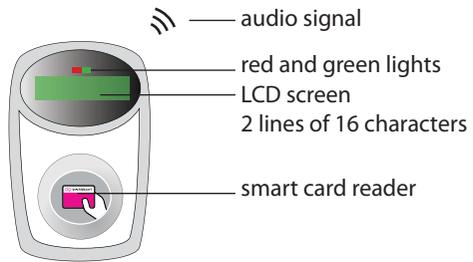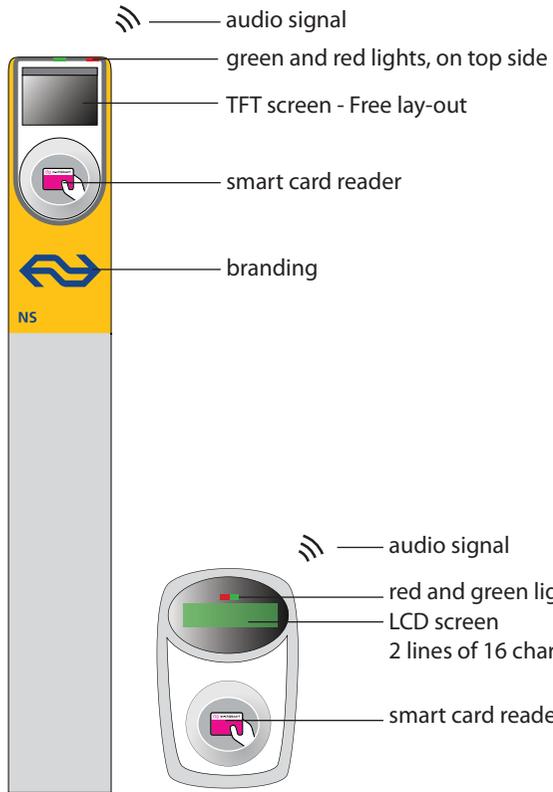
East-West e-Ticketing

V3

V3

NTX/V4

NTX/V4

Prodata

V760

OV750

V3000

OV3000

Validators

The purpose of a validator is to calculate the fare. At check-in it will check which products are in use and it deducts some initial money. At check out the validator calculates the fare based on the distance travelled. Error messages at check out are rare, validators will mainly indicate when a card cannot be read well enough, the card met all conditions at check in already.

Location

In the train domain validators are placed just before the travel domain of stations. In reality validators can be found closer to the entrance of stations.

At the bus and tram validators are placed at all entrances: typically one at the front entrance, two at the sides of any other doors.

Metro stations can be compared with train station, but are generally more compact with only two platforms and always closed off with gates.

Operating validators

The interaction with a validator consists of only one active action from the user: presenting the card to the validator. After this action travellers get feedback about the status of the card, they read the message and pass on. This is a description of the ideal situation.
There are no use cues (ref.) for holding a smart card in front of a reader. Travellers are dependent on feedback of the validator to understand their action was correct. There are no buttons to interact with the validator after the feedback is given. The only option is to present the card a second time, repeating the same action, starting the interaction from scratch.

Audio signals

All validation equipment use audio signals to confirm an action. Most equipment uses a single beep for check in and check out. With some validators this can be hardly heard or is defect. Only V4 (East-West) validators with TFT displays differentiate the signals for all three types of feedback; check in, check out and error.
Most travellers only listen to validation equipment. When the signal is absent or cannot be heard, light and display activity becomes more important. The time span spend at the validator becomes longer.

Perceived loudness
The loudness of audio signals can be expressed in decibels (dB). The level can be measured with a meter. The perceived loudness is different per context and per user. It can occur that current beep sounds 'disappear' in the noise of its context. A decibel meter is a good start to validate the loudness of audio signals, but calculations made with extreme constraints are more useful. On the user side: age is an important proxy for the ability to hear high frequencies: older means less sensitive.

Light signals

Green and red lights indicate whether a check in or check out succeeded. The lights are placed at various locations with respect to the display. There is no consistent layout, some equipment have the green light on the left side of the display, others on the right. (see image XX)
The Prodata OV750 validators have three extra indicator lights at the bottom of the display: blue, yellow and red. The blue light seems to indicate the activity of the processor, the yellow en red light are redundant with the bigger lights on the sides of the display.
The exact meaning of the green or the red light is given by the information on the display. At NTX/V4 validators the red and green lights have an extra function: indicating whether the validator is operational or not.

Traffic lights
Different locations for the green en red lights can be confusing for color blind (5% of male population). Comparison with traffic lights: the order of the red, yellow and green lights is always consistent, worldwide. The relative positions of the lights have become a part of the meaning of each individual light.

Display

Two main differences can be identified: LCD and TFT. The LCD displays are limited in the number of characters (2x16 and 5x20) compared to the TFT displays that can be used more freely. The LCD display from East-West only shows capital letters. The displays from Prodata (LCD and TFT) present lower-case letters as well but only with a fixed width. The TFT displays only have limitations in the number of pixels. The contrast of the LCD displays is not consistent at all times. There seems to be no difference between the two brands. Validators with TFT displays are more consistent.
The type and size of the display determines the possibilities for the quantity of the information presented and quality of the communication to travellers.
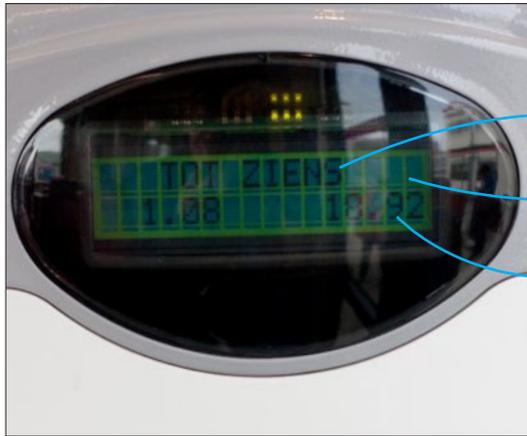
fixed letter-width and -height:
all capitals

inconsistent contrast

numbers and codes
without explanation

unimportant informat
less prominent

spacing between lines

lowercase letters with
letter-spacing

consistent contrast
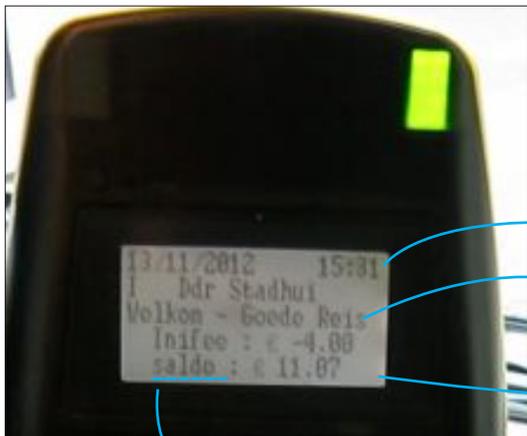
date and time not relevant

redundant terms for same
message: "check in successful"

no spacing or differences in size:
all information equally important

fixed letter-width and
constant font size
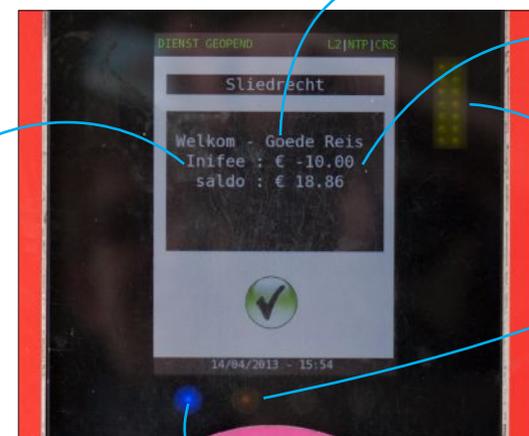
fixed letter-width

lines very compact

English abreviation

redundant light signa

flickering processor light

People tend to read short or common words as an image. When there is limited time to read the information on the display, it becomes more important for users to capture the message in a split second. Lowercase letters help to recognize words and form that image by making use of ascenders and descenders of lower-case letters. (ref?)

Messages

All messages displayed by validators can be categorized into three groups: steady states, correct check in/out or faulty action. A steady state has to communicate two options: 'ready to use' and 'out of operation'. Communicating 'ready to use' to travellers is done in different ways: 'check in/out' or 'present your card'. The first message says something about the possibilities of the validator, it can be used for check in and check out, the second about what action users should do.
In most use cases validators only give the status of the card. (see figure X) Only when a card cannot be read well enough (faulty action) the validator will ask the user to perform another action, in other cases it will just return the reason of the fault.

Terms used in messages

Terms used for messages in all three categories are dependant on the possibilities of the display and choices made by the designers of the system. There are clear differences in the information shown on a LCD display with two lines of 16 characters and a screen that can be designed freely. For example a discount card for students is called 'Studentenweekend' on a TFT screen. At the LCD of an East-West validator it is called 'W3', followed by the date of expiration: '311230'. 'W3' can be read very fast but it has no meaning for most travellers.

Another phenomenon is the use of English abbreviations at equipment of Prodata. 'Inifee: €-10.00' (Initial fee €10.00) and 'T-P ONVOLDOENDE' (Ticket-Purse insufficient). These terms are not in use in other communications about the OV-chipkaart. Using more languages is preferable for any non-native Dutch speakers, as long as it is consistent and linked to the language setting of a smart card.

Timing

Apart from the content of the feedback, the timing of the different signals is important as well.
The light signals are redundant with information on the display and often with the audio signals. Exact timing of those changing indicators is critical for a smooth user experience. Differences of 300 ms are already noticeable. (ref?) Current equipment is not consistent: Prodata equipment is noticeable slower than validators from East-West and 2 or more indicators are not in sync.

Sequence of use

The main purpose of a validator is to check in and check out. The actual function is different according to the goals of travellers. Five different goals why travellers use validators:
- Check in, start trip
- Check out, end trip and calculate the fare
- Transfer to other train
- Read message again
- Read credit
- Read error
- Check validity status in case of doubts
- Enter station to:
- Bring someone to the train
- Visit a shop in the station building
- Pass the station to the other side

Check in and check out is just a part of the sequence when using the validators, it consists of multiple phases:
- Locate
- Validate
- Resolve errors
- Continue journey

Locating validators is mainly an issue in the train domain. The basic design of a station is consistent: one or multiple platforms. The buildings, the number of exits and the routing is different for most stations. Travellers are trained to scan their surroundings for validation equipment: at the entrance of the main hall, near a tunnel, in the tunnel, next to the elevator, near the stairs or on the platform. A green light indicates the equipment is operational, a red light indicates the 'out of operation' mode.

In the validation phase travellers walk up with a card expecting to pass with a correct action. At check in they expect to pass with a valid ticket. They have to remember the most recent status (products and credit) of the card; there are no possibilities to verify this without the help of external products. Travellers basically have a blank card and are 'asking' the validator: "Can I

pass?" A green light indicates the action is successful.

Resolve errors

There are two error types: the validator detected a smart card but it cannot be read properly, it will indicate, "Try again". In case of mismatching products or credit the validator gives the status of the card: "Not enough credit" or "Card not valid" for example. It does not give extra information what travellers should do to resolve these errors. The interaction stops with questions with the users. Five phases are followed by travellers in the train domain (UXAD B5, research for NS only)

Identification	Understanding the problem.
Attribution	Whose problem is it? Me or 'the system'.
Prioritizing	Catch train or fix underlying problem?
Trying out	Try out problem solving strategies.
Denouement	Postpone problem or resolve on the spot.

Continue journey

After validation travellers continue their journey with information from the validator. They can for example conclude they have little credit left and have to add value for next trips. Or they want to check the products and transactions at a service point.

Check in

0.
Check in

Steady states — "Check in/out"
"Check in"
"Out of operation"
(multiple reasons)

1.
Present card

2.
Read message

2.1
Card accepted

2.2
Error

"Check in OK,
product,
initial fee,
credit left"

2.2.1
Already
check in

2.2.2
More than
1 card

2.2.3
Too fast

Extra stress just
before the trip

2.2.4
Card expired

2.2.5
Card blocked

2.2.6
Card not
activated

2.2.8
Too little
credit

service desk, ticket desk, service staff,
ticket machine, information panels,
asking other travellers

Check out

0.
Check out

Steady states — "Check in/out"
"Check out"
"Out of operation"
(multiple reasons)

1.
Present card

2.
Read message

2.1
Card accepted

2.2
Error

"Check out OK,
product,
journy fee,
credit left"

2.2.1
Already
check out

2.2.2
More than
1 card

2.2.4
Too fast

2.2.3
Card blocked

service desk, ticket desk, service staff,
ticket machine, information panels,
asking other travellers

audio signal

TFT screen - Free lay-out
smart card reader

arrow or cross

Front view V4 gate

Side view V4 gate

East-West e-Ticketing

V3

V4

TARL

V3 (GVB, RET)

V4 (NS)

TARL (NS, Amsterdam Central)

Gates

Gates are essentially validators with an extra purpose: closing off stations. All together gates are there for three purposes:
•   Collecting fares in a forced way, users cannot forget to check in or out.
•   Closing off stations to ward unwanted visitors, reducing the risk of the presence of troublemakers.
•   Reducing fare dodging, travellers are forced to check in or out.

Most components of gates are comparable to East-West validators, except for the doors. Basically there are two different gates; variations are made with the doors.

Gate used in the metro domain, with LCD display.
•   V3 – high doors

Gates used in train domain, all with TFT displays.
•   T14 – high doors (identical as V4, but different door construction)
•   V4 – high doors
•   V4 – low doors
•   TARL – low doors entirely from glass.

The indicator light of the V4 version is replaced by the green arrow and the red cross in front of the gate, these are visible from a distance. Other signals are identical to other V3 and V4 validators.

Interaction with gates

The doors characterize the interaction with gates. Although gates are operated in the same way as validators, the opening of the doors is for users the main indicator for a successful action. Travellers can both look at the display as well as the doors. The opening of the doors can be compared to the green indicator lights. Closed doors can mean anything: card not scanned well enough or an error message. In the last case travellers have to lean back to see what is wrong.

Two-way gates

Two-way gates are accessible from two sides. As soon as a card is presented to the reader, the green arrow on the other side turns into a red cross.

Travellers have to track both the indicator on the front side as well as the approaching travellers on the other side. Until one of the travellers presents his card to the reader the gate is available to both travellers. First time users can be surprised by this event; it is not clear whether a gate is in two-way mode. Experienced travellers are aware of this situation, but still have something extra to think of when approaching gates.

operation indication light

Verkoop & Opladen — header

instructions

output slot smart card — input cash

touchscreen — payment module

smart card tray

output slot disposable card — printer

header — Tickets — kopen ov-chipkaart

OV-chipkaart indicator

machine ID and phone number

coin slot

touchscreen — payment module

printer — smart card reader
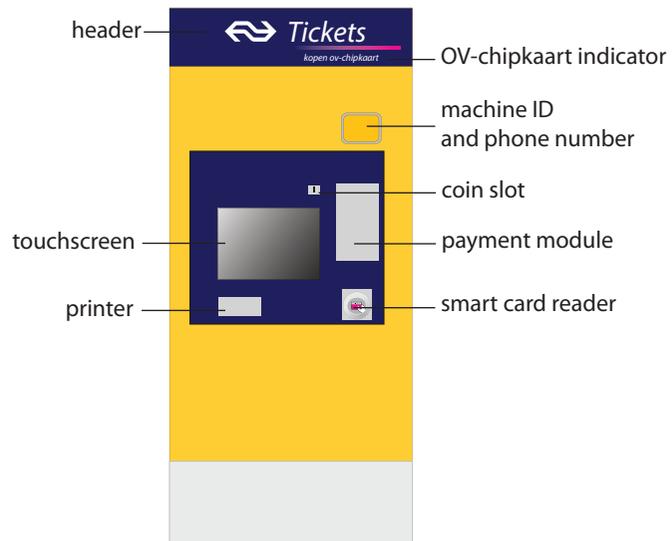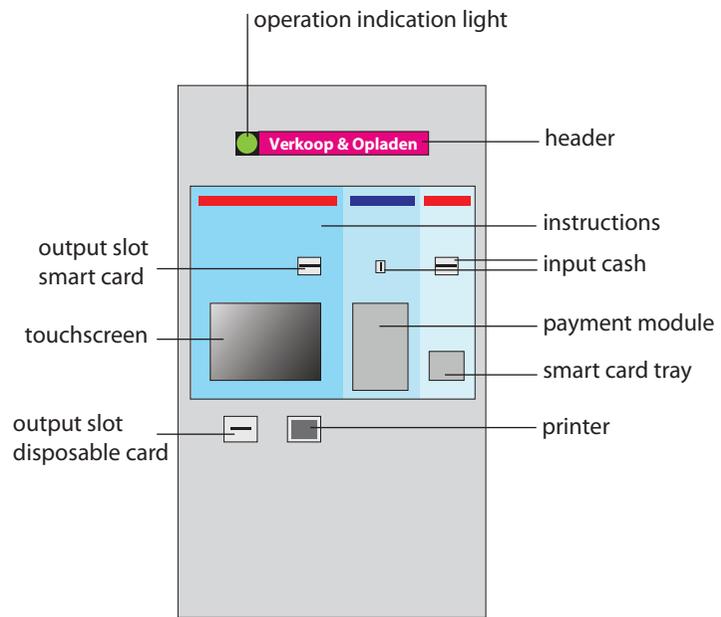
Add Value Machine

Add value machines (AVM) and ticket vending machines (TVM) are used both in the train and metro domain. The main difference is the possibility to buy paper tickets or disposable smart cards at a TVM. Anonymous smart cards can be bought at TVMs as well. Travellers can use more payment options: various debit cards, coins or bills.

Services offered by AVM and TVM:
- Activate Travelling with credit (NS);
- Pick-up 'keuzedagen 60+' (NS);
- Check actual credit on OV-chipkaart;
- Load credit or travelproducts, pay with PIN-card;
- Pick-up orders from OV-chipkaart webshop;
- Pick-up online automatic reload activation or change requested online;
- Pick-up or terminate student product;
- Check products on the card;
- Deblock e-purse;
- Check recent transactions (last 10).

Operating Add Value and Ticket Vending Mmachines

Add value and ticket machines are operated by touchscreens. These displays are comparable to midsize computer displays. Almost all actions are done via this touchscreen. Other buttons, slots and input options are related to payment and the output of tickets.

The NS has an extra option for 'help on distance' (HOA, Hulp Op Afstand). Travellers can call a free telephone number, service employees can answer questions and have the ability to take over control of the machine.

Location

AVM and TVM equipment is located just outside the travel domain: near gates, platforms or entrances.

Shifting function of ticket machines

From a historical point of view ticket machines are a replacement for ticket desks, selling disposable single journey tickets. The introduction brought cost reduction for transport operators, but also increased availability of sales channels for travellers. These benefits are clear to travellers.

The OV-chipkaart is becoming the most prominent ticket for the use in public transport. Ticket machines have all kind of options to give travellers information about their card, their products and the costs. Ticket machines are becoming ticket and service machines; they should be designed accordingly.

optional information panel

6 buttons
LCD screen

smart card tray

payment module

payment card

printer
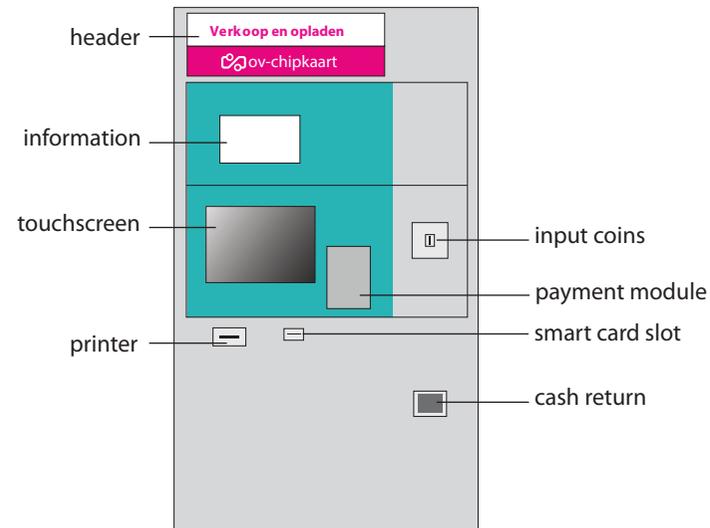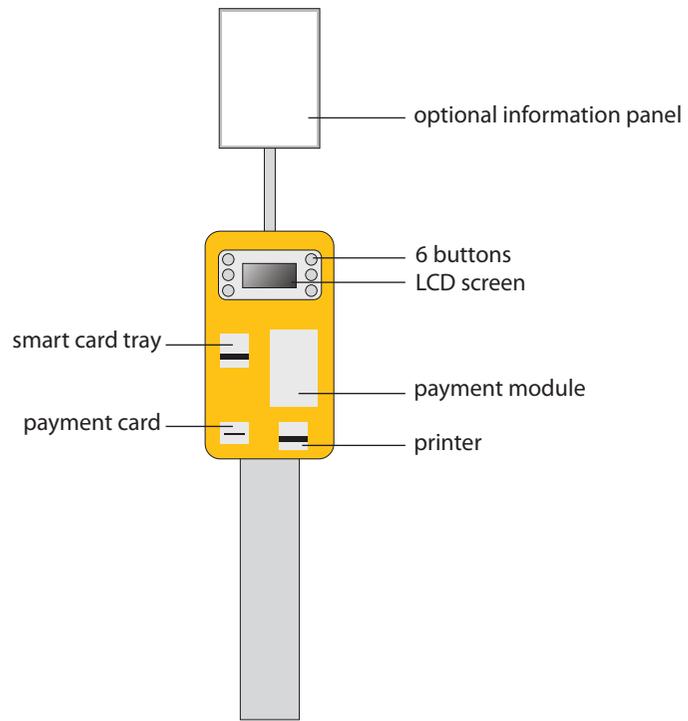
CCV

AVM light

AVM light
(outdoor)

PUD

PUD
(outdoor)

Prodata

PUD
V750

PUD
OV750

Mcom

AVM light

PUD and AVM light

Pick-up devices got their name from the main function: picking up products and activations bought or selected via the Internet. With AVM light devices it is also possible to add value to an OV-chipkaart by paying with a debit card. The functionality is basically the same as an AVM, but with a smaller footprint and a smaller screen with tangible buttons on the sides.

PUD and AVM light equipment is characterized by small displays and few buttons. The components in AVM equipment seem to be arranged from a functional perspective instead of a logical one, which would follow the actions of users.

Services offered at a MCOM and CCV AVM devices:
• Check actual credit on OV-chipkaart.
• Load credit and pay with PIN-card.
• Pick-up orders from the OV-chipkaart webshop.
• Pick-up automatic reload activation or change requested online.
• Pick-up or terminate student product.
• Deblock e-purse.
• Activate Travelling with credit (NS).
• Pick-up NS 'Keuzedagen 60+'

Extra service at a CCV devices:
• Buy a Sterabonnement.
• Check products on the card.
• Check recent transactions (last 10).

All these services are communicated via a display that can only show short sentences. Transaction or product overviews can only be given by using multiple 'pages'. Because of the difference in services, users have to consult the OV-chipkaart website to be sure what services they can expect at a certain location.

Location

Pick-up devices can be found near or in the travel domain: a platform, a bus stop or in a bus. Devices in the bus are only accessible with a valid ticket and are generally operated when the bus is driving. AVM light devices can be found in convenient stores, tobacco shops and super markets. Some counters also sell anonymous smart cards without credit.

SOS and information pole

Arriva

RET

NS

Check in

0. Check in

Steady states
"Check in/out"
"Check in"
"Out of operation"
include feed forward "ready in 30 sec."
include message what travellers have to say to conductor

1. Present card

2. Read message

2.1 Card accepted

"Check in OK, product, initial fee, credit"

2.2 Error

2.2.1 Already check in → **2.2.1** Do nothing

2.2.2 More than 1 card → **2.2.2** Present 1 card only

2.2.3 Too fast → **2.2.3** Try again

Extra service just before the trip

2.2.4 Many open transactions → **2.2.4** extra service needed

2.2.5 Card blocked → **2.2.5** extra service needed

2.2.6 Card not activated → **2.2.6** extra service needed

2.2.7 Card expired → **2.2.7** extra service needed

service desk, ticket desk, service staff, ticket machine, information panels, asking other travellers

2.2.8 Too little credit → **2.2.8** Add value

ticket desk, add value machine

2.2.9 No check-out at other PTO → **2.2.9** Check-out at other PTO

validator of other PTO

New function

Check out

0. Check out

Steady states
"Check in/out"
"Check out"
"Out of operation"
include feed forward "ready in 30 sec."

1. Present card

2. Read message

2.1 Card accepted

"Check out OK, product, journy fee, credit left"

2.2 Error

2.2.1 Already check out → **2.2.1** Do nothing

2.2.2 More than 1 card → **2.2.2** Present 1 card only

2.2.4 Too fast → **2.2.4** Try again

2.2.3 Card blocked → **2.2.3** extra service needed

2.2.4 Many open transactions → **2.2.4** extra service needed

service desk, ticket desk, service staff, ticket machine, information panels, asking other travellers

2.2.5 Little credit for next trip → **2.2.5** Add value

ticket desk, add value machine

New function

Appendix B　　　Research setup user evaluation

A payment border and its elements are designed. How do travellers interact with this new concept? An explorative test with travellers helps to reveal the potential of a payment border.

Research questions
- How do participants interact with the newly designed payment border?
  - Is it likely that travellers will remember to check in and check out with the new concept?
  - Are the participants able to find solutions for possible problems?
  - Are they satisfied with the answers they get?
  - How would the participants solve their problems?
  - Are they satisfied with this way of problem solving?
  - Do they feel more confident buy using the information near the payment border?
  - What do the participants think of the newly designed validator?
  - Do they understand the messages on the display?

Qualitative research and methods
Qualitative research methods help to understand the needs of the participants. Two methods are used in particular: a tabletop walkthrough of scenarios with a 1:10 scale model of the payment border and a test with a full-scale functional validator.

Participants
Participants must have some experience with travelling by train, bus, tram and metro. Age ranging from 20 to 70 year. At least 7 out of 15 of the participants should have little experience with new technology or having troubles with adapting to new technologies.
Participants should bring their own ov-chipkaart. Any type of card is allowed.

Stimuli
Multiple models and images will be used to help participants explain their thoughts.
- Photos of current situations: bus/tram, train/metro station (gates and validators)
- Paper model of a bus, 1:10 scale.
- Paper model of the payment border in train and metro domain, with validators, 1:10 scale.
- Scale model persons, 1:10: traveller, service employee and participant traveller.

Some models will be used to show participants what it will look like in full scale. Participants can respond to the layout of information and components, not to the entire interaction.
- Information poster, A2
- Paper screenshots of a ticket machine display.
- Paper model of a gate console, 1:1 scale.

A functional prototype of a validator is used to test the combination of the rfid reader, LED-ring and messaging. A rfid reader combined with a display help to simulate the interaction and timing of a full working validator.

Procedure
Participants are taken on a virtual trip by public transport. The trip consists of five phases:
1. The moment just before entering a station or vehicle.
2. Validation, check in
3. Time from check in to check out
4. Validation, check out
5. The moment just after leaving a station or vehicle.

Participants run these five phases in the current situation. The current situation is done with photos and some basic paper models of a bus and validators, this may not take longer than 10 minutes. The new situation is tested with paper models and a functional model of a validator, this may not take longer than 40 min. The session is closed with some last words of the participant.

5 min　Introduction and explanation
10 min　Old situation with photos and scale model.
40 min　New situation with models, starting with the border.
5 min　Closing

Introductie en uitleg

Dit onderzoek gaat over het gebruik van de ov-chipkaart tijdens het reizen. Er is een groep studenten die een concept hebben bedacht, ik neem alleen de tests af. Het gaat komende uur over wat jij van het concept vind en er is geen fout antwoord.
Het onderzoek bestaat uit twee onderdelen: we bekijken eerst de huidige situatie, daarna gaan we over op de nieuwe. We doen dit door scenarios te doorlopen met schaalmodellen en 1:1 modellen.
Je mag alles zeggen wat je te binnen schiet. Er bestaan geen foute antwoorden. Mocht je suggesties hebben, leg ze voor.

Huidige situatie: bus, trein en metro

Je gaat oppad met het openbaar vervoer.
Wat doe je doorgaans vlak voordat je een bus of tram instapt of een station binnengaat.
Je wilt inchecken, hoe doe je dat? (er gaan dingen mis: hoe los je dat op?)
Je bent ingecheckt en vervolgt je reis, waar ben je op dat moment mee bezig?
Je komt aan bij de eindbestemming, hoe verloopt dat? (er gaan dingen mis: hoe los je dat op?)
Je bent nu uitgecheckt, waar ben je op dat moment mee bezig?

Nieuwe situatie: trein en metro

Een groep studenten is bezig met een onderzoek naar reizen in het openbaar vervoer. Er is iets nieuws bedacht en we zijn benieuwd naar hoe jij ermee omgaat. Om de situatie na te bootsen gebruiken we schaalmodellen van karton.
We nemen nu een aantal situatieschetsen door, jij mag aangeven hoe je dat zou doen.

Van buiten het station naar het perron toe.

[Iemand wegbrengen]
　　Stel je voor, je brengt een vriend of vriendin weg naar het station en je wilt meelopen naar het perron. Hoe doe je dat?

[Niet genoeg saldo]
　　Je komt aan bij een paal of poortje en je wilt inchecken.
　　<feedback paal: niet gelukt, te laag saldo>
　　Wat ga je doen?

[Kaart verlopen]
　　Je komt aan bij een paal of poortje en je wilt inchecken.

Wat ga je doen?

[Kaart geblokkeerd]
    Je komt aan bij een paal of poortje en je wilt inchecken.
    <feedback paal: niet gelukt, kaart niet meer geldig>
    Wat ga je doen?

[Kaart niet geactiveerd]
    Je komt aan bij een paal of poortje en je wilt inchecken.
    <feedback paal: niet gelukt, kaart niet geactiveerd>
    Wat ga je doen?

[Genoeg saldo?]
    Je weet niet of je genoeg saldo hebt. Wat doe je?
    <automaat erbij plaatsen>
    Maakt dit een verschil?

Van het perron naar buiten toe.

[Paal zoeken]
    Je bent met de trein of metro aangekomen op een station en je loopt naar de uitgang.
    Waar ga je uitchecken?

[Kaart defect]
    Je bent met de trein of metro aangekomen op een station en je hebt inmiddels de paal
    gevonden. Je wilt uitchecken.
    <feedback paal: kaart defect>
    Wat doe je nu?

Bus en tram

Bij een bus en tram is er een iets andere situatie. We doorlopen een paar situaties, jij mag
aangeven wat je dan doet.

[Niet genoeg saldo]
    Je stapt de bus in en wilt inchecken.
    <feedback paal: niet gelukt, te laag saldo>
    Wat ga je doen?
    Wat zou de chauffeur kunnen betekenen voor jou?

[Kaart verlopen]
    Je stapt de bus in en wilt inchecken.
    <feedback paal: niet gelukt, kaart verlopen>
    Wat ga je doen?
    Wat zou de chauffeur kunnen betekenen voor jou?

[Kaart geblokkeerd]
    Je stapt de bus in en wilt inchecken.
    <feedback paal: niet gelukt, kaart verlopen>
    Wat ga je doen?
    Zou je extra informatie willen?
    Zo ja: waar en op welk moment. Zo nee: waarom niet?
    Wat zou de chauffeur kunnen betekenen voor jou?

[Haltenaam]

Je wilt inchecken in de bus.
Weet je altijd of je bij de juiste halte incheckt?
Mis je deze informatie?

[Genoeg saldo?]
    Je stapt in de bus maar je twijfelt of je genoeg saldo hebt.
    Wat doe je?

[Check out reminder]
    Je hebt op de stop-knop gedrukt en gaat bij de volgende uitstappen. Wanneer check je
    uit?
    Waarom op dat moment?
    Weet je of je bij de juiste halte uitcheckt?

Sluiting

We zijn nu bijna aan het einde van het onderzoek gekomen. Heb je nog vragen of opmerkingen?

Ik zou je willen vragen dit enquêteformulier in te vullen en een handtekening te zetten voor de
ontvangst van een cadeaubon en toestemming voor het gebruik van het beeldmateriaal voor
verslaglegging en presentaties.

Appendix C   User evaluation paraphrases

72901
rechtshandig
geen smartphone
automatisch opladen

Bus
Ik weet niet precies hoe die apparaten eruit zien. Ik kijk gewoon naar zo'n ding met dat roze logo.
Het is eigenlijk belachelijk dat iedereen langs de buschauffeur moet gaan als je ook gewoon achterin kan inchecken. **Ik vind het kneuterig dat iedereen langs die man moet, bij de trein staat er toch ook niemand naast. Ik vertrouw in de goedheid van de mens.**

4 apparaten bij de uitgang zou wel fijn zijn, zodat het in- en uitstappen sneller gaat. In het begin deed ik nog weleens een 'swipe', maar toen kwam ik er achter dat dat helemaal niet werkt

Trein
Als het niet lukt en ik zie niemand om me te helpen, dan stap ik gewoon in. Ik kan er dan geen tijd aan besteden.
Regels voor uitchecken weet ik niet precies, soms is het 3 min, dan weer 30 of toch weer 60 minuten.
Als er iets mis is met de kaart dan zou ik naar het eerste station met een loket gaan.

De betaalgrens
Volgens mij is dit een hele ruimtelijke plek voor 'hier is de OV-chipkaart', 'hier moet je je kaart activeren'. SOS/info knop weet ik niet precies wat het doet, nooit gezien. Als je iemand wegbrengt bij een poort moet je eerst weer uitzoeken hoelang je hebt, maar dat zou gewoon bekend moeten zijn. Als je zo'n kaart aanschaft zou je die informatie er gewoon bij moeten krijgen. Nu leer ik het door het fout te doen. Ik realiseer me vaak pas achteraf dat ik verkeerd heb in- of uitgecheckt en dan is het te laat. Ik heb nu pas een redelijke routine, na 3 jaar. **In het begin heb ik zeker wel 20 keer geld teruggevraagd, vooral bij de trein. In Den Bosch zijn de paaltjes bijna niet zichtbaar bijvoorbeeld.**

De [nieuwe] paal is wat gebruiksvriendelijker want hij staat een beetje schuin. Bij de huidige paal moet je altijd een beetje bukken. De informatieposter hangt nu ook in dezelfde oogopslag als de paal.

Ik snap dat dit niet overal zo kan staan, als de symbolen maar goed zichtbaar zijn: de kleur en het logo.

De paal
De geluiden zijn hetzelfde toch? De berichten komen helder over. Soms pak ik per ongeluk de kaart van mijn werk erbij en dan geeft het apparaat ook al dat het niet de juiste kaart is.

De ring is een soort focus voor waar je de kaart moeten houden. En het roze kleurtje is hetzelfde als de kleur van het chipkaart logo.

De NS paal staat altijd onder je leeshoogte en je loopt er altijd langs. De nieuwe paal staat net iets meer in het zicht, dat is sowieso duidelijker dan de huidige paal.
De letters van andere apparaten [validators] in de bus en tram zijn veel kleiner en onduidelijker. **Vaak denk ik dat het wel OK is, maar ik lees eigenlijk nooit, ik denk dan dat ik naar het piepje luister.**

Poortjes
Het is duidelijk waar ik wat moet doen: kaart tegenaan houden en de display. Ik let op het OV-chip logo, maar dat zie ik dan niet overal. **Soms hebben ze op pilaren een roze vlak met een logo, dat is dan wel weer herkenbaar. Dan krijg je ook overzicht boven de hoofden van mensen. Je hoeft niet te zoeken, want alles op ooghoogte is niet te zien in de drukte. Maar dat is ook weer omdat die palen niet in een systematische ordening staan.** Stations hebben vaak een duidelijk ingang, dus dat is de beste plek. Met een overstap naar de randstadrail in Den Haag Centraal ben ik altijd even in verwarring omdat ik dan in een station ben, dan verwacht ik niet dat ik in het voertuig moet inchecken.

Het schuine voorkantje van de poort nodigt uit om zo [neemt linkerkant van kaartlezer] te gaan. De afstand tussen kaartlezer en display is goed, want dan kan je doorlopen.

8202
Geen automatisch opwaarderen. Geen idee hoeveel geld er op de rekening staat.
Rechtshandig
Geen smartphone

Bus
Chauffeur moet niet teveel belast worden met ov-chipkaart, die moet zorgen
Chipkaart houd ik in de hand want ik ben als de dood dat ik vergeet uit te checken. **Het is zoveel gedoe om het achteraf te regelen dat ik daar wel echt aan probeer te denken.**

Informatie op het scherm gaat veel te snel bij het uitchecken. **En als je dan vergeet uit te checken dan kan je er niks meer aan doen op dat moment, dat geeft geen ontspannen reizen.**

Trein
Vrijwel koop ik altijd een kaartje, zolang het nog kan. Ik ben blij dat de doorgang breed genoeg is voor de fiets.

Kan je de laatste reizen op de automaat zien? Dat wist ik helemaal niet. Is het daarom zo druk bij die automaten?
Info/SOS paal weleens gebruikt toen mijn kaart was ingeslikt bij de automaat en er verder niemand was. Of op een verlaten station en de trein niet kwam. **Er komt iemand live, dat is ook erg prettig. Die kan je verder helpen.**
Op stations moeten gewoon mensen zijn die je kan aanspreken.

Betaalgrens
Het is meer gesloten dan de open poorten en meer informatiekanalen. Het dakje geeft meer geslotenheid, maar verder is het opener, vriendelijker.
Het NS logo is verdwenen, dat betekent dat het voor alle vervoerders is? Dat is ook erg fijn.
Er zit een klein knikje in de paal. Dat geeft een vorm waardoor hij meer opvalt, hij neemt meer ruimte in. Net als lantaarnpalen die gebogen zijn, die nemen meer ruimte in en vallen meer op; eigenlijk heel lelijk. Als je die knik/vorm gewend bent dan zien je ze wel. Maar ik denk dat ze gewoon op duidelijke plekken moeten staan.

Bij een foutmelding hangt het er vanaf hoeveel haast ik heb. Als ik geen tijd heb dan is het jammer voor de paal, of het systeem, maar ik moet dan die trein hebben. Dan overleg ik het met de conducteur in de trein. Als ik meer tijd heb dan zoek ik iemand op.

Informatievoorziening
Ik denk dat extra informatiepanelen best goed zijn voor mensen die er net aan beginnen of wat meer willen weten.
Over het algemeen vind ik het heel veel gedoe, ik weet nou niet of het gemak geeft waar het voor bedacht is.

De paal
De paal is veel beter: de hoek is goed, je kan er beter bij, het is groter. Lekker groot en overzichtelijk, dat kon ik wel volgen.

Al ingecheckt melding: ...dat lijkt mij een grote verbetering.
Verschil tussen modaliteiten: Nee joh, niet doen.
Groen is OK, Geel is Let op, Rood kan echt niet.
Hoe minder, hoe rustiger... niet te kort wegfloept.

Eisen aan MMI:
Ritprijs, saldo
Misschien: klok, haltenaam

Poortjes
De helling loopt naar beneden, dus ik moet aan deze kant staan. De stand van de informatie is ook logisch om het aan deze kant te hebben.
Ik houd eigenlijk helemaal niet van poorten. Ze helpen wel bij het uitchecken, maar ze hoeven dan niet van die hekjes te hebben. Lage hekjes zien er vriendelijker uit, maar het blijven obstakels. Het moet vriendelijk en uitnodigend zijn. Beetje esthetiek op het station, want nu is het gewoon een gevangenis.

8203
Geen smartphone
Rechtshandig
Multifocale bril
Automatisch opladen

Bus
Je moet altijd afgaan op het geluid en het groene lampje, want je kan het lang niet altijd lezen. Dat heeft te maken met het oppervlak, of het beschadigd is of dat er licht op schijnt. Heeft ook te maken met hoe hoog het apparaat hangt.
Ik wacht altijd tot de vorige klaar is anders weet je nooit zeker of je nou bent ingecheckt.
Soms zijn er ook apparaten in de bus die geen incheckapparaten zijn, dat is verwarrend.

Als het misgaat bij het inchecken kan je het nog aan de bestuurder vragen, bij het uitchecken niet. Maar ik heb een keer in Arnhem gehad dat de buschauffeur een kaartje voor me had en dan kon ik dat opsturen. **Dat moet je een keer mee hebben gemaakt, dan weet je dat.** Een tweede keer vroeg ik dus een kaartje aan de buschauffeur en die keek me verbaasd aan.

In het begin wist ik ook niet of je moest zwaaien met de kaart en dan pakt ie het niet goed. Dat zie je nog steeds gebeuren bij onervaren reizigers. Bij korte ritten houd ik de kaart altijd in de hand, bij langere stop ik het weleens weg, dan heb ik mijn handen vrij.

Bij het uitchecken wil ik graag kunnen zien hoe duur het was. Sommige ritten declareer ik en onthoud ik liever het bedrag dan dat ik het op moet zoeken. **Ik ben niet geïnteresseerd in het saldo, want ik heb automatisch opladen aan staan.**
De hoogte van het apparaat is het belangrijkste en niet pal naast de deur, want daar staan dan mensen voor. Een keer vergeten uit te checken toen de tram kapot was. Ik dacht dat de uitcheck gekoppeld was aan de halte, maar dus ook aan het voertuig! Had ik twee keer ingecheckt. Bij de trein is dat dus niet zo, dat is verwarrend. **Je leert het systeem kennen door fouten te maken terwijl het gaat om hele basale informatie.**

Als je een station binnenkomt moet er een bord staan waar de basisinformatie opstaat waar de essentie opstaat die nog nooit gereisd hebben met zo'n ding.

Trein / metro
Als er meerdere vervoerders op een station zijn is dat heel verwarrend. Bij Pijnacker is het heel verwarrend dat de RET en HTM op hetzelfde spoor rijden. De een met apparatuur in het voertuig, de ander op het station, dat ging hopeloos mis.
De locatie van de palen is altijd ergens anders, dat is heel irritant.

Info / SOS paal
Ik vraag me altijd af of het werkt, het ziet er zo onpersoonlijk uit. Het is gewoon een stuk metaal, het heeft niks menselijks. Ik wil ook weten dat iemand mij kan zien, dat staat er niet op.

Sinds ik automatisch opladen aan heb staan kom ik nooit meer bij de automaat. Alleen voor een overgangskaartje. Een kaartje voor een langer traject over meerdere vervoerders doe ik op de computer met een e-ticket, die print ik uit.

Poortjes
Ik weet nu dat ik met de rechter hand moet bliepen, maar als er mensen komen die het met links doen, dan werkt het dus niet, dan moeten ze naar het andere poortje. **Ik heb heel veel mensen moeten uitleggen dat ze het met hun rechter hand moeten doen.**

Betaalgrens
Fijn dat het paaltje een beetje naar me toe is gedraaid. Het ziet er heel helder uit. Het enige nadeel is dat je niet snel kan inchecken als je vergeten bent om in te checken, je moet terug naar de ingang.

De paal
Oh, dat is mooi, veel helderder. Het is alleen het woord 'In', dat is genoeg, want dan weet je dat je ingecheckt bent. **En een goede reis enzo dat hoeft allemaal niet, dat is overbodig. Het woord 'In' en het is groen dat is veilig.**
2 seconden is genoeg, want daarna loop je door, anders stagneert het zo.

Thales paal is niet prettig, problemen met de vari-focus bril. De hoogte luistert heel nauw met vari-focus. Door de hoek en de hoogte is het veel helderder.

Bij de gele schermen mag je wel reizen maar moet je er nog iets voor doen. Bij die rode schermen mag je helemaal niet reizen, dan moet je terug.

Als het display niet werkt dan is het niet duidelijk wat je moet doen.

Extra boodschap 'let op, saldo is laag' is verwarrend bij inchecken.

8205
smartphone
linkshandig
geen automatisch opwaarderen

Bus
Als ik een piep hoor dan zal het wel goed zijn. Ik kijk niet altijd even goed op het scherm. Ik weet niet of het inchecken niet gelukt is, dat heb ik dan niet door.
Op een bekende route stop ik de kaart wel weg omdat ik precies weet waar ik uit moet stappen en dan denk ik ook aan het uitchecken. Op een onbekende route houd ik de kaart altijd in mijn hand omdat ik dan meer bezig met waar ik eruit moet en dan vergeet uit te checken. Zeker als ik met iemand aan het praten ben.

Voordat de bus stopt loop ik meestal al naar de deur en check ik uit, dan hoef ik daar niet meer aan te denken als ik uitstap.

Ik wil graag de ritprijs weten voor als ik wil declareren. Trajecten die ik vaker reis heb ik al in een Excel overzicht staan dus dat is copy/paste.
Ik heb bewust geen automatisch opwaarderen want dan weet ik wanneer ik ben vergeten uit te checken. Ik zet er 50 euro op en daar doe ik dan twee weken mee.

Trein
Op de langere trajecten koop ik een kaartje omdat ik anders vergeet uit te checken. Op stations waar ik vaker kom weet ik waar de palen staan en ben ik er wel alert op. Maar ook dan vergeet ik weleens uit te checken. Of dan check ik uit gewoonte uit op het perron, terwijl ik nog doorrijd met de NS.

Betaalgrens
Het ziet er wel uitnodigend uit, ook omdat de palen een beetje naar je zijn toegedraaid. Het ziet er ook wel open uit.
Infobord is heel handig voor onregelmatige OV-reizigers.

De paal
Handig dat de locatie erbij staat. Foutmelding blijft ook lang genoeg staan als je er snel voorbij loopt. Die bolletjes en lijntjes zijn ook wel helder, dan ka je zien waar je zit in de reis.
Dat uitroeptekentje betekent dat je even iets anders moet doen. Bij rood is het echt game-over.

Ik vind de paal wel prettig, het trekt meer de aandacht omdat hij gebogen is. **Het is wat uitnodigender om het display te lezen. Het staat ook meer in de stand van een boek of een tablet.**
'OV-chipkaart voor de ring houden' kan ook heel letterlijk worden genomen en dan doet hij het niet.
Toelichting in het scherm is wel nuttig. **Knipperen is niet direct nodig, maar het is wel een aanvulling op de piepjes.**
Bij de NS paal loop ik vaak langs zonder te kijken, ik luister alleen naar het piepje.

Zou wel fijn zijn om te kunnen controleren of je bent in of uitgecheckt zonder daadwerkelijk een handeling uit te voeren. Of meteen weer in kunnen checken bij de NS ipv 3 minuten wachten.

Ritprijs wel op scherm, maar liever op telefoon, dat je na de rit kan bekijken hoeveel het heeft gekost.

Poortjes
Oppassen dat je niet te snel achter iemand aan loopt, dan gaat het in of uitchecken niet goed.
Vooral op piepje en deuren als indicatoren dan een scherm.
Weleens aan verkeerde poort gestaan omdat ik linkshandig ben. Schuine kant is wel logisch.
Reader en display moeten bij elkaar want daar heb je de focus op.

8206
smartphone
rechtshandig
geen automatisch opladen

Bus
Ik check uit voordat de bus stilstaat. Ik luister naar het geluid en probeer te zien wat erop staat, maar dat lukt niet altijd. Het geluid en het groene lampje zijn het belangrijkst.
Ik kijk hoeveel het gekost heeft, zodat ik een beetje bijhoudt hoeveel mijn reizen kosten. Saldo is niet zo interessant want ik heb automatisch opladen. **En als het fout gaat, gaat het vast ook bij 10.000 andere mensen fout en die gaan dan bellen.**

Trein
Met de vouwfiets vergeet ik weleens om uit te checken want dan ben ik bezig met die fiets.
Ik heb vrije keuzedagen bij de NS. Dat ging niet goed, want toen ik uitstapte in Groningen zij het apparaat dat er niet genoeg saldo opstond.
Ik zit te loeren naar palen als ik op een vreemde plek ben. Maar het wordt steeds beter allemaal. Of ik ben steeds beter in het vinden van die palen. Kijk, die NS is ook niet gek, die zet ze op logische plekken neer, maar je moet er nog even achter komen wat zij de logische plekken vinden.
Ik ben ook wel verkeerd ingecheckt als er meerdere palen staan. Dat is zo belachelijk, als ik naar Appingedam ga dan weet Arriva toch wel dat ik van Groningen naar Appingedam geweest ben.
Ik moet gaan bijhouden wie waar rijdt en dan roepen ze ook om dat het NS kaartje niet geldig is.
Ik begrijp waarom het zo werkt, maar over 10 jaar wordt het gewoon 1 netwerk. Het is zo jammer dat het niet zomaar werkt.

Info/SOS paal
Ik zou niet weten wat ik zou moeten vragen. Als er iets mis waar ik niet uitkom dan stap ik gewoon de trein in en dan leg ik het uit aan de conducteur.

Betaalgrens
Lekker breed. Het is ook duidelijk aangegeven dat het een incheck gebied is, het ziet er overzichtelijk uit. **De palen zijn schuiner, wat simpel, dan kan je veel beter zien wat er op staat.**

De paal
Veel duidelijker dan dat andere ding, groter lettertype.
Bij het inchecken wil ik weten of je op korting rijdt. Bij uitchecken wil ik soms wel weten hoeveel het heeft gekost.
Bij geel komt het wel weer goed, bij rood is er iets aan de hand met je kaart.

Gebruikt de automaat soms ook om tijd te doden. Beetje bekijken wat er op de kaart staat enzo.
Automatisch opwaarderen nog steeds niet gedaan omdat de automaat zegt: onbekend product. Ik ben bang dat dan de korting eraf gaat.
De ring nodigt uit om de kaart ervoor te houden. Knipperen van de ring trekt de aandacht, maar de display geeft de meeste informatie natuurlijk.
Je moet weten in welke fase de chipkaart zit. Dat is het belangrijkste wat ik wil weten.

Poortjes
Ik denk dat je sneller de poortjes doorgaat omdat je niet hoeft te wachten als je wat wilt lezen. Als het mis is dan kan je stoppen met lopen.

8302
Geen automatisch opwaarderen

Bus
Het scherm is vaak slecht leesbaar. Bij het uitchecken let ik wel goed op hoeveel het gekost heeft en of het lichtje groen wordt. Bij de bus voel ik me gehaast, want de buschauffeur zit op mij te wachten, want er is maar 1 instap punt. Bij een tram heb je meer deuren en neem ik meer de tijd om te lezen, er zullen vast nog andere mensen zijn die bezig zijn met instappen. Als er iets mis is bij het inchecken in de bus dan zit er altijd nog de chauffeur, in de tram ben je toch op jezelf aangewezen.
De rol van de buschauffeur is vooral sturen, bij de tram in Amsterdam moet je langs een controleur, die heeft als hoofdtaak om kaartjes te controleren.
Ik probeer efficiënt te zijn dus ik loop al naar de uitgang als de bus nog rijdt, dan is dat ook maar gebeurd.

Trein
Zolang je alleen NS hebt gaat het goed want ik ben gewend om gewoon over te stappen zonder opnieuw in en uit te checken. Dit is veel erger, zo het afwentelen van een probleem op de reiziger. In Dordrecht moet je overstappen en moet je zoeken naar die palen. Zo'n grote verslechtering. Dan denk ik: zoek het even samen uit NS en Arriva en vraag mij niet steeds om in en uit te checken. Als de trein vertraagd is dan moet je al haasten en dan moet je ook nog in- en uitchecken.
Het kan aan mij liggen dat ik het niet goed zoek, maar dit is toch zo'n grote achteruitgang. Ik wil gewoon reizen niet zoeken, dat geeft irritatie bij mij.
Voor het vinden van perrons zijn hele duidelijke aanwijzingen/borden. Om dit ook te doen voor OV-chippalen lijkt me wat teveel worden. Misschien moet je de palen gewoon op logische plekken plaatsen, waar de trein stopt bijvoorbeeld.

Betaalgrens

De paal
Haltenaam is prettig als extra bevestiging op plekken waar je niet bent. 'In' en 'Uit' is duidelijker dan 'goede reis' of 'tot ziens'.
Kleuren zijn duidelijk, mooie signaalkleuren. Het kruis betekent 'stop, alles stilleggen', samen met rood. Bij een uitroepteken en geel is het een mooi alarm signaal.
Heel handig dat je de oplossing gelijk aangereikt krijgt.

Als je me laat kiezen dan vind ik de nieuwe paal fijner, al vind ik de ring wel overdone, het is een beetje kermis achtig. Het is een kwestie van smaak maar ook hoe je je perron wilt hebben. Je wilt het wat rustig hebben. **Ik heb ook wel iemand gehoord die de kaart bij het display hield. Daar is de ring dan wel handig voor, het is bijna niet te missen.**

Informatie op scherm:
Saldo bij uitchecken is belangrijk want ik heb eens heel erg moeten zoeken naar waar ik kon opladen.

Poortjes
Geen idee dat je station in en uit kan zonder te betalen. Was bang dat er steeds geld werd afgeschreven. Het is belangrijk dat het duidelijk is hoe het werkt met in en uitchecken.

Je doet eigenlijk twee handelingen: kaart voor de lezer houden en het lezen van het display. Ik vind het wel handig als daar tijd tussen zit. Lezer zoveel mogelijk vooraan.

8304
rechtshandig
automatisch opwaarderen

Bus
De gele apparaten [prodata validator] reageren wat minder dan de anderen. Bij het instappen let ik niet heel erg op, ik luister voornamelijk naar de piep. Bij het uitstappen vind ik het belangrijker om goed op te letten want dan staat er informatie over de ritprijs en saldo. Het scherm is soms lastig te lezen als de zon erop staat.
Bij korte ritjes steek ik mijn kaart in mijn borstzakje. Bij een langere rit dan berg ik hem op.
Bij het opstaan anticipeer ik op de omgeving. Meestal sta ik eerder op tenzij ik een bocht of iets dergelijks aan zie komen. **Ik wil zo snel mogelijk uitchecken om geen gedoe te hebben bij het uitstappen zelf. Bij het uitchecken kijk ik voornamelijk naar de ritprijs en of ik echt ben uitgecheckt, saldo is niet belangrijk want ik heb automatisch opwaarderen.**

Trein
Ik ben weleens de mist in gegaan omdat de palen vlak naast elkaar stonden en er geen duidelijk onderscheid was te zien. Dat is nu wel beter met die kleuren.
Bij de trein let ik vooral goed op of ik wel met korting reis. Of als ik een foutmelding krijg omdat ik mijn portemonnee er tegenaan houd.
Ik ben het ook weleens vergeten omdat ik haast had ofzo. **Laatst ook vergeten in te checken omdat ik met vrienden op pad was en in gesprek was.**
In het begin was het wel een beetje zoeken, maar merk dat ze nu wel meer palen hebben neergezet. **Het bepaalt echt of je je trein haalt of niet.**
Ik weet niet of er [plaatsing van palen] echt een systeem achter zit, ze lijken het op te lossen door meer palen neer te zetten.

Betaalgrens
Een duidelijk punt om in te checken. De palen staan ook een beetje naar je toe gekeerd. En er staat nog wat informatie op als je het nodig hebt. Info paal zou ik alleen gebruiken als ik er echt niet uitkom.
Dat van dat wegbrengen wist ik niet, dan moet je dus je kaart gebruiken als ik niet ga reizen?
Het lijkt me helder als dit bij de ingang staat.

De paal
Duidelijk beeld dat ik incheckte en ook de halte waar ik incheckte. Het beeld is duidelijk. Door de schuine vorm kan je het beter zien.
Verschilt per vervoerder of je opnieuw kan inchecken of niet. Zou meer uniformiteit in mogen komen.

Bij het gele scherm heb je nog een escape, bij de rode kan je niks, dan kan je niet herstellen.
Oppassen dat er niet teveel informatie op het schermpje staat. Ik houd van minimaal maar toch nuttige informatie.
Abonnement weergave bij inchecken kan wel, zodat je weet of je met korting rijdt. Ik kijk op stationsklok voor voordeelurenabonnement. Klokje op de paal is heel klein, niet te lezen.
Dank u en goede reis, is leuk, maar als je kijkt naar essentiële informatie die nodig is, dan zouden dat soort dingen er wel af kunnen.

De ring moet niet teveel een kermis attractie worden.

Poortjes
[Kaart] lezer zit nu meer in de loop, dat is fijn. Scherm niet te ver weg want dan is het niet goed te lezen. Scherm is ook meer service om te weten wat je hebt gereisd.

8501
Rechtshandig
Automatisch opwaarderen

Bus
Het piepje is te zacht in de bus, bij de trein is het lekker hard. Zo heb ik eens nog een keer ingecheckt in de bus omdat ik de kaart twee kort achter elkaar tegen het apparaat heb gehouden.
Ik luister alleen naar de piep, ik kijk er bijna nooit naar. In de bus zijn ze ook slecht leesbaar en zonder [lees]bril is het ook wat lastiger.
Ik heb een verdomd goed vertrouwen in apparaten al weet ik dondersgoed dat dat niet altijd terecht is.

Trein
Ik reis bijna altijd met de NS, dus niet veel ervaring met andere vervoerders.
In allerlei vormen vergeten in of uit te checken. Het gaat weleens een keer mis. Dan let ik niet op. Teveel routine, te weinig bewust handelen.
De poortjes zijn helemaal hopeloos. Dan kan ik mijn reis niet onderbreken, dat irriteert mij. En bovendien vind ik het wantrouwend tegenover de burger. Maar het zal wel nodig zijn...
Mijn dochter zei laatst: "Ja, stom, hier heb je geen poortjes, vergeet ik uit te checken." Want die woont in Amsterdam.
De poorten zijn niet per definitie wenselijk. De paal weigert wel eens een keer, dan moet je het opnieuw proberen.
Wat leuk om te horen hoe zo'n informatiepaal werkt, dat zou best eens uitgelegd mogen worden in een blaadje ofzo.

Betaalgrens
Ik denk dat het een incheckpoort is. Het is nu meer geaccentueerd, ook 1 kleur, 1 logo, 1 soort paal. Wat bij mij even heeft geduurd is begrijpen dat die palen van heel andere organisatie zijn dan de bus of trein organisatie. Het is een betaalsysteem wat er los van staat wat een dienst verleend aan vervoerders. Heeft wel geduurd tot ik dat door had. En de vraag is of ik dat als reiziger ook door MOET hebben. Het zou voor mij als gebruiker niks uit moeten maken, ik wil met die trein mee. Je wordt doorverwezen van de NS site naar de OV-chipkaart website. Terugblikkend zou ik zeggen dat dat logo eraf zou kunnen, maar we zijn nu zo ver dat het een eigen identiteit heeft gekregen. Als je duidelijk maakt dat het 1 systeem is voor alle vervoerders dan is het ook makkelijker te accepteren denk ik. Ik weet niet wat wijsheid is, maar ik ben er nu wel aan gewend.
Ik zou het fijn vinden als het op het perron ook kan, want als ik met korting reis dan wil ik zo dicht mogelijk bij de trein inchecken. Maar het zou wel handig zijn als het overal hetzelfde is.

De paal
Dat paarse lampje is natuurlijk geweldig... dat trekt onmiddellijk de aandacht. Dit is echt fantastisch, piepje had iets harder gemogen, maar dat het lichtje uitvalt dat is natuurlijk prachtig. Dat is veel duidelijker dan een lichtje wat aan gaat denk ik.

Uitchecken is duidelijk, is kort, maar erg duidelijk. **Het is ook belangrijk dat deze wat hoger staat, want de huidige paaltjes staan lager en staan verticaal. Dan moet ik echt moeite gaan doen om dat te gaan lezen. De nieuwe paal is groter, duidelijker en betere hoogte.**
De hoek is fijn, maar is natuurlijk wel gevoeliger voor de zon dus daar moet je wel iets voor bedenken zodat de zon geen overlast geeft. Oude mensen kunnen het gewoon niet zo goed zien en ook niet zo snel. Als je iets niet goed ziet heb je ook meer tijd nodig om het wel goed te zien. Ik kijk ook nooit om, ik luister naar het piepje. In de bus heb je maar 1 piepje, dat is verwarrend, of zijn het wel 2 piepjes en heb ik dat niet in de gaten. **Overigens had ik dat pas na een tijdje door dat 2 piepjes uitchecken was. Dat hadden ze ook wel een keer mogen uitleggen. Een keer uitleggen was misschien handig geweest.**

Info op Arriva paal: te veel en te vaag.

Ritprijs is goed om die te geven, verder mis ik geen informatie.

Dit is wel een beetje gek: ov-chipkaart is een organisatie en nu word ik toch naar de vervoerder gestuurd. Dat zet me een beetje op het verkeerde been.

Rood, kruis: je kan de kaart niet meer gebruiken.
Geel: je hebt iets niet goed gedaan, je kan nog herstellen.
De kleurtjes en symbolen komen op mij duidelijk over.

Poortjes
Belangrijkste feedback van een poort zijn de deurtjes.
Ik zou het scherm zover mogelijk naar achter willen zetten. Dat je net in die fractie van een seconde het scherm kan lezen. Zeker als je de gang erin wil houden.

8502
Geen automatisch opwaarderen
Smartphone

Bus
Er zijn wel piepjes, maar die snap ik nog steeds niet. Tijdens de rit houd ik de kaart in de hand, om niet vergeten uit te checken. **Bij de bus en tram check iedereen in en ook iedereen uit, dat helpt me herinneren dat ik ook iets moet doen.** Ze hangen altijd bij de ingang, dus dat is duidelijk.
Ik wacht tot het voertuig stilstaat voordat ik naar de uitgang loop.
Bij uitstappen let ik op of ie het doet en hoeveel saldo erop staat. Ik heb geen automatisch opwaarderen want dan heb ik geen controle over het moment dat er geld van m'n rekening wordt gehaald.

Trein
Bij de metro vergeet ik het nooit, daar staan poortjes. Bij de NS vergeet ik het nog weleens.
Soms staan ze bij de trap, soms staan op het perron, soms staan ze verdekt opgesteld. Station Sloterdijk is een ramp, daar staan ze om een liftschacht en dat zijn er dan maar 4.
Het is geen stroom waarin je meegaat waarbij iedereen in of uit checkt.
Ik probeer altijd te lezen wat er op het schermpje staat. Lampje? Nooit gezien.

Betaalgrens
Dit zou bij een ingang moeten staan. **Het moet je geen tijd kosten dat in en uitchecken, dat is bij Sloterdijk wel het geval. Je moet zoeken.**
Als je door de deuren komt moet je het meteen tegenkomen. Je moet erover struikelen.
Dat informatiebord is een goed idee... dat geeft wel heldere informatie.

De paal
[uitchecken] Wat een heldere letters.
[2 kaarten] Ohja, moet je ze een voor een ervoor houden.

Ring
Dit vind ik echt handig. Je zou eens moeten weten, digibeten zoals ik hebben eerst dit gedaan [houdt kaart bij display] Die ring is echt een vondst.

Teksten
Of geslaagd, als je pint tegenwoordig dan ben je geslaagd. Er staat alleen 'geslaagd', niet 'betaling' erbij. Ik ben er nu aan gewend, maar in het begin dacht ik: geslaagd, waar slaat dat op.
Maar ik zou het kort houden.
De haltenaam vind ik ook handig.

8505
Rechtshandig
Anonieme kaart
Geen automatisch opwaarderen
Geen smartphone

Bus
Bij het inchecken let ik op het geluid of een dingetje op het scherm. In de tram zijn ze slecht leesbaar, dus toch voornamelijk let ik op het piepje. Ik maak meestal korte ritjes, dus houd de kaart in de hand.
Bij het uitchecken let ik ook weer vooral op het piepje, omdat je naar buiten loopt en geen tijd hebt om te blijven staan. **Ik let nooit op de bedragen, ik zie liever gewoon staan "u heeft uitgecheckt" dan allerlei bedragen.**
Ik weet ook nooit hoeveel ik precies op mijn kaart heb staan. Als ik weet dat ik met de bus ga dan controleer ik het saldo bij de supermarkt ofzo.

Trein
Je hebt iets langer de tijd om te kijken naar de paal. Bij een bus en tram ben je bezig met in of uitstappen. Soms controleer ik mijn saldo bij de automaat of koop een kaartje als ik een bonnetje voor declaratie nodig heb.

Betaalgrens
Lijkt me wel handig. Soms moet ik wel zoeken naar die palen of moet ik teruglopen omdat ik ze niet gezien had.
Het doet me denken aan een soort tolweg, met zo'n bord boven de weg.
Ik vind het fijn om de kaart met mijn rechterhand voor een apparaat te houden, links voelt een beetje raar.
Ik denk dat het wel fijn is als je haast hebt dat een automaat je meteen naar de juiste opties leidt.

De paal
Ik ben nog heel ouderwets en denk dat je het pasje er voorbij moet bewegen.

Ik vind deze [nieuwe] paal plezieriger, dat je beter zicht op het scherm. Als je iets meer tijd hebt [omdat trein nog niet gaat] dan neem ik ook meer tijd om te lezen. Maar bij het uitchecken loop je er vaak snel langs.

Ik heb allemaal RFID kaartjes in mijn portemonnee, dus ik haal mijn ov-chipkaart er altijd uit. Het piepje is vaak voldoende om te weten of je bent uitgecheckt.

Het verschil tussen een uitroepteken en een kruis is ook duidelijk. Het uitroepteken geeft aan: het kan nog goed komen. Bij een kruis heb je meteen zoiets van: ohje, dit is foute boel.

Poortjes
Als de reader bovenop zit kan je beter doorlopen. Net zoals ik met mijn kaart een swipe maakte, swipe ik mijn lichaam erdoor, haha.
Schermpje wat verder is wel prettig, dat je een beetje vooruit kan blijven kijken in plaats van terug moet kijken.

Als ik hier [rechter poort] doorheen zou moeten dan zou ik het ik het niet in m'n hoofd halen dan hier [linker poort] in te checken.

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