

Facilitating Efficient & Effective Wayfinding Experiences for Rail–Air Passengers at Train Stations

Design for Interaction – Master Graduation Thesis

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I cannot believe this incredible journey has finally come to an end. The last seven months have been a roller coaster of emotions, but I wouldn't have had it any other way. I will cherish everything I have gained and experienced, not only during my thesis but throughout my entire master's course here at TU Delft.

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Avi

Abstract

This thesis aims to enhance wayfinding experiences for rail-air passengers at train stations, facilitating efficient and effective navigation during the initial phase of their journey. By improving wayfinding at train stations, this project seeks to promote multimodal travel, particularly the use of trains as a sustainable alternative to short-haul flights. This research contributes to the European Green Deal's objective of reducing transport emissions by 90% by 2050 (EU Action, n.d.).

This research process follows the double diamond model as shown in figure 0.0 (Design Council, 2005). This structured approach consists of 4 phases: Discover, Define, Develop, and Deliver. The 'Discover' phase involves the study of literature, existing practices, field research, and journey mapping to gain an understanding of the context. The 'Define' phase involves analyzing the rich data & insights from the previous phase to find the gap and define the design direction. For this thesis, the discover & define phase was repeated twice- first to identify the gap in wayfinding & rail-air journeys and second focused on a case study of KLM Air&Rail, to identify specific wayfinding challenges faced by their passengers at Brussel Zuid train station. The 'Develop' phase involved an iterative ideation process. The 'Deliver' phase involved an iterative concept testing. The final design is a signage that allows KLM Air&Rail passengers at Brussels Zuid train station to begin their wayfinding journey confidently and navigate to the KLM Air France Air&Rail terminal in a composed

manner. By enhancing the wayfinding experience for the first phase of their rail-air journey, KLM Air&Rail passengers will have a more positive perception of the overall Air&Rail service provided by KLM.

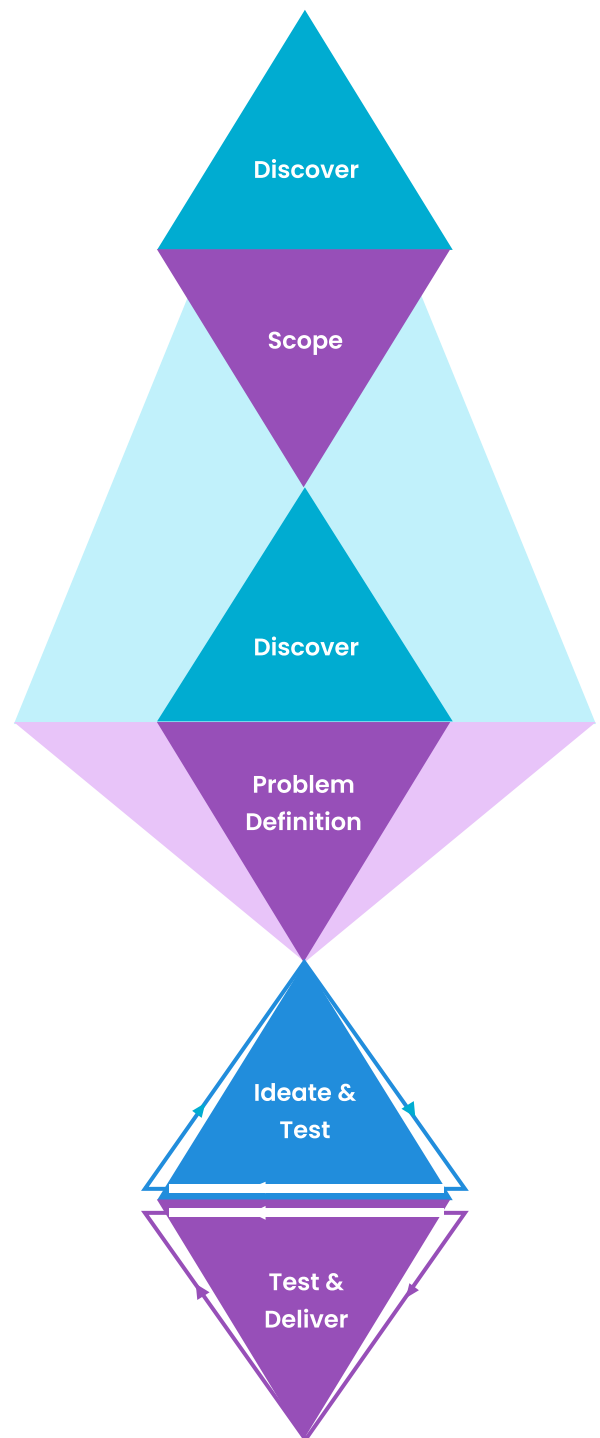


Figure 0.0: Double Diamond Design Process

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01 Introduction

This chapter introduces the relevant topics for this project and provides an overview of the context of study. Furthermore, it discusses how wayfinding is integral to enhancing rail-air journeys and in turn, promoting alternative, sustainable modes of travel.

- Introduction
- Opportunity
- Rail-Air Journeys
 - Wayfinding & Passenger Transport
- Wayfinding, Multimodal Hubs, and Rail-Air travel
 - Gap



1.0. Introduction

In 2023 alone, almost a billion air passengers were carried out at an EU level. This number is increasing every year. The European Commission has stated that aviation is one of the fastest-growing sources of greenhouse gas emissions. With the global shift towards adopting sustainable lifestyles, there is added pressure on airlines and the aviation industry to offset carbon emissions by 90% by 2050 (EU Action, n.d.).

Currently, some airlines in Europe adopt a hub-and-spoke model as shown in figure 1.0. As its name suggests, the airlines use a hub, in most cases airports located at strategic locations with impressive connectivity like Schiphol Airport, as a transport point to the final destination of the journey (Rousian, 2023). A passenger departs from a non-hub airport (spoke) and arrives at the central (hub) airport, where he continues to the final destination airport. This model produces a vast quantity of short haul flights, thus raising sustainability concerns.

For this reason, airlines are adopting alternative modes of travel called multimodal transportation. It is said to be the organic combination of two or more modes of transport (Rousian, 2023). Multimodal travel is a strategy used across Europe to reduce the negative impact on the environment by integrating the advantages of different types of transportation. One such popular multimodal travel is Air-Rail or Rail-Air journeys as shown in figure 1.1.

Rail-Air journeys are becoming increasingly popular for several reasons. The convenient access to public transport and train stations allow passengers to reach airports efficiently. Furthermore, flexible train schedules allow more freedom for passengers to plan their travels (Bruinsma, 2022). For such journeys, sustainable high-speed trains substitute the unsustainable short haul flights in the hub-and-spoke model. Passengers travel through train, transfer at the hub airport, and continue on their long haul flight to reach their final destination as shown in figure 1.1.

These agreements are implemented in many European countries, such as the Netherlands, Belgium, and Germany (Yuan et al., 2021). When passengers use a location to change between 2 or more modes of transportation, it acts as a multimodal hub. This way, railway stations and airports are also contributing towards sustainability measures by evolving into multimodal hubs.

Currently air-air journeys are familiar, smoother, well-integrated, and better designed than air-rail or rail-air journeys (Hendrikx, 2021). Therefore, the majority of the travelers make the choice for a multi-leg flight. Improving public transportation UX and ensuring the services or organizations of multimodal journeys are seamlessly integrated, are possible solutions to promote efficient and sustainable travel like rail-air & air-rail journeys (Oliveira et al., 2017).

Multimodal travel like rail-air journeys require their passengers to navigate through different types of environments. A requirement to ensure positive passenger experiences across the entire length of the journey, is ensuring convenient transfers and wayfinding experiences at train stations and airports (Castellsaguer Petit, 2019).



Figure 1.0: Traditional Hub and Spoke Model

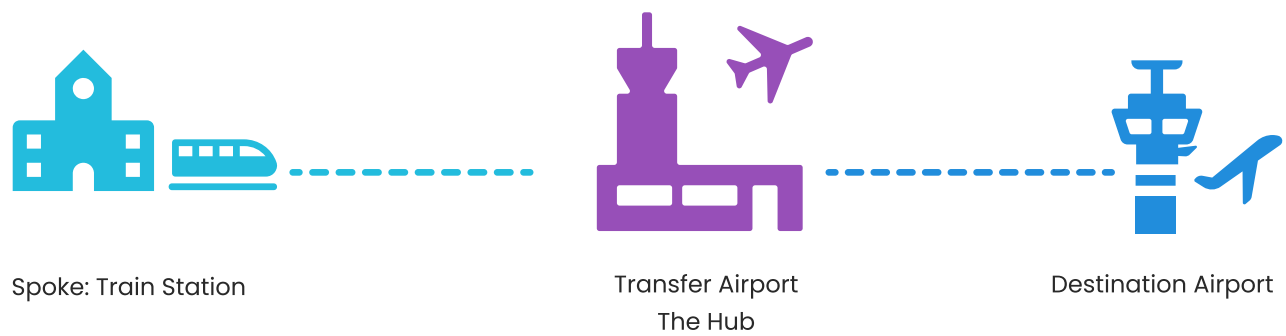


Figure 1.1: Depiction of a Rail-Air Journey

1.1. Opportunity

Train stations and airports are complex environments with multiple facilities & services operating within them. Thus, there is a higher chance passengers face additional challenges when navigating across these environments. Navigation & wayfinding are closely linked to the feeling of safety & security. Additionally, wayfinding is linked to the ability to successfully reach a train or flight departure on time. Terrible wayfinding systems can affect the efficiency of movement, leading to possible loss of time and in turn dissatisfied passenger experiences (Grimme, 2007).

A study on wayfinding at Atlanta Lenox Station has shown that passengers at railway station or airports, tend to become more confused and disoriented when they have to adhere to a strict train or flight schedule (Jackson et al., 2011). This reinforces the need for effective wayfinding systems that aid navigation in these environments and reduce the risk of missed transfers & departures.

Extensive research has been conducted to improve wayfinding at airports. Consequently, passengers accustomed to the airport environment are generally able to navigate with ease due to well-established wayfinding systems. This familiarity benefits air-rail passengers who start their journey at the airport, as they are already familiar with effective wayfinding practices. Additionally, it benefits companies providing air-rail services, as passengers begin their journey at the airport with a positive

experience- contributing to an overall favorable perception of the journey. In essence, the airport's effective wayfinding systems help ensure that the air-rail service is experienced positively from the beginning.

Train stations present an interesting opportunity in this context. For passengers commencing their rail-air journeys at the train station, it is crucial that the station's wayfinding systems and services offer the same level of familiarity and ease. The goal is to ensure that passengers experience seamless navigation at the train station, comparable to their experience at an airport.

Rail-Air services not only provide a sustainable alternative to the traditional air-air hub and spoke model but also appeal to passengers who frequently take connecting trains to reach the airport (Hendrikx, 2021). This option is cost-friendly and offers the advantage of frequent high-speed train operations, which eliminate the need for less profitable & unsustainable short-haul flights. Additionally, they can accommodate a large number of passengers and reduce congestion at airports (Zhang et al., 2019).

Given that the train station marks the starting leg of the journey, it is crucial for the wayfinding experience to be as efficient and positive as possible. Poor navigation at this stage can lead to passengers possibly missing their trains, and increased stress due to tight schedules, underscoring the need for

effective wayfinding systems at train stations.

1.1.2. Conclusion

The aviation industry's rapid growth in Europe has heightened the need for sustainable travel solutions, prompting the shift from the traditional hub-and-spoke model to multimodal transportation, particularly rail-air journeys. These services offer a promising way to reduce carbon emissions.

Effective wayfinding systems across multimodal journeys are essential for the success of this transition. Passengers are currently accustomed to using the wayfinding systems for effective navigation at airports. This familiarity benefits air-rail passengers. Similar improvements are needed at train stations to ensure similar seamless, stress-free rail-air travel experiences. By enhancing wayfinding at railway stations, we can promote rail-air travel, contributing to a more sustainable alternative to the air-air hub-and-spoke model.

Moving forward, we need to understand current rail-air journeys and the various factors that need to be considered to ensure seamless travel and passenger satisfaction. By learning more about rail-air services being provided by companies in Europe currently, we can identify areas for improvement to enhance the overall travel experience.

1.2. Rail–Air Journeys

A popular and sustainable multimodal journey is Rail–Air. In this model, passengers begin their journey at the railway station, travel by train, and reach the airport to board their connecting flight. Railway stations and airports act as multimodal hubs since passengers use the environment to transfer between multiple modes of transportation. Rail–air passengers beginning their journey at a railway station might reach there by a connecting train, bus, or local transport–making the train station an equally complex multimodal hub & structure. Train

stations often have to cater to multiple organizations utilizing the space– such as local & international organizations/ services, recreation brands & stores, etc, making these environments challenging to navigate.

Rail–air agreements, like Air–Rail Integrated Services (ARIS), are gaining traction in Europe and Asia, aiming for cooperative operations among airlines, railways, and airports (Yuan et al., 2021).

1.2.1. Passenger Experience and Seamless Travel

A study conducted by Drouet L et al.(2023) on the factors influencing passenger experiences at multimodal hubs revealed that passengers have a psychological need to feel in control of their journey. Services offering multimodal travel like need to provide relevant information needed to make the right decisions even during uncertainties. Furthermore, passengers want to use their time efficiently when using the various environments encountered during a rail–air travel by accessing information across different touchpoints such as apps, displays, signages (Drouet L et al., 2023). This further reinforces the need to design spaces and services that help passengers navigate throughout the journey efficiently.

To ensure a positive passenger experience across multimodal journeys like rail–air, Li & Loo, (2016) propose a conceptual model concerning the various levels of

performance factors needed for seamless multimodal integration, figure, 1.2. The study states that information systems and signages are the lowest performance factors. Medium level integration factors include accessibility facilities such as luggage handling & time of transfer efficiency at multimode hubs. The study suggests further improvement on high level multimodal ticketing integration, particularly, the ease of booking (Li & Loo, 2016). A study on the challenges multimodal passengers face revealed that difficulties with planning, including having too many options, and lack of discounts continue to be a hassle during the booking process (McIlroy, 2023).

One such service in mass development to enhance multimodal journeys are MAAS applications– Mobility as a Service. These applications aim to integrate multimodal transportation options such as combined air–rail/rail–air tickets, coordinated

schedules, and luggage handling shuttle transfer into a single on-demand mobility service accessible via a single digital interface. This could potentially motivate passengers to opt for high-speed trains for short-haul travel instead of flights (McIlroy, 2023). However, combined tickets add further pressure on passengers due

to the fear of missing transfers. High integration factors such as MAAS applications can be supported by medium and low tier integration factors discussed earlier, particularly systems that enhance time & transfer efficiency, and navigation at airports and train stations to avoid delays and missed connections.

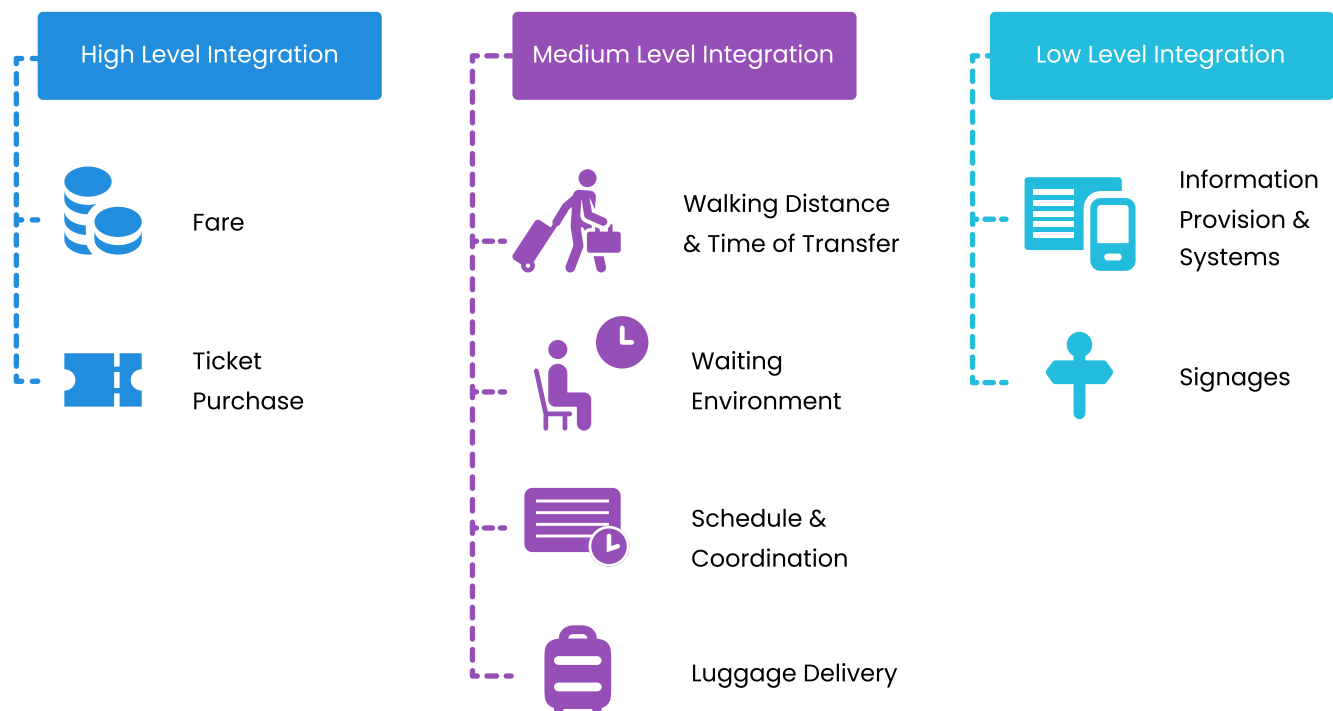


Figure 1.2: Integration ladder with Performance Indicators for Seamless Multimodal Integration

1.2.2. Current Rail–Air Services

Rail&Fly: In cooperation with Deutsche Bahn (DB), Lufthansa offers a German train ticket at a discounted price or in some instances, is even included in the basic airfare. Rail&Fly has gained a high acceptance in Germany by passengers for the flexible and attractive prices (Grimme, 2007). Passengers can travel from any city in Germany to their international flight through train. Rail&Fly is an additional service that can be added during the online booking process at [lufthansa.com](https://www.lufthansa.com). Following completion, passengers receive a booking

confirmation with voucher codes for the Rail&Fly tickets. These codes can be converted into a valid train ticket that be used flexibly for any train on the selected day, this prevents passengers from having to adhere to a strict train departure. Rail&Fly tickets encourages passengers to use the train for hub airport access, instead of using a feeder flight on a domestic air carrier.

KLM Air France Air&Rail: On specific journeys, a high-speed train ride to Schiphol Airport or Paris–Charles De Gaulle

is included in a passenger's ticket. A partnership between KLM and Air France offers passengers traveling from Belgium the option to opt for a high-speed train instead a short haul flight to Schiphol Airport or Paris-Charles De Gaulle respectively on some selected ticket options. These passengers can begin their train journey from either Brussels Zuid train station or Antwerp Centraal. They then continue on their long haul flights once reaching the airports.

Passengers traveling from Brussels Zuid to Paris-Charles De Gaulle through Air France also benefit from baggage handling services further improving overall passenger satisfaction. The CEO of KLM, Marjan Rintel has stated that the company aims to invest into the Air&Rail service to ensure smooth customer journeys, making the high speed train an ever-better sustainable alternative to air on short-haul routes in Europe. The company is seeking to improve passenger experiences during their multimodal rail-air travels. Air&Rail services require passengers to frequently navigate and use train stations and airports.

As mentioned in chapter 1.2.1, certain factors of multimodal travel need to be well integrated across the journey to ensure seamless travel. KLM Air&Rail passengers boarding a train from Brussels Zuid train station to Schiphol Airport with the Air&Rail ticket will expect to have full control of their journey, beginning at the train station. **These passengers would mostly be accustomed to departing from airports after booking their flights with KLM, and will anticipate the same procedures, quality levels, and**

navigational experience at the departing train station as at a departing airport. For ticketing facilities like Air&Rail to perform well, wayfinding systems that ensure passengers navigate through the station efficiently and board their train on time need to be well incorporated. The train station must ensure a positive wayfinding experience for KLM Air&Rail passengers during the pre-travel stage of the rail-air journey. This in turn will allow them to reach their transfer on time and improve the overall perception of the KLM Air&Rail journey more positively

1.2.3 Conclusion

Rail-air journeys represent a sustainable and increasingly popular mode of travel, seamlessly connecting passengers from railway stations to airports. To ensure passengers feel in control of their journey, it's essential that rail-air performance factors such as ticketing, baggage handling, and information systems are well integrated across the entire journey.

For rail-air services like Mobility as a Service (MaaS) applications to function effectively, wayfinding systems at railway stations and airports must ensure efficient navigation for passengers at the start and during their transfer. Since time efficiency is crucial to positive multimodal travel, it must be a key consideration.

Current rail-air services, such as Lufthansa's Rail&Fly and KLM Air France's Air&Rail, aim to offer seamless rail-air journeys. However, to ensure passengers begin their journey positively and efficiently at train stations, these services must be supported by well designed wayfinding systems.

Exploring the connection between wayfinding and travel involves understanding current wayfinding systems at multimodal hubs, identifying gaps in the wayfinding experience for rail-air journeys, and examining the factors that influence navigation.

1.3. Introduction to Wayfinding & Passenger Transport

We accomplish wayfinding tasks in our everyday lives. Wayfinding is the way we make sense of our environment and find our way through it. It is a purposeful, problem-solving interaction with an environment, the goal being to reach a destination safely and efficiently (Dogu et al., 2000).

Within the context of travel, wayfinding is successful if we reach our destination within spatial and temporal constraints. Passengers often need to find their way through multiple types of environments such as airports, train & bus stations etc when undertaking long journeys (Glastra-van Loon, 2017).

Passengers using transportation are often under the pressure of time, and are required to navigate efficiently throughout their journey in order to reach the final destination. This requires complex cognitive tasks that involve perceiving the environment, interpreting the information, and subsequently making decisions to get to a certain location (Jackson et al., 2011).

Wayfinding decisions follow a hierarchal chunking format. We naturally break down a larger wayfinding task into smaller decisions while navigating (Royal Schiphol Group, 2020) For example, if a passenger wants to reach a gate at the airport, he or she would locate a departures board to learn the gate number, then they would search for a nearby gate signage board, and finally navigate to the gate. This comprehensible planning of their journey

involves taking important decisions along the way.

1.3.1 Wayfinding Types

1. Analogue or traditional wayfinding:

Utilizes information gained by observing and interacting with the physical elements of the environment for navigation such as traditional signages, site maps, the architectural layout, landmarks etc.

2. Digital wayfinding: Encompasses the use of technology to provide directions & information to help people navigate their environment more efficiently. This includes digital boards, interactive maps & kiosks, mobile apps, and other digital tools (Chatterjee, 2023).

Useful applications for digital wayfinding such as real time navigation apps, and experimental AR guidance technology enhance navigation. However, without a good analogue wayfinding system, there is a limit to what digital wayfinding can do to aid wayfinding. An experiment on comparing the benefits of analogue and digital wayfinding revealed that even though GPS and other digital based navigation apps are used abundantly in today's society, they do not reduce feelings of anxiety (Vaez et al., 2019). Hence, it is imperative to maintain a good balance between the two. A well-considered interplay between analogue and digital navigation is said to offer the best possible wayfinding experience for travelers (Fian et al., 2020).

1.4. Wayfinding, Multimodal Hubs, and Rail-Air travel

As stated previously, multimodal hubs are complex environments requiring multiple services and organizations to work together in order to ensure a smooth passenger travel experience. Multimodal hubs are one aspect of the rail-air journey. The entire rail-air journey acts as separate zones passengers will need to interact with and navigate. Though train stations are the first environment rail-air passengers have to traverse through, its requirement to perform as a multimodal hub to cater to other multimodal journeys & services using the space could result in rail-air passengers finding its layout & infrastructure challenging to navigate.

Zones are spatial units with similar functionalities we club together to make sense of complex environments as shown in figure 1.4. Efficient wayfinding is established when traversal and navigation between these zones are well connected (Martins et al., 2014). This concept can be applied to the entire rail-air journey, with each part of the journey, the booking process, the railway station, the train, the airport, the flight, and arrival destination acting as independent zones.

The challenge lies in passengers requiring to adapt to the wayfinding systems for each zone during a rail-air journey. For example, for the Air&Rail service provided by KLM, passengers will need to adapt to multiple types of systems for the journey—the wayfinding system at Brussels Zuid train station, the Eurostar wayfinding systems, Schiphol Airport's wayfinding

system, and KLM's wayfinding systems. When focusing on the pre-travel stage of a rail-air journey, the zones passengers need to interact would include the booking process with company services, the wayfinding systems at the railway station till they enter the train.

As stated earlier railway stations might cause rail-air passengers occasional stress at the start of their journey due its complex layout, big crowds, and ambiguous wayfinding systems (Oliveira et al., 2017). Passengers have to navigate their way from one location or mode (like a connecting bus or train) to another in the course of a single visit. They might have to do this in an entirely unfamiliar location. While good wayfinding can reduce stress, poor wayfinding can not only increase an individuals' anxiety but also cause missed departures leading to additional incurred costs for both passengers and companies (Castellsaguer Petit, 2019).

The feeling of security is closely related with feeling lost. Foreigners visiting a land with an unfamiliar language and wayfinding system may feel especially stressed & uncomfortable while trying to navigate through environments that serve as multimodal hubs (Dogu et al., 2000).

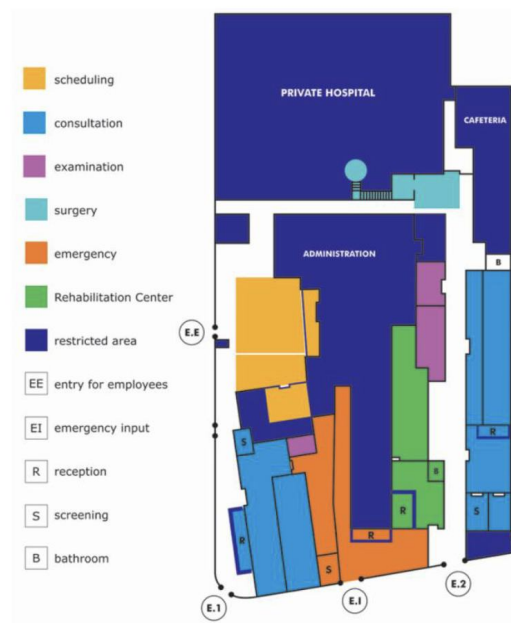


Figure 5.0: Zoning of a Hospital Environment (Martins et al., 2014)

1.5. The Gap

A significant gap exists in the uniformity and integration of wayfinding systems across rail-air journeys disrupting efficient passenger experiences.

Research on wayfinding mostly focuses on specific zones like airports or railway stations, neglecting the uniformity and linearity of the entire rail-air journey. Fragmented management by different organizations leads to disjointed wayfinding systems, forcing passengers to frequently adapt, causing confusion and frustration, especially under time constraints. This lack of seamless wayfinding integration results in complex traversal and negative passenger experiences.

As stated previously, focusing on the wayfinding experience of the pre-travel stage of rail-air journeys at train stations could ensure passengers begin their travel positively & efficiently, which will lead to an overall improved perception of the service. Wayfinding at railway stations, particularly for rail-air services like KLM Air&Rail, is a relatively new area with limited research. It

is crucial to design railway stations with effective wayfinding systems to help passengers easily navigate to their specific trains and subsequently reach the airport for their transfer. Ensuring a seamless wayfinding experience passengers are accustomed to when navigating to their flights at airports, will improve the overall perception of the rail-air experience.

Different organizations & services are often involved in the pre-travel stage of rail-air journeys at railway stations. This leads to a disjointed wayfinding experience at the start of the passengers' journey in turn, negatively influencing their overall perception of the service. Therefore, research will be focused on the train station to improve the wayfinding for the pre-travel stage of a rail-air journeys.

I wish to facilitate efficient passenger navigation by designing a well integrated wayfinding system for the pre-travel stage of the rail-air journey.

1.6. Factors Affecting Wayfinding

As established, wayfinding is a complex problem-solving phenomenon involving orientation and navigation.

Mijksenaar, responsible for one of the world's most intuitive and user friendly wayfinding systems at Amsterdam Schiphol Airport states that wayfinding should cater to flow control. He believes that intuitive or natural wayfinding can be achieved when there is a holistic integration of all the factors influencing navigation and flow. The wayfinding system must assist passengers in finding

their way and ultimately reaching their destination goal (UX Collective, 2018). The factors mentioned below will be used to study wayfinding experiences later during field research and data analysis.

Decision Points & Layout

The architectural layout of an environment influences the performance of wayfinding.

Decision points are where paths & corridors intersect. Here, the navigator must make a wayfinding decision for example, whether to continue along the current route or change directions, as shown in figure 1.6.1. Good wayfinding affords navigators with the right kind of information at these crucial points to assist decision making while completing a wayfinding task, in turn, aiding the navigator in their larger goal of navigation (Foltz, 1998).

When changing the layout of the building is not practical, adjusting or incorporating useful wayfinding systems can help improve wayfinding capabilities and performance.

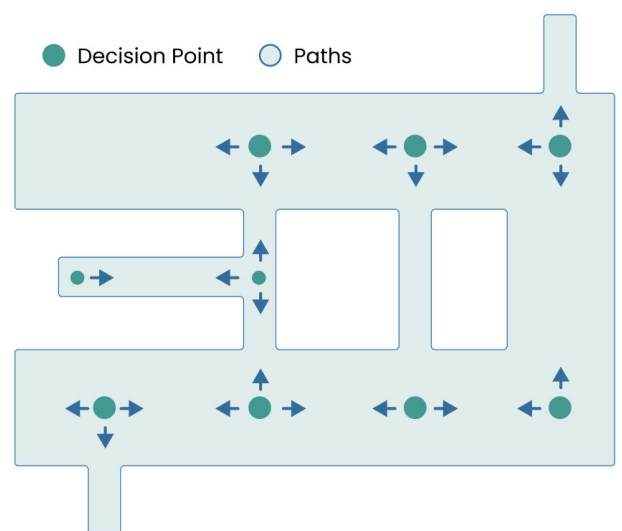
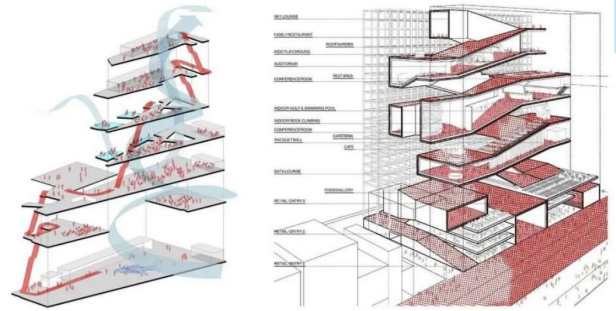


Figure 1.6.1: Figure 8.0: Decision Points at the Intersection of Paths and Corridors

Circulation is how people move through the environment as shown in figure 1.6.3. Paths need to be well structured to maintain a navigator's orientation with respect to both the next decision point and the eventual destination.



Landmarks

Signages

20

Signage systems need to have a unique visual identity to help make navigation efficient. A visual system in multimodal hubs can be used to differentiate signages of varying functionalities such as departures, recreation, and safety. Ambiguous pictograms & symbols lead to possible misinterpretations and thus, wrongful wayfinding decisions.

A good balance between internationally established symbols and textual information help passengers feel more assured of their interpretations during wayfinding. Big, and bold signages with a high contrast offer higher visibility and can be viewed from longer distances. When too much information is displayed across multiple signages, it is harder for passengers in stressful and time based environments like airports and train stations to effectively retrieve relevant information to aid their navigation (Signs&Safety, 2022).

There are 4 types of signages (Davis, 2023):

1. Identification Based Signages: informs a navigator of whether they have reached their destination, figure 1.6.5.
2. Directional/Confirmation Signages: act as guiding hands and help navigators confirm their position and inform their next decisions when traversing to their destination, figure 1.6.6.
3. Informational Based Signages: provides additional information regarding the facilities offered in a certain environment such as cafes, bathrooms etc, figure 1.6.7.
4. Regulatory Based Signages: focuses on conveying safety and security based information, figure 1.6.8.



Figure 1.6.5: Identification Signage. Source: Schiphol Airport



Figure 1.6.6: Directional Signage. Source: Schiphol Airport

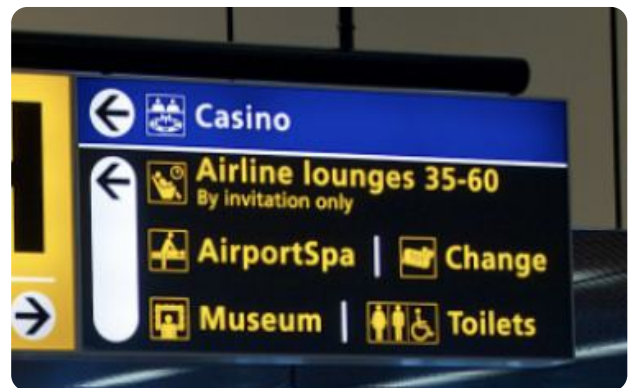


Figure 1.6.7: Informational Signages. Source: Schiphol Airport



Figure 1.6.8: Regulatory Signages. Source: Schiphol Airport

Information Systems

Information systems in the context of wayfinding are collections of hardware, software, and other integrated services that help people navigate through an environment more efficiently & effectively. Information systems range from physical environmental information such as signages, layout maps, and tactile based wayfinding systems such as tactile

pavings to digital environmental wayfinding systems.

Digital Environmental Wayfinding Systems

These digital wayfinding systems are built into the physical environment and leverage the advantages of technology. These systems include interactive kiosks, ticketing systems, digital boards, interactive maps, and audio wayfinding. These systems offer the benefits of real-time, dynamic, and personalized navigation solutions. Fast paced environments with a continuous exchange of information like airports and train stations, particularly leverage the advantages of these types of systems.

Departure boards and interactive floor plan kiosks as shown in figures 1.6.9 & 1.6.10, are extensively used in present day airports and railway stations to offer a more efficient and accessible wayfinding experience. These systems also help organisations quickly update lengthy traffic schedules on a timely basis. Digital systems offer a simple solution to seamlessly keeping passengers informed of any unforeseen circumstances such as cancellations & delays (Chatterjee, 2023). Audio announcements regarding delays, lost luggage & departures offer additional wayfinding accessibility for passengers.

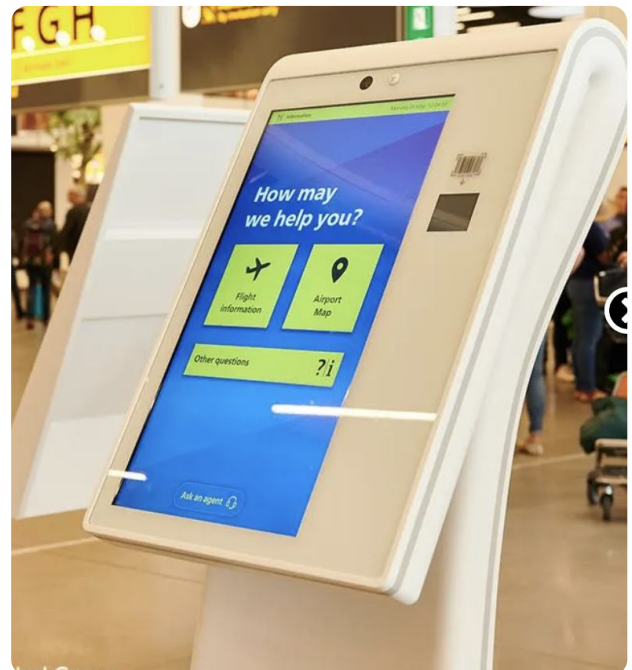


Figure 1.6.9: Self Service Interactive Kiosks. Source: Schiphol Airport



Figure 1.6.10: Digital Departures Boards. Source: Schiphol Airport

Integrated Services & Technology

These systems include integrated services such as navigation & route planning apps and brand based services that enhance and aid overall wayfinding experiences.

Integrated apps such as the Schiphol Airport app, figure 1.6.11, improve and enhance accessible experiences since wayfinding systems such as departures and delays can be integrated seamlessly into mobile devices. Information required for efficient navigation and planning can be accessed from anywhere, even outside the specified environment. Integrated ticketing services such as the OV chipkaart, figure 1.6.12, offers seamless public transport usage.

These systems support real-time, and dynamic updates. They also allow passengers to create a more personalised experience: passengers can choose to switch on alerts, choose travel packages, and input preferences for their navigation. Integrated digital wayfinding solutions could also cater to inclusive experiences by offering haptic and auditory based feedback, visual guidance for the visually impaired (Chatterjee, 2023).

Familiarity

Research indicates that familiarity with an environment prompts individuals to rely on memory and cognitive maps, facilitating a more relaxed and flexible wayfinding experience. Familiarity significantly influences decision-making behavior, leading to confident and strategic navigation. Conversely,

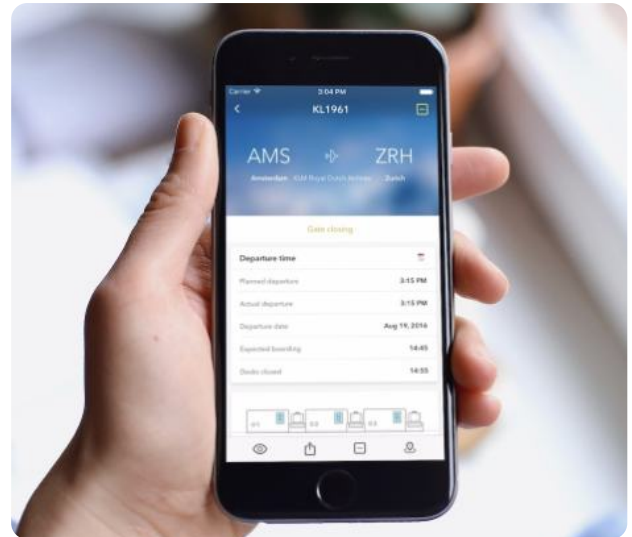


Figure 1.6.11: Integrated App. Source: Schiphol Airport App



Figure 1.6.12: Integrated Services & Technology. Source: NS

unfamiliarity induces uncertainty and erratic decision-making, leading to increased feelings of anxiety and stress, particularly in complex environments (Iftikhar et al., 2020).

Legibility, Comprehensibility, & Color

The legibility and comprehensibility of written text, printed characters and pictograms are fundamental to designing signages and other information systems. Aspects of wayfinding systems that require some form of interpretation need to ensure the message is communicated swiftly and accurately, leaving no room for misinterpretation (HSC, 2023).

Accessibility standards in signage design vary by country however a few guidelines set the foundation for enhanced legibility and readability as shown in figure 1.6.13. Choosing high-contrast color combinations when designing signages, maps or interfaces will significantly improve readability and legibility. Colors can also be used to evoke emotions and familiarity with brand values. Larger text sizes and heavier font weights are easier to read, particularly for signages. Finally, universally accepted and standardized pictograms must be used when designing wayfinding systems to ensure their purpose is clear and straightforward. These elements, when not strategically arranged together could be ambiguous to read and convey unintended messages as shown in figure 1.6.14. (Murphy, n.d.).



Figure 1.6.13: Colour Contrast Theory for Good Signage Design. Source: Identity Group, 2023



Figure 1.6.14: Ambiguous & Confusing Signage Design. Source: Bored Panda, 2024

1.7. Conclusion

In conclusion, wayfinding is essential for passenger travel, especially in rail-air journeys that require navigating various environments efficiently. A balanced integration between analogue and digital wayfinding systems are integral to offer the best experience.

Rail-air services provided by some companies such as KLM require their passengers to navigate through a train station at the start of their rail-air journey. This could present some challenges for passengers due to the complex nature of train stations. Additionally, the pre-travel stage of a rail-air wayfinding journey will require passengers to interact with multiple & unfamiliar wayfinding systems. This can cause stress and confusion, since these systems are not well-integrated to ensure effective and positive wayfinding experiences. Improving wayfinding at railway stations, is a key part of rail-air journey, as it can ensure passengers have a positive start to their journey, prevent time delays and missed connections, enhancing the overall travel experience.

Moving forward, by immersing myself into the role of a rail-air passenger, I can gain an understanding into how current wayfinding systems are experienced during the pre-travel stage of a rail-air journey at a train station. This approach will allow me to identify problem areas and opportunities for improvement to enhance navigation at train stations, ultimately aiming to enhance the overall rail-air travel experience.



02 Research Plan

This chapter examines a realistic rail-air case study chosen to understand how wayfinding is experienced at a train station during the pre-travel stage of the journey. It then discusses the field study approach and the method for collecting rich qualitative data.

- Understanding the Context
 - Method: Data Collection
 - Method: Analysis
 - Case 1: Rotterdam Centraal
- Case 2: Brussels Zuid Train Station
 - Gap

2.1. Understanding the Context

2.1.1. Pre-Travel Stage of Rail-Air Journeys

Companies such as Lufthansa, Air France, and KLM provide rail-air services in Europe. These services usually require passengers to book their combined train and flight tickets online using the company website. They are then required to reach the railway station to board their chosen train for departure to the airport.

KLM offers a service that allows their passengers to travel from Brussels Zuid train station to Schiphol Airport in a high speed train to catch their KLM flight on selected tickets. KLM Air&Rail passengers book their combined train and flight journey on the KLM app or website. They are then required to reach Brussels Zuid train station and navigate towards the KLM Air France Air&Rail terminal to check-in and pick up their physical boarding pass for both their train and their flight.

Navigating through the railway station to receive the boarding pass to board the train is the pre-travel stage of the rail-air journeys for KLM Air&Rail passengers. Since trains typically operate more frequently than airplanes, missing a flight is considered to be more stressful for passengers than missing a train. And as mentioned previously in the opportunity, passengers in railway stations or airports, tend to become more confused and disoriented when they have to adhere to a schedule.

This can significantly impact the stress levels of passengers when beginning their rail-air journey at railways stations and affect the performance of their wayfinding abilities. This in turn can negatively affect their overall journey experience (Hendrikx, 2021).

This offers an opportunity to learn more about how wayfinding can affect the overall experience of the pre-travel stage of rail-air journeys at train stations.

2.1.2. Cases

For this thesis, I will be conducting my field study at Brussels Zuid train station and

Rotterdam Centraal train station.

Why Brussels Zuid?



Brussels Zuid is a critical part of the rail-air service offered by KLM for their Air&Rail customers traveling from Belgium to Schiphol Airport in the Netherlands, marking the beginning of their journey. Studying this location aligns with the research focus on the wayfinding experience of the pre-travel stage of rail-air journeys at train stations. Additionally, budgetary and feasibility considerations make it convenient for me to travel to Brussels Zuid, making it an optimal choice for my field studies.

Why Rotterdam Centraal?



Rotterdam Centraal serves as a valuable benchmark to compare the wayfinding experiences of passengers using this station with those of KLM Air&Rail passengers at Brussels Zuid. Rotterdam Centraal caters to a diverse range of passengers, including those utilizing train services to reach Schiphol Airport, providing a suitable comparison. Furthermore, the budgetary and feasibility advantages make it convenient for me to conduct field studies at this location.

2.1.3. Field Research Aim

The aim of field research is to gain insight into how KLM Air&Rail passengers experience wayfinding at Brussels Zuid train station. By immersing myself into the context of a KLM Air&Rail passenger during the pre-travel stage of their rail-air journeys at Brussels Zuid, I can experience different aspects of the wayfinding journey till they board their train to Schiphol Airport. I can also observe fellow train passengers in their contexts, gaining

insights into different passenger types, their experiences, needs, the challenges they face (Interaction Design Foundation, 2016). An additional goal to discover how passengers traveling from Rotterdam to Schiphol Airport by train experience wayfinding at Rotterdam Centraal train station. The field research takes a qualitative approach and the methods to data collection and analysis is discussed further in chapter 2.2.

2.2. Method: Data Collection

2.2.1. Auto-Ethnographic Studies

An auto-ethnographic approach will be applied to reflect on and learn from personal experiences during the field study. This approach maintains an emphasis on subjectivity. It allows the researcher to systematically analyze personal experiences in order to understand cultural and contextual experiences (Ward, n.d.). This method will allow me to have a personal connection to rail-air passengers and experience the context of study as they do,

gaining qualitative insights into the factors that influence passenger wayfinding experiences at train stations (Interaction Design Foundation, 2016). The auto-ethnographic studies will be documented in the form of journey maps.

2.2.2. Direct Observation

Direct observation will also be done as a part of the field studies. Since rail-air passengers cannot be interrupted when they perform complex wayfinding tasks while navigating through the train station, direct observation will allow me to gain perspective on how these passengers naturally interact with the various wayfinding systems in the environment without interference (Fessenden, 2024). Observations will be captured using

photographs (ensuring privacy of personal information), personal voice notes, and the observation cards shown in chapter 2.2.5. Findings and observations gained through this method can validate and reinforce self-reported experiences and also provide new insights pertaining to wayfinding experiences.

2.2.3. Contextual Interviews

Contextual enquiries will be conducted to provide nuanced insights into how rail-air passengers feel & think, what their motivations are when navigating through the train station (Salazar, 2020). However, there are some possible limitations. Since I will not be interfering while passengers complete their

wayfinding tasks, I will have to conduct the interview a few minutes post the process, resulting in some amount of recall bias. The approach for the contextual interviews is discussed in Appendix A.

2.2.4. Factors Affecting Wayfinding

Factors affecting wayfinding performance, discussed during the literature study, will guide the field research. Personal experiences, passenger observations and interactions, and other insights gained during field research will be analyzed through the lens of these wayfinding factors. The aim is to understand how and when these factors are interacted with during wayfinding in the train station.

Additionally, it will assess how these specific factors, when encountered during the wayfinding journey as touchpoints, influence the efficiency of wayfinding performance and how rail-air passengers feel. Segregating these factors into tiers based on their importance for ensuring good wayfinding experiences was informed by the literature study and subjective opinions. This tiering could be a

potential limitation, as my assessment of a high-tier factor might differ from its actual importance.

To minimize this limitation, I conducted a thorough analysis of the existing literature on wayfinding, which allowed me to understand the fundamentals necessary for effective navigation. Key elements such as signage, layout, and landmarks are essential to facilitating wayfinding. Furthermore, my field research provided additional insights to support literature, revealing which aspects of wayfinding are most utilized and needed by passengers at train stations. This combination of literature review and observational research helped ensure that my tiering of wayfinding factors is as accurate and relevant as possible.



Figure 2.2.4: Wayfinding Performance Factor Tiers

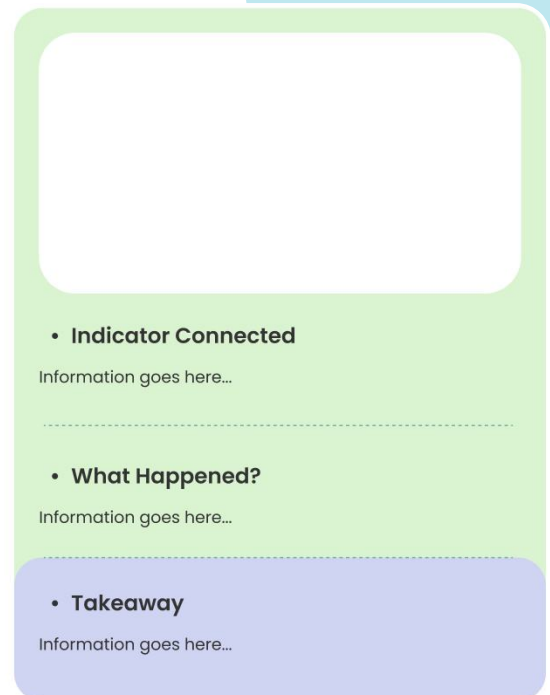
2.2.5. Observation Card

Key insights and personal/observed findings during the field research will be organized into the following card template, figure 2.2.5.

What happened discusses the observed behavior or interaction during wayfinding or navigation in a train station in brief—particularly rail-air passengers. A relevant quote will be placed on the card for qualitative insight. Factor Connected will contain any relevant wayfinding factors discussed in 2.2.4 attached to the specific observation. I also hypothesis in brief how the wayfinding factor could be causing the observed negative or positive behavior/experience.

During field research, I should ask: What wayfinding factors are interacted with, and how do these factors positively or negatively affect the wayfinding experience, and why?

This will help identify which aspects of these factors work well and which don't, pinpointing specific elements that trigger negative or positive emotions. Understanding these details will allow me to focus on factors that negatively impact the journey and improve them using qualitative feedback from the field research.

The image shows a template for an observation card. It is a vertical rectangle with a light green background. At the top, there is a large white rounded rectangle for a photo or drawing. Below this, the card is divided into three sections. The first section is light green and contains the heading "• Indicator Connected" followed by the text "Information goes here...". The second section is also light green and contains the heading "• What Happened?" followed by the text "Information goes here...". The third section is light blue and contains the heading "• Takeaway" followed by the text "Information goes here...".

• **Indicator Connected**
Information goes here...

• **What Happened?**
Information goes here...

• **Takeaway**
Information goes here...

Figure 2.2.5: Observation Card Template

2.3. Method: Analysis

2.3.1. Brussels Zuid

The observation cards discussed in Chapter 2.2.5 will be grouped with similar personal experiences mapped in the auto-ethnographic journey maps. These will be analyzed to identify actionable insights and challenges faced by KLM Air&Rail passengers during wayfinding at the Brussels Zuid train station. The insights and challenges will be clustered based on their similarities to form problem domains or categories, providing an understanding of the broader challenges that affect wayfinding performance. These challenges and insights will then be ranked in a grid to determine which ones currently cause the most problems during the wayfinding journey for KLM Air&Rail passengers, which will then inform the design direction.

2.3.2. Rotterdam Centraal

For Rotterdam Centraal, the analysis will differ. While observation cards will still be mapped to the auto-ethnographic journey maps, the focus will be on identifying findings or insights that can inspire the ideation phase and guide solution formulation for KLM Air&Rail wayfinding experiences. These insights will highlight effective aspects of the wayfinding system at Rotterdam Centraal that enhance passenger experiences, as well as ineffective elements to avoid in future designs. This comparative analysis aims to utilize insights of the best and least effective wayfinding strategies in Rotterdam Centraal to refine the experience for KLM Air&Rail passengers.

2.4. Case 1: Rotterdam Centraal

2.4.1. About the Context

Rotterdam Centraal has an intercity direct and intercity train that takes passengers from the station to Schiphol Airport directly or with multiple transfers respectively. Passengers may purchase tickets online or use the ticket booths at the train station. A ticket to use the intercity direct requires an additional charge to be paid.

These journeys are not a part of rail-air tickets. Therefore, the train taken by passengers to reach the airport is not 'missable' but 'flexible'. The responsibility is solely on the passenger to catch any train throughout the day with their purchased train ticket to reach the airport on time to catch their flight. This needs to be considered when drawing comparisons between passengers in Rotterdam Centraal and KLM Air&Rail passengers in Brussels Zuid who have a pre-booked train to catch.

Since a part of the pre-travel rail-air stage includes booking the journey, I will also be going through the process of booking a train ticket to Schiphol airport to experience how the booking process influences how I perceive wayfinding at the Rotterdam Centraal train station.

What is wayfinding task to be completed by passengers?

Passengers need to board a train from Rotterdam Centraal to Schiphol Airport to catch their long haul flight.

2.4.2. Pre-Travel Knowledge

Some aspects will affect the auto-ethnographic research I conduct at Rotterdam Centraal:

- I am an international student studying in the Netherlands
- I am a frequent traveler and have used public transport in the Netherlands
- I have travelled to Schiphol Airport several times
- I am a frequent NS app user (NS app is the integrated digital service for public journeys in the Netherlands).
- I am adept with the OV- Chip Kaart (it is the integrated ticketing system used for all public transport in the Netherlands).

2.4.3. Auto-Ethnography Conditions

It is also important to note that the task mentioned previously can be completed by different types of passengers with varying levels of familiarity and experience using the station.

For this reason, 4 passenger journey conditions or passenger roles, were defined to help me analyze the wayfinding task in Rotterdam Centraal in a more thorough manner during auto-ethnographic studies.

It would be good to keep in mind that my level of skill and strategic wayfinding performance will inevitably improve over the 4 conditions and I will be able to make

my way around the station with more ease and efficiency, possibly leading to more biased and professional interpretations over time.

Passenger Role 1 or Condition 1:

Catching a train from Rotterdam Central to Schiphol Airport as a novice/ tourist, without the OV-Chipkaart [may/may not use digital wayfinding support or ticketing kiosks].

This condition is the most ideal way to test the current wayfinding experience in Rotterdam train station and identify factors that affect journeys experience. We can assume passengers with OV-Chipkaarts already have a level of prior expertise and can make their way through the station with a higher level of skill.

Condition 1 considers a user with no prior level of knowledge regarding using the public journeys facilities in the Netherlands. Tourists typically utilise all aspects of a wayfinding system when navigating through a unfamiliar environment. Transversing through the stations as this type of user could lead to the most rich & unbiased experiences and feelings regarding most of the wayfinding factors at once. Tourists, non residents, and business travellers, will probably face the most number of challenges when interacting with a new environment.

Passenger Role 2 or Condition 2:

Catching a train from Rotterdam Central to Schiphol Airport as a novice/ tourist using only environmental digital wayfinding systems

Passenger Role 3 or Condition 3:

Catching a train from Rotterdam Central to Schiphol Airport with the Ov- Chipkaart using only environmental digital wayfinding systems and no NS app (integrated digital wayfinding systems)

Passenger Role 4 or Condition 4:

Catching a train from Rotterdam Central to Schiphol Airport with the Ov- Chipkaart using the NS app

2.5. Case 2: Brussels Zuid

2.5.1 About the Context

KLM Air&Rail tickets can be purchased online on the KLM website or through the KLM app. KLM assures their customers a seamless transfer between the train services and the KLM flight, similar to their flight-to-flight transfer experiences. KLM Air&Rail passengers who choose Brussels as the city they begin their journey from are required to pick up their physical boarding pass at the KLM Air France Air&Rail terminal at Brussels Zuid train station 2 hours before train departure. They are also required to present a valid ID to check-in. This boarding pass is used for both the train leg of the journey and for their flight from Schiphol. The terminal at Brussels Zuid is shared by KLM and Air France as a part of their partnership. Both companies provide services for their passengers at the station.

To truly experience the pre-stage rail-air journey as a KLM Air&Rail passenger, I will be going through the booking process as well. However, due to budgetary constraints, I will be using a mock confirmation ticket. By studying tickets received by previous KLM Air&Rail passengers, I have gathered the possible information presented to a passenger before their rail-air journeys as shown in figure 2.5.1. Information regarding the confirmation of tickets including itinerary details (departure timings, and destinations/stations) are delivered to passengers via email. The same information is also displayed in the KLM app if one has the app installed on their mobile devices.



Figure 2.5.1: KLM Air&Rail Confirmation Details

Since the passenger is required to check-in at the terminal at least 15 min before train departure to get their boarding pass, it is a more stressful journeys due to a ‘missable’ train and departure time. There is an added pressure and responsibility on the passenger to manage their time well and board their train to the airport successfully.

However, it is important to note, despite performing auto-ethnographic studies, a mock ticket will alleviate the added pressure of time management and related feelings of stress and anxiety a regular KLM Air&Rail would typically face. This could lead to a more relaxed wayfinding experience, possibly missing interesting insights.

2.5.2. Pre-Travel Knowledge and Context

What is wayfinding task to be completed by KLM Air&Rail passengers beginning their travel from Brussels, Belgium at Brussels Zuid train station?

Once reaching Brussels Zuid train station, a KLM Air&Rail passenger needs to reach the KLM Air France Air&rail terminal to pick up their rail-air boarding pass and reach the platform to board their train to Schiphol Airport.

Some aspects will affect the auto-ethnographic research I conduct at Brussels Zuid train station:

- I have never visited the station before. I will be traversing through an entirely unfamiliar environment.
- I have never used the station for a rail-air journeys
- I have never used the KLM Air&Rail service

For the field research, I selected a KLM Air&Rail journey on the 5th of March starting from Brussels at 13:52. The Eurostar train would depart from the station at 13:52 and I would eventually make my flight transfer at Schiphol Airport at 15:26.

As a first time KLM Air&Rail passenger who has never visited or used Brussels Zuid Midi train station prior to purchasing the tickets, I will most likely face the most number of challenges during my wayfinding experience. The problem areas I discover during my journeys can be worked on to improve experiences for all types of KLM Air&Rail passengers with

with varying levels of expertise and reasons for travel.

Using a connecting train from Rotterdam to reach Brussels Zuid train station adds more subtlety to the possible variations of KLM Air&Rail passengers using the station to begin their rail-air journey. My particular experience can mirror the journeys undertaken by passengers taking a connecting train from a different city in Belgium to Brussels. For such passengers like myself, the wayfinding journey and entry point into the station would begin once reaching the platform at Brussels Zuid after exiting the train.

2.5.3. Auto-Ethnography Conditions

Passenger Role 1 or Condition 1:

On entering Brussels Zuid train station, navigate to the the KLM Air France Air&Rail terminal and receive the boarding pass to catch the Eurostar train from Brussels Zuid to Schiphol Airport.

2.6. Conclusion

Companies offering rail-air services, such as Lufthansa and KLM, require their passengers to begin their journeys at train stations. KLM requires passengers to navigate the station to pick up a physical boarding pass at selected locations like Brussels Zuid.

A research plan was set up to conduct field research at Brussels Zuid. This station was selected as the main case study for its accessibility and because it is a critical part of the rail-air service provided by KLM. Rotterdam Centraal was chosen as a benchmark to compare wayfinding experiences at both stations.

With the research plan and approach outlined, the next step is to conduct field studies and truly experience wayfinding at Brussels Zuid train station as a KLM Air&Rail passenger. This involves using the field study approach to gain insights into the various aspects of wayfinding interacted with during navigation. Questions about how and why these aspects affect emotions, perceptions, and efficiency of wayfinding need to be answered. Constructing the journey will help identify where and why wayfinding is perceived negatively. Additionally, comparing the wayfinding experiences between Rotterdam Centraal and Brussels Zuid will provide valuable insights to inform the design direction. Findings from this study will inform and guide the formulation of the design direction & criteria.

03 Field Study

This chapter discusses key insights and discoveries gained from the field research. Building on these insights, the chapter also discusses the process of defining the design goal and criteria later on.

- Journey Map
 - Clustering
 - Ranking Grid
- Problem Domains & Challenges
 - Benchmarking
 - Scoping
 - Signage Problem Areas
- Design Direction & Criteria



3.1. Journey Map: Brussels Zuid

At 10:00am, I reached platform 14 at Brussel-Zuid train station after completing my ICE train journey from Rotterdam Centraal. Using my mock confirmation ticket as shown below in figure 11.0 as reference I knew I had to pick up my boarding pass at the air&rail counter in the train station. Figure 16.0 illustrates the steps of the journey undertaken while completing the Brussels passenger role or condition. Each journey step beginning from platform 14 till the departure platform, including the related indicator influence can be found in Appendix B.

As stated in the previous chapter, this type of journey is representative of any KLM Air&Rail passenger that could possibly begin their wayfinding to the KLM Air France Air&Rail terminal at Brussels Zuid from the train platforms. These passengers typically use a connecting train from a different city to arrive at Brussels Zuid train station. Navigation would begin when exiting a platform and entering the station below. Therefore, in this case, the point of entry is the train platforms.

Further research would need to be considered for other types of KLM Air&Rail passengers accessing the station through different entry points and by different modes of transportation such as bus, car, metro, etc. The design process in the following chapters will be informed by my specific KLM Air&Rail passenger journey. Therefore, it is crucial to consider that the design would specifically enhance

wayfinding for KLM Air&Rail passengers entering Brussels Zuid through a train platform and then needing to navigate to the KLM Air France Air&Rail terminal.

Further research and testing would need to be undertaken to refine the final design to include all types of KLM Air&Rail passenger journeys and entry points.

3.1.1. Wayfinding to the KLM Air France Air&Rail Terminal

For constructing the journey map, I will use a color-coded legend to represent my experiences. Red indicates moments where wayfinding was highly challenging and perceived as very negative, reflecting strong negative emotions. Orange

represents slightly less severe challenges but still negative feelings. Yellow signifies tolerable experiences, though still not ideal. Green marks moments of excitement and satisfaction during the wayfinding journey.

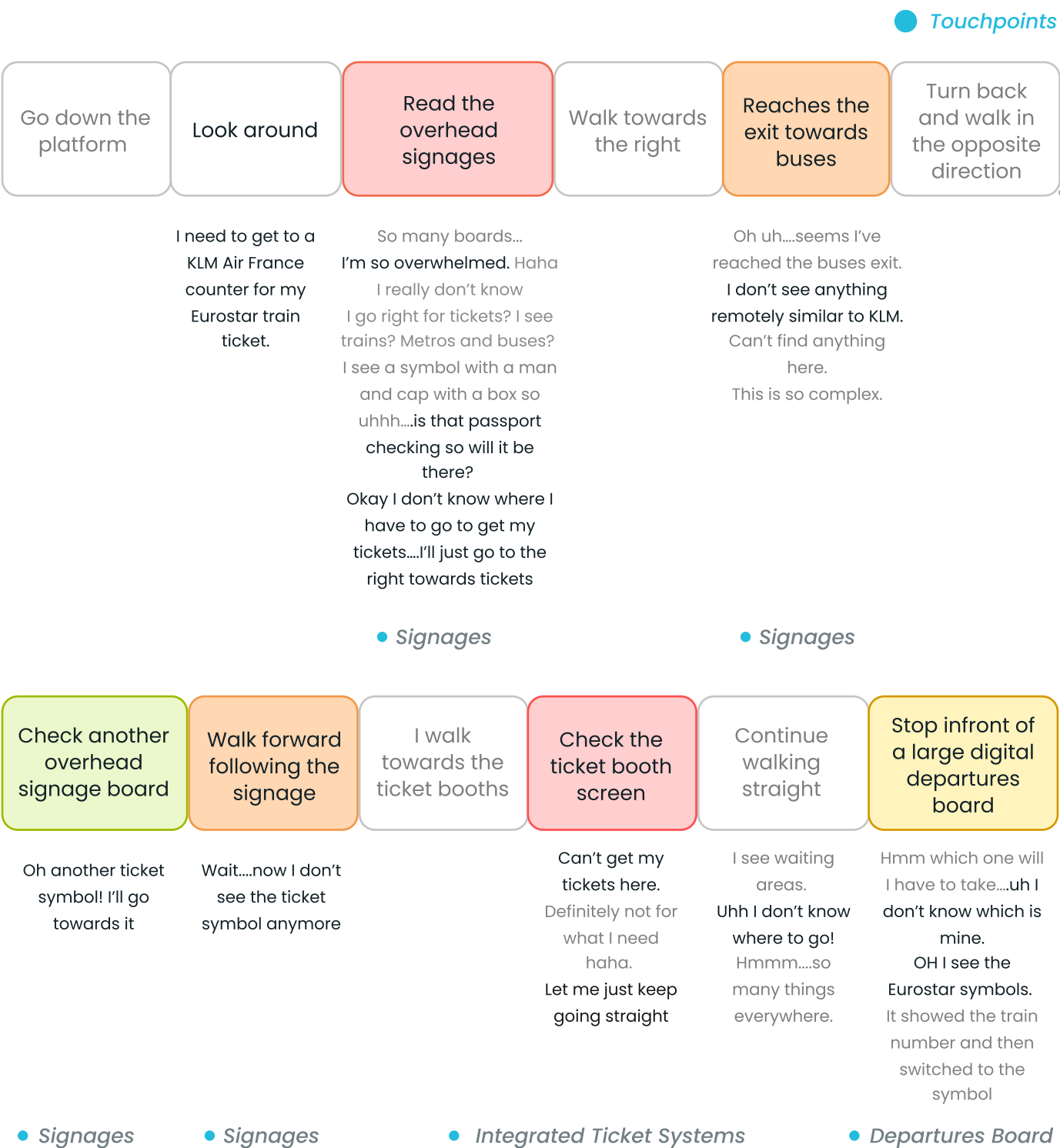


Figure 3.1: Journey Map of the First Half of the Wayfinding Task conducted in Brussel Zuid Train Station: Navigation from the Platform till the Air&Rail Terminal

Check for the specific Eurostar train on the phone/email to match it on the board

Uh 13:52 okay...it says Amsterdam Centraal...but does it go to Schiphol? Is that mine? No via....Uhh...i don't know. I'll check later after I get my tickets.

● Signages

● Integrated Technology

Walk further ahead to front exit

There's a big ticket office, can I get them here maybe? I see a Channel Terminal. I don't know what that does.

● Signages

Spot the Eurostar information desk in front of the ticket office
Ask the official about an KLM Air&Rail ticket

OH I see a Eurostar desk! That's where I can probably get my tickets from! But it doesn't really look KLM like...

● Signages

● Information Desks

Official manually directs to the actual KLM Air&Rail Terminal

Oh. I'm completely in the wrong location of the train station. The Eurostar counter isn't the same as the KLM air-rail counter. I feel stupid haha.

● Information Desks

Official gestures the directions to the KLM Air&Rail Terminal

"Haha it's totally okay. You're not too far from it. Go towards the exit and take a left."
I was right, this information desk does not look remotely close to KLM haha.

● Information Desks

Walk towards the front exit and take a left

I didn't even know this led anywhere

● Layout

Look at the overhead signages after the left turn

I don't see anything related to getting Air&Rail tickets? I don't know I'll just follow her directions. OH I see a counter with a flight sign?? OHH maybe it was that! I couldn't even see this signage from the entrance.

● Signages

Keep walking towards the terminal

Its a long walk to wherever this is. Okay I'm starting to feel kind of unsafe now

Encounter a dead end/exit

Umm I don't know.... I'm assuming I follow that sign. So I'll go left.

Air&Rail KLM Terminal is spotted

OH okay, alright I see it. It's probably in the most dingiest place in this station

● Signages

3.2. Clustering

The wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station was studied by constructing a journey map that detailed qualitative experiences & findings and noted the associated wayfinding factors (touchpoints) encountered along the way. By clustering observations and statement cards collected during field research with similar findings on the journey map, key challenges that may cause KLM Air&Rail passengers difficulties during their wayfinding were identified. These challenges were then grouped based on their similarity in how they negatively

affect wayfinding. The clustering process revealed problem domains, as shown in Figure 3.1. These domains or categories offered an overview of the broader wayfinding systems and aspects passengers find challenging during the wayfinding journey- such as information systems: departure boards, station signages, etc. Being aware of which problem domains the specific challenges fall under will help during ranking and eventual design direction formulation.

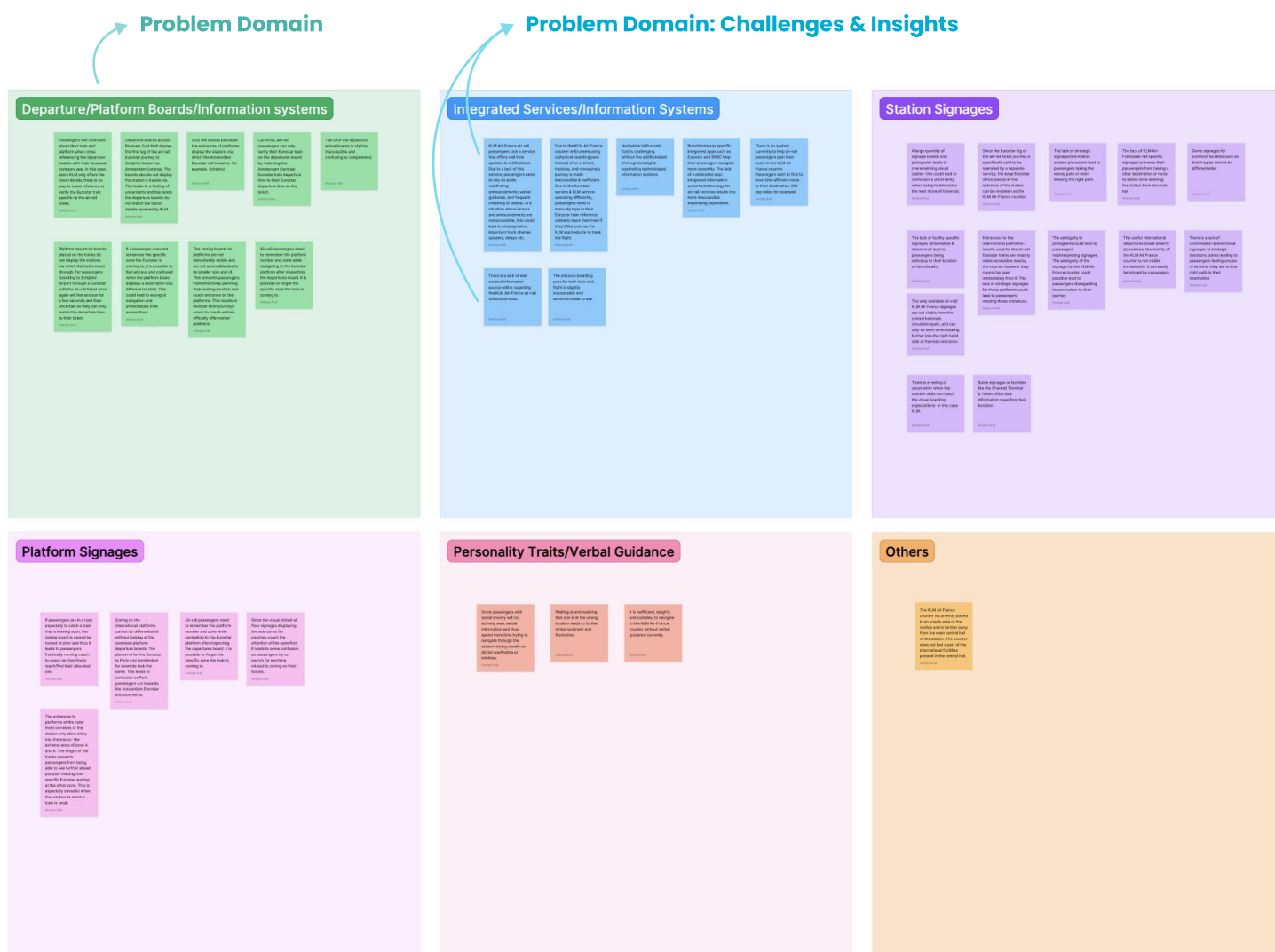


Figure 3.2: Process of Clustering Insights & Challenges into Domains/Categories

3.3. Ranking Grid

After clustering the findings and discovering problem domains each with its own specific challenges, I plotted them in the ranking grid as shown below. The challenges were ranked in the grid to identify which of them currently impact the wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station most negatively. The severity of negative emotions experienced when encountering a specific challenge during the wayfinding journey is shown across X-axis, from left to right, representing lesser negative emotions to stronger negative emotions. The type of negative emotions experienced range from frustration, anger, fear, confusion, and anxiety.

The wayfinding factors (identified during chapter 2.2.4) or touchpoints attached to each challenge are shown across the Y-axis, with the factors responsible for least impacting wayfinding performance at the bottom and those responsible for majorly influencing the performance of wayfinding at the top. Each challenge identified after clustering contained a wayfinding factor or touchpoint and the associated negative emotion, guiding its ranking on the grid. Positive emotions and experiences are not considered in this grid as they already indicate effective aspects of the current journey. The enlarged & magnified look of grid is shown in Appendix D



43 Figure 3.3: Process of Ranking Insights & Challenges into Impact Grids

3.4. Key Identified Problem Domains & Challenges

After ranking the challenges on the grid, those positioned in the top-right corner as shown in figure 3.1—indicating the most significant negative impact on both the practical efficiency/performance and

3.4.1 Signages

During my field study, I interpreted the KLM Air France Air&Rail terminal signage as a local facility selling tickets to the airport due to the absence of a train symbol and its resemblance to other local signages. This ambiguity could lead KLM Air&Rail passengers to misinterpret its message and disregard its relevance to their wayfinding tasks.

Upon arriving at the train platform, I could not locate a signage related to a rail-air journey/terminal or KLM on the first signage boards I encountered. The only available KLM Air France Air&Rail signages were not visible from the central hall and could only be seen when looking further into the right-hand side of the main entrance. This lack of visibility at the start of the journey could possibly make passengers feel lost and confused.

The overwhelming visual clutter and numerous signages on the boards at the start of my journey left me feeling anxious. To simplify my interpretation process, I expected the KLM Air France Air&Rail terminal signage to be located beside other ticketing and information-related signages. However, due to the absence of such signage in the central hall, I mistakenly followed the ticket signage meant for local services.

emotional experience of wayfinding for KLM Air&Rail passengers at Brussels Zuid train station—were identified. These key challenges will be further examined in this sub-section.



Figure 3.4.1.1: Ambiguous Air&Rail signage visually resembling other local signages

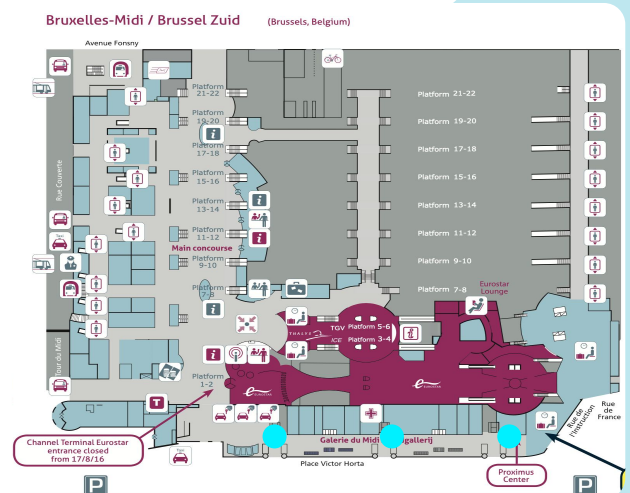


Figure 3.4.1.2: Only encountered Air&Rail signages shown in Blue Dots. Source: Brussels Zuid Site



Figure 3.4.1.3: Overwhelming visual clutter on signages boards. Tickets signage could be misinterpreted as the Air&Rail signage

3.4.2 Integrated Technology & Services

During my navigation to the platform for a Eurostar train to Amsterdam Centraal, an official redirected me and another passenger to the changed platform for our train. Without this verbal and visual guidance, we would have missed the updated platform information. KLM Air&Rail passengers lack a service like Google Maps, NS, and SNBC that offers real-time updates and notifications for track changes and delays. Due to this, passengers must rely on audio announcements, verbal guidance, and frequently checking boards, which may not always be immediately accessible. This reliance can lead to missed trains, missed track changes, and delays.

Dedicated brand-integrated apps such as Eurostar and SNBC enhance passenger navigation by providing accessible wayfinding and real-time updates, offering a smoother overall experience.

When navigating to the terminal, I required verbal guidance from officials at the train station. Without their help, I would have remained at the wrong location. This reliance on verbal guidance is particularly frustrating during a time crunch and for passengers who find it difficult to approach people for help. There is currently no service to assist KLM Air&Rail passengers in planning their route to the terminal once they begin their navigation at the station, unlike how NS integrates Google Maps GPS services with their app.

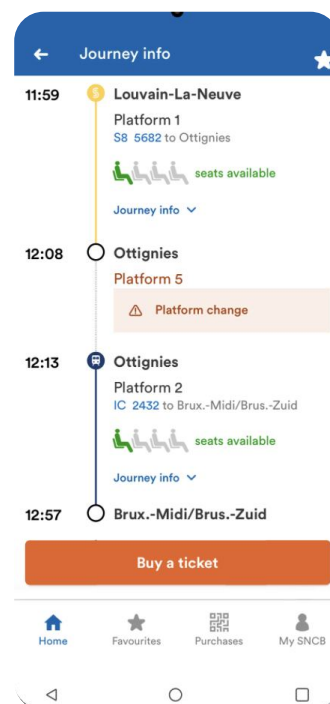


Figure 3.4.2.1: SNBC App offering dynamic, real-time updates. Source: SNBC App

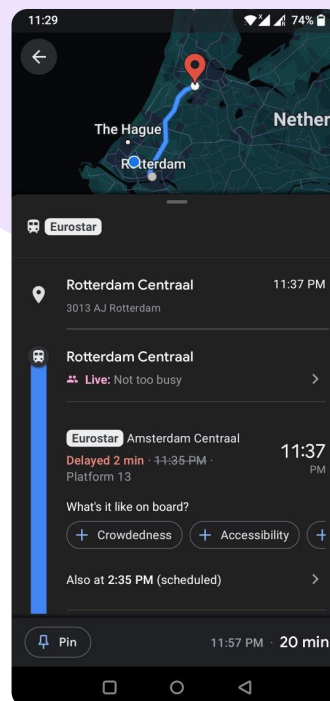
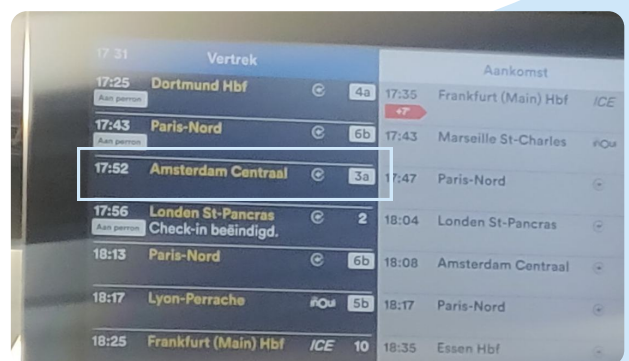


Figure 3.4.2.2: Google Maps offering indoor GPS navigation assistance. Source: Google Maps

3.4.3 Environmental Digital Wayfinding: Departure & Platform Boards

When trying to spot my specific Eurostar journey on the departure boards to learn my departure platform number, the final destination displayed was Amsterdam Central, without any mention of Schiphol Airport (my final destination for the first leg of the rail-air journey). This discrepancy led to confusion and concern about whether the train departing at the same time mentioned in my KLM itinerary details would stop at Schiphol Airport. Most departure boards across Brussels Zuid train station only display the final destination, without indicating via stations, such as Schiphol Airport. This mismatch between the departure boards and the travel details provided by KLM creates uncertainty and fear for KLM Air&Rail passengers needing to reach Schiphol Airport.

Additionally, when traveling to my platform for a Eurostar train, I couldn't remember whether the platform was 4A or 4B. Due to the station's structural design, I was unable to walk back the way I came and would have had to make a long journey back to the departure boards. My memory failed me, as I waited on the wrong side of the platform. I only managed to reroute because the platform board at 4B displayed Paris Nord and not Amsterdam Central. If a KLM Air&Rail passenger does not remember the specific zone the Eurostar is coming to, it can lead to anxiety and confusion when the platform board displays a different destination. This can result in wrongful navigation and unnecessary time expenditure, reinforcing the need for accessible wayfinding solutions.



The image shows a digital departure board at Brussels Zuid train station. It is divided into two main sections: 'Vertrek' (Departures) on the left and 'Aankomst' (Arrivals) on the right. The 'Vertrek' section lists several trains with their departure times, destinations, and platform numbers. A red box highlights the entry for 17:52 to Amsterdam Centraal on platform 3a. The 'Aankomst' section lists arriving trains with their arrival times, origins, and platform numbers.

Vertrek				Aankomst			
17:25	Dortmund Hbf	ICE	4a	17:35	Frankfurt (Main) Hbf	ICE	47
17:43	Paris-Nord	ICE	6b	17:43	Marseille St-Charles	POU	5b
17:52	Amsterdam Centraal	ICE	3a	17:47	Paris-Nord	ICE	4a
17:56	Londen St-Pancras	ICE	2	18:04	Londen St-Pancras	ICE	4a
18:13	Paris-Nord	ICE	6b	18:08	Amsterdam Centraal	ICE	4a
18:17	Lyon-Perrache	POU	5b	18:17	Paris-Nord	ICE	4a
18:25	Frankfurt (Main) Hbf	ICE	10	18:35	Essen Hbf	ICE	4a

Figure 3.4.3.1: Departures Board at Brussels Zuid train station showing only the final destination



The image shows a digital departure board at Brussels Zuid train station. It is divided into two main sections: 'Vertrek' (Departures) on the left and 'Aankomst' (Arrivals) on the right. The 'Vertrek' section lists several trains with their departure times, destinations, and platform numbers. A red box highlights the entry for 17:52 to Amsterdam Centraal on platform 3a. The 'Aankomst' section lists arriving trains with their arrival times, origins, and platform numbers.

Vertrek				Aankomst			
12:08	Aan perren	Frankfurt (Main) Hbf	ICE	7			
12:28	Check-in	Londen St-Pancras	Check-in via Channel-Terminal	ICE	1		
12:56	Check-in	Marseille St-Charles	POU	5b			
13:17	Check-in	Strasbourg-Ville	POU	5b			
13:21	Check-in	Paris-Nord	ICE	4a			
13:22	Check-in	Amsterdam Centraal	ICE	4a			
13:22	Check-in	Amsterdam Centraal	ICE	4a			
14:28	Check-in	Frankfurt (Main) Hbf	ICE	5a			
14:43	Check-in	Paris-Nord	ICE	4a			
14:52	Aan perren	Londen St-Pancras	Check-in voorzien om 13:00	ICE	2		
15:03	Check-in	Nantes	POU	5b			
15:16	Check-in	Paris-Nord	ICE	4a			
15:22	Check-in	Amsterdam Centraal	ICE	4a			
15:13	Check-in	Paris-Nord	ICE	4b			
15:16	Check-in	Montpellier saint-Roch	POU	6b			
15:23	Check-in	Frankfurt (Main) Hbf	ICE	7			
15:51	Check-in	Londen St-Pancras	Check-in voorzien om 15:00	ICE	3		
15:52	Check-in	Amsterdam Centraal	ICE	4a			

Figure 3.4.3.2: 2 International trains departing from the same platform numbers

3.5. Benchmarking

As part of the research, the wayfinding experience at Brussels Zuid train station was benchmarked against Rotterdam Central train station in the Netherlands. Each wayfinding factor discussed in chapter 1.6 was analysed after completing the auto ethnographic research. The relevant insights for the problems identified earlier are shown below. This analysis provided a deeper understanding of the current wayfinding systems and processes, offering inspiration for solutions to the previously identified problem areas. Additionally, it could also help explain why certain wayfinding factors are positively perceived at Rotterdam Central but are seen as problematic and negatively

impacting wayfinding experiences at Brussels Zuid.

However, it is important to note that this analysis was done through the lens of personal experiences while traversing both the stations. This could lead to some bias and possible misinterpretations regarding what certain systems are meant for and how they are supposed to work. To minimize this limitation, I supplemented my personal experiences with passenger observations, interactions & interviews, ensuring a broader perspective. Additionally, my findings were cross-referenced with existing literature and opinions on wayfinding systems

Rotterdam's signage employs clear pictograms reinforced with text for efficient and easy wayfinding.



Minimal clutter on signage boards offer better readability and prevent passengers from feeling overwhelmed.

Specific signages with similar services/ functionalities are grouped together and thus speed up the process of locating a particular signage.

The KLM Air France Air&Rail signage at Brussels Zuid employs simple and clear pictograms but it not reinforced with text possibly leading to misinterpretations.



Signage boards contain numerous signages placed closely to one another leading to overwhelming visual clutter.

There is a lack of effective grouping as signages with similar services such as ticket offices, information booths, and the KLM Air France Air&Rail terminal (offering international ticketing facilities) are not placed on the same board.



Clear signage grouping: services such as ticketing and restrooms in one group, exits and other city modes of transportation grouped together.



Clear discernible boundary for each signage reinforced with text signage eg, WC-Toilet, allow passengers to quickly identify different signages and their purpose.

Signages for specific purposes such as platform numbers, are consistently placed along central navigation routes shown in next page. Some signages, such as zone numbers at the platform are not immediately visible due to its elevation.



The KLM Air France Air&Rail Terminal signage is not placed beside the ticket signage but beside restroom facilities- leading to possible neglect.

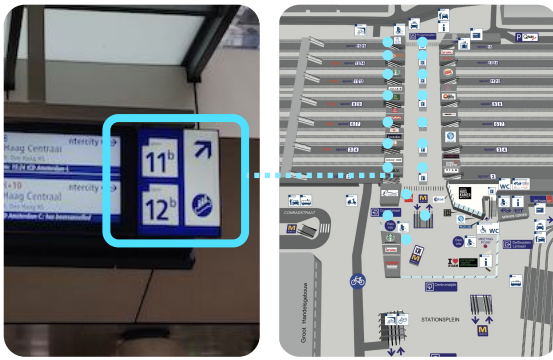


Due to their proximity and unclear boundary, 2 signages might get clubbed together or be perceived as one signage though they portray different functionalities.

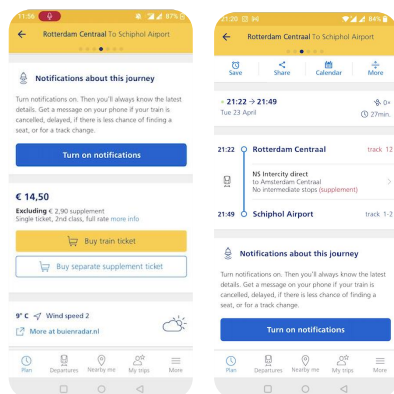


Multiple use of text in different languages beside one signage meant for one purpose could lead to passengers thinking the same signage depicts multiple facilities and locations.

The KLM Air France Air&Rail and other signages at Brussels Zuid are not consistently placed along important traversal routes shown in next page, leading to potential uncertainty on how to begin navigation. Zone signages on platforms are clearly visible and accessible.



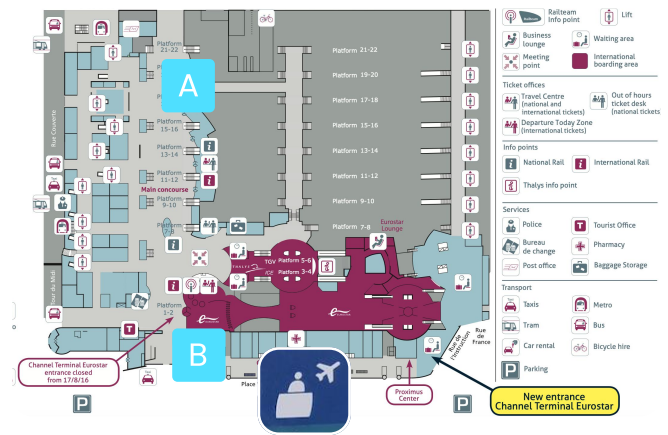
Confirmation signages such as platform numbers and the direction to go towards them are placed strategically at each decision point along central traversal routes, i.e, the cross section of the central atrium and elevated platform. This prevents passengers from feeling lost.



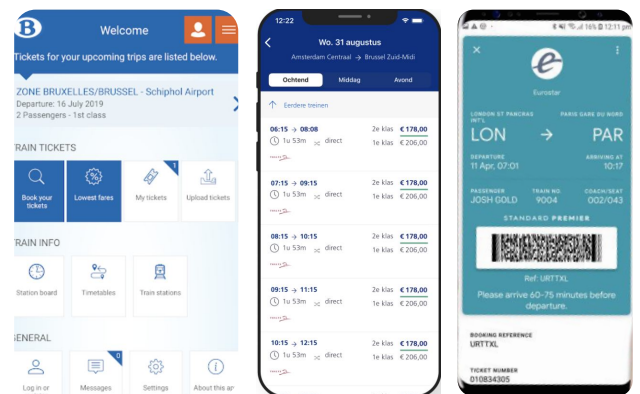
All passenger types going through Rotterdam Central may utilize the NS app (public transport app), 9292, Eurostar or ICE for international travel, or Google Maps.

Passengers can purchase tickets for any journey of their choice using the NS app. The e-ticket received can be used once anytime during the day for the same type of journey. International travel apps require passengers to travel specifically for their booked journey.

NS app allows passengers to plan their



If a passenger reaches the station at location A, there are no guiding/confirmation signages related to the KLM Air France Air&Rail terminal to help them reach their intended destination (the KLM terminal) confidently and efficiently. The only available signage is at location B.

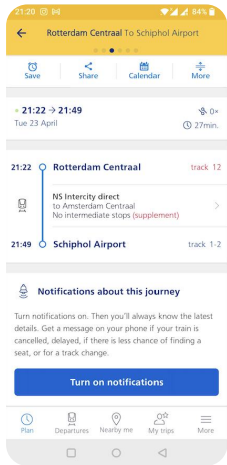


All Passengers types going through Brussels Zuid can utilize the SNBC app for domestic travel, Eurostar or ICE for international travel, or Google Maps

Each of these apps allow passengers to purchase tickets online for any journey of their choice. The e-ticket received through SNBC can be used once anytime during the day for the same type of journey. International travel apps require passengers to travel specifically for their booked journey.

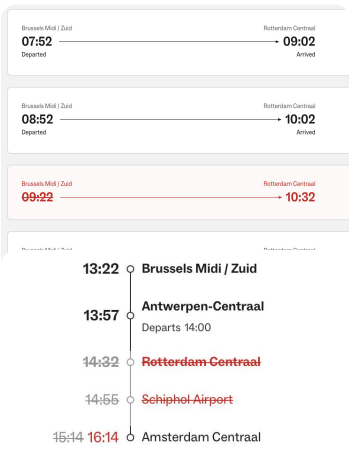
Most apps allow their passengers to plan

journey through route planning features- walking routes, platform number, train number, route itinerary, departure/arrival.

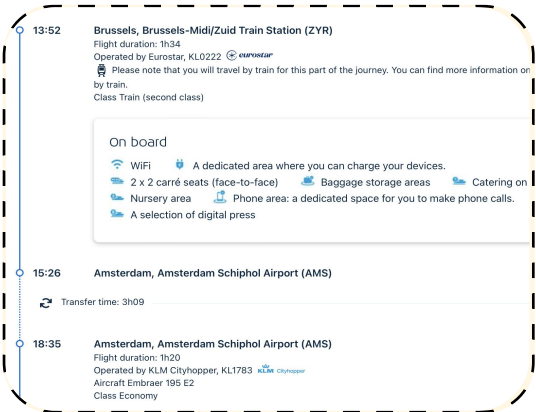


NS app passengers needing to travel to the airport can use the app to learn about any sudden changes in their trip. Additionally, they can track their train and learn of any possible disruptions much ahead to time to plan themselves ahead.

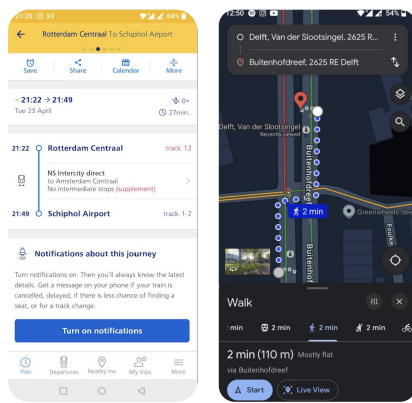
their journey through route planning features- train number, route itinerary, platform information, departure/arrival.



Eurostar travelers going through Brussels Zuid mostly book their train through the dedicated app. The app allows passengers to track their train, receive their coach number, learn of any changes or updates in their journey- particularly routes changes, delays, and cancellations.



KLM Air&Rail passengers who book their combined journey through the KLM app cannot track their high-speed train through the app and cannot be made aware of real time updates. They only receive the itinerary details leading to an inaccessible wayfinding experience. Unless these passengers download the app operated by the high-speed train company mentioned in their itinerary or utilize google maps to search for their journey, they cannot feel reassured.



NS enhances navigation through the train station by integrating Google maps. Passengers can click on the walking route in the journey details and use google maps to navigate themselves efficiently to the platform.



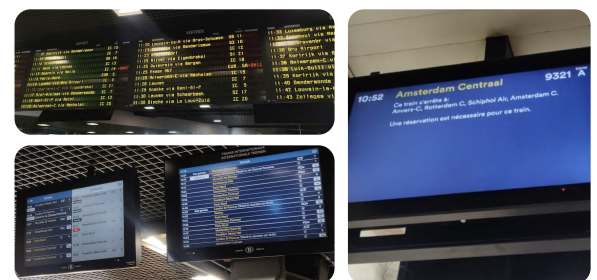
Rotterdam Central features general digital departure boards in the central hall and on the platforms. The station also contains digital platform departure boards at the entrance of platform and on the platforms.

These boards are placed at decision points along traversal routes to help passengers reconfirm their position and their train/destination. This strategic placement, reinforced by the smaller size of the station, lessens the need for passengers to remember their platform number.



Receive your boarding pass
Please note:
To receive your boarding pass, please go to the AIR&RAIL terminal at least 30 minutes before departure of your train. The AIR&RAIL terminal is located at Rue de France, 1060 Brussels.

The KLM app offers an extensive map of Schiphol airport and even offers GPS features to help Schiphol passengers plan their route to their gate. However, KLM Air&Rail passengers in Brussels Zuid cannot plan their route to the KLM Air France Air&Rail terminal using the app. They are only provided with the terminal name and are required to plan their own through the station.



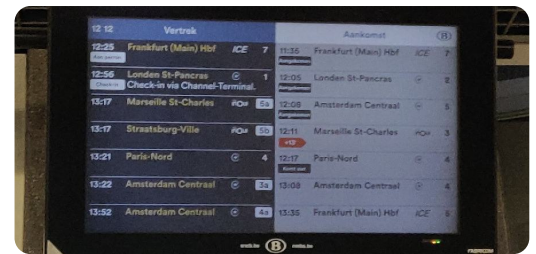
Brussels Zuid features general digital departure boards across the station. It also features digital platform departure boards at the entrance of platforms and on the platform tracks.

Some boards are not placed strategically at decision points along certain traversal routes. This necessitates passengers to reroute to find a particular board. For example, it lacks general departure boards on platforms preventing passengers from possible pre-planning their traversal to their next platform. The size of the station also might require passengers to remember their platform number for larger lengths of time.

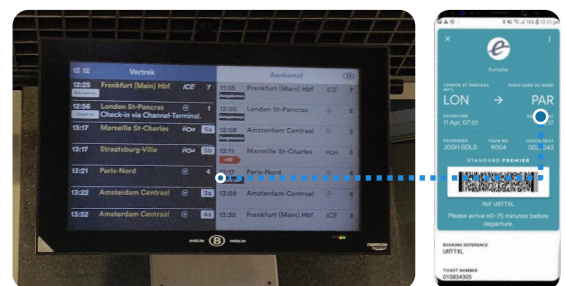


Cross verifying boards and the NS app: The information displayed can be matched quickly.

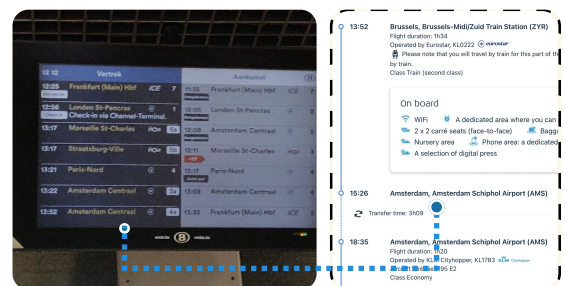
In Rotterdam, passengers benefit from cross-verifying train information using digital boards & integrated apps at every decision point, ensuring accurate & accessible information, enhancing wayfinding.



It is interesting to note, the station features a dedicated international train departures and arrivals board helping international passengers plan their journey more efficiently.



Cross verifying boards and the Eurostar app: The information displayed can be matched quickly.



Cross verifying boards and the KLM Air&Rail confirmation: The information displayed cannot be matched quickly.

In Brussels Zuid, unlike other types of passengers KLM Air&Rail passengers cannot benefit from cross-verifying the departure board with announcing real-time updates. They can only use their confirmation details & itinerary. However, the itinerary details display different departure/arrival location names than what the departure boards display. This leads to KLM Air&Rail passengers feeling unsure and anxious when reading the departure boards.

Den Haag Centraal	Delft, Den Haag HS
Utrecht Centraal	Alexander, Gouda
Amsterdam Centraal	Schiphol Airport ✈
Schiphol ✈ → Venlo	Schiphol Airport ✈, Utrecht C., Eindhoven C.
Vlissingen	Blaak, Dordrecht, Roosendaal

The departure boards also offer more accessibility by showing multiple stations the train will stop at across the journey eg, an Amsterdam Train stopping at Schiphol

Rotterdam central enhances information accessibility by information passengers of journey route for each train in some way. By placing a flight symbol beside Schiphol Airport, passengers needs to to go the airport can quickly recognize the train they need to take.



For KLM Air&Rail passengers needing to go to Schiphol Airport, the departure boards mention the final destination of the train as Amsterdam Centraal without mentioning the stations via which the train goes. This results in KLM Air&Rail passengers feeling slightly unsure of whether this train will actually stop at Schiphol Airport, relying on departure time only.

3.5.1. Conclusion

Three key problem domains negatively affecting the wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station have been identified: Station Signages, Integrated Services and Technology, and Departure Boards. These domains include issues such as unclear signage designs, lack of real-time updates, and inconsistent departure board information. A benchmarking analysis between Rotterdam Central and Brussels Zuid was conducted to understand why certain wayfinding factors perform poorly at Brussels Zuid.

Moving forward, it is important to acknowledge the time constraints of this project, which require prioritizing specific domains. Identifying which of these three domains—Station Signages, Integrated Services and Technology, or Departure Boards—is most feasible to tackle is crucial. Additionally, it is essential to determine which domain could have the greatest overall impact on the wayfinding experience and why within the scope of this thesis. After selecting the domain to focus on, a deeper analysis of the specific issues and challenges within that domain need to be further discussed. This analysis will examine how these issues affect user emotions and the overall wayfinding experience, thereby informing the formulation of the design direction.

3.6. Scoping

The previous analysis uncovered 3 problem domains each with their specific problems that negatively affect the wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station. However, considering the duration of this project, not all identified problems will be tackled. The main focus of this thesis will be on improving the signages for the KLM Air France Air&Rail terminal. However, by tackling and designing solutions for the 2 other identified problem domains in the future will ensure a more holistic positive impact on the overall wayfinding experience for KLM Air&Rail passengers when beginning their first leg of the rail-air journey at Brussels Zuid train station.

3.6.1 Why signages?

Through analysis, I have observed that first point of contact between KLM Air&Rail passengers and a touchpoint concerning their wayfinding journey is signage—underscoring its immediate importance on the overall navigation influence. Passengers enter the station and first look around to find signage to begin their navigation to a destination.

Paul Mijksenaar, responsible for the design of the wayfinding system at Schiphol Airport, Amsterdam, has stated during that during wayfinding at airports, only 5% of passengers use their phones, making integrated digital wayfinding redundant. Strategic wayfinding elements, such as signages and boards, have been shown to improve immediate wayfinding efficiency (UX Collective, 2018).

Integrated technology can assist with indoor navigation using location-based technology; however, quite often, this technology causes more stress than comfort. According to Technology Trends(2024), reduced signals due to infrastructural obstruction could make GPS unreliable when indoors. Additionally, mobile phones are not immediately used at airports and stations except for looking at itineraries or delays/changes.

Additionally, as shown in the detailed journey map in Appendix B, signage is a touchpoint that does not interact with the other two major domains or touchpoints—Integrated Technology and Departure Boards. Meaning it is easier to focus on improving it without considering how it affects the other touchpoints. For example,

during the passenger journey, information systems, particularly the digital departure boards and integrated technology, go hand in hand; passengers read the departure board in tandem with their mobile devices (itinerary details).

This means there needs to be further research conducted to understand how these systems interact with one another. Improving one of these systems is not enough to improve the overall experience without improving the other.

This way, improving signages could immediately enhance the overall experience for immediate impact.

3.7. Signages Problem Areas

3.7.1 Signage Design

The current wayfinding signage for the KLM counter at the Brussels train station lacks clarity and fails to effectively communicate its international rail-air services. The absence of accompanying textual signage alongside the ambiguous signage design—a counter with a small flight symbol—hinders passengers' ability to interpret its intended meaning accurately and confidently.

Moreover, the contextual influence of the environment further complicates passengers' interpretation of the signage. For instance, some passengers, like myself, may misinterpret the design as representing a ticketing service that offers one-way tickets to Brussels Airport rather than an international facility like KLM since

the signage is located within Brussels train station.

This misinterpretation of the signage is reinforced by its visual resemblance to other signage within the station—this leads to passengers like myself believing it to be a local facility rather than a brand related facility like KLM.

3.7.2 Signage Grouping

Passengers tend to naturally group signages by functionality and type to better help themselves simplify the process of interpretation and in turn, navigate efficiently in a train station (Interaction Design Foundation, 2016). The cognitive load theory suggests grouping similar elements in units to exert less pressure on the brain during information processing, allowing passengers to quickly locate any relevant information they need (Cognitive Load Theory, 2023). However, the current signage system at the station fails to effectively group signages of similar functionalities to aid information processing & readability.

Additionally, these signages with similar functionalities cannot be visually differentiated, leading to confusion and misdirection. For instance, in seeking out the KLM Air&Rail terminal, mostly perceived as an international ticketing facility after the booking process, KLM Air&Rail passengers will instinctively gravitate towards signages related to ticketing. However, due to the absence of the KLM Air France Air&Rail terminal signage, passengers naturally consider one of the other similar ticketing signages relevant to their goal, resulting in incorrect assumptions and unintended detours.

3.7.3 Signage Placement

The only available KLM Air France Air&Rail signages are not visible from the central hall and main circulation paths. While explicit resources do not detail the reasons for the limited placement of these signages across the station, one plausible explanation is the recent inauguration of the terminal on March 26, 2024. This suggests that ongoing improvements in the strategic placement of signage may still be underway.

Additionally, it is possible that concentrating signage solely at the front entrance was a deliberate decision to ensure that a critical decision & entry point is clearly marked, guiding KLM Air&Rail passengers efficiently from the entrance directly to the terminal (Knowledge Hub, 2024)

This approach minimizes unnecessary clutter from signage in other areas of the station.

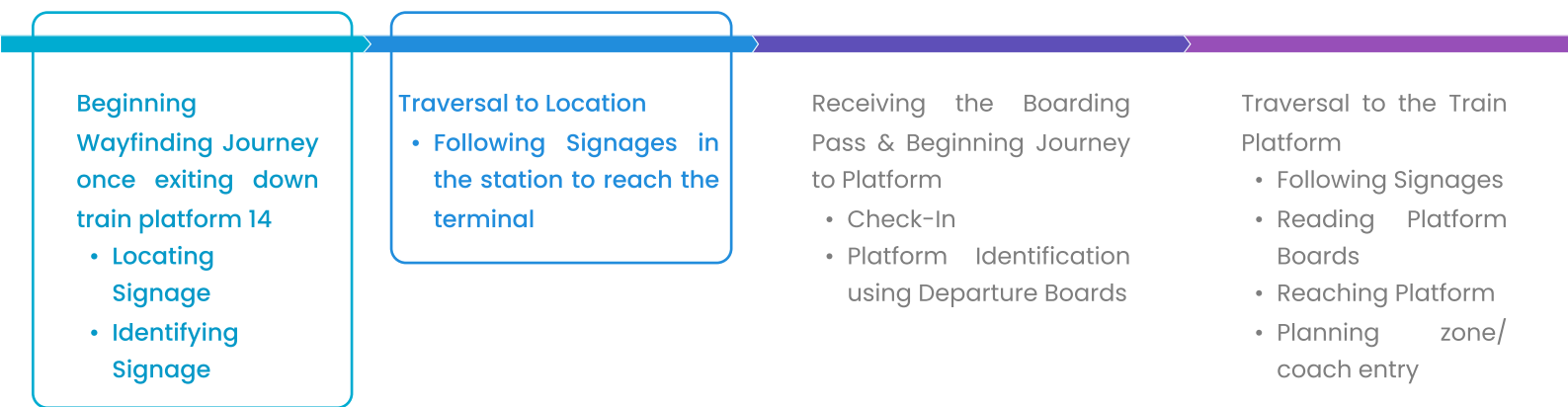
Currently, the KLM Air France Air&Rail signages can only be seen when looking further into the right hand side of the main front entrance. Due to this limitation, there is an inadequacy of strategic directional signages across other key navigation paths and critical decision points for KLM Air&Rail passengers starting their journey from from any point in the central hall. This results in passengers like myself feeling unsure of how to plan their route to the terminal due to an absence of a clear directional signage. Additionally, the lack of continuous confirmation signages also led to me frantically searching my environment for any meaningful signage to reconfirm my position.

3.8. Design Direction

The focus will be on simplifying and enhancing the first part of the wayfinding journey as shown below. This is to ensure KLM Air&Rail passengers who exit the train platform and enter the station can begin their navigation towards the terminal stress-free and do not feel lost. This would entail redesigning the KLM Air France Air&Rail terminal signage to ensure it is immediately recognizable and reconsidering the placement of the signage across the station to aid traversal.

My particular journey has revealed an integral entry point that could be used by KLM Air&Rail passengers when beginning

their wayfinding at the station. Other key entry points include the main entrances of the station and the underground metro. While the signage system should ensure that all KLM Air&Rail passenger types can begin their navigation confidently and are guided efficiently to the terminal from any entry point, the focus of this thesis will be on ensuring the system enhances the wayfinding experience and navigation for my particular type of KLM Air&Rail passenger journey.



KLM Air&Rail passengers beginning their journey from the entrance of platform 14 must feel **confident and composed** when using the analogue wayfinding signage system inspired by *Rotterdam Central* at Brussels Zuid train station while navigating to the KLM Air France Air&Rail terminal.

This can be achieved by designing **a clear and straightforward visual identity** for the KLM terminal signage that aligns with KLM Air&Rail passenger expectations. The signages must also be **strategically placed** at major decision points across central traversal paths to **effectively** guide passengers from their starting destination till the KLM Air&Rail Terminal.

How

Who How What

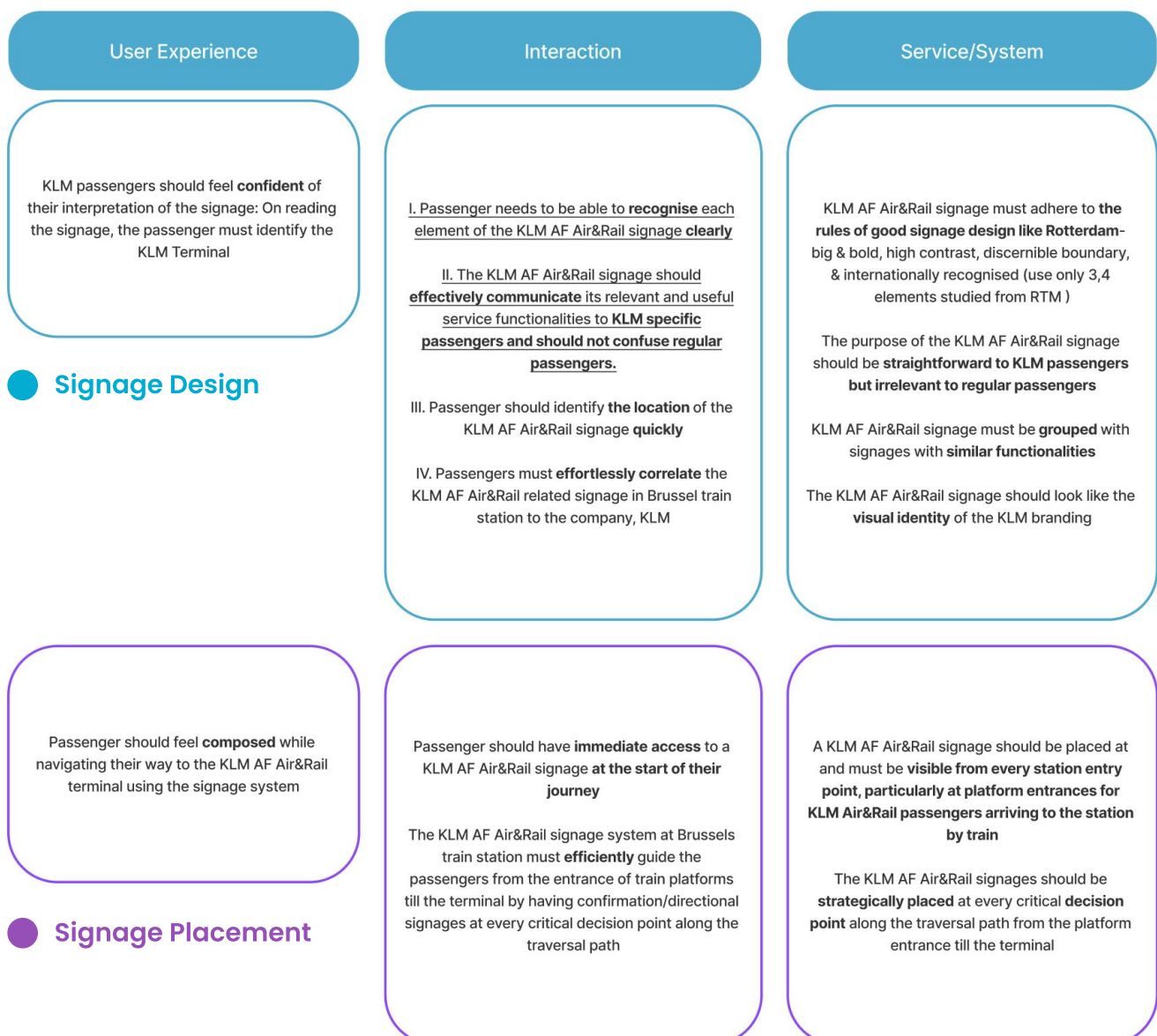
The design direction was informed by the issues identified with the signage systems at Brussels Zuid train station, as discussed in Chapter 3.7. The emotional experience I aim to evoke in my target audience is inspired by my own feelings when facing these challenges during my wayfinding journey. Essentially, I want to design

solutions that elicit the opposite emotions of what I experienced – for instance, transforming feelings of uncertainty into confidence and turning moments of franticness into a sense of composure.

3.9. Design Criteria

To ensure alignment between the design direction and ideas and eventual final design, specific design criteria were established on a user experience, interaction and service level, see figure 3.6. The formulation of these criteria were

guided by various problem areas and insights gained from the research findings and will ensure the ideas brainstormed during the next phase serve to enhance wayfinding experiences for KLM Air&Rail passengers.



● Signage Design

● Signage Placement

3.10. Conclusion

The focus of the thesis moving forward was narrowed to improving the signages for KLM Air&Rail passengers at Brussels Zuid, specifically aiding navigation from entry into the station from the train platforms to the KLM Air France Air&Rail terminal. Key challenges include the KLM Air France Air&Rail signage design, the current grouping and arrangement of signages on overhead boards, and the placement of these signages throughout the station. These challenges informed the design direction and criteria.

Now that we have the design direction and criteria, these will inform the creation and brainstorming of diverse signage concepts for the KLM Air France Air&Rail terminal during the ideation phase. I will need to discover which concepts most enhance wayfinding for KLM Air&Rail passengers and why. Feedback, along with the design direction and criteria, will be continuously used in an iterative ideation cycle to develop the best possible concepts. These concepts will ensure enhanced wayfinding by making my users feel confident and composed when interacting with them.

04 Ideation

This chapter details the ideation process and the iterative development of signage concepts. It discusses key discoveries after each ideation phase that are used to inform further concept refinements and describes the rationale behind the final 3 selected concepts.

- Ideation Approach
 - Ideation Phase 1
 - Ideation Phase 2
 - Ideation Phase 3
- Final Concepts for User Testing



4.1. Ideation Approach

This section provides an overview of the ideation process, its goals, and methods. To design the best possible signage for the KLM Air France Terminal at Brussels Zuid train station, an iterative design process consisting of three ideation sprints is conducted. This method is inspired by Sarah Van Coevorden’s thesis on reshaping the booking process of international train tickets (Sarah Van Coevorden, 2024). Her approach, inspired by Nielsen Norman Group, emphasizes iterative design, rapid prototyping, and user testing to explore and test the effectiveness of various signage concepts quickly- some concepts might fail sooner while others succeed sooner.

Participants were recruited through my own network for each ideation sprint, with different participants for each phase to avoid familiarity bias and gain diverse insights

Concepts were created using inspiration from keywords passengers were bound to come across or remember during booking process, and other relevant services being provided by KLM and the KLM Air France Air&Rail terminal such as- combined train

and flight journey, check-in, high-speed train, airport, boarding pass, ticket, baggage etc. Each sprint included informal testing, and the insights gained informed the brainstorming and creation of new concepts for subsequent sprints. The goal of the ideation phase is to select three diverse signage concepts that could potentially improve the wayfinding experience for KLM Air&Rail passengers, particularly those that offer the most confidence during interpretation. The following subchapters describe each sprint and the main insights in more detail.

During the ideation phase, the focus will be on creating effective signage pictograms rather than text and branding design. This ensures that even non-English speakers and those unfamiliar with the company’s branding can easily recognize the counter by its symbol alone. During my ethnographic studies I discovered some passengers struggle with English signage and departure boards. Additionally, space constraints in some areas of the station necessitate symbol-only signage first. The goal is to make the signage as inclusive and accommodating as possible.

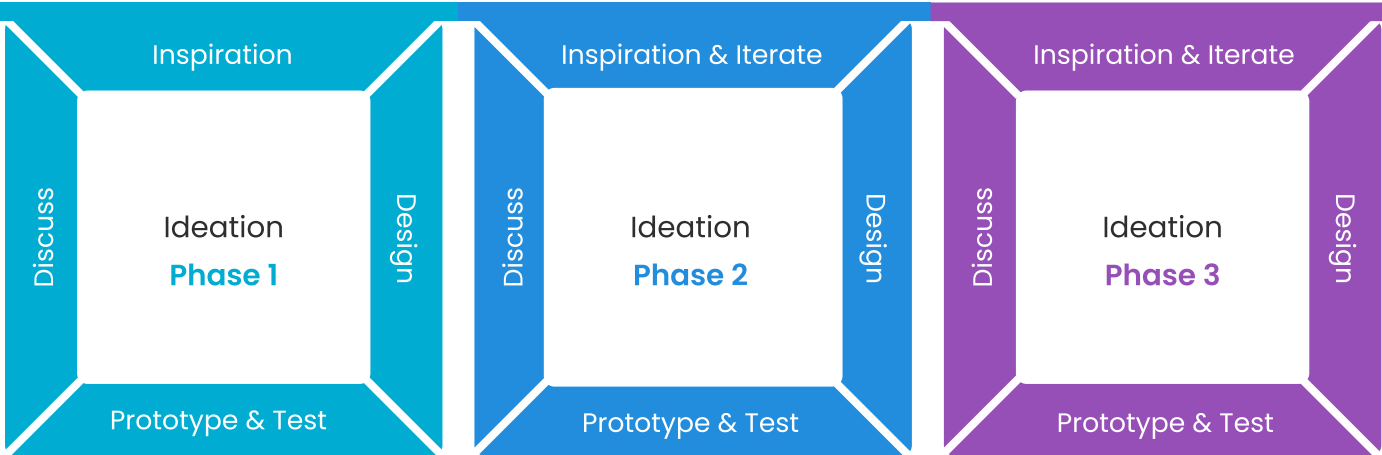



Figure 4.1: Iterative Ideation Approach & Phases

4.2. Ideation Phase 1

Goal	Activities	Participants
Create a variety of signage concepts, test them with KLM Air&Rail passengers and select the ones which work best for further iteration.	<ul style="list-style-type: none">• Brainstorming Session• Think Aloud Sessions• Reflective Sessions• Paper Prototyping	<div>● — Age: 23-26 — ●</div> <div><div>Dutch, Taiwanese, Indian</div></div>

4.2.1 Set Up

The goal of the first ideation sprint is to explore different signage concepts for KLM Air&Rail passengers and evaluate them through user tests, reflective sessions, and the design criteria established during the design direction formulation. This phase begins with a brainstorming session to create various concepts inspired by keywords from the design direction, the facilities offered at the KLM Air France Air&Rail terminal, as well as signages analyzed during the Rotterdam Central and Brussels Zuid train station field study.

Participants were given two tasks, assuming different passenger roles and encouraged to think aloud:

1. Interpret the meaning of each signage concept as regular train station passengers.

In this case, regular passengers are not specific groups like local train travel, Eurostar travellers, etc. They are given the role as passengers in a train station and then asked to interpret the signages.

2. As KLM Air&Rail passengers, book a ticket on the app and reinterpret the signage concepts.

While assuming a role, participants were asked to verbally communicate their internal thoughts and interpretations of the signages they were interacting with (Nielson, 2012). The purpose of this was to peek inside the complex thought processes that could occur when KLM Air&Rail or regular train passengers interact with the signage at Brussels Zuid train station

The order of these tasks aims to understand how regular train station passengers as well as KLM Air&Rail passengers interpret the signages to gain more insights from different passenger groups.

After completing these tasks, each participant takes part in a reflective session to share further thoughts on all the signage concepts. They are then asked to select their favorite concepts as KLM Air&Rail passengers.

The most liked and well-interpreted concepts were taken forward for further iteration.

Participants selected for the ideation phases either lived in Europe and were familiar with travel in Europe and public transport or have traveled across Europe or other countries for tourism. The range of expertise and familiarity with the train stations in Europe and travel offered interesting insights.

For task 1, participants were asked to imagine themselves as a passenger in a train station at Brussels, Belgium. The ambiguity of why they were at the train station allowed them to interpret the signages in a variety of different ways. For example, one participants imagines himself to be at the train station to take a train to the airport, while another passenger imagined herself to be an the train station to take a train to a nearby city.

For task 2, participants were asked immerse themselves into the role of a KLM Air&Rail. This was done by asking them to imagine themselves to be in Brussels for a holiday. For their next destination they wanted to fly to Copenhagen with KLM. They were then asked to book a KLM ticket, particularly, an Air&Rail ticket, using the KLM app prototype. Once completing the task, they were then asked to imagine themselves reaching and entering Brussels Zuid train station. They were asked to think about a signage they would expect to guide them to the KLM Air France Air&Rail terminal and then asked to reinterpret the signage concepts and discuss which ones they liked and why.

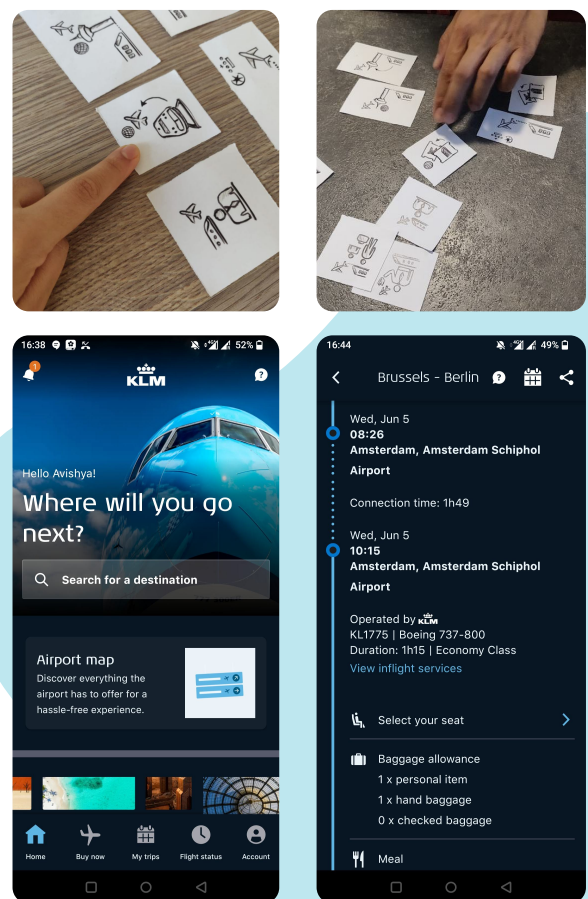


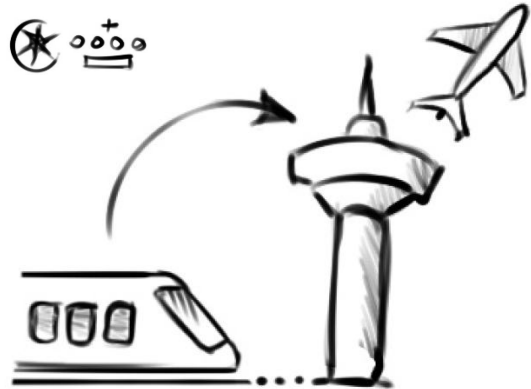
Figure 4.2 Samples of the concepts & prototypes tested by participants during the Ideation Phase

4.2.2 Selected Concepts

Concept 1

Pros: The rail-to-airport-to-flight journey was visually clear and matched KLM passenger mental models regarding their journey, boosting confidence. Brand logos identified by passengers offered further reassurance to their preliminary interpretations.

Cons: The signage failed to clearly indicate the immediate action of picking up tickets at the station confusing some KLM passengers. Some elements were misinterpreted (e.g., dotted line seen as a runway, tower not recognised as an airport). Logos alone were not as effective, as some participants didn't recognise the companies.



Concept 2

Pros: Minimalist design with three elements enhance readability. Certain keywords KLM passengers look for like tickets/boarding pass, train, flight, are matched offering confidence quickly. The rail-air journey was thought of one combined journey due to it being placed on a single ticket. KLM passengers interpreted this signage as a ticket pick-up location when in their context.

Cons: Regular passengers misinterpreted it as a place to buy combined train and flight tickets when in their context.



Concept 3

Pros: This signage was interpreted as a service desk by both passengers. KLM passengers identified these signages as locations concerning flight documentation & verification to board a train before their KLM flight within the context of their journey. The train and flight were associated with their journey further confirming its relevance to KLM passengers. The visual depiction of the bent arm conveyed handing over tickets.

Luggage, documents, and the official were seen as irrelevant to regular passengers unless they were to cross country borders.

Cons: Complex design with 5+ elements and ambiguous pictograms (eg, the passport documents were also interpreted as tickets) reduced readability.



4.2.3 Conclusion

After the first ideation phase, I learned several key insights to take forward to the next phase.

KLM passengers look for signage elements that match keywords from their booking experience, wayfinding tasks, and follow-up email confirmations.


The signage needs to visually convey the rail-air journey.

Simplicity and minimalism improves readability, however complex designs can provide nuanced information, possibly preventing regular train passengers from misinterpreting the signage.

Concepts during phase 1 failed to describe the 'international' aspect of the journey-crossing the border to an airport in a different country. Both regular and KLM Air&Rail passengers interpreted the signages as mostly 'domestic' travel within the country.

Brand logos offer reassurance to interpretation when passengers are familiar with them. They are irrelevant for passengers who do not recognise the company meaning the signage should be designed to convey the story or information as accurately as possible before including branding.

4.3. Ideation Phase 2

Goal	Activities	Participants
Create new and iterated signage concepts from phase 1, test them with regular & KLM Air&Rail passengers, and select the ones which work best for further iteration.	<ul style="list-style-type: none">• Brainstorming Session• Iteration• Think Aloud Sessions• Reflective Sessions• Paper Prototyping	<div>● — Age: 45-55 — ●</div> <div> Indian</div>

4.3.1. Set Up

The goal of the second ideation sprint is to explore different and iterated signage concepts informed by insights gained during phase 1 for KLM Air&Rail passengers, evaluate them, and carry forward new insights and well performing ideas for further iteration during phase 3.

The overall set up and method used during phase 2 remains the same as discussed during phase 1 chapter 4.2.1.

Sub Goals for Phase 2:

1. Depiction of International Travel:

Ensure symbols for international travel are clear and universally understood.

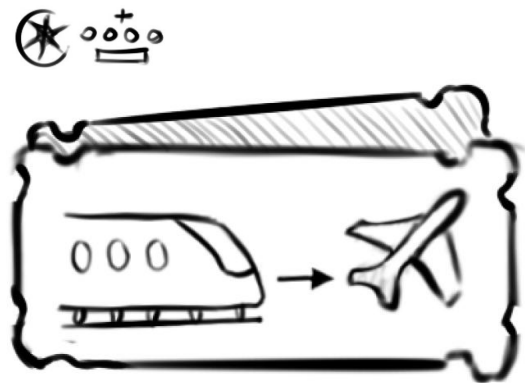
2. Differentiation: Design and discover signage ideas that inform regular passengers of its specific use for KLM Air&Rail passengers. Particularly, whether the depiction of international travel/facilities is useful for KLM Air&Rail passengers during interpretation while possibly dissuading regular train passengers from thinking the signage relevant to their needs and goals- like taking a train from Brussels Zuid train station to Brussels Airport.

4.3.2. Selected Concepts

Concept 1

Pros: Simple and straightforward design with matching keyword elements like ticket, train, flight, arrow were liked by KLM participants. The simplicity ensured quick recognition and confident interpretation.

Cons: Some regular passengers saw it as a domestic train to city airport ticket within their context of travel or a location offering tickets for any train and flight journey. Some passengers were unfamiliar with the brand logos and hence, completely ignored it.

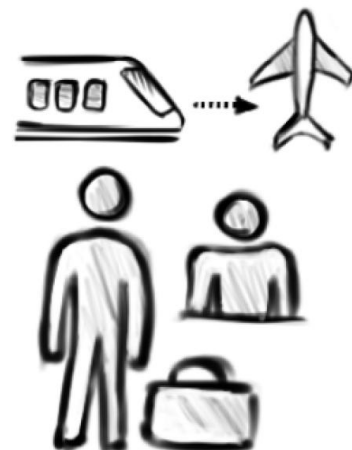


Concept 2

Pros: Information desks combined with the train and flight symbols were interpreted as services or help regarding any rail-air journeys by KLM passengers. Flight travel related elements like luggage, documents/passport, flight, desk, were relevant to and useful for the wayfinding task of KLM passengers. These same elements were considered as immigration by regular passengers and hence, slightly irrelevant to their usual travel.

They perceived this location as documentation check for international train & flight journeys meaning they had to have already booked tickets for that journey.

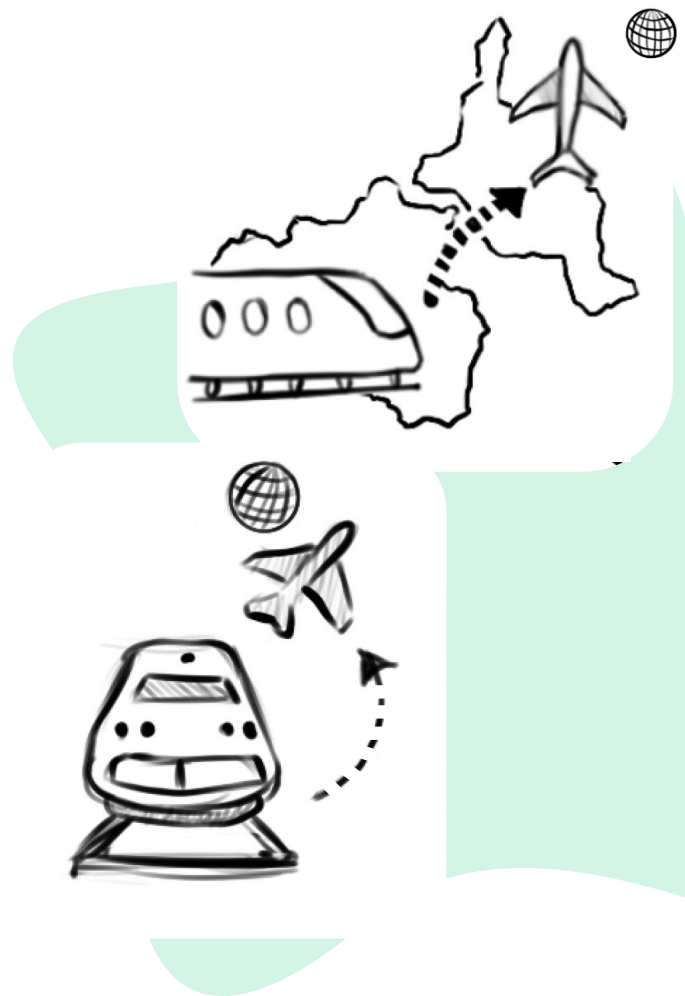
Cons: The number of elements increased complexity and reduced readability. Participants took time to fully interpret the signage.



Concept 3

Pros: The rail-to-air journey was depicted well and boosted confidence. The tilted flight symbol was correctly interpreted as taking off, while a 90° angle was seen as an airport. The dotted line was accurately interpreted as crossing country borders.

Cons: The globe symbol caused confusion amongst some passengers, often seen as a satellite and not 'international' travel. KLM participants did not find it necessary as they assumed all flights were international. The train symbols were interpreted differently by participants depending on travel experience (those familiar with Europe interpreting it as a high-speed train while those unfamiliar considered it a top view of a car).



4.3.3. Conclusion

This ideation phase provided several new insights, while reinforcing insights gained from phase 1.

Train, flight, ticket, and official/desk/documents were consistently identified by KLM participants. This confirms these are crucial components to include moving forward to ensure clarity and relevance.

Clear, simple/minimalist, and straightforward signage design quickens and enhances readability.

Certain symbols, such as the globe and dotted line, can effectively convey the concept of crossing borders or international travel possibly preventing confusion amongst regular passengers.

Interpretations of certain symbols are

dependant on passenger travel experience, particularly in Europe. To ensure inclusivity, universally recognised symbols must be used.

Discussions revealed that many participants book their trips through travel agencies and are unfamiliar with specific company logos, reaffirming the need to design the signage to convey functionality first.

Immigration and documentation elements were seen as mostly irrelevant by regular passengers but relevant for KLM passengers within their wayfinding journey. This indicates that certain signage elements can help differentiate facilities intended for international travellers, reducing confusion for local passengers.

4.4. Ideation Phase 3

Goal	Activities	Participants
Create iterated variations of signage concepts from phase 1 & 2, test them with regular & KLM Air&Rail passengers, and select the ones which work best.	<ul style="list-style-type: none">• Brainstorming Session• Iteration• Think Aloud Sessions• Reflective Sessions• Paper Prototyping	<div>●———— Age: 25-26 ———●</div> <div> Indian German</div>

4.4.1. Set Up

The goal of the third ideation sprint is to improve upon well performing signage concepts informed by insights gained from phase 1 and 2 to further help KLM Air&Rail passengers interpret the meaning of the KLM Air France terminal signage more confidently and accurately.

Sub Goal for Phase 2:

Insights from Regular Passengers: Gather insights from regular passengers regarding their interpretations of the signages meant for KLM Air&Rail passengers to further inform final concept iterations to prevent confusion amongst the unintended target group.

Although one concept emerged as the favourite in earlier phases, I developed two additional concepts to compare their effectiveness. The goal is to identify which concept best enhances wayfinding for KLM Air&Rail passengers without confusing regular train passengers.

Phases 1 and 2 revealed that certain elements help KLM passengers confidently interpret the signage while indicating to regular passengers that the facility is

specific to KLM. This aspect will be explored further in Phase 3.

The overall set up and method used during phase 2 remains the same as discussed during phase 1 chapter 4.2.1.

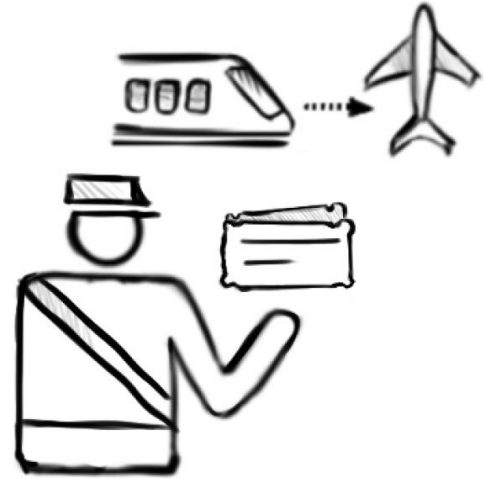
4.4.2. Selected Concepts

Concept 1

Pros: This signage was identified as immigration or an official offering tickets for rail-air journey by both passenger types. The train and flight symbols reinforced the relevance of the signage to KLM passengers. The officer and ticket symbols were interpreted as a boarding pass hand-off. KLM passengers felt confident of following the signage since they believed a hand-off occurs at a terminal.

Regular passengers once again, found the signage irrelevant to their needs unless they had bought or booked an international rail-air journey.

Cons: The ticket symbol was small and hard to discern reducing its importance in aiding interpretation for KLM passengers.

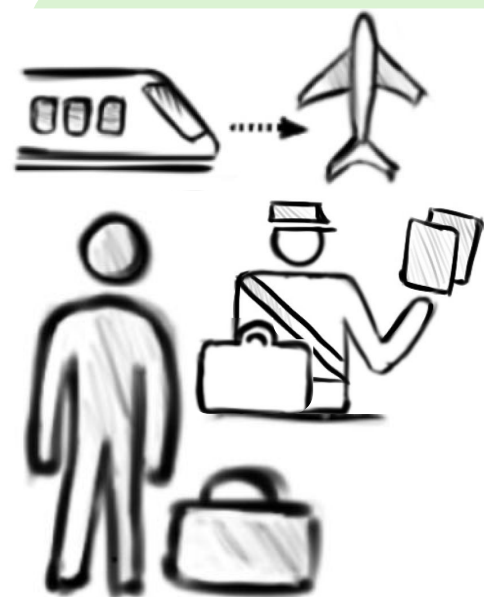


Concept 2

Pros: KLM passengers interpreted the signage as a waiting lounge before departure or check-in due to a counter, official, and luggage. They felt confident of their interpretation since immigration or check-in or waiting were seen as relevant during an international rail-air journey. The train to airport symbols further aided interpretation.

Regular participants saw the signage as a check-in/immigration counter similar to airports and thus, an international facility

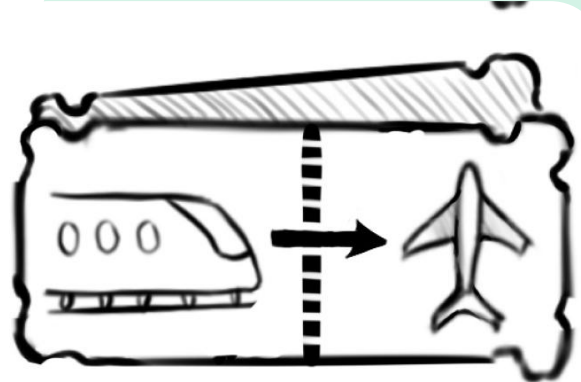
Cons: The vast number of elements increased complexity and severely hampered readability. Passengers took time to discuss their interpretations.



Concept 3

Pros: The simplicity and straightforwardness of the design improved readability. The depiction and combination of international rail-air journey on a boarding pass was more evident and considered more relevant within the wayfinding task of KLM passengers, offering more confidence that the signage must be followed. Regular passengers interpreted train and flight journey as international due to the border symbol.

Cons: Both passenger types were unsure of whether the signage was a 'pickup' location since the signage just displayed a boarding pass without 'someone or something' giving it out.



4.4.3. Conclusion

The last phase of ideation resulted in 3 diverse signage concepts that improved the wayfinding experience for KLM Air&Rail passengers by making them feel confident during their interpretation of the signage at the start of their journey. Some of these signages had elements that were considered useful for KLM passengers while irrelevant for regular passengers and their goals and needs.

I found that a well-designed pictogram can communicate information regarding a wayfinding task effectively, even without text and branding. This is especially important in multicultural or multilingual environments where text and company

branding might not be universally understood, thus improving accessibility and inclusivity. Pictograms are also larger improving visual accessibility.

Company logos like KLM were found to be useful to offer more confidence and assurance to KLM participants who already interpreted the signage correctly and were familiar with company logos and branding.

I do need to consider how these pictograms are arranged and placed in the signage. More elements increase complexity and hamper readability though conveying nuanced information.

4.5. Final Concepts for User Testing

The final signage concepts identified after the three ideation sprints were further refined to match the visual style of the signages at Brussels Zuid train station. Since the signages were to be placed on signage board prototypes for user testing, they were designed more realistically.

Concept A

The signage concept depicts the boarding pass to be picked up at the KLM Air France Air&Rail Terminal. The rail-to-Schiphol airport journey is shown on the pass with the dotted line depicting crossing country borders.



Concept B

The signage concept depicts immigration or visiting an immigration officer for international travel. The rail-air journey is also shown below the counter to help KLM air&rail passengers identify that immigration is for their specific journey.



Concept C

This signage concept depicts a check-in counter. KLM air&rail passengers are required to check-in at the terminal to receive their boarding pass. The passenger with luggage also depicts baggage drop off usually done at check-in counters. The train to airport journey is placed on the counter to inform KLM passengers that the counter is for their type of journey.



4.6. Conclusion

In this chapter, three ideation sprints were conducted to design signage concepts aimed at improving the wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station. The concepts were evaluated and discussed by participants role-playing as both KLM Air&Rail passengers and regular train passengers to inform the concept refinement for the next phases. Finally, three diverse concepts were selected that could enhance wayfinding for KLM Air&Rail passengers while also avoiding confusion for regular train passengers.

Moving forward, these final concepts will undergo formal user testing with KLM Air&Rail passengers to evaluate their effectiveness in improving wayfinding at Brussels Zuid train station. The goal is to determine which concept or aspects of a concept successfully instills the most confidence during interpretation and aligns best with KLM Air&Rail passenger expectations. Additionally, we need to discover whether these concepts or aspects also manage to dissuade regular train passengers from confusing it as useful for completing their own tasks and goals. The insights and feedback gained from this testing phase will inform necessary refinements for the final design, ensuring a more effective wayfinding experience for KLM Air&Rail passengers.

05 Testing & Final Design

This chapter details the iterative testing & evaluation process. Key insights & feedback gained over each phase will be used to inform the final signage design. Furthermore, it describes the various aspects of the final design and proposed a conceptual diagram for its placement at the train station.

- Testing & Evaluation
 - Testing Phase 1
- Testing Phase 1 Insights
 - Final Concepts
 - Testing Phase 2
- Testing Phase 2 Insights
 - Final Signage Design
- Strategic Signage Placement
- Implementation Roadmap



5.1. Testing & Evaluation

This chapter aims to evaluate the refined design concepts of the final ideation sprint. The goal of the testing phase:

- 1. Evaluate which signage concept instills the most confidence in my KLM Air&Rail passengers when interpreting the KLM Air France Air&Rail terminal signage when beginning their wayfinding task at Brussels Zuid train station.
- 2. Evaluate how effectively the signage communicates the intended message of the KLM Air&Rail service.

The prototypes were tested and refined through a set of 2 consecutive user tests. Insights gained from the final testing session will be used to inform the design of the final signage for the KLM Air France Air&Rail terminal.

The participants for the user tests were recruited though my personal network however had no prior knowledge or bias about the project.

The user test provides insights into the user experience and interaction with the signage system. The method, set up, and insights of each testing phase are discussed in subsequent chapters in detail.

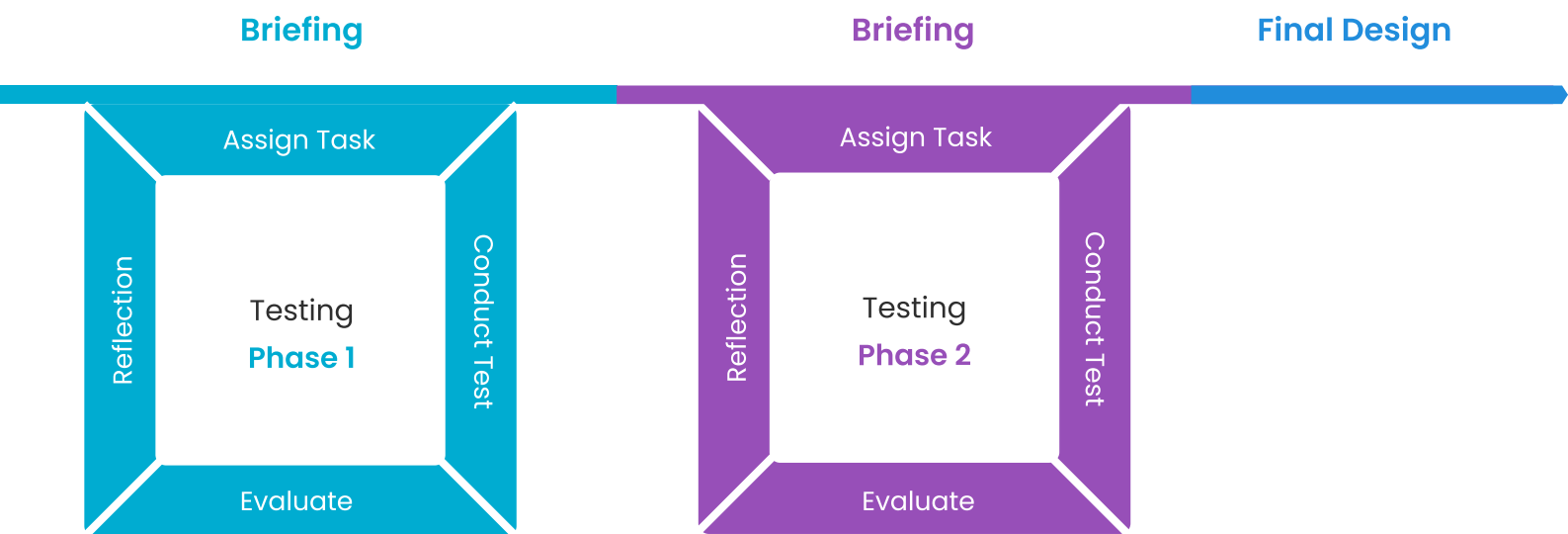


Figure 5.1: Iterative Testing Approach & Phases

5.2. Testing Phase 1

5.2.1. Goals

The goal of the first user test is to identify which of the three signage concepts chosen during the ideation phase best enhances the wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station. User experience and interaction with the system will be evaluated in terms of the confidence felt during signage interpretation and how effectively the signage communicates its intended message for the target group. Insights from this session will guide the iteration of the most effective concept, which will then be tested further in the second user test.

Additionally, the test aims to compare the new signage concepts against the existing signage at the KLM Air France Air&Rail terminal to determine if the new designs improve the wayfinding experience and understand why they may be more effective.

Another objective is to gather feedback from non-target users discussed further through the chapter. This ensures that those who do not need the signage can easily recognize that it is not relevant to them and avoid confusion.

In Testing Phase 1, the foundation of the signage design is being tested, excluding branding and textual signage. During my field research, I observed that Brussels Zuid train station and Rotterdam Centraal did not display company brand logos on their signage. Brussels Zuid recently

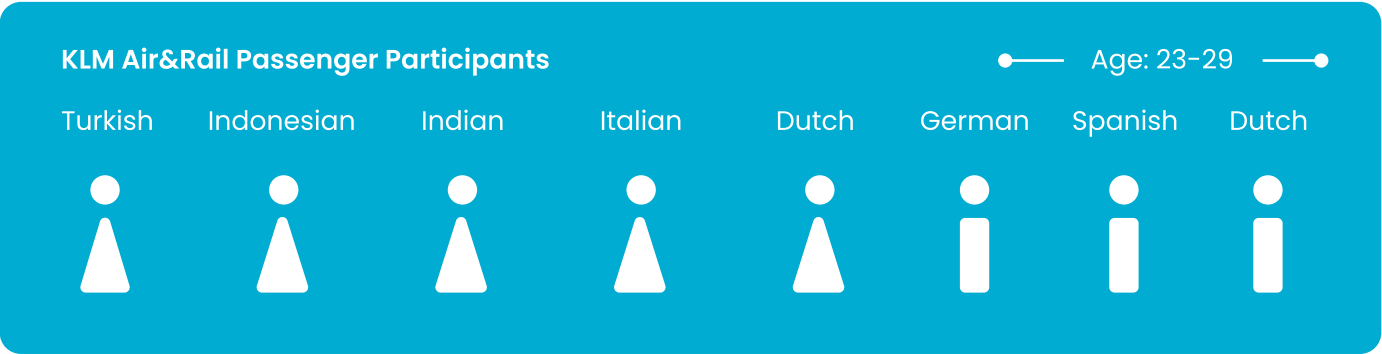
underwent a revamp, removing logos of companies like Thalys, Eurostar, and ICE. This shift aligns with a growing trend towards a cohesive brand and visual identity across all channels (They Make Design, 2024) SNCB aims to create a more recognizable identity across its stations, minimizing the display of external brand logos to reinforce the national brand and provide a consistent visual experience for passengers (About SNBC, 2024) This approach prevents visual clutter due to varying brand colors, helping to create a uniform look. To align with this trend, I will not focus on testing or implementing branding.

Additionally, discussions during the ideation phase revealed that some passengers book their journeys through agents and may not be familiar with specific brand logos. These passengers rely on clear and effective signage design to navigate the station. Therefore, the emphasis will be on designing signage that conveys the necessary information accurately without relying on branding.

5.2.2. Participants

Jacob Nielsen (2000) suggests that a sample size of six participants can uncover at least 75% of usability issues in qualitative research. Based on this, the user tests involved eight participants acting as KLM Air&Rail passengers. These participants were selected to ensure a balanced male-to-female ratio and represented different countries, 6 belonging to Europe. Multicultural participants were considered for this test since wayfinding signage must be universally understood, regardless of language or cultural background. Since KLM offers global services, the varied cultural backgrounds will ensure that the signage is effective for all passengers.

Additionally, five participants with similar backgrounds were recruited for non-target passenger discussions. All participants were recruited through my personal network, ensuring they had no prior knowledge or bias about the project. All participants had travel experience across Europe. The age range of participants was 23-29. However, for future tests, including participants of various age groups and travel experiences would be beneficial for a more comprehensive evaluation.



5.2.3. Method & Set Up for KLM Air&Rail Passenger Participants

The design criteria identified during the design direction formulation will be used to define testable targets to help evaluate each signage concept against one another and also compare them to the original signage design. The test will be moderated and in-person, focusing more on discovering insights and gaining nuanced feedback through qualitative testing.

After a quick briefing, participants were placed in a mock-up environment similar to the signage boards placed in Brussels Zuid train station currently as shown below. They were tasked with locating the the KLM Air France Air&Rail terminal signage after completing a preliminary task of booking their air&rail ticket on an KLM app prototype. Each participant was asked to complete the same task for each signage concept including the original signage.

After testing each concept, participants filled in a questionnaire rating their experience against the design criteria & testable targets as shown in table 5.1. This questionnaire and time taken to complete the identification task were used to encourage reflection and concept discussion. While interacting with each prototype/concept, participant body behavior was observed and they were asked to think aloud.

A reflective semi-structured interview was conducted after each prototype was tested and a final general and comparative reflective session was done after all 4 signage prototypes were tested.

To prevent testing & concept bias over time, the order of prototypes to be tested for rotated across participants ensuring rich insights for each signage concept.

More details of the test plan is shown in Appendix C.

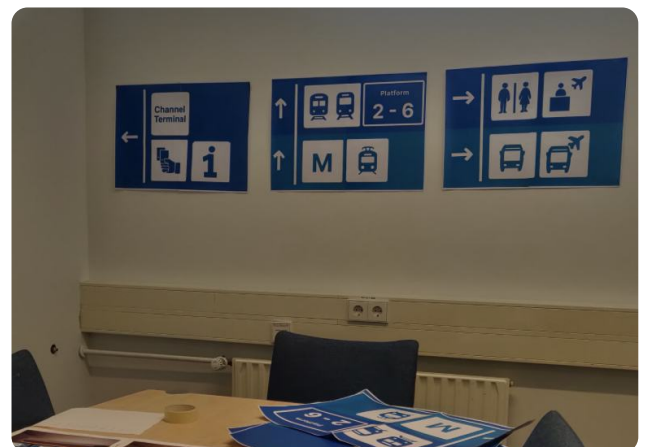


Figure 5.2: Samples of the Testing Set-Up for Phase 1

Additional Prototype Points

To align with the visual identity of Brussels Zuid while drawing inspiration from the effective signage design at Rotterdam Centraal, I modified the current signages at Brussels Zuid to match the style of my concepts, which were also informed by the successful signage design in Rotterdam. This approach ensures a cohesive visual appearance for my design concepts alongside the existing signage at Brussels Zuid, helping to prevent recognizable bias. For example, I not only used a white background as a boundary for my concepts but also applied it to the signages at Brussels Zuid to create consistent looking signage board prototypes. The prototypes of the signage boards will be shown in the following sections.

The process of booking a KLM Air&Rail ticket was prototyped on Figma. Slightly edited screenshots from the existing app were used to ensure a realistic experience for participants. Furthermore, the prototype also included the email confirmation with all additional details KLM usually sends their passengers after the booking process- these details are to be read by their passengers before beginning their rail-air journey.

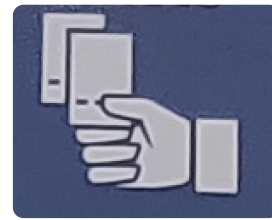


Figure 5.2.1: Reimagination of the original Tickets Signage at Brussels Zuid train station for prototype design

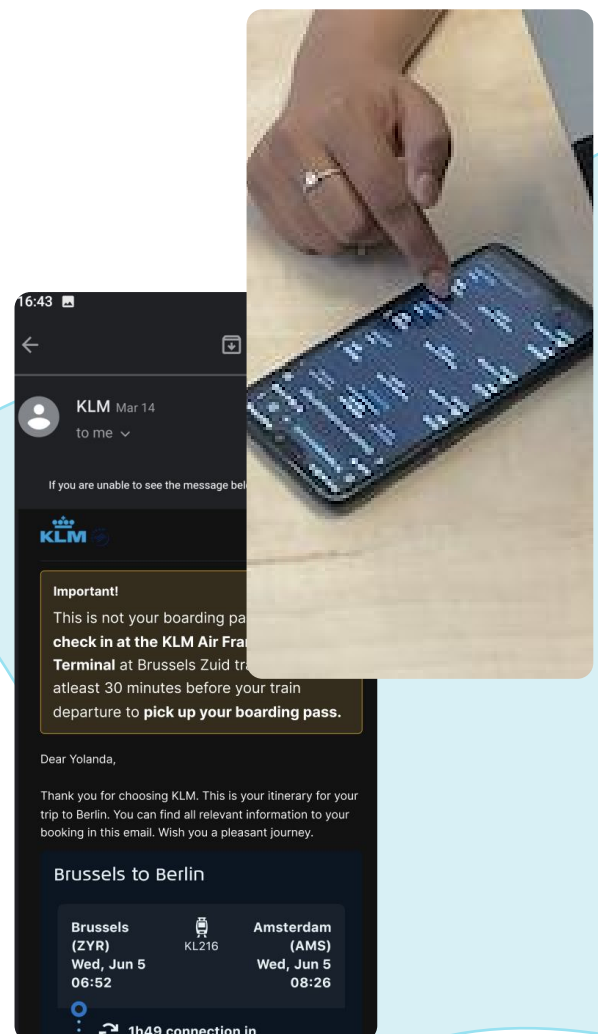


Figure 5.2.3: The KLM Air&Rail booking process prototype

5.2.4. Design Criteria & Testable Targets

The testable targets displayed below will allow me to evaluate the concepts during testing. The testable targets will be used to analyze whether a concept fulfils a certain design criteria successfully and in turn fits well within the design direction.

Evaluations are visually represented through Tables 5.1 and 5.2 after the completion of phase 1 and 2 respectively.

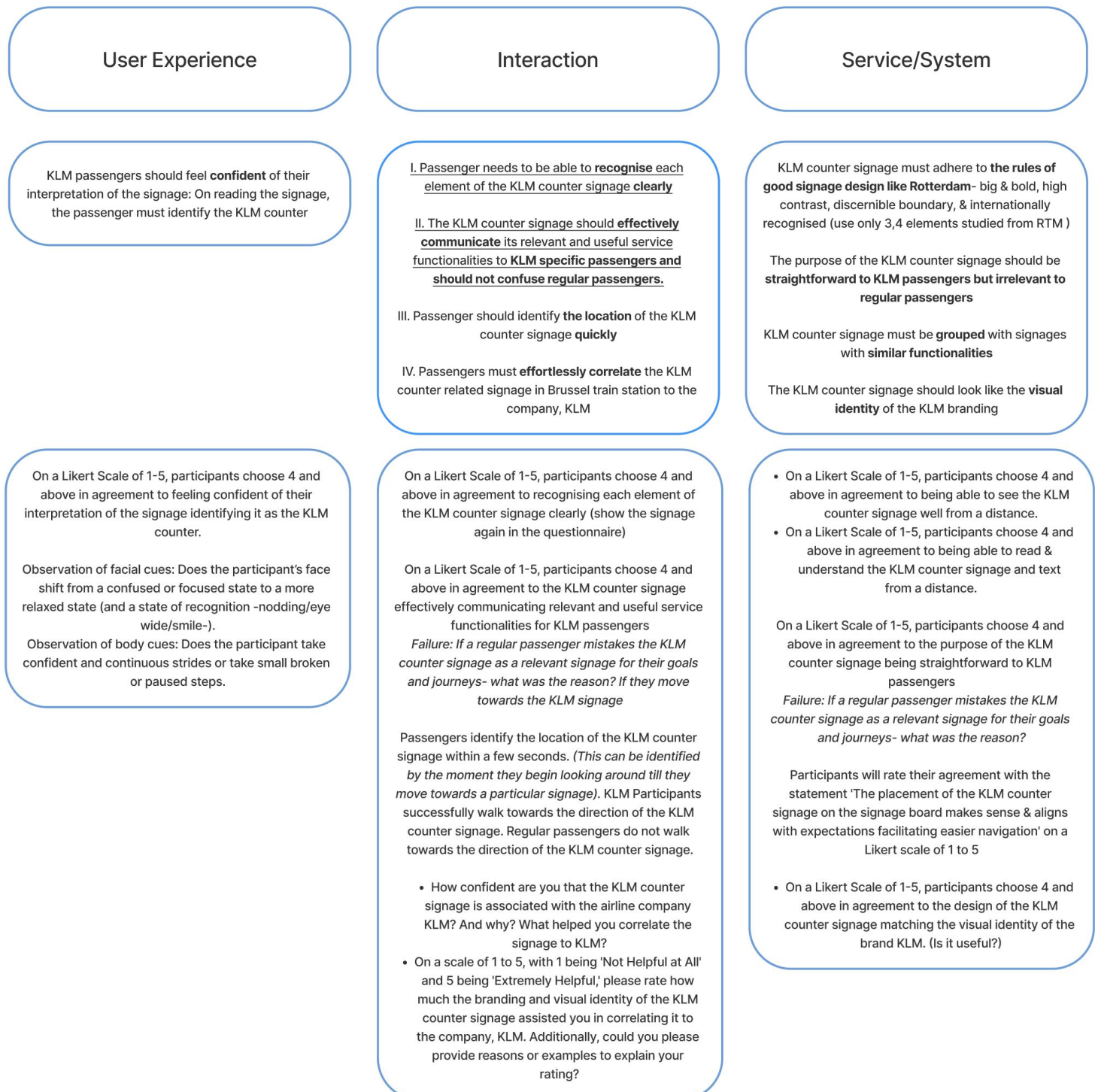


Figure 5.1 Design Criteria and Testable Targets

5.3. Testing Phase 1 Insights

5.3.1. Signage Concept: Original

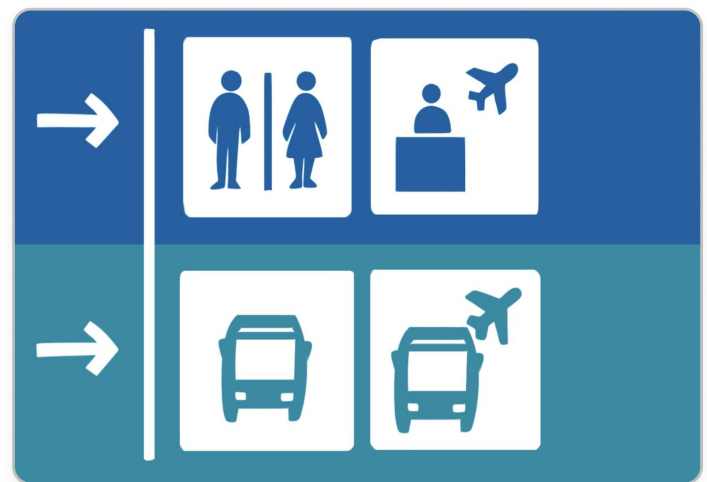


Signage Concept O

KLM Air&Rail participants broadly disliked and misinterpreted the original signage for the KLM Air France Air&Rail terminal at Brussels Zuid train station. Most participants found its purpose confusing and were not able to confidently follow the signage some opting to follow the existing ticket signage.

Though participants appreciated the simplicity of the signage- consisting of just 2-3 elements, they found that to be the reason of its vagueness and ambiguity leading to a variety of different interpretations- such as a luggage drop off desk, an information desk for flights, or a check-in desk, or a ticket booth for flights. The lack of important keyword elements such as a train or ticket instilled a sense of uncertainty regarding whether the signage was meant for them to follow or not.

The lack of a train symbol also failed to communicate the overall wayfinding task, and rail-air journey they were undertaking leading to further confusion shown in table 5.1. Participants took time scanning through all the signage boards before making their decision. Overall, most participants stated that since the



Signage Board Mock-Up

signage had at least a flight and looked like facilities usually present at an airport like a boarding gate or check-in, they would follow it since no other signage made sense to them.

Finally, participants complained about the placement and grouping of the signage on the board, stating that the placement confused them further since they saw 2 signages with a flight symbol- a shuttle bus and desk but no flight. They also felt the signage placed next to toilets made no sense in terms of function grouping.

“

For all I know this guy could be sitting behind a box- Participant B (German)

“

I would eventually get there after getting lost. There's no train sign and I need that. It's related to my journey- Participant D (Turkish)

“

I love the simplicity. It's only 3 elements to get the message across though it's wrong- Participant C (Indian)

Summarizing, Concept O faired the lowest amongst the 4 signages. The simplicity & minimal elements improved readability allowing participants to clearly recognize & discern each element. However, minimalism can also lead to misinterpretations of the signage or uncertainty if crucial elements are

missing. KLM Air&Rail passengers need to recognize keywords regarding their rail-air journey such as the train, flight, ticket, etc to be shown on the signage to convey its relevance to them, thus, offering more confidence of their interpretation and subsequent wayfinding to the terminal.

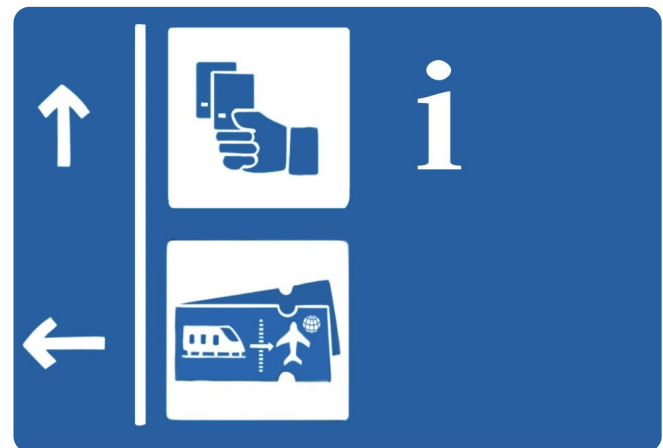
5.3.2. Signage Concept: A



Signage Concept A

KLM Air&Rail participants broadly liked concept A, confidently, quickly, and correctly interpreting it as the KLM Air France Air&Rail terminal signage. During reflection, participants revealed that the signage fit well within their wayfinding task and would greatly aid them in navigating to the terminal at Brussels Zuid train station. As shown in table 5.1, its purpose was clear and straightforward, as the design correlated well with their unique interpretation journey- for example, some read the signage as a location to receive a train ticket to the airport while some just considered it the location to reach before taking a train to catch their flight.

Participants stated that concept A met their expectations of what the KLM Air France Air&Rail signage should 'look like', containing elements that depicted the rail-air journey and a boarding pass/ticket, which they were



Signage Board Mock-Up

informed to pick up. Interestingly, whether or not participants had read the email confirmation, they would follow the signage confidently, thinking they could buy the physical pass there. However, this also means regular passengers might confuse this location as a place to buy combined rail-flight tickets. This issue could potentially be addressed through branding discussed in testing phase 2.

Some participants wished for additional branding or text beside the signage to reinforce their understanding, as they felt slightly uncertain due to their tendency to combine the KLM signage with the Channel Terminal signage. They noted that 'Terminal' being a keyword in the email confirmation added to this confusion. Additionally, the arrows pointing in different directions further confused them since their 'grouping' was not

pointing to the same area. Opinions on the element size ratio varied: some preferred larger train and flight icons to quickly draw their attention and felt the ticket as negative space led to hampered readability, while others liked the balanced and central alignment of the pictograms, which required less searching. Additionally, the globe was found to be relevant but ultimately ignored due to its small size and lack of impact on interpretation.

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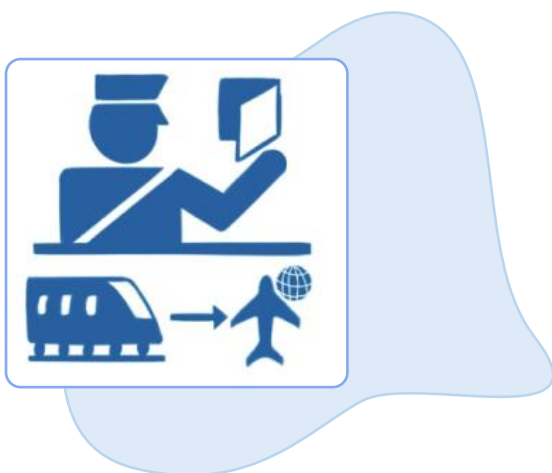
Ah that's where I need to go. That felt nice. I'm satisfied since I can continue my navigation- Participant B (German)

//

I feel confident that this is where I have to go for my journey. I looked at all the boards and signages and there was no doubt this is where I had to go- Participant G (Dutch)

Summarizing, concept A faired the highest amongst the 4 signage concepts. The design was effective in communicating relevant information needed to help KLM Air&Rail passengers correctly interpret it and confidently follow it. Key elements like the depiction of the rail-air journey and a boarding pass/ticket were well-received and meet KLM Air&Rail passenger expectations enhancing wayfinding. The simplicity and the central alignment of the design improved overall readability. Certain elements like the globe do not add any relevant guidance and lead to visual clutter. Some concerns emerged about potential confusion for regular passengers and the need for additional branding or text to reinforce the signage's purpose. Opinions on the size ratio of the pictograms varied requiring further adjustment of the size based on element importance and visual balance moving forward.

5.3.3. Signage Concept: B



Signage Concept B

Concept B was largely disliked by KLM Air&Rail participants with some feeling confused and taking time to make their decision while others misinterpreting and following the wrong signage. A primary reason for this were the



Signage Board Mock-Up

officer & official document elements. The prominent size of the officer took up much of the space negating the importance of the rail-air journey. Participants interpreted the signage correctly as immigration, however,

since they were unaware that this particular step occurs at the KLM Air France Air&Rail terminal, they were unable to correlate the signage to their journey. This resulted in participants uncertain of the purpose of the signage as shown in table 5.1.

Through discussions, participants felt lost or confused since they perceived the signage to be depicting a part of their wayfinding journey after they receive a boarding pass- that is, immigration, check-in at a boarding gate etc. This resulted in them feeling unsure of whether they had to go elsewhere first to pick up their tickets before going here. Once again, it was the train and flight that offered some reassurance to participants.

Some participants combined the signage with the Channel Terminal signage once again to mitigate their confusion- since the word terminal, combined with the train and flight matched their expectations. Finally, the lack of visual clutter and better use of negative space gave the design more breathing room, improving readability. Some participants suggested that adding branding would've made the decision making easier.

//
I don't think the officer makes any sense? I don't find it useful. It confuses me about what happens at that location- Participant H (Italian)

//
I think this concept focuses more on the officer rather than the important journey of a train and flight which is why my eyes were drawn immediately to the platform signage since it's prominent there- Participant E (Indonesian)

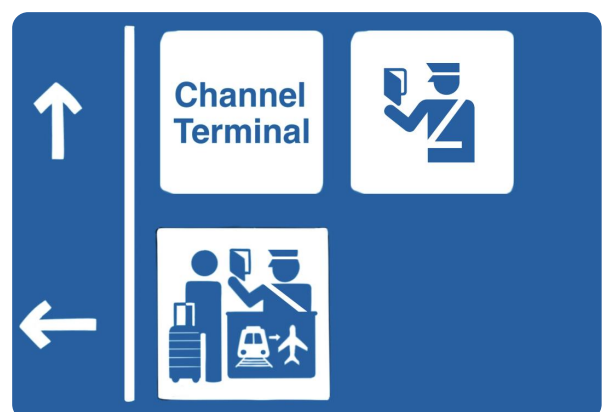
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I feel I'm in the wrong place. Since I'm already at check-in. I feel like I have missed a step in my navigation- Participant B & F (German & Dutch)

Summarizing, concept B faired second amongst the 4 signage concepts but below average. The train and flight symbols offered the most guidance reinforcing the need to keep them more prevalent in the final design. Since KLM Air&Rail passengers are highly likely to be unaware of what happens at the terminal, removing elements of immigration and documentation could prevent any confusion and uncertainty. The tendency to combine text with signage to aid interpretation suggests adding a title next to the KLM Air France Air&Rail terminal could further enhance interpretation and make it simpler. Adding branding could possibly quicken decision making. The tendency to compare signages on the board also calls for a more distinct & effective design. And finally, an efficient way of using negative space could enhance readability of signages.

5.3.4. Signage Concept: C



Signage Concept C



Signage Board Mock-Up

Concept C was largely found to be complex to comprehend, with mixed opinions from participants. Some perceived it as slightly clearer and more helpful than Concept B in communicating its purpose. However, the overall rating for Concept C was still lower than Concept B, as shown in Table 5.1. This was mainly because participants needed ample time to fully discern what the signage depicted. The large number of elements, though balanced in size, resulted in a cluttered and crowded visual. Overly detailed elements like the rail-air kiosk, the officer, and the passenger with luggage caused some participants to be unable to recognize their meaning and, in turn, feel uncertain about their decision.

Some participants correlated elements such as luggage drop-off and the officer behind a check-in kiosk with activities at an airport before their journey. Reinforced by the train-flight logo on the kiosk, they felt the signage made the most sense within their overall wayfinding journey. However, similar to Concept B, they were unsure whether these steps actually occurred at the location since they received no information about such steps during their booking process.

Overall, participants found most elements to be unnecessary or unhelpful during their decision-making process and felt the train and flight needed to be more prominent since they could connect those elements immediately to their task. Additionally, some passengers felt confused about the grouping of this particular signage, comparing Concept C with the passport control signage due to the visual similarities between the officials/officer. This suggests eliminating elements that match other signages in the station.

//

If I had known I need to go through someone. I think I would find this okay as well but obviously I didn't- Participant A (Spanish)

//

I would definitely stop here for 2 minutes to think and then I'd head in the right direction- Participant C (Indian)

//

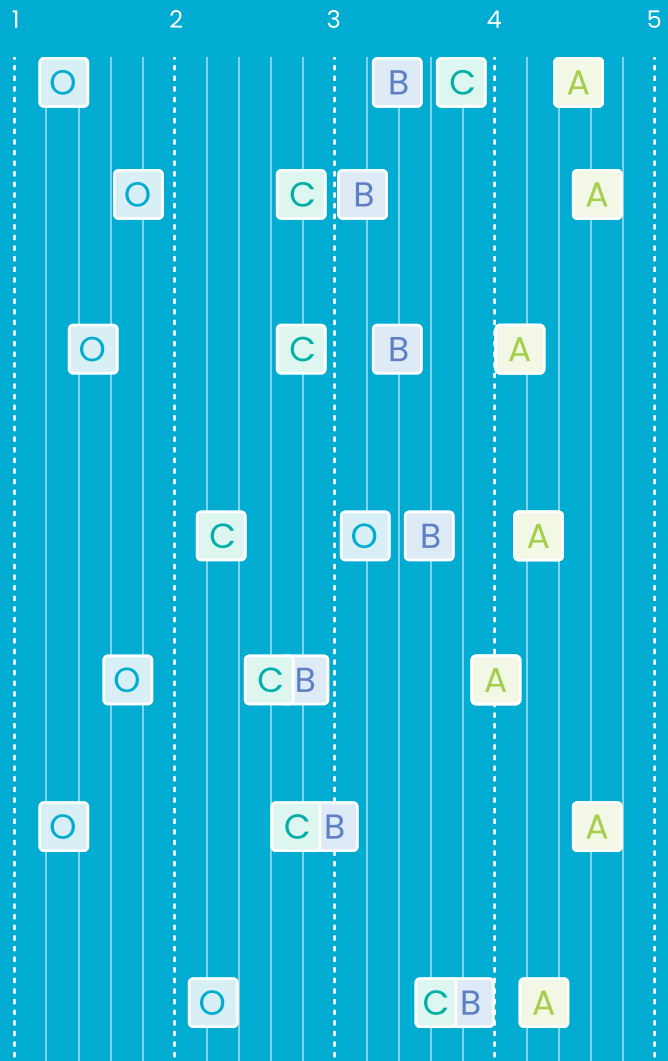
But since I did not know this at first and I don't relate baggage drop off as possible at a train station, I wouldn't immediately think this is where I can go?- Participant F (Dutch)

Summarizing, Concept C faired third amongst the 4 signages. Signages exceeding 3-4 elements are perceived as complex and require time to comprehend suggesting a good visual balance between 3 elements at the most to improve readability. Passengers unsure about certain steps or interactions depicted in the signage such as baggage drop off, or check-in, will feel uncertain when making their decision if they are not made aware of them during their booking process. Ensuring the signage contains keywords passengers look for or will definitely remember will help them feel more confident when making their decision. The train and flight symbols are used to reinforce interpretation of other elements when not visually prominent, as suggested by passengers perceiving the check-in kiosk as specifically for rail-air journeys.

Design Criteria

Strongly Disagree

Strongly Agree



5.3.5. Conclusion

During testing phase 1, four signage concepts including the original signage for the KLM Air France Air&Rail terminal at Brussels Zuid train station were tested amongst 8 KLM Air&Rail participants. From discussion and qualitative data analysis, the original signage performed the poorest amongst while concept A was considered the signage most effective in communicating relevant information needed to help passengers feel confident when beginning their journey at the station. Using minimal, universally recognized pictograms to depict keywords participants are most likely to remember is what led to the success of concept A- this should stay consistent when iterating the final design.

Some pictograms used in other concepts- such as baggage drop, check-in were also well liked by participants and could also be used moving forward. Before selecting a concept for further iteration and testing, it will be important to gather feedback from non-target passengers regarding the three signage concepts. This will help determine which concept could not only enhance navigation for my target users but also prevent any confusion or wrongful decision making amongst non-target passengers at the train station. Furthermore, discussions revealed textual signage & branding could possibly aid KLM Air&Rail participants during interpretation suggesting their implementation in the signage design. Moving forward, variations in branding & text must be tested to determine which style best enhances interpretation of the signage.

5.4. Set Up for Non Target Passenger Participants

Goal: Discover which signage concept well-liked by KLM Air&Rail passengers is ignored by regular train passengers and correctly identified as specific to the needs of KLM passengers. Regular train passengers should not confuse the concepts as relevant to their goals and needs.

The discussion with non-target passenger participants was conducted after completing the user testing with KLM Air&Rail passengers participants. This was done to discover if a concept though ranked second for example, in terms of enhancing wayfinding for KLM Air&Rail passengers avoids confusing regular train passengers. It is possible that the best-performing concept for KLM passengers may confuse regular train passengers, making the second-best concept a better overall choice when further iterated upon feedback gained from phase 1.

Types of non-target passengers identified:

User A: Passengers who wish to take a Eurostar train from Brussels Zuid to Schiphol/Paris Airport preferring to buy a ticket at the station itself.

User B: Passengers who are at the train station and wish to purchase a ticket from Brussels Zuid train station to Brussels International Airport using the facilities there.

All other passenger types, such as passengers taking international trains from one country to another are not relevant for this test since the KLM Air France terminal specifically offers train

services till international airports. I can assume Eurostar passengers who are traveling from Brussels Zuid to Amsterdam Central for example will not mistake my signage relevant to them unless their goal is to use the Eurostar to reach an Airport.

Since the non-target passengers A & B are not my primary target group (KLM Air&Rail passengers), I will not be conducting a detailed usability test with them.

The task assigned to the participants was simple: they were asked to put themselves in the shoes of User A and User B, and imagine themselves to be inside Brussels Zuid train station:

1. User type A was asked to buy a ticket for a Eurostar train from the station to Schiphol Airport.
2. User type B was asked to buy a ticket from the station to the Brussel International airport.

They were then asked to select a signage they would 'think' they had to follow to reach the location to buy these tickets. The prototypes used during phase 1 testing with KLM Air&Rail participants were used here as well (signage boards).

After assigning a task that aligns with their specific role as non-target user to each participant, I will conduct a semi-structure interview and quick discussion to gather their feedback and perceptions for each signage concept tested during the first session with KLM Air&Rail passengers.

It is important to mention that the original signage at the station these non-target passengers are actually meant to follow is displayed on the right. This is the original ticket booth/office facility they can buy the previously identified tickets at. While showing the participants the prototypes, the actual signage meant to be followed at the station was also added. This was to identify whether participants would find this signage relevant and useful enough to follow or whether they would mistake this signage with my designed concepts from phase 1.

5.4.1. Insights from Discussion

Most participants from the two types of non-target users identified the signage concepts as relevant or useful for completing their tasks, often ignoring the original ticket signage at Brussels Zuid train station they were meant to follow.

They felt that Concepts B and C, which included elements like baggage drop, documentation check, and check-in kiosk, were immediately associated with the airport. This was said to provide confidence during their stressful wayfinding task, reinforced by the train and flight symbols.

Concept A was frequently chosen for its simple design, as participants felt it visually represented their journey well—needing a train ticket to the airport. They feared they wouldn't be able to purchase the same type of tickets if they followed the original ticket signage since Concept A specifically had a representation of this particular type of journey. Some



Figure 5.4.1: Reimagined Tickets Signage



Concept A



Concept B



Concept C

Figure 5.4.2: Concepts used for testing during phase 1

interpreted Concept A as the platform to head to if they already had a boarding pass, due to a separate ticket signage pointing the other way.

The addition of branding either helped some participants correctly change their interpretation or further confused them. Some participants switched to the original ticket signage upon seeing branding, feeling it was facility-specific and not relevant to them. Others felt that if they had bought a KLM flight ticket already, the signage concepts were meant to guide them to their KLM flight.

Some reinterpreted Concept A as a facility for buying combined train + KLM/AF flight tickets, while Concept C was seen as a facility for completing check-in or baggage drop-off before heading to KLM or Air France flights at the airport.

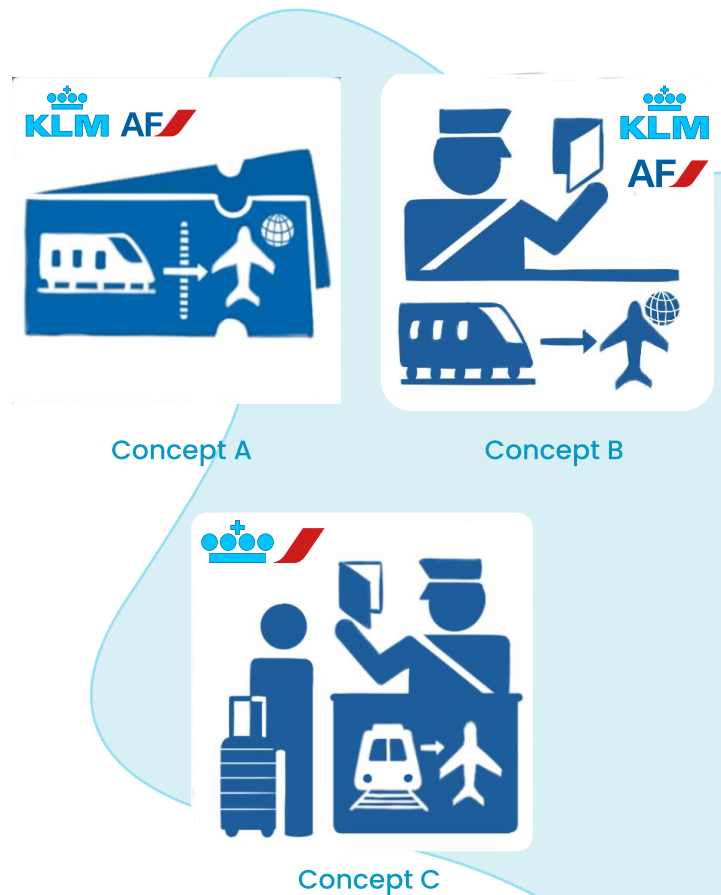


Figure 5.4.3: Concepts used for testing during phase 1 with the incorporation of branding elements

5.4.2. Summary

Summarizing:

1. I failed to accurately design a concept that could enhance wayfinding experiences for my target users while not confusing non-target users.

2. The lack of good signage design for other types of passengers could result in non-target passengers confusing their needs with my signage concepts. Designing signage for their specific needs and goals in the future would be useful.

3. Adding textual signage like "KLM Air France Air&Rail Terminal" could greatly reduce wrongful interpretations.

4. Branding dissuaded some passengers from finding the signage useful for them due to it being brand-specific, which they may not have any relation too during their wayfinding task. This could reduce some amount of misinterpretation.

Moving forward, I will stay with Concept A since it performed the best among KLM Air&Rail participants. Though it was also most confused with by regular passengers, Concepts B and C performed below average for target users and were found relevant to non-target user needs making them poor choices for further development. The addition of branding for Concept A, helped some participants reinterpret correctly, allowing them to ignore it for their needs.

- Reimagining the organization of elements in Concept A, such as placing the boarding pass symbol only behind the train symbol and not the flight-depicting a location to buy only train tickets to the airport, could help.
- Maybe even making two separate boarding passes for the train and flight could also depict getting tickets for not only train but also flight possibly dissuading passengers who just want a train ticket.

Further research needs to be conducted to discover insights and iterate on Concept A to prevent confusion among non-target users.

5.5. Final Concepts for User Testing

Following the discussion with non-target participants, Concept A was selected for further testing in Phase 2. Using feedback gathered during Phase 1, along with aspects of Concepts B and C that were liked and said to enhance wayfinding, Concept A was further iterated. This process led to the creation of three

Concept A1

Concept A remains similar to Concept A of phase 1. Unhelpful elements like the globe and the second ticket have been removed. The train symbol has been iterated to depict a high-speed train more realistically, to discover whether passengers find this more helpful than regular train symbols during their interpretation. And finally, the branding style includes the company logo & name in line with their brand color.

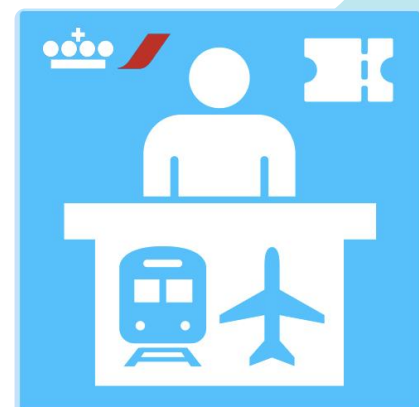
Concept A2

This concept depicts the rail-air journey and boarding pass pick up similar to A1. However, the train and flight are made more prominent visually with the help of white negative space. The variation of the ticket symbol is placed close to the train/flight. The train matches similar train signages used across central Europe. Finally, company names are displayed next to the signage in brand colours.

Concept A3

This signage concept depicts a check-in kiosk reinforced by the rail-air journey or logo placed on the counter. The ticket symbol is placed next to the kiosk to depict pick-up location. Finally, branding includes using the brand colors of KLM as negative space. Additionally, company logos are placed on the signage matching the brand identity.

polished signage concepts, all built upon the already well-performing Concept A. In addition to visual changes, the 3 concepts also include 3 variations of branding to discover which style of branding enhances wayfinding for KLM Air&Rail customers.



5.6. Testing Phase 2

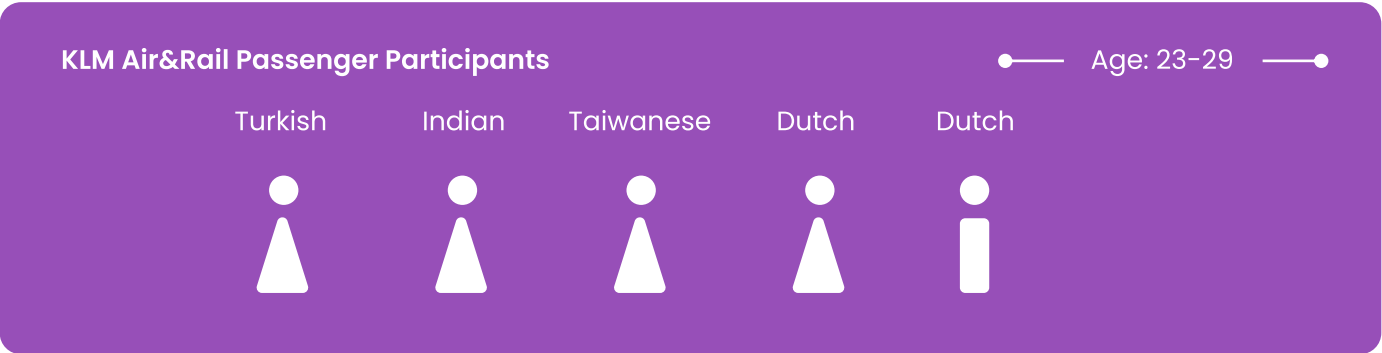
5.6.1. Goals

The main goal of the second testing phase is to identify which of the 3 reiterated Concept A signages, further enhances the wayfinding experiences for KM Air&Rail passengers at Brussels Zuid train station. The best performing concept will be chosen as the final design for the KLM Air France Air&Rail terminal signage with minor iterations guided by qualitative feedback gathered from discussions.

Feedback from phase 1 suggests that branding could possibly help KLM Air&Rail passengers gain more confidence when studying signages and in turn, enhance their overall wayfinding experience. Additionally, it was also shown to prevent non-target passengers from confusing the KLM Air France Air&Rail signage as relevant to a certain degree. Therefore, it is clear branding is integral to creating more positive experiences. Therefore, an additional goal during this phase will be to further study how different branding styles affect the ability of KLM Air&Rail passengers to interpret the signage concepts more confidently. This will be evaluated against branding related testable targets shown in table 5.1.

5.6.2. Participants

The process of how participants were recruited for phase 2 follows the structure of phase 1. 5 participants were recruited for phase 2 with the order of concepts to be tested for each participant being rotated to avoid bias. Due to a smaller number of participants, more research needs to be conducted in the future to gain more qualitative feedback pertaining to the user experience and interaction. This will help guide the final design of the KLM Air France Air&Rail signage during implementation.



5.6.3. Method & Set Up for KLM Air&Rail Passenger Participants

The overall setup and method used during phase 2 remained consistent with those discussed in chapter 5.2.3 of phase 1.

Beyond feedback on the signage concepts, I received valuable input regarding the design and presentation of the signage board prototypes, which might have caused some confusion. The signage board now features a discernible boundary separating top station-related signages from bottom external facilities related signages. Arrows on the signage board now point in the same direction to align with good signage design and also prevent participants from misinterpreting grouped facilities as being in different directions- for example when participants used to combine Channel Terminal with Concept A and feeling confused since they pointed in different directions. To align with the signage board design of Brussels Zuid train station, a single long vertical line indicating "all these signages" was redesigned into smaller vertical strips adjacent to each signage with the relevant arrow.

Additionally, different branding styles were implemented. It is important to note that since the terminal at Brussels Zuid train station is not solely operated by KLM but is a service provided by both KLM and Air France, it would be inappropriate to only include KLM branding. Therefore, Air France branding has also incorporated to reflect the joint service and ensure inclusivity for all customers.

Textual signage has not been added during the reiteration of the signage concepts and will not be tested since it is clear it will aid some passengers during wayfinding. Additionally, due to the concerns raised in chapter 4.1, I will continue to focus on the foundation of the signage design with the additional incorporation of branding this time.



Figure 5.6: Samples of the Testing Set-Up for Phase 2

5.7. Testing Phase 2 Insights

5.7.1. Signage Concept: A1

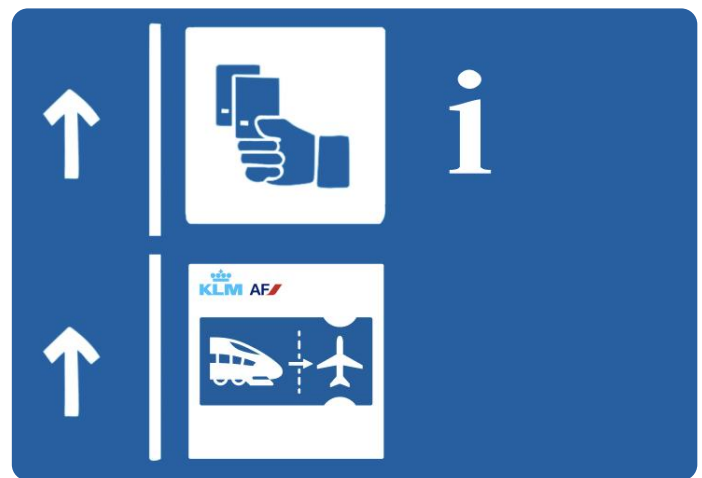


Signage Concept A1

Most participants liked the simplicity of A1. The combination of the branding style and signage design made them feel very confident in their decision to follow the signage, as shown in Figure 5.2. Some participants interpreted the signage first and then used the branding, particularly 'KLM' and the crown, as reinforcement. Others stated that the branding caught their eyes first, and they scanned through the signage to identify relevant elements such as the train, flight, and ticket.

The branding style struck a good balance among participants. Some believed the crown and bright blue were useful in confirming that KLM was the aviation company, while others unfamiliar with the logo appreciated that KLM was present in text. The combination of the logo and company title was perceived as 'complete,' enhancing readability.

Most participants liked the layered design of the signage, with the rail-air journey and transfer being placed inside a ticket. They stated they could read and understand it better when perceiving the signage as a whole, without scattered elements requiring



Signage Board Mock-Up

cognitive effort to make sense of it. However, the use of a boarding pass or ticket as negative space had varying opinions. Some liked the visual contrast between the train and flight and the boundary, while others found it a little hard to quickly discern the ticket's boundary. Most also found the vertical dotted line unhelpful and visually distracted them from spotting the arrow.

Interestingly, participants slightly uncertain of whether the location was meant to be a pick-up location or platform arrival felt reassured to follow the signage regardless, due to branding reinforcement.

Lastly, the high-speed train symbol largely caused confusion among most participants. Discussions revealed that passengers are familiar with regular train symbols used in stations across Central Europe like Rotterdam, Brussels, and Frankfurt, as well as in navigation apps, leading to uncertainty about the type of train depicted on the signage. Interestingly, a Dutch participant familiar with Eurostars found the design helpful and confidence-boosting.

//

Branding is very important to me and here, the branding feels complete with the text and the logo- Participant C (Indian)

//

This is the least complex. There are layers here representing the journey well all within one elements almost. I see one combined element compared to seeing 4 elements- Participant D (Taiwanese)

//

The branding plus the design was great. I was fully confident that I had to follow this signage- Participant E (Dutch)

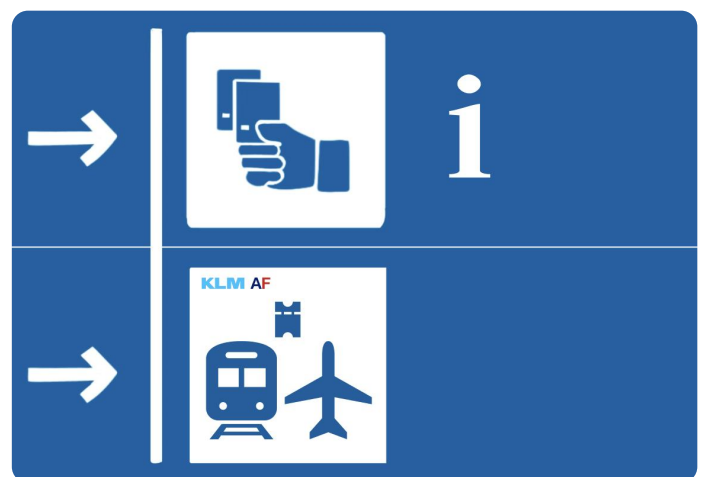
Summarizing, concept A1 performed the best amongst the 3 redesigns, with participants appreciating its simplicity and effective combination of branding and design. The branding effectively reinforces the signage and vice versa, suggesting that maintaining the balance of company logos & text with the signage design is important for user confidence. The layered design to make elements feel like a combine whole aids comprehension, so this approach should be retained. However, the visual boundary of the ticket needs to be clearer to ensure quick recognition. The high-speed train symbol caused confusion, indicating a need to redesign it for universal understanding while ensuring it somewhat resembles what Eurostars look like.

5.7.2. Signage Concept: A2



Signage Concept A2

Concept A2 received mixed opinions, as shown in Table 5.2. Participants generally found the train, flight, and ticket elements useful and straightforward in conveying the signage's message. Some felt these elements were more discernible due to their separation and contrast against the white background.



Signage Board Mock-Up

However, others found this separation complex, and the imbalance between the size of the ticket and train/flight made it difficult to comprehend the relation between them and in turn, relate it to their wayfinding task. One participant mentioned the absence of the transfer arrow made the journey depiction

unclear, leading her to interpret the signage as indicating a location or platform from where both KLM/Air France trains and flights operate from. Another participant initially overlooked the signage due to the smaller ticket symbol, instead following the original ticket office signage, thinking a hand with a ticket was more relevant to his task. While most elements were easily recognizable, the ticket symbol received mixed feedback—some liked its realism, while others misinterpreted it as different items like a shirt.

The branding style was mostly helpful, with most participants stating that the text "KLM" added confidence to their interpretation. However, the brand color was seen as irrelevant since it almost matched with the shade of signage board colors at Brussels Zuid train station. Additionally, the inclusion of "Air France" caused confusion for 1 participant she was not made aware during booking that the terminal was shared by KLM and Air France.

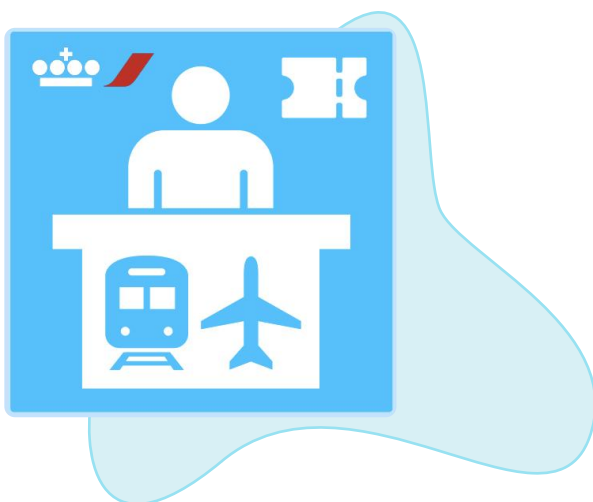
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I didn't immediately look at this at first glance because the signage with the hand and the large tickets made more sense: I see a ticket, and I need it. I go there- Participant E (Dutch)

//
The elements used here are old. Recognizable. Which is nice- Participant C (Indian)

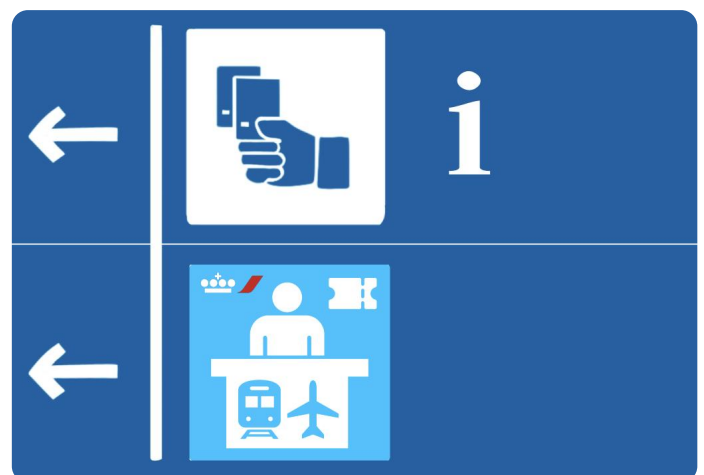
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I didn't know this was a joint terminal. Air France was never mentioned during my booking process- Participant B (Indian)

Summarizing, Concept A2 faired second amongst the reiterated designs. The positive feedback on the train, flight, and ticket elements suggests that universal pictograms are effective and should be retained. However, the imbalance in size and the lack of a transfer arrow element caused confusion, indicating the need for better visual hierarchy to improve readability and clearer depiction of the journey as in Concept A1. The branding text "KLM" was helpful, but the color clashing with existing signages across Central Europe means that KLM's brand colors do not need to applied to aid navigation. The confusion caused by "Air France" text shows the necessity of clearly communicating the shared terminal during the booking process to avoid misunderstandings.

5.7.3. Signage Concept: A3



Signage Concept A3



Signage Board Mock-Up

Concept A3 was found to be complex and hard to understand by all participants. While the kiosk and official were correctly interpreted as related to rail-air journeys, their exact purpose—whether a pick-up location or ticket booth for KLM and Air France—was unclear. Most participants ignored the kiosk and official, instead focusing on the train, flight, and ticket/boarding pass elements, which they found to give them more confidence when interpreting the signage. However, the elements did not work well together, with some participants feeling the ticket was misplaced, leading to multiple interpretations of the kiosk.

The branding style received mixed opinions. Participants familiar with company branding found the logos and blue background helpful being the only reason they could correlate it to their wayfinding task. Others felt uncertain about remembering them under stress. One participant noted confusion due to the presence of Air France branding instead of Eurostar, which she associated more with her booking process. The branding color was generally unhelpful, as the shade of blue did not stand out against the signage boards hampering legibility.

Despite these issues, the placement of the signage was appreciated. Participants found it logical to group it with information/help desks and other ticketing services, as these locations could provide assistance even if they were heading in the wrong direction.

//

I didn't realize the blue of the background was KLM's. Because the other signages also have some other signages on that background color- Participant D (Taiwanese)

//

The logos are carrying the weight for sure- Participant E (Dutch)

//

I'm not so sure now. Why is the man here? I can understand that there's a man giving me a ticket. But I can also interpret it as someone selling tickets to both trains and flights?- Participant A (Turkish)

Summarizing, Concept A3 fared lowest amongst the reiterated signages. It highlights the need to keep the design simple using only keywords prominent during the booking process. Universal pictograms like the train, flight, and ticket/boarding pass are the only elements required to enhance wayfinding for KLM Air&Rail passengers. Branding style to reinforce interpretation should be easy to understand and recognizable, avoiding reliance on memory & brand colors that do not stand out. The placement strategy of grouping signage with related services was effective and should be maintained.



Table 5.2 Design criteria survey results for Phase 1

5.7.4. Conclusion

In this chapter, two testing phases were conducted to determine which signage concept best enhances the wayfinding experience for KLM Air&Rail passengers at Brussels Zuid train station.

During phase 1, concept A performed the best amongst participants for its minimal design and clear, straightforward message. Despite the best-performing concept significantly outperforming the others for KLM Air&Rail participants, it was also mistaken by non-target users as relevant to their needs due to the similar conveyance of a rail-air journey. This highlights the necessity for further research and development into designing separate signage for non-target users.

The size, arrangement, and pictogram style of Concept A was iterated on for further testing in phase 2 with the additional implementation of 3 branding styles. Feedback revealed that a layered arrangement of pictograms, and balance size ration amongst elements is integral to enhancing readability and conveying the message more accurately. Furthermore, the company name with the logo was shown to work the best for supported interpretation. These aspects must be carried over to the final design. Additionally, placement of this signage amongst other ticketing signages and information services was said ti fit well with passenger expectations- helping them scan through the boards quicker. Recommendations and feedback from both phases will be used to refine this final design, which will be presented in the next chapter.

5.8. Final Signage Design

The final design is informed by the qualitative feedback gathered from testing sessions with KLM Air&Rail participants and is inspired by the visual signage, color schemes, and pictogram styles at Brussels Zuid and Rotterdam Centraal, which I analyzed during field studies. The chosen colors and pictogram

styles prioritize visual readability, leveraging the thorough design considerations already implemented at these stations. Moreover, the pictogram styles align with universally accepted standards.

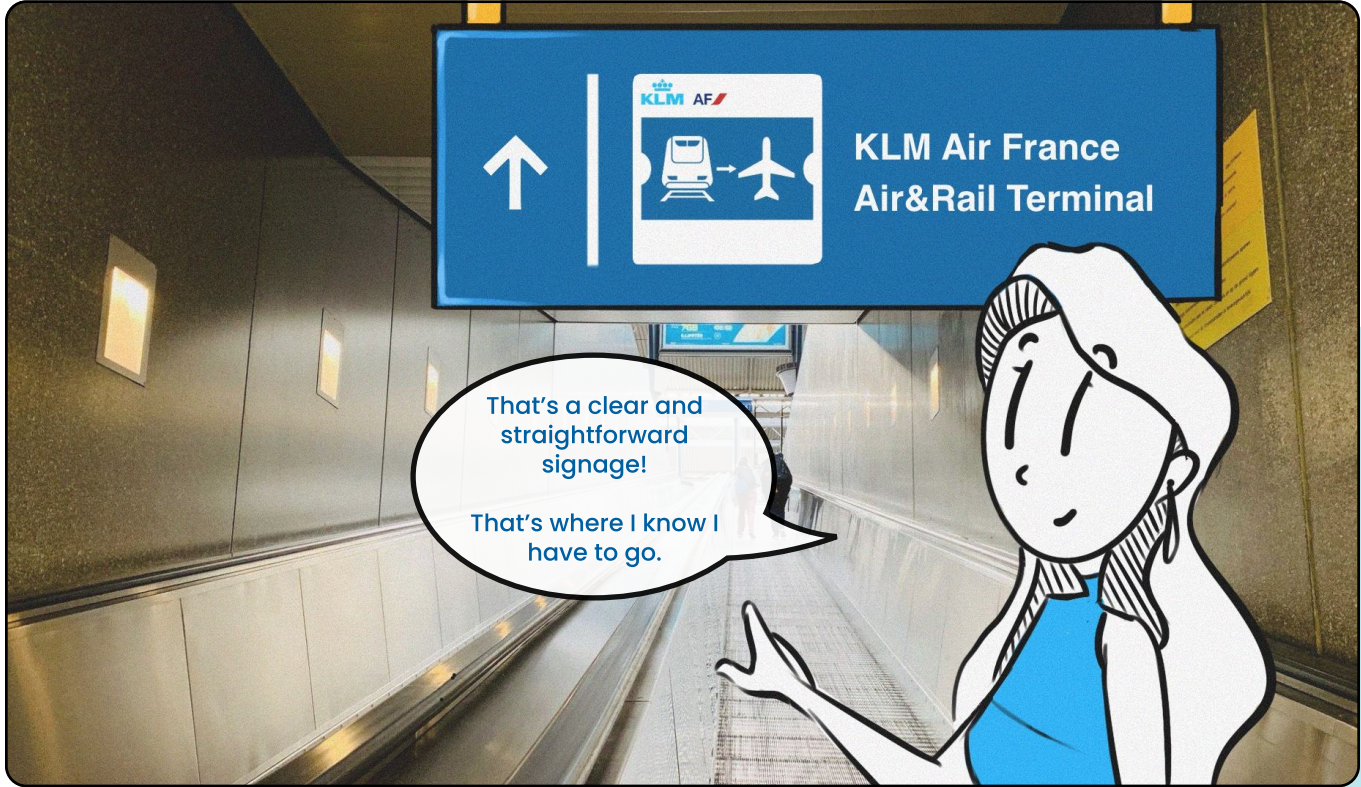


Figure 5.8: Representation of the Final Design in Context

1. Branding

The branding style consists of the company name abbreviation and the logo for both KLM and Air France in their respective brand colors. The size of the text and logo have been slightly increased to improve readability while maintaining visual balance with the rest of the elements.

2. Boarding Pass/Ticket

The boarding pass or ticket element is redesigned to depict a more universally recognized ticket symbol switching the circular cutouts from the top-bottom to the sides. The boarding pass is one of the 3 most important keywords KLM Air&Rail passengers look for during interpretation. The element is aligned at the center of the signage, takes up the most space visually, and stands out against the white background with the signage board's shade of blue to help passengers discern its boundary more efficiently.

3. Train

The train element is redesigned to depict a more universally accepted train symbol inspired by Rotterdam Centraal while also matching the pictogram style of Brussels Zuid train station signages. The element is also designed to depict an abstract version of a high-speed train like Eurostar, to help passengers differentiate it from regular train platforms. This element along with the flight are the 2 other important keywords. It is redesigned to depict the front side of a train instead of the side to reduce space consumption, in turn-allowing me to increase its size on the boarding pass- improving readability. The

train stands out against the boarding pass as positive space matching the signage boundary color- white. This symbol is also aligned to the left of the boarding pass depicting the first leg of the journey.

4. Flight

The flight/airport element remains the same as past iterations. The size of the element has been increased to improve readability. Both the flight and train symbols are the same size and visually take up the same space to create visual harmony and balance. The flight also stands out against the boarding pass as positive space. The flight symbol has been aligned slightly to the right to depict the next leg of their journey after transfer at the airport.

5. Arrow

The arrow largely stays the same as past iterations. The thickness has been increased to improve readability. The arrow is also aligned centrally to the boarding pass to maintain visual harmony and sits at equal distance between the train and flight. It depicts the journey from train to airport or depicts the transfer from train to flight at the airport. Finally, the dotted line has been removed to reduce visual clutter.

5. Text

Sans serif fonts are said to be easier to read, particularly for large overhead signages (Murphy, n.d.). Further refinements pertaining to font type, size, leading etc, need to be done.

5.9. Strategic Signage Placement

For the strategic placement of signage across the station, I focused on the route I took to reach the KLM Air France Air&Rail terminal from my point of entry into the station (i.e., the escalator from train platform 14 to the main concourse hall). As mentioned in chapter 3.1, there are several other points of entry for different types of KLM Air&Rail passengers, such as the main entrance, back entrance, and metro entrance. Therefore, further research is needed to study the complex layout of Brussels Zuid train station to understand how to strategically place signage for all points of entry. However, for the scope of this thesis, I only consider the placement of signage along the route I took. My recommendations aim to make

the route to the terminal as efficient as possible. The suggested locations for signage ensure that passengers like myself, entering from platform 14 feel composed when navigating to the terminal. This approach is informed by literature discussed in chapter 1, field research conducted at Rotterdam Centraal and Brussels Zuid train stations, with Rotterdam serving as a benchmark, and the design criteria formulated in chapter 3.9.

As stated in chapter 1.6, signage must be placed at crucial decision points—where corridors and paths intersect. In Rotterdam Centraal, the minimal usage and strategic placement of signage is

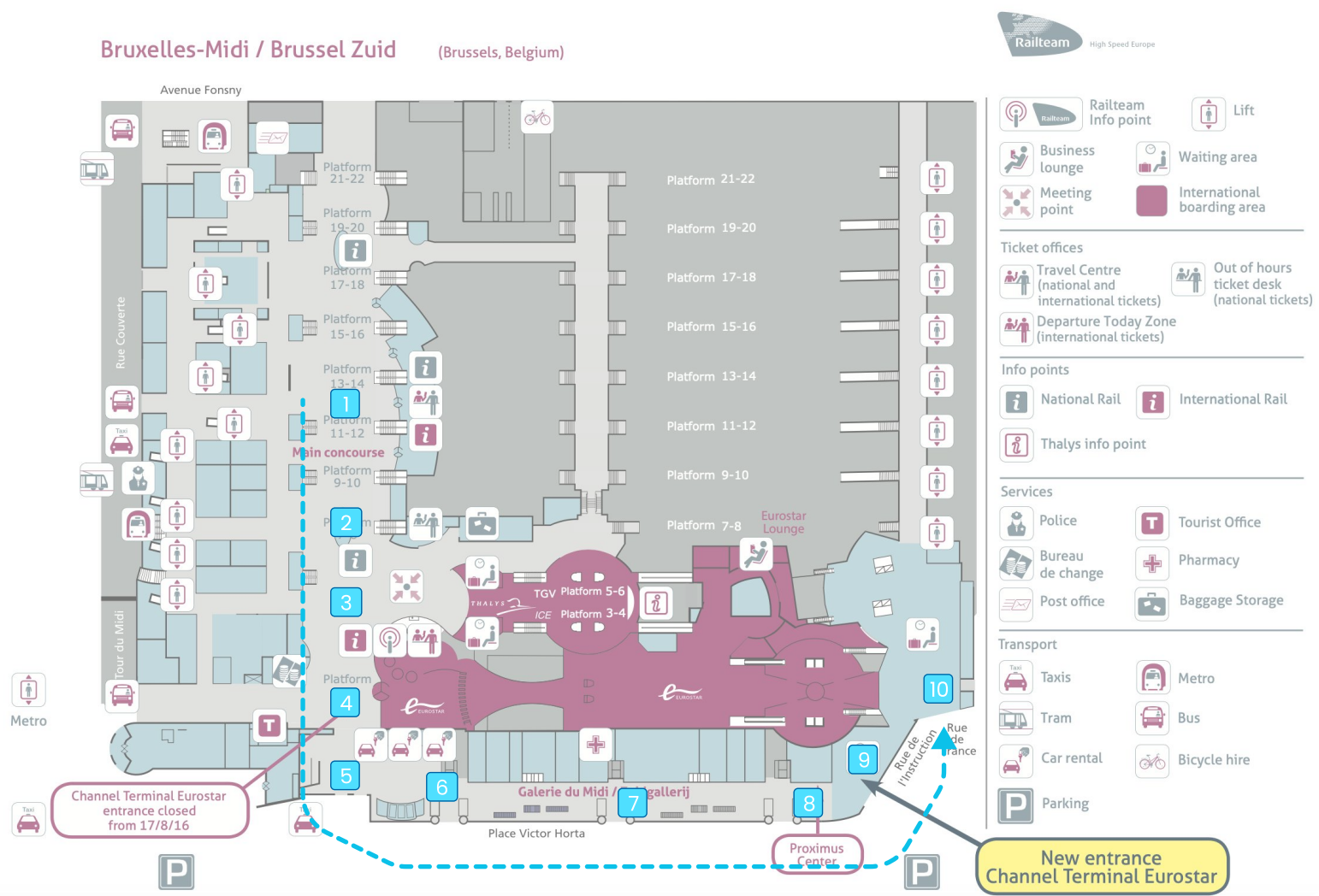


Figure 5.9: Conceptual Framework of the Strategic Placement of the Final Signage design at Brussels Zuid train station

facilitated by its singular main concourse and simple layout, which lacks intersecting corridors. This means there are very few decision points, and passengers do not have to rely heavily on signage for guidance. They can assume that if they travel down the single path, they will reach their destination.

Conversely, Brussels Zuid has a complex layout with multiple intersecting paths and corridors. Due to this, there are numerous decision points that KLM Air&Rail passengers like myself will encounter along the route to the terminal, requiring confirmation signage at every decision point to ensure we are on the right path. Consequently, it is impractical for the station to minimize its signage. At least 10 signs are necessary to provide the best possible guidance and ensure passenger composure for those navigating from platform 14 to the KLM Air France Air&Rail terminal at Brussels Zuid train station. The proposed signage placements, numbered 1-10 (with 1 being the first strategic placement), are shown in the figure below. These placements are at crucial decision points. Signages 6, 7, and 8, are points at which the current Air&Rail signage is placed at the station. 11 marks the final destination- it would be beneficial to place a clear & visible identification signage.

5.10. Implementation Roadmap

The signage I have designed is intended for KLM Air&Rail passengers, aiming to enhance their wayfinding experience at Brussels Zuid train station. This signage will help KLM passengers navigate the pre-travel stage of their rail-air journey at Brussels Zuid effectively & efficiently, in turn, positively improving their overall perception of the Air&Rail service being provided by KLM. Therefore, I propose the

following roadmap for KLM to suggest to Brussels Zuid train station, or SNBC, as the signage implementation falls under the station's jurisdiction. This plan could facilitate the successful setup of the signage at the station for KLM passengers (Guide, 2022).

Approx. 2 years



5.10.1. Stakeholder Planning

For stakeholder meetings, I have streamlined the process to help KLM persuade SNBC (Brussels Zuid train station) to implement the signage for KLM Air&Rail passengers. I carefully aligned the signage design with SNBC's branding goals as stated in chapter 3.7.3, which focus on achieving a cohesive brand identity across all their channels, including signage.

To maintain visual harmony and consistency, I used SNBC's color palette and matched the signage style to that of existing station signage, with only minor adjustments. The pictograms used are consistent with the style seen in SNBC stations like Brussels Zuid.

One potential challenge is the station's policy against displaying brand logos, which could complicate KLM's efforts to implement the design. However, the signage could be adjusted further according to stakeholder requirements to reach a mutual agreement. However, KLM could counter with the knowledge that branding could prevent Brussel Zuid's other train passengers from confusing it as a signage relevant to them.

5.10.2. Permit Allocation

The permit allocation process for the signage design should proceed smoothly, as I when designing for KLM, have taken into account municipal regulations and requirements during the design phase (Goad, 2023). The objective was to maximize the signage's impact, while considering SNBC's branding, and remaining within legal constraints.

In my design, I have considered all three elements. For instance, I incorporated pictograms inspired by universally recognized symbols that comply with international standards, based on literature reviews and field research at Rotterdam Centraal and Brussels Zuid train stations, both of which utilize internationally standardized pictograms.

However, additional research is necessary to refine the signage design further, particularly regarding the size when placed on overhead signage boards and achieving the required visual balance between the pictograms. This also includes considerations for text size and typeface, although I have chosen a Sans Serif font for its suitability for large, bold signage headings.

06 Discussion

This chapter draws and discusses the conclusion of the project. Furthermore, it includes recommendations and explores the project's limitations. Finally, it presents a personal reflection, detailing personal experiences and key learnings.

- Conclusion
- Limitations & Recommendations
 - Reflection
 - References



6.1. Conclusion

The goal of this project was to facilitate efficient and effective wayfinding experiences for rail-air passengers at train stations. This research focused on improving the integration of wayfinding systems during the pre-travel stage of a rail-air journey to ensure passengers begin their travel positively. The KLM Air&Rail service provided by KLM at Brussels Zuid station was chosen for the case study. The findings across the chapters revealed several critical insights:

1. Need for Improved Wayfinding: Time efficiency is integral to improving rail-air experiences and perception. Effective wayfinding is essential for seamless rail-air journeys, as these systems help passengers navigate complex environments efficiently reducing stress. Wayfinding systems such as signages, and departure boards need to be placed at decision points to help passengers reconfirm their position and plan their navigation efficiently. Passengers are accustomed to effective wayfinding systems at airports, which could facilitate smoother air-rail travel. To make rail-air journeys equally desirable and efficient, it is essential that railway stations offer similar seamless wayfinding experiences. A gap in literature revealed that disjointed wayfinding experiences offered by multiple organizations during multimodal travel like rail-air lead to passengers well overwhelmed and anxious suggesting the need for a more uniform & linear wayfinding design.

2. Challenges Identified: Specific challenges at Brussels Zuid included unclear signage design & placement, inadequate integration of different information systems such as departure boards and integrated services like the KLM app. These issues were addressed through field research, & benchmarking. Signages were identified as the most feasible touchpoint to carry forward due to its direct impact of navigational efficiency and due to its immediate encounter at the start of a wayfinding journey.
3. Design Solutions: The ideation, testing, and discussions revealed interesting insights. The best performing & final signage concept was found most effective due to its minimal design, usage of internationally recognized pictograms, balanced visual hierarchy, and clear, straightforward messaging. KLM Air&Rail passengers were found to look for keywords matching their booking experience and visual expectations of the rail-air journey. Furthermore, the addition of branding was found to reinforce signage interpretation for those familiar with KLM while also successfully dissuading some regular train passengers wanting to take a train to an airport from following the signage due to its facility/company specific design. Finally, a framework for the strategic placement of these signages at crucial decision points in the station for KLM Air&Rail passengers navigating to the terminal from train platforms was suggested.

In conclusion, this project has provided feasible & practical solutions to improve wayfinding for KLM Air&Rail passengers at Brussels Zuid train station. The final solution impacts the wayfinding journey positively and works towards enhancing the overall perception of the rail-air journey. Similar practices and methodologies can be applied to other companies offering rail-air services, contributing to enhanced multimodal travel and sustainability across the industry.

6.2. Limitations & Recommendations

Time constraints & Limited access to the context: A significant limitation is the restricted access to the project's context. Since the train station is in another country, field research was undertaken within only one day. Time constraints played an important role in shaping the project. A deeper understanding of the wayfinding touchpoints/systems at the station was conducted within a short time frame. Moderated lab testing conducted at the university had to be done within a limited time frame, which could have possibly restricted depth of exploration and discovery of necessary refinements of the final signage design. Furthermore, since testing was not done at the train station, the strategic placement of the signages is conceptual and could not be tested.

Feasibility & Implementation
Implementing the concepts may still require more attention, as more obstacles always arise in practice. Due to limited access to the context of study, real-time

testing within the actual train station environment with actual KLM Air&Rail passengers was not possible. Certain aspects, such as long-term user behavior and operational impact, could not be thoroughly investigated due to these time limitations.

Stakeholder Involvement: This thesis only grasps a part of understanding the stakeholder environment. For implementation, further discussion between train and airline stakeholders need to be considered to further shape the final signage.

Signage Design Rules: Mixed opinions regarding how visual hierarchy, size of elements, and negative-positive use of color affect readability of the signage suggests the need to further research the rules & principles of good signage design thoroughly, and implementing these rules to further test the signage amongst a larger group of participants with varying cultural backgrounds and age ranges.

Information System Integration:
Discussions with participants revealed that KLM needs to consider how their booking process on their app affects how their passengers read and interpret signages. The booking process might need to consider showing other relevant information regarding the services provided at the terminal such as baggage drop and check-in more prominently.

Problem Domains: The scope of this thesis focused on improving the signages for KLM Air&Rail passengers at Brussels Zuid train station. To ensure the best wayfinding experience for passengers, further research and work will need to be conducted to improve the departure & platforms boards at Brussels Zuid train station for KLM Air&Rail passengers. A more seamless integration between the KLM app & information systems at the station should be considered.

6.3. Reflection

The conclusion of this project marks the end of one the most impactful phases of my life. The last seven months has taught me so much about the possibilities of design, and in turn, so much about myself and my identity as a designer. I am grateful for this project for allowing me to dip my toes into the field of service design and explore an industry I have been passionate about since I was a child-travel & tourism. It truly has been a beautiful challenge, blending the business and organizational considerations of service design with the emotional and functional requirements of interaction design.

An important insight I've learnt over this project is that the final KLM Air France Air&Rail signage needs to undergo several stakeholder meetings and further design refinements/iterations before it could be installed at the train station. For this project, I have considered developing the signage purely for the requirements of KLM passengers, however, the Air&Rail service is a joint partnership between Air France and KLM. Meaning the branding and signage design cannot solely emphasize the services provided by KLM only and negate the value added by Air France. For this reason, I had added the Air France branding in the final design as well. However, this revealed interesting insights- participants were unsure of why the Air France branding was present on the signage. They were unaware of the partnership between both the companies.

Lastly, I wished to understand if & how other train passengers using the station could possibly be affected by my signage design for KLM Air&Rail passengers. I identified passengers who wish to take a train from the station to an airport were most likely to find my signage confusing. My signage concepts did not successfully prevent them from being confused. Elements related to the visual depiction of a rail-air journey and a ticket were identified as useful. As the final design stands, the message it communicates matches the journeys of both KLM Air&Rail passenger as well as the identified regular train passengers. Further research is required to discover nuanced differences between both the passengers groups to further inform the reiteration of the final design or guide the design of new signages for different train passenger journeys.

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