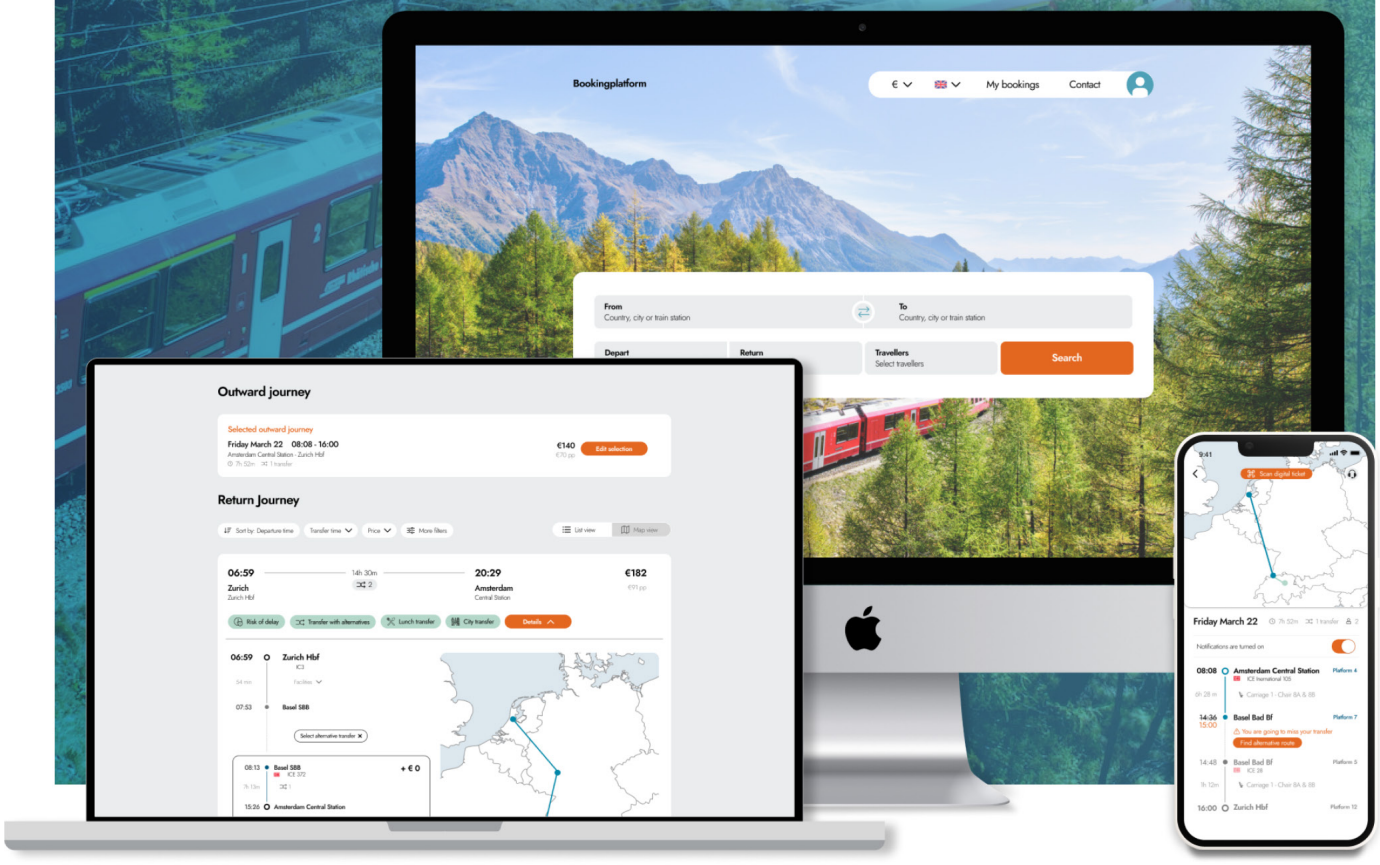
RESHAPING THE BOOKING PROCESS OF INTERNATIONAL TRAIN TICKETS IN EUROPE

MASTER THESIS BY SARAH VAN COEVORDEN
TU DELFT 2024



Colophon

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Thesis

Graduation project
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Image on the front page: Bopp, J. (2019). red and white train near trees during daytime. Unsplash. https://unsplash.com/photos/CIb3g_RUIb0

List of definitions

Booking Horizon
How long in advance travellers are able to book a ticket

Carrier
Railway company operating on a rail network providing the service of transportation

Disruption
Disturbance or problem which interrupts of hinders a users' journey

Distributor
An agent or organisation who sells tickets

Rescheduling
Replanning the route and

Touchpoint
A point of contact or interaction between a service and the user

Transfer
Changing from one train to a connecting train

Travel rate
The tariff paid for a ticket which comes with specific terms, conditions and flexibility

List of abbreviations

DB
Deutsche Bahn

HOTNAT
Hop On The Next Available Train

IRT
Integrated Reservation Tickets

NRT
Non-Integrated Reservation Tickets

NSI
NS International (Nederlandse Spoorwegen)

RHDHV
Royal HaskoningDHV (Project partner)

SUS
System Usability Scale

Preface

With this thesis, I will have completed my master Design for Interaction at the Industrial Design Engineering faculty of the TU Delft. Over the past 6,5 years I have been able to participate in many inspiring projects and find my voice as a designer. Through these projects, I developed a keen interest in combining Service Design and UX Design approaches which I was able to further explore in this graduation project. In my opinion, the holistic approach of service design and the detailed interaction focus of UX design complement each other nicely and provide a balanced approach. This is something I hope to pursue after graduating.

Over the past 6 months I have delved into the world of international train tickets in Europe in order to contribute to the modal shift from air to rail for short distance journeys. I felt a special connection to this topic since my love for travel and consciousness about our future and sustainability often conflict. I would love to contribute to a world where my fellow travellers and I are able to continue exploring in a more sustainable way.

I would not have been able to complete this project without the support of my team. To my chair, Jasper van Kuijk, and mentor, Aniek Toet, I would like to express my gratitude for the inspiring discussions, for always asking the difficult questions to help me further improve and for encouraging me to make the most out of this project. I don't think I would have enjoyed this project this much if it wasn't for your enthusiasm and encouragement.

I also want to thank my RHDHV supervisors, Wouter Leyds and Barth Donners for introducing me to the world of international train travel, for sharing your expertise, including me in the team and introducing me to interesting stakeholders. With the help of your insights and expertise I was not only able to complete this project but also provide train travel advice to friends and family.friends, family, roommates and fellow students who supported me throughout this project.

Additionally, I want to thank all external parties involved: Bob Vinke (Sales, Payment & Ticketing Specialist NS International), Martijn Heufke Kantelaar (Alliance Manager Eurostar Group NS International) and all other NS International employees who were involved. Thank you for participating in the interesting discussions and providing valuable insights.

Finally, I want to thank everyone who participated in my research through interviews, user tests and creative sessions, and all my friends, family, roommates and fellow students who supported me throughout this project.

And for the reader, enjoy diving into the world of international train tickets and let yourself be inspired to take the train.

Enjoy!

Sarah

Executive summary

International train travel could serve as a more sustainable alternative to flying, especially for short distance journeys up to 750 km. Though both forms of transport have negative impacts, the environmental costs of travelling by train are significantly lower than travelling by plane (European Environmental Agency, 2021). Therefore, the European Union, governments, environmentalists and railway companies see great value in promoting train travel over flying for short distance journeys (Ministry of IenW, 2022).

In order to further promote this transition, a couple of action points have been identified by Donners (2018) to improve international train travel, ticketing being one of them. Unlike booking a flight ticket - which can be done within just a few clicks - finding, comparing, and booking a train ticket has proven to be a more challenging task. Recent research conducted by the University of St. Pölten in Austria (Preslmayr, 2022) revealed that one third of travellers are unable to complete their booking, highlighting the difficulty of this process. In order to promote the transition from air to rail for short distance journeys, the bookability of international train tickets in Europe needs to be improved.

This project addressed this issue by delving into the system context, context of use and usability of existing touchpoints and services. The system context analysis reveals that despite the infrastructural differences of the railway network in Europe, a lot can be done within these barriers to improve the bookability of international train tickets. However, the system is very complex making it difficult for travellers to navigate it. Field research and interviews revealed that currently travellers are required to have prior knowledge about international train travel to navigate the various ticketing systems, travel rates and booking horizons. This adds to the complexity of the booking process. In analysing the user journey, two booking moments were identified: the initial booking process and the potential rescheduling process in the event of disruption.

The existing touchpoints in these booking moments were tested with users which provided insights into the usability issues. This showed that booking and rescheduling an international train journey is currently experienced as a complicated process as the current touchpoints are not in line with user's patterns, lack transparency & consistency and require prior knowledge about international train travel, leaving the users feeling uncertain and lost.

It is difficult to change a complex system such as the international railway industry, but we can help travellers navigate it. This project aims to do that by redesigning a booking platform and app that support holiday travellers when booking and potentially rescheduling their international train journey in Europe with an intuitive booking process that provides clarity and guidance at every step leaving them feeling confident and excited about their journey.

Through an iterative design process, through which the target group was frequently included, a final design proposal was made to reshape the booking process of international train tickets. The final design proposal aims to reshape the booking process of international train tickets in Europe. This includes improving the initial booking process as well as guiding travellers through a potential rescheduling phase in the event of disruption along the way. In order to do so the redesign includes a booking platform and travel app.

Created to be intuitive, supportive, adaptive and exciting, this redesign booking platform aims to ensure that every traveller, regardless of their prior travel experience, can easily book a suitable train ticket, leaving them feeling confident and excited about their journey ahead. The booking platform was designed to align with the user needs and decision making patterns. Core features to support this include route characteristics, transfer alternatives and search filters.

A travel app was redesigned to complement the booking platform, creating a bridge between the booking process and the train journey. In case disruption does occur, the travellers are supported by the travel app that provides clear guidance for how they can continue their journey.

The user evaluation of the final design proposal shows promising results with an excellent score on its usability according to the adjective rating scale of Bangor et al. (2009) and positive responses from participants. To facilitate this redesigned user journey, some supportive processes need to be improved, including open communication and collaboration between carrier and ticket distributors, updated route information database and an EU wide disruption protocol.

All in all, it is difficult to change a large complex system such as the international train industry, but we can help travellers navigate it. While the railway system is expected to evolve, impactful changes may take time. Meanwhile, optimising services through redesigns can have a significant immediate effect on the travellers experience and provide access to a sizable potential customer segment. Therefore, further exploring and implementing the designs as proposed in this report will improve the bookability of international train tickets in Europe.

Table of contents

1.

Introduction

1.1 Topic introduction

Every year, millions of people travel by plane to go on holiday. This behaviour is very damaging for the environment. In a world where there is an increasing need to build a sustainable society, international train travel could serve as a more sustainable alternative to flying, especially for short distance journeys up to 750 km.

Though both forms of transport have negative impacts on air pollution, greenhouse gas emissions, noise, soil and water pollution, habitat damage and produce waste, the environmental costs of travelling by train are significantly lower than travelling by plane (European Environmental Agency, 2021). Therefore, the European Union, governments, environmentalists and railway companies see great value in promoting train travel over flying for short distance journeys (Ministry of IenW, 2022). Some countries, like France, are even introducing a short-haul flight ban on routes where comparable more sustainable alternatives are available, in the effort to cut down on journeys that could also be made by train (Euronews Green, 2023). Other European countries are considering similar measurements, highlighting the overall interest and attention for this transition from air to rail for short distance journeys.

In order to further promote this transition, a couple of action points have been identified by Donners (2018) to improve international train travel. These action points include improving travel time by eliminating barriers and optimising the planning process, and investing in a High Speed Rail network in Europe. In addition to these infrastructural, operational and organisational improvements, ticketing has also been identified as a crucial aspect in this transition. Donners (2018) even goes as far as to suggest that by enhancing the ticketing service alone, travel behaviour can be influenced, leading travellers to opt for trains over flying even without improving the travel time.

Unlike booking a flight ticket - which can be done within just a few clicks - finding, comparing, and booking a train ticket has proven to be a more challenging task. Recent research conducted by the University of St. Pölten in Austria (Preslmayr, 2022) focused on the bookability of international train tickets. The study showed that more than one-third of the participants were unable to find and book an international train ticket, highlighting the difficulty of this process, see figure 1.1. Travellers encounter difficulties with finding suitable tickets, such as tickets being unavailable on certain platforms, limited route alternatives and the need to purchase tickets from multiple carriers, among other challenges.

This project explores how to promote the transition from air to rail for short-distance journeys, with a focus on the bookability of international train tickets and how the planning and booking process could be improved in a user-centred way. The aim is to identify their needs, desires and behaviour patterns to ultimately design a service that enables travellers to easily find and book an international train ticket to travel around in Europe.

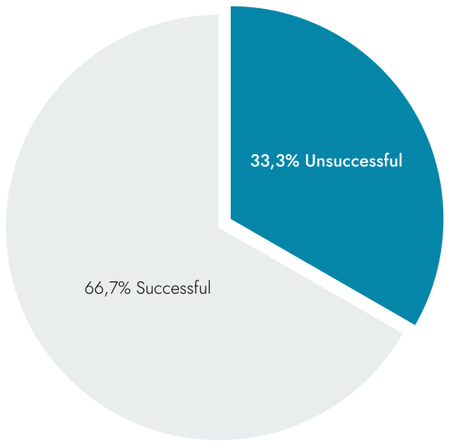


Figure 1.1: Percentage of users unable to book an international train ticket according to Preslmayr (2022)

1.2 Problem definition, goal & scope

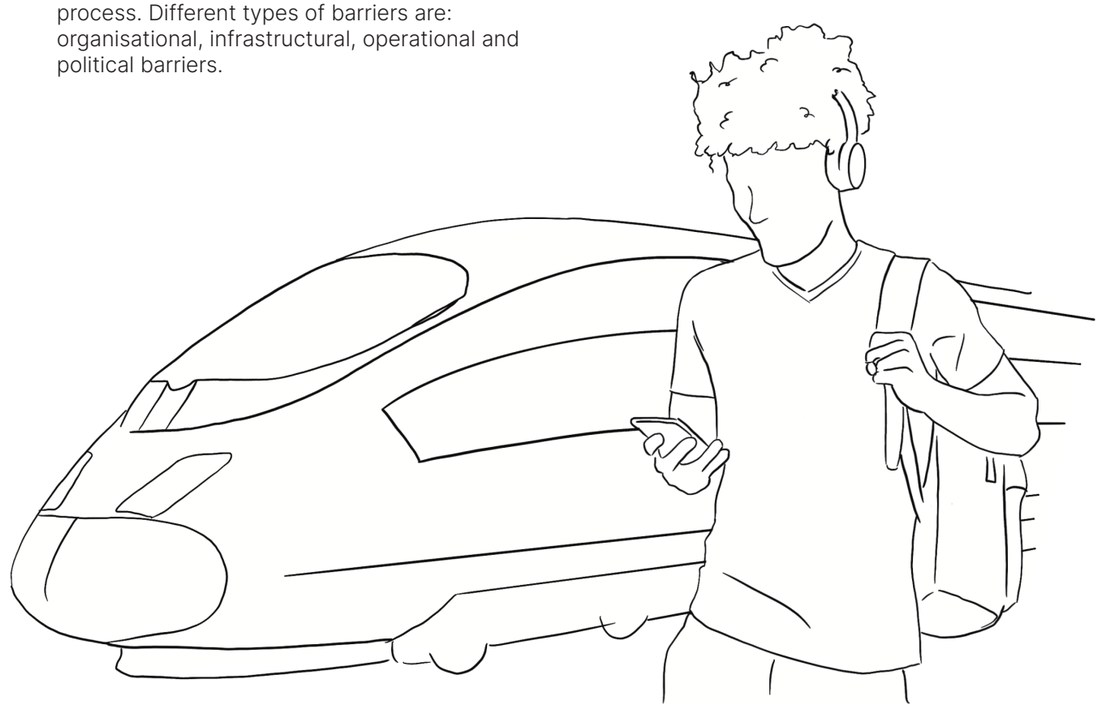
This graduation project focuses on a specific aspect of a much bigger effort, namely, the modal shift for short distance journeys from air to rail. Multiple studies have identified the difficulty of the booking process as a big obstacle for travellers. Yet very little research has been conducted that focuses on solving this specific problem.

Therefore, the main research question of this project has been formulated as: **How can the booking process for international train travel within Europe be optimised to achieve an overall positive travel experience?**

The aim of this project is to design a service that enables travellers to easily book an international train ticket to travel around in Europe in a more sustainable way. There are certain barriers within the railway industry that could be the cause of the current difficulty that travellers experience during the booking process. Different types of barriers are: organisational, infrastructural, operational and political barriers.

The user-product interactions are taken into account while also considering the existing systemic barriers and challenging them when necessary. The goal is to deliver a sufficiently functional service prototype which can be tested and evaluated with users.

This project is scoped on international short distance journeys in Europe. It should be noted that this project is executed from a mainly Dutch perspective with the main involved parties in the effort being; TU Delft Seamless Personal Mobility Lab and Royal HaskoningDHV, and most users involved in this study having a Dutch background or nationality.



1.3 Project context

This is a graduation project in collaboration with Royal HaskoningDHV (RHDHV) and the Seamless Personal Mobility Lab (SPM-Lab) at the faculty of Industrial Design Engineering of the TU Delft.

RHDHV is a global consulting engineering company of which the Rail and Sustainable Mobility departments work closely together with railway companies in Europe. RHDHV's mission is to 'Enhance Society Together', through which they take responsibility for having a positive impact on the world with sustainability being one of their main focus points. The Rail department and Sustainable Mobility Hub of RHDHV has therefore taken a keen interest in improving international train travel. Barth Donners, who is currently a sustainable mobility consultant at RHDHV, has graduated from the TU Delft with his thesis 'Erasing borders: European Rail Passenger Potential' and has since contributed to numerous research projects regarding the modal shift from air to rail. In his research, he identified ticketing as a crucial step in promoting this modal shift and has therefore proposed this topic as a graduation opportunity to the SPM-Lab. Additionally, Wouter Leyds, who is a rail advisor at RHDHV, was involved in this project. As an experienced train traveller and rail enthusiast, Wouter has a lot of knowledge when it comes to international train tickets in Europe and has even been titled as the one-man train travel agency of RHDHV.

The SPM-Lab is part of the Delft Design Labs from the TU Delft which explores concepts for future personal mobility and is involved in collaboration with stakeholders such as the Dutch Ministry of Infrastructure and Watermangement and Rover. Both academic supervisors of this project, Aniek Toet and Jasper van Kuijk, are part of the SPM-Lab team. This project is enhanced by the extensive knowledge and expertise of all parties involved.

1.4 Approach

This project takes a user-centred approach while also combining service design and UX design. User-centred design is a design process in which the end user and their needs are the main focus throughout different phases in the design process (Interaction Design Foundation, 2016). In order to improve the bookability of international train tickets, the user experience, needs and behaviour patterns should be prioritised throughout the design process. In addition, a service design process is employed (Mager and Gais, 2008) , recognizing that train ticketing is part of a broader transportation service. Moreover, the context is quite complex as there are many different stakeholders involved and the service contains a multitude of steps. Therefore, a holistic service design approach is adopted through which the ecosystem surrounding the rail-industry is considered (Interaction Design Foundation, 2016). Finally, UX design methods are applied to explore the user experience, interactions and the usability issues during the booking process and to eventually design new interaction concepts (Interaction Design Foundation, 2016).

1.5 Reading guide

This project follows the double diamond process (Design Council, n.d.). As the name suggests, this process consists of two diamonds each with a diverging and a converging phase. The first diamond is all about exploring the context and finding the right problem to solve with the phases: Discover & Define. The second diamond focuses on designing solutions for this defined problem with the phases: Develop & Deliver.

The report is structured in a similar way as it is divided into two parts to align with each diamond:

Part I: Analysis
Discover
Define

Part II: Synthesis
Develop
Deliver

Each part is subdivided into chapters, starting with chapters 2 and 7 which are dedicated to outlining the approach and methods applied. Part I: Analysis contains chapters analysing the context on various levels: chapter 3 focusses on system context analysis, chapter 4 delves into the context of use analysis and chapter 5 on usability analysis. Each chapter builds upon the insights of the previous chapters and dive deeper into the context of the bookability of international train tickets. The Analysis part of this report is concluded with chapter 6 which discusses the defined design brief which resulted from converging all the insights of the previous chapters.

The second part: Synthesis discusses the concept evaluation in chapter 8 after which the final design proposal is presented in chapter 9. Finally, chapter 10 presents the final conclusions, discussion and recommendations.

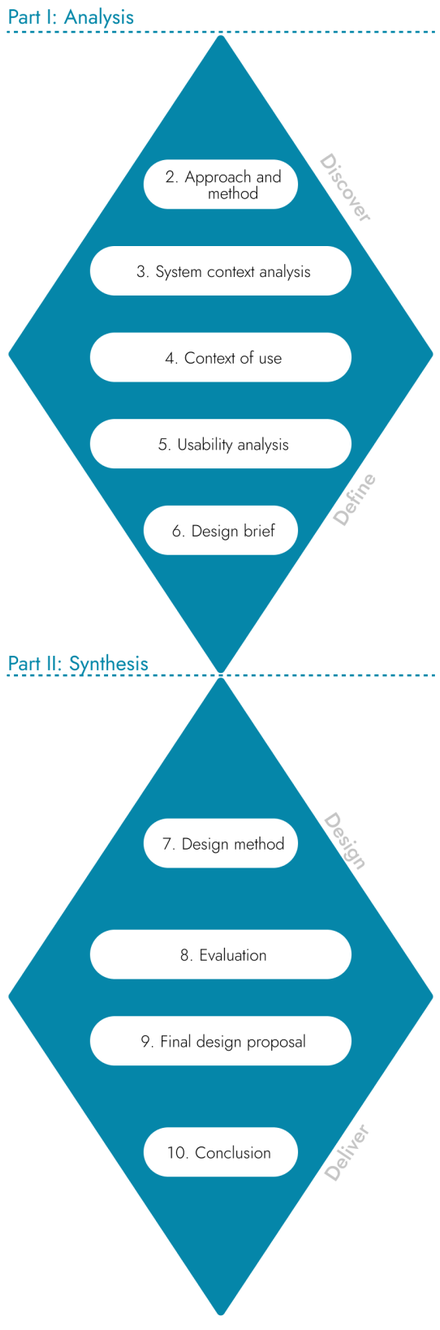


Figure 1.2: Double diamond & reading guide

Part I
Analysis

Exploring the problem and finding direction

2. Research approach & method
3. System context analysis
4. Context of use
5. Usability analysis
6. Design brief

2.

Research approach & method

Explorative research

This chapter describes the research methods that were applied during the analysis phase of this project to get a deeper understanding of the system behind international train travel, the context of use and usability of ticketing platforms for international train tickets. Four different methods have been applied: Literature research, field research, interviews and user tests. The insights from these research activities are presented in the following chapters.

2.1 Literature research

In order to gain insights and a deeper understanding of the context, its stakeholders and the rail sector in general, a literature study was conducted to build on existing knowledge. Since this is such a widely discussed topic with many interested parties, substantial research has been conducted regarding the modal shift from air to rail for short distance journeys. RHDHV has produced numerous reports regarding this topic, including some of Barth Donners' work. In addition, the SPM-Lab has also contributed to multiple research and graduation projects about this subject over the years. Moreover, there are numerous other research papers, articles, journals and forums dedicated to the modal shift from air to rail in Europe.

2.2 Field research

The goal of the field research was to gain insight in the process and experience of planning, booking and travelling with international trains through Europe. By being immersed into the context as a user, I was not only able to experience the different aspects of international train travel myself, but also observe fellow travellers in context, which provided insights into the different users, their patterns, experiences, needs and challenges (Farrell and Fessenden, 2024). This research takes a qualitative approach and applies two different methods: autoethnography and observation. Both were documented through a travel diary. See appendix A-B for more information about the field research setup.

2.2.1 Train journey

Due to the nature of the project being focussed on the bookability of international train tickets, one could deem it logical to limit the research scope up to the point of payment. However, considering the holistic service design approach, this project explores the bookability of international train tickets in relation to the overall train transportation service. The choices made during the booking process have a big influence on the journey that travellers make and their overall travel experience.

Additionally, the booking and planning process is not limited to booking tickets from the comfort of your home, as travellers often have to rebook train tickets or replan their journey during their travels due to delays, cancellations or other factors disrupting their journey. Therefore, this field research encompasses both the booking process and the journey itself.

According to the research conducted by the University of St. Pölten in Austria (Preslmayr, 2022) the most challenging booking experiences are journeys including a transfer and with destinations in Eastern Europe. In order to experience all facets of train travellers, I planned a journey to align with these challenging aspects. Without prior consideration for the train connection, two destinations were selected: Budapest and Vienna.

2.2.2 Autoethnography

An autoethnographic method is applied to map, reflect and learn from my personal experiences during the field research (Poulos, 2021). This method allows for a more subjective understanding and personal connection with the user and the context. However, limitations such as a potential personal bias and assumptions should be considered. Therefore the assumptions were mapped prior to the field research to prevent them from affecting the study.

2.2.3 Observations

Observing during field research allows for studying fellow travellers, their behaviour, interactions and other events that occur in their natural environment. This provides an authentic perspective on the travellers in context. Observational research can also help in validating traveller's self-reported behaviour or provide insight that is not mentioned during interviews. For this field research, a naturalistic observation approach is applied, meaning that there is no interference with the context and solely observation of travellers during their train journeys. (QuestionPro, n.d.)

Figure 2.1: Field research

2.3 Interviews

In addition to literature research and the field study, interviews were carried out to gain more insight into the context and the user experience. Interviews are often used in a design process to gain an understanding for interviewees perceptions, opinions, motivations and behaviour (van Boeijen et al., 2013). Therefore, interviews were conducted with RHDHV employees and international train travellers.

2.3.1 RHDHV interviews

During the initial discover phase, seven interviews were conducted with RHDHV employees (table 2.1). Although their job titles varied, all interviewees possessed knowledge and expertise related to train travel or travel behaviour. One of the goals of these interviews was to gain expert insight into the context of international train travel within Europe and what plays behind the scenes. Secondly, all the interviewees were experienced international train travellers. Therefore, these interviews were also used to gain insight into their travel and booking experiences, behaviour and tips. Lastly, given RHDHV role as a project partner, the interviews also served as a means to get to know RHDHV as a stakeholder and establish a mutual understanding of the project. The interview topic guide can be found in appendix C.

2.3.2 Traveller interviews

Although the interviews with the RHDHV employees provided insights into their travel experience and behaviour, it is important to recognize that they don't represent the average traveller as they possess a fair amount of industry knowledge and above average international train travel experience. Therefore, an additional eight interviews were conducted with travellers who had recently travelled by train in Europe (table 2.2). The goal of these interviews was to gain insights into the average traveller's experience with booking a ticket and travelling by train. The interview topic guide can be found in appendix D.

Roll within RHDHV	# interviewees
Rail Consultant	3
Consultant Rail Traffic Technology	2
Mobility Consultant - Sustainable Mobility	1
Behaviour and traffic psychologyist	1
Total number of interviewees	**7**

Table 2.1: RHDHV interview participants

Characteristics	# interviewees
Last train travel experience in Europe	
<6 months ago	4
6-12 months ago	3
12+ months ago	1
Booking experience	
No experience booking international train tickets	0
Experience booking international train tickets	8
Age	
16 - 30	6
31 - 50	2
51 +	0
Gender	
Male	4
Female	4
Total number of interviewees	**8**

Table 2.2: Traveller interview participants

2.4 User tests

Thanks to the research conducted by the University of St. Pölten in Austria (Preslmayr, 2022), we now know that one-third of the participants were unable to find and book an international train ticket. Preslmayr (2022) also provides insights into which journeys were most difficult to book. However, the research does not provide sufficient insights into what makes these journeys difficult to book and which obstacles travellers face during the booking process. Therefore, user tests were conducted in order to take a more qualitative approach and explore what obstacles travellers encounter and how they experience the process. Since there are many different booking platforms, a selection was made of three platforms to be tested: NS International, Trainline and Deutsche Bahn. This study included 8 participants with no prior experience with booking international train tickets (table 2.3). Each participant was asked to book an international train ticket on all three booking platforms. To avoid learnability from influencing the study results, varied sequences of platforms were assigned to each participant. For more information about the user test setup and explanation about the platform choice, see appendix E.

Characteristics	# of participants
Travel history	
No international train travel experience in Europe	6
International train travel experience in Europe	4
Booking experience	
No experience booking international train tickets	10
Experience booking international train tickets	0
Age	
16 - 30	4
31 - 50	4
51 +	2
Gender	
Male	4
Female	6
Total number of participants	**10**

Table 2.3: User test participants

2.5 Conclusion

This chapter outlines the different research methods used in the initial discovery phase of the project. The varying methods complement each, offering insights into bookability of international train tickets on multiple levels, namely: system context, context of use and usability (figure 2.2). These insights are presented in the following chapters, each diving into one of these levels.

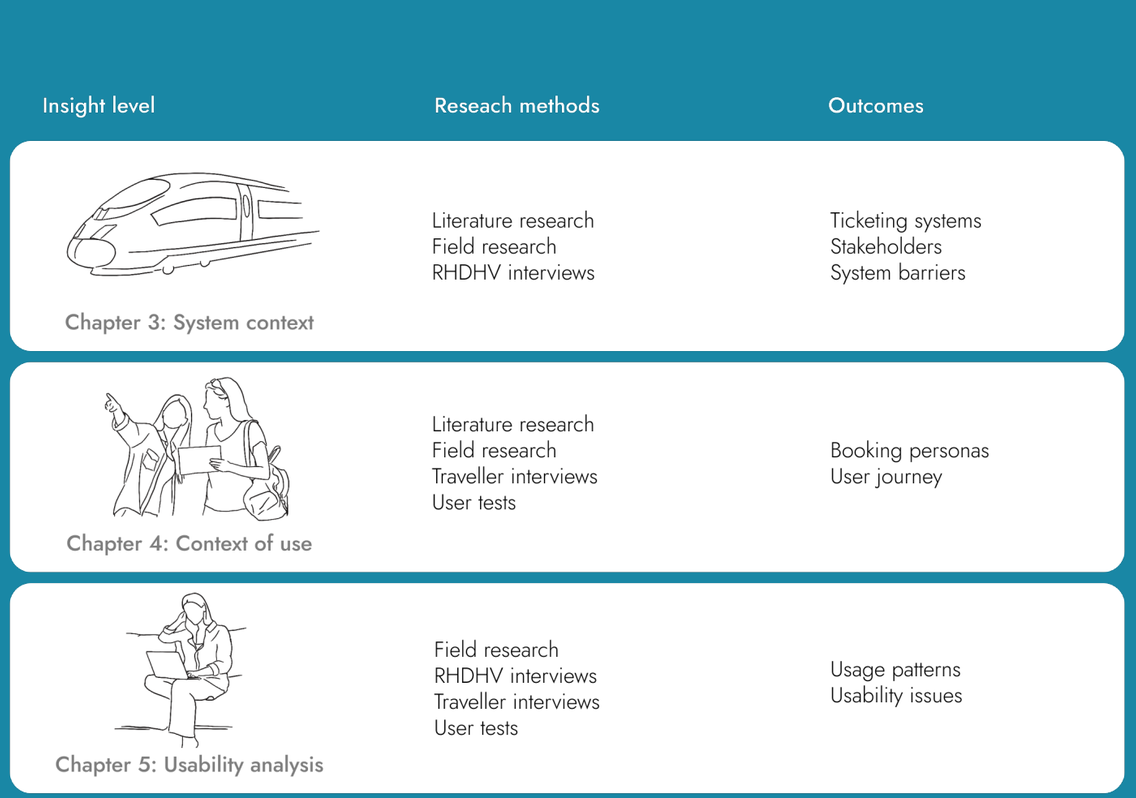


Figure 2.2: Insights, research methods and results

3.

System context analysis

Understanding the backstage of international train travel

The previous chapter described the different research methods that were applied in the discovery phase of this project. The data derived from these methods were analysed, resulting in insights into the context of international train travel. This chapter presents these insights on a system context level. In order to improve the bookability, it is crucial to understand behind-the-scenes operations and how it might influence the booking process. This involves identifying stakeholders, their relations and how the system behind the international train travel could influence the bookability of train tickets. These insights will form the base for further analysis in following chapters.

3.1 International train tickets

In order to understand the booking experience of international train tickets, we first explore the nature of the tickets, how and where these tickets are sold and which types of tickets are available.

3.1.1 Transport contract

A train ticket is also often described as a transport contract which states that the traveller is permitted to travel to a designated destination, on a particular train, operated by a specific carrier and often on a specified date and time (NSI, n.d.). It is possible to have a combined train ticket of multiple carriers or multiple trains that form one transport contract. However, travellers need to pay close attention to this, because even though they book the trains at the same time from the same platform, they still might not count as a single transport contract. This influences the travel rights which can cause complications along the way. This will be further explained in chapter 3.3.2. (NSI, n.d.)

3.1.2 Ticket distributors

There are three different types of ticket distributors: national railway companies, commercial carriers and independent distributors, see figure 3.1. National railway companies often sell tickets for both their own trains and those of other partner carriers. In contrast, commercial carriers exclusively sell tickets for their own train services. Independent distributors, lacking their own train services, solely distribute tickets for other carriers, earning a share of the profits in return. (van Overhagen, 2020)

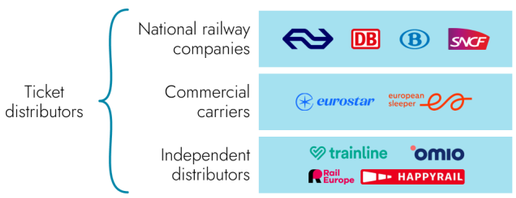


Figure 3.1: Overview of ticket distributors, updated figure from the project of van Overhagen (2020)

3.1.3 Ticketing systems

Currently, European carriers employ two ticketing systems. The first, known as Integrated Reservation Tickets (IRT), provides passengers with a ticket for a specific train on a specific date and time and an integrated seat reservation (European Railway Agency, 2013). The second system is known as Non-Integrated Reservation Tickets (NRT) which provides travellers with a ticket for a specific train with seat reservation not included in the ticket price (European Railway Agency, 2013). These trains either have no seat reservation options or optional seat reservation for an additional fee. In the last case, the traveller is responsible for their own seat reservation.

Depending on the ticket provider and carrier, seat selection freedom varies with both IRTs and NRTs. Some allow precise seat and carriage selection (e.g., České dráhy), while others only take seat preferences (e.g., NSI) or assign seats randomly (e.g., Trainline). With NRTs, it's even possible to reserve a seat without purchasing a train ticket (e.g., DB), although not all providers offer this.

National carriers in Europe employ one of these two ticketing systems for their long distance connections, while commercial carriers mainly apply IRT. Some carriers like the TGV even employ routes with a NRT system in Germany and a IRT system in France, switching ticketing systems when the train crosses the border (RHDHV interviews).

The ticketing systems are illustrated on a map in figure 3.2, highlighting how these systems form new 'borders' within the European railway industry. Interviews with RHDHV employees revealed how these borders create challenges for travellers as they need to navigate varying rules regarding seat reservations and different travel rights. In case the route is disrupted, due to delays, cancellations or other reasons, travellers with NRT tickets can take any alternative trains along that route to get to their final destination, provided the connecting train tickets fall under the same transport contract. Whereas travellers with IRT tickets, being tied to a seat reservation, are required to purchase a new ticket to get to their final destination. Therefore, navigating varying ticketing systems can be complex for travellers during both the booking process and travels.

3.1.4 Travel rates

Travel rates differ per carrier and are dependent on the traveller's age, time of booking, class and amount of flexibility. Each fare comes with its own ticket conditions and cancellation policy. In addition, special rates and discounts can be applied to specific destinations or group travel. The fares of some of these operators are mapped in table 3.1. (NS International, n.d.)

3.1.5 Interrail

Another type of international train ticket is an Interrail or Eurail pass. This is a train ticket that allows travellers to travel with any train in Europe for a specific amount of days (Interrail, n.d.). Instead of having to purchase several different train tickets separately, travellers are able to buy one Interrail pass which can help save money and effort. Although Interrail is a valid type of train ticket with its own potential for improvement, it does not fit the scope of this project as it has a completely different booking process, user group and use case. Therefore, Interrail tickets will not be considered in the following chapters.

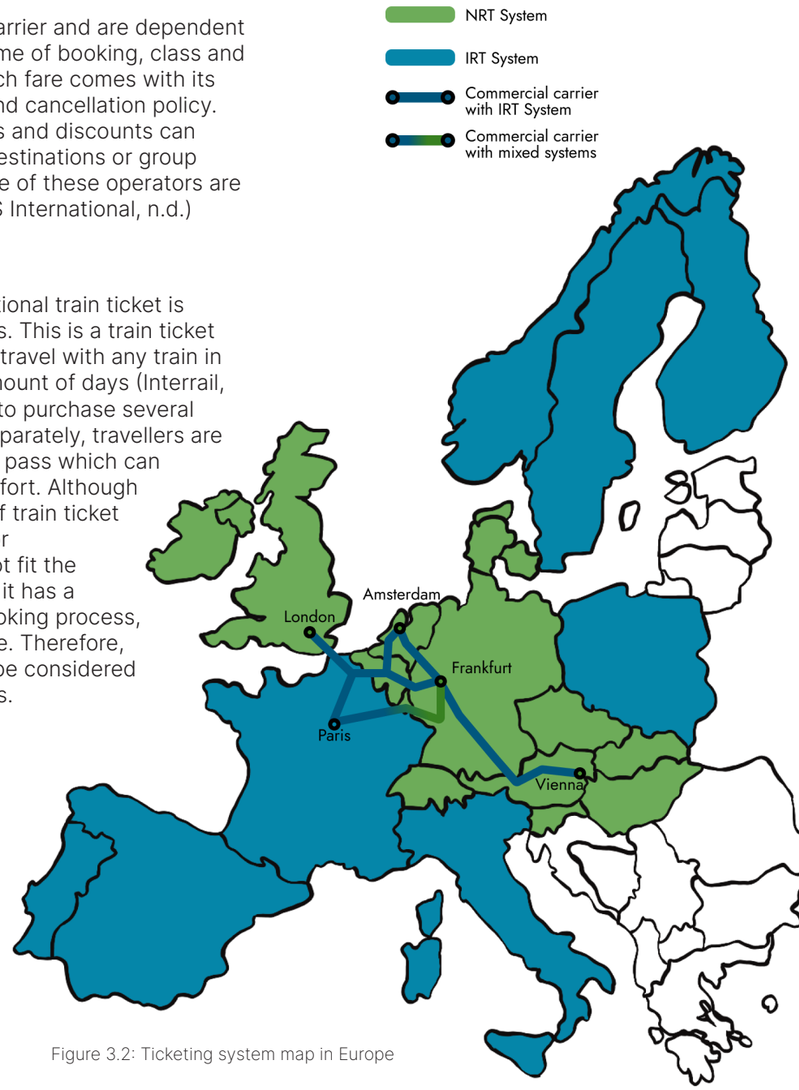


Figure 3.2: Ticketing system map in Europe

Eurostar (IRT)	ICE and Intercity Berlin (NRT)	Intercity Brussels (NRT)	TGV (IRT)	Other
Standard	Supersparpreis Europa	Early bird high	Perm's	No - Flex
Standard Premier	Sparpreis Europa	Early bird low	Loisir	Semi - Flex
Business Premier	Flexpreis Europa	Flex rate	Full Rate	Full - Flex

Table 3.1: Travel rates (NSI, n.d.)

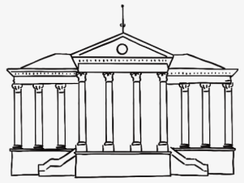
3.2 Stakeholder map

International train ticketing is part of a broader railway system. Each stakeholder within this system has a specific role and responsibility and they all collaborate to enable international train travel in Europe.

3.2.1 Stakeholders

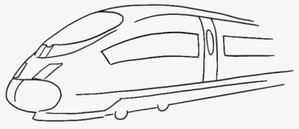
Within the railway sector, a variety of stakeholders play an important role in shaping the context of international train travel. Key players include governments, infrastructure managers, carriers, ticket distributors and travellers. Figure 3.3 provides an overview of each stakeholder and their respective roles and responsibilities.

European Commission
Creating proposals for new European legislation in regards to international train travel and executing the decision of the European Parliament and the Council of the EU (EU, n.d.)



Governments
National and local governments follow regulations form the EU Commissions, create policy for infrastructure manager and concessions for carriers.

Infrastructure managers
Infrastructure managers, like ProRail, are responsible for building, updating and maintaining railway tracks (ProRail, n.d.).



Carriers
Both national carriers, like NS International, and commercial carriers, like Eurostar use the railway tracks in order to provide the service of transport form A to B.

Ticket distributors
Ticket distributors provide the opportunity to purchase a tickets that allows travellers to travel. These ticket distributors could be national carriers, commercial carriers and independent.

Traveller
Travellers use the services provided by carriers and purchase tickets from distributors. Each traveller has personal needs and desires.

Figure 3.3: Stakeholders and their respective roles

3.2.2 Stakeholder relations

For international train travel in Europe to be possible, effective collaboration among stakeholders is necessary. The stakeholder map of Laura van Overhagen (2020) illustrates how the different parties are interconnected, see figure 3.4. The stakeholder map shows how each stakeholder either directly or indirectly influences ticket distributors and thus the ticketing system of international train travel. How the ticketing system is influenced will be further discussed in chapter 3.3.

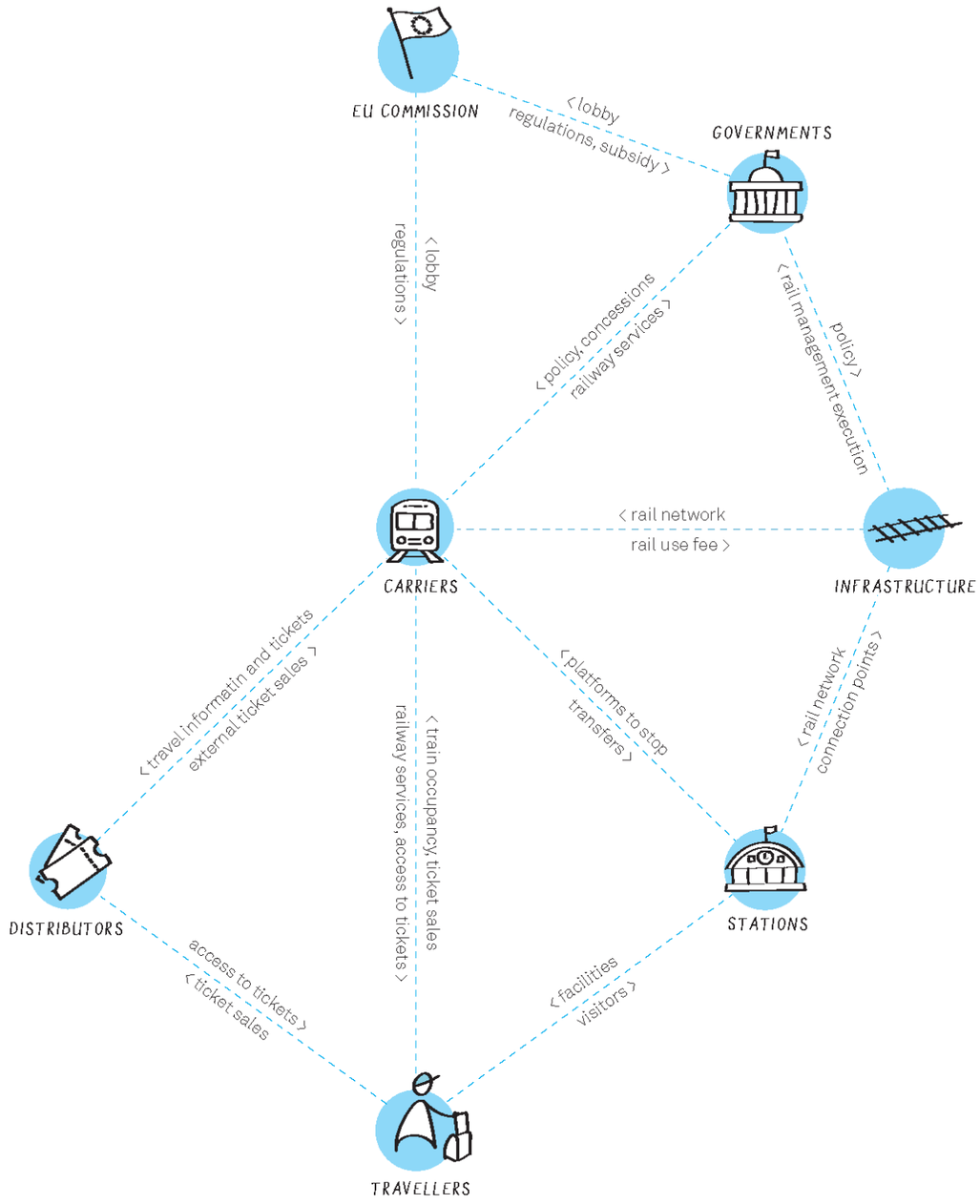


Figure 3.4: Stakeholder relations (van Overhagen, 2020)

3.2.3 Stakeholder per country

The railway sector has a long history, in which each country pursued railway development independently at a different moment in time (Railways Explained, 2020). This faceted construction of national railway infrastructure across countries lead to infrastructural and technical differences. This includes different gauge width, platform height, overhead wire currents and safety systems (Donners, 2018).

Currently, a lot of stakeholders still mainly operate on a national level, which results in each country having different stakeholders (Rli, 2020), see figure 3.5. The Council of the European Union (n.d.) describes this as a fragmentation of the industry due to complex stand-alone national systems. This does not only refer to the infrastructure but also the carriers that provide transport to travellers who mainly operate out of national interest (Rli, 2020). This shows how the long history can still be recognized in challenges that this sector faces today and indirectly affects the bookability of international train tickets. This impact will be further discussed in chapter 3.3.

3.3 System barriers

Now that there is a deeper understanding of the nature of international train tickets and the overall system that it is a part of, this subchapter delves into the influences of the system context on ticketing and how it affects the bookability from a user perspective.

3.3.1 Infrastructural influence on ticketing

Like mentioned in chapter 3.2.3, the difference in track widths, platform height, overhead wire currents and safety systems, as a result of the faceted construction of railways in Europe, still create challenges that influence ticketing. In addition, there are gaps in the High Speed Rail-network in Europe (Donners, 2018). These infrastructural differences and gaps in the high speed rail connections cause routes to certain destinations to not be optimised, potentially leading to many transfers and a longer travel time. Multiple transfers automatically makes the booking process more complex and less appealing for travellers as there are multiple carriers, different ticketing systems and travel rights to consider (Rli, 2020)(Van Hagen en De Bruyn, 2015).

New and upcoming developments offer solutions to current barriers. European countries are standardising track width, facilitating seamless cross-border travel (European Commission, n.d.)(Puente, 2013). Moreover, the Fourth Railway Package aims to create a Single European Rail Area, with measures including the implementation of the European Rail Traffic Management System (ERTMS) for enhanced safety and efficiency (European Commission, n.d.)(ProRail, n.d.). Additionally, plans to expand the High-Speed Rail network promise significant reductions in travel time between major European cities (Donners, 2018). These developments will improve the connection between European cities and therefore improve this aspect of the bookability in the long term. According to Rli (2020), a lot can be done within existing limits of the infrastructure. However, infrastructure is not the only systemic barrier that influences the bookability of international train tickets.

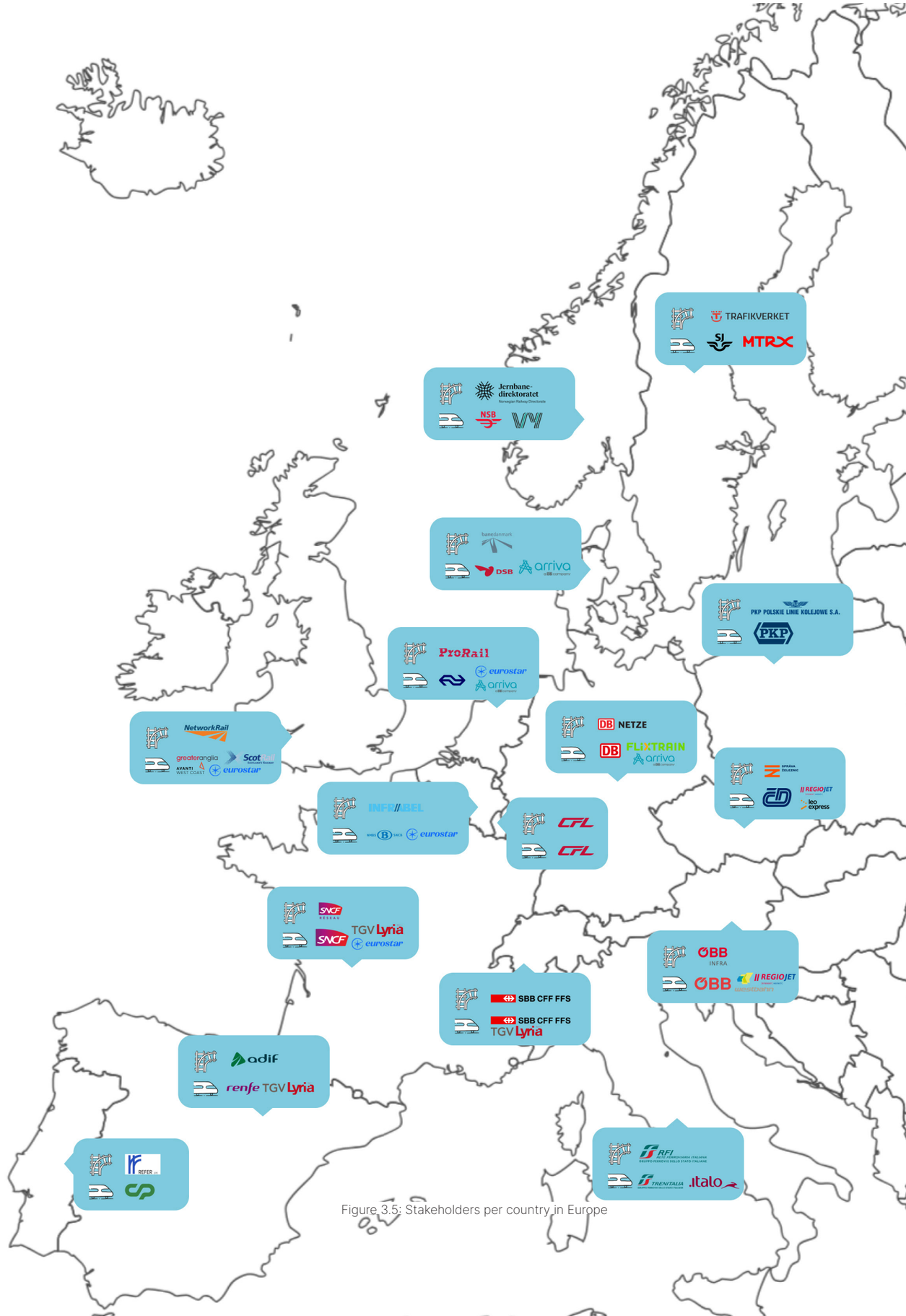


Figure 3.5: Stakeholders per country in Europe

3.3.2 Booking horizon and scheduling

By analysing different booking platforms and ticket distributors it becomes apparent that different carriers have different booking horizons varying from 2-11 months. Booking horizon refers to how long in advance travellers are able to book a train ticket. The booking horizon is determined by the carriers themselves but it is dependent on the timetable scheduling.

Countries in Europe apply varying train schedules, see figure 3.6 (Heise, 2014). While some follow a rigid timetable with trains scheduled at fixed intervals throughout the day, others tailor their schedules according to anticipated traffic. In order to determine a Europe wide train schedule, local governments, carriers and infrastructure managers come together before they submit an official requisition on a European level in April for the next year (Wouter Leyds, Rail Consultant RHDHV). The final timetable is determined in August, confirmed in October and implemented in December. However, carriers can decide to sell tickets before the final schedule is determined with the risk of timetable changes. Therefore, some carriers make their tickets available nine months in advance while others only three months.

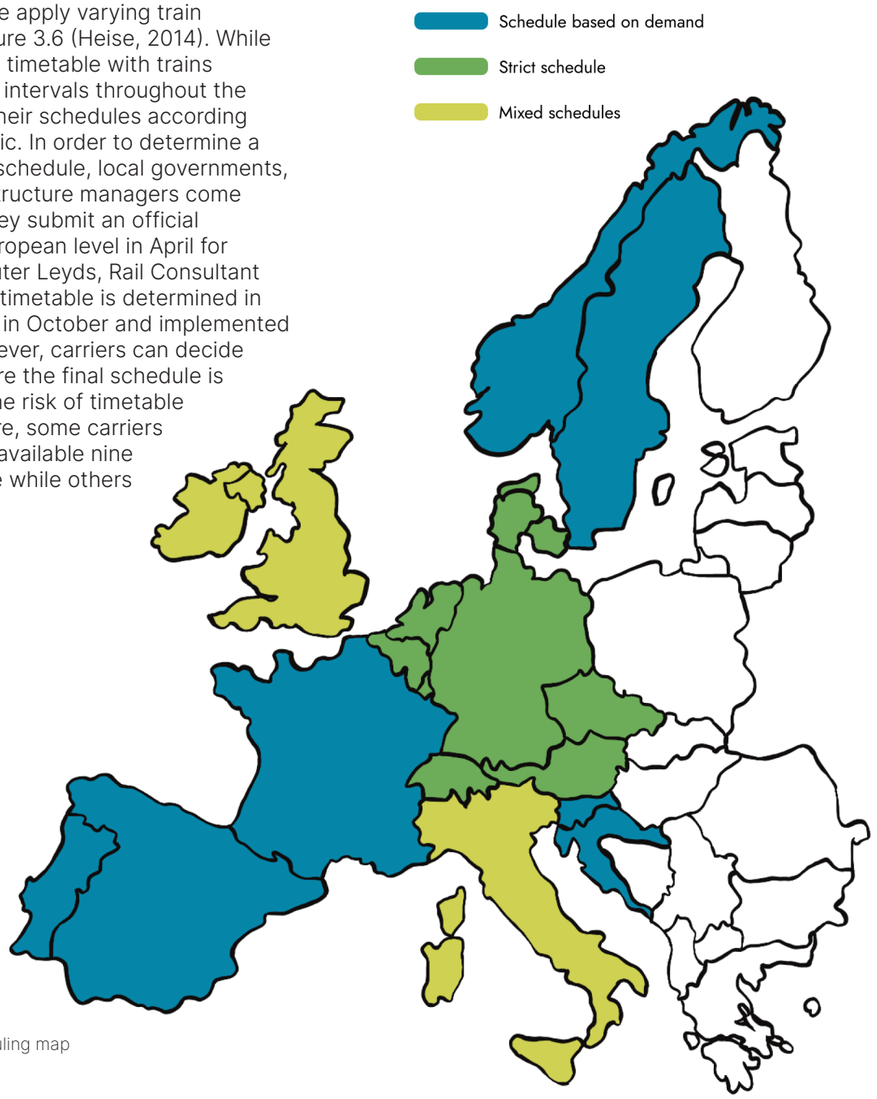


Figure 3.6: Train scheduling map

Each scheduling approach offers their own advantages with the rigid approach being predictable and the flexible approach accommodating demand. However, navigating these divergent schedules can prove challenging, as certain schedules may not guarantee alternative train options in case of disruptions. Prior knowledge regarding the schedules could influence travellers booking approach.

The difference in booking horizon further complicates the booking process, especially for travellers travelling with a variety of carriers, which is common with cross-border travel. If travellers plan to take a route where one train's tickets are available three months in advance and another train's tickets nine months in advance, there's a risk of the latter train selling out before the former's tickets are available. Moreover, ticket prices typically increase over time, so delaying purchase may result in higher costs for the second train. However, purchasing tickets separately introduces the risk of lacking a single transport contract which influences the travel rights. Moreover, there is the added risk of booking tickets before the official timetable is determined as schedule changes may lead to train cancellations or complicate certain transfers, at times even making them impossible. This could leave travellers to have to book a more expensive last minute ticket.

3.3.3 Lack of cooperation and information exchange

Another systemic aspect that affects ticketing is the lack of cooperation and information exchange between carriers, evident from the inconsistent selling of each other's tickets and communication of travel details, such as timetable changes (Worth, 2023). This is caused by fear of competition, with much of the information deemed confidential (Rli, 2020). This fear is further exemplified by the open access market which was introduced through the Fourth Railway package by the European Commission, aimed to enhance competition and industry quality (European Commission, n.d.). While this initiative has led to the introduction of numerous new operators, resistance from established carriers has hindered collaboration as they have become even more hesitant in their information exchange (Worth, 2023).

In addition, opening the market creates opportunities for upcoming carriers to introduce even more ticketing systems, further complicating the booking process. Consequently, there is an increasing need for a European railway authority to facilitate communication and information exchange (Worth, 2023). However, the absence of such an authority complicates the situation, creating challenges for travellers and potentially fragmenting the market further (Worth, 2023).

Due to the limited cooperation and information exchange between carriers and ticket distributors, travellers face challenges in finding tickets through their national carriers or independent distributors (RHDHV interviews). Consequently, they may need to purchase tickets directly from the carrier, adding complexity as travellers must know which carriers operate on their route. This becomes exceedingly challenging considering the numerous carriers in Europe and the potential future growth of this number due to the open access market. Additionally, the different ticketing systems and rates with varying rules and conditions, require travellers to do thorough research before booking. This system barrier does not only affect travellers during booking but also after, as travel information, like timetable changes, are inconsistently shared, leaving the traveller vulnerable and at risk of missing their trains (Donners and Voerknecht, 2020).

3.3.4 Travellers rights in case of disruption

International trains can encounter disruptions that hinder the planned route, like fallen trees, technical issues, heavy weather, accidents, delays, etc. In addition, some international trains are notoriously unreliable with some carriers like Deutsche Bahn having a punctuality rate of only 58,4 percent (Mat, 2023). According to the RHDHV interviews, most carriers are known for operating in a rather conservative way in case of disruption by avoiding ownership, cancelling trains or even skipping stations to make up for lost time. Switzerland has even taken the drastic measure of rejecting delayed German international trains to prevent them from entering their country (SBB, 2023). This measure was taken to prevent further timetable complications in Switzerland which shows that national interests are often the main priority. However, the international train traveller who planned on going to Zurich is suddenly stranded at the border.

“You rarely ever take the trip like you booked it.” - RHDHV interviewee 5

“You think you have everything covered but then everything changes anyways.” - RHDHV interviewee 4

Jon Wright (2023) attempted to map the traveller’s rights, which shows that travellers rights are dependent on the amount of travel contracts, which type of tickets were purchased, where they were purchased, which carriers the tickets apply to, alternative available trains and the cause of disruption, highlighting the complexity of understanding travellers’ rights. Without support or prior knowledge on the subject it can be rather difficult for travellers to figure out what they are entitled to, and even then, there are instances where the rights are uncertain or dependent on the conductors.

Based on the many anecdotes that were shared with me during the interviews and throughout this graduation project, it appears that travellers are often left stranded. This, of course, creates an overall negative train travel experience, sometimes even causing travellers to avoid international train travel in the future. The prior knowledge of these ticketing systems and terms and conditions could influence the booking behaviour of travellers causing them to opt for routes with longer transfer times or different travel rates, thereby reducing the risk of being stranded.

3.4 Conclusion

The goal of this chapter was to understand the backstage of international train travel. In order to do that, this chapter delved into ticketing systems, distribution and stakeholders. In addition, the systemic influences on the bookability of international train tickets was analysed. The analysis showed that despite the infrastructural differences of the railway network in Europe, a lot can be done within these barriers to improve the bookability of international train tickets. Currently, travellers are required to have prior knowledge about international train travel to navigate the various ticketing systems, travel rates and booking horizons. The lack of cooperation and information exchange between carriers and ticket distributors further complicates the booking process for users. These insights will be considered in the design brief to explore solution space. Now that there is a comprehensive understanding of the backstage of international train travel, the following chapter delves into the context of use.

4.

Context of use

Understanding the user and the user journey

The previous chapter analysed the system context of international train travel and how it affects the bookability of train tickets. Having gained insight into the system, this chapter analyses the context of use by exploring different types of travellers and their overall user journey. The insights serve as a foundation for the subsequent usability analysis.

4.1 Perception of international train travel

The interviews and user tests provided insights into assumptions and perceptions about international train travel, highlighting key concerns such as ticket prices, travel time, comfort, and, notably, the challenges encountered during the booking process.

Despite the widespread assumption that train travel is expensive, train ticket prices are not consistently pricier than flying (Rli, 2020). This misconception is fueled by a lack of awareness about dynamic ticket pricing, as revealed in research by Inge Boon (2017). Additionally, many people view train travel as time-consuming compared to flying, often overlooking the time spent getting to and from airports and waiting at security. However, trains offer relaxation and flexibility, aligning with the principles of the slow travel movement, which emphasises the journey over the destination (van Overhagen, 2020) (Boon, 2017).

"It is a real adventure. That effect is stronger when it is not just three hours on a plane but when you get out on the other side of the world. Versus sitting in the train much longer, but experiencing the whole journey much more." - RHDHV interviewee 2

However, the primary challenge lies in the effort required to successfully book and travel by train. Despite growing environmental awareness and the phenomenon of "flight shame," travellers may remain hesitant to choose international train travel as long as they experience "train fright" which refers to the anxiety from planning, booking, and navigating train journeys (van Luyn, 2023).

While environmental awareness has led to 'flight shame', travellers are not likely to opt for international train travel as long as 'train fright' persists (van Luyn, 2023). Train fright refers to the anxiety travellers feel because of all the complications around planning, booking and making the journey by train. Until a suitable and user-friendly alternative is provided, travellers are likely to continue opting for flying, emphasising the urgent need to improve the bookability of international train tickets.

4.2 Types of users

It is important to gain a deeper understanding of the different types of users in order to later design with the end user in mind. There are different ways of categorising the different types of users. This project mainly focusses on purpose of travel and need based persona's

4.2.1 Travel purpose

A distinction that can be made is the purpose of travel with the distinction between business travellers and holiday travellers (Boon, 2017). The main focus of this project is on the different types of holiday travellers since business travellers are not always booking their own form of transportation and even when they do they might be limited in their booking options depending on the company policy regarding business travels.

4.2.2 Need based persona's

Creating need based personas is a method often used by designers to map the different types of users because, regardless of the demographic or experience, users may have different needs which the service should align with (Koos, n.d.) (Schopman, 2020). A variety of different graduation projects already explored and discussed the different types of travellers. If, as a reader, you want more information regarding these different types of travellers, I would recommend the graduation report of Rosa Hendrikx (2021).

In this project, my primary focus lies in understanding the diverse needs of various types of travellers during the booking process. Through field research observations, interviews and user tests, I identified distinct types of bookers which are presented in a framework of three axes representing tensions in booking behaviour. These tensions are:

'Having to book a ticket' vs. 'Enjoying the puzzle'

The first tension represents how travellers differ in their approach towards the booking process. Some dread it, viewing it as a tedious task to quickly check off their to-do list as they expect it to require a lot of time and effort. Other travellers enjoy the challenge and take pleasure in the hunt for information and scouring websites to secure their ticket.

'Trusting the system' vs. 'Prepare for disaster'

The second tension concerns travellers' trust in the system behind the ticket. Some travellers, usually lacking experience, blindly trust all suggested options leaving them vulnerable to the unpredictability and unreliability of some international trains (see chapter 3). On the other end of the spectrum there are travellers with great distrust in the system who meticulously plan their travels to avoid potential risks.

'Knowing what I want' and 'Get inspired'

The last tension revolves around traveller's preferences. Some have precise requirements, sometimes even down to specific train sets and seat numbers while others seek inspiration and value flexibility.

Need based persona framework

These tensions were combined to create the following framework (see figure 4.1) on which user needs were mapped. Personas were created to fit the different needs, leading to seven personas: the efficient booker, the responsible strategist, the vulnerable rookie, the intuitive explorer, the spontaneous adventurer, the experienced puzzler and the determined dealseeker, see figure 4.2. These personas are further elaborated in figure 4.3.

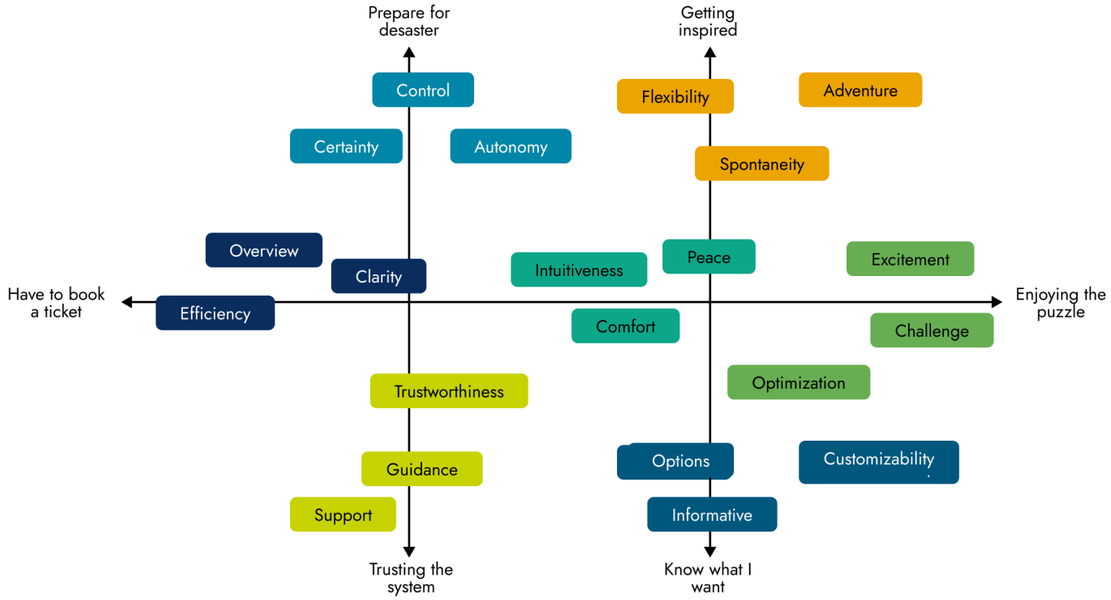


Figure 4.1: Need based persona framework

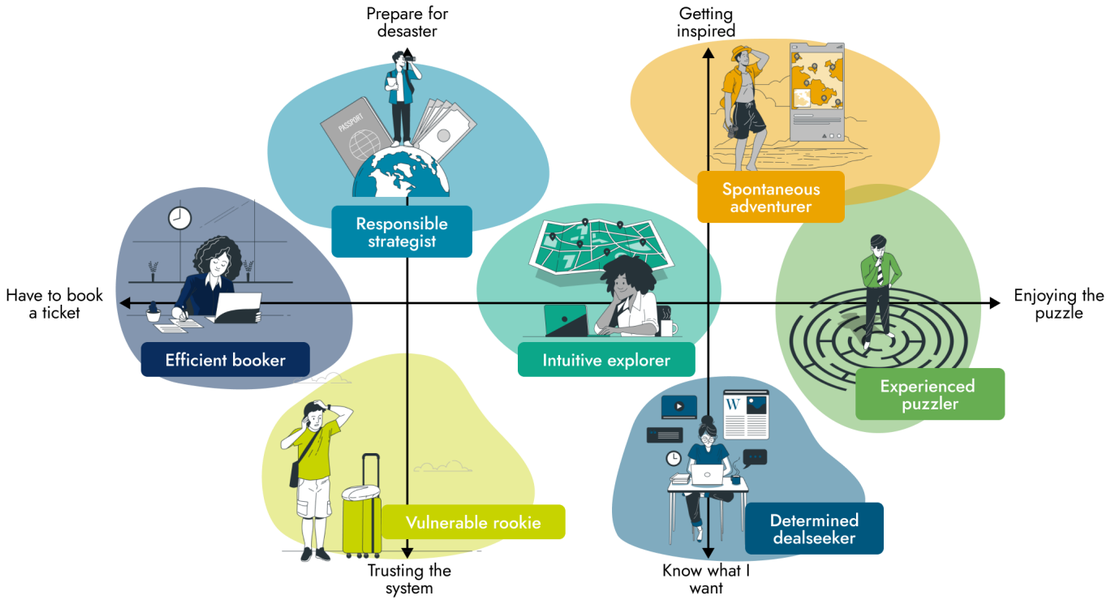


Figure 4.2: Seven need based personas

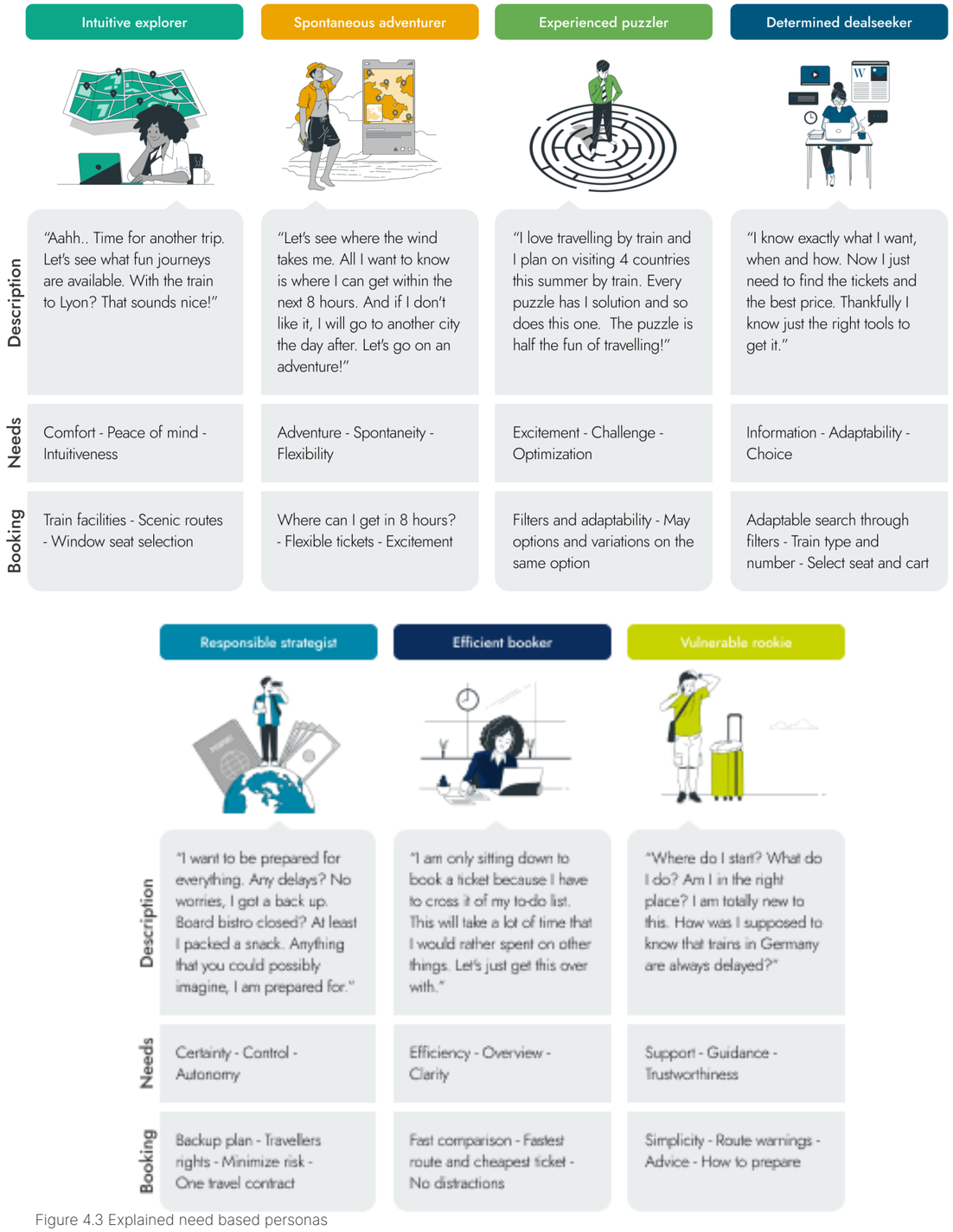


Figure 4.3 Explained need based personas

Market analysis

Examining the needs of the booker persona's and the existing booking platform, I recognized that there are existing markets that already address some of these needs. The spontaneous adventurer fits the Interrail market really well as they are able to travel flexibly and get inspired. In addition, the experienced puzzler and, according to the RHDHV interviews, determined dealseeker already benefits from the adaptability of ticketing platforms like Deutsche Bahn, see figure 4.4. And although the booking process could be improved for these groups as well, there is more to be gained from the persona's placed on the left side of the framework, namely: the efficient booker, the responsible strategist and the vulnerable rookie. responsible strategist, efficient booker and the vulnerable rookie.It is more likely that these persona's fall into the category of the large majority and the personas on the right side of the framework are part of the early adapters. Therefore, this project mainly focuses on accommodating the needs of the responsible strategist, efficient booker and the vulnerable rookie.

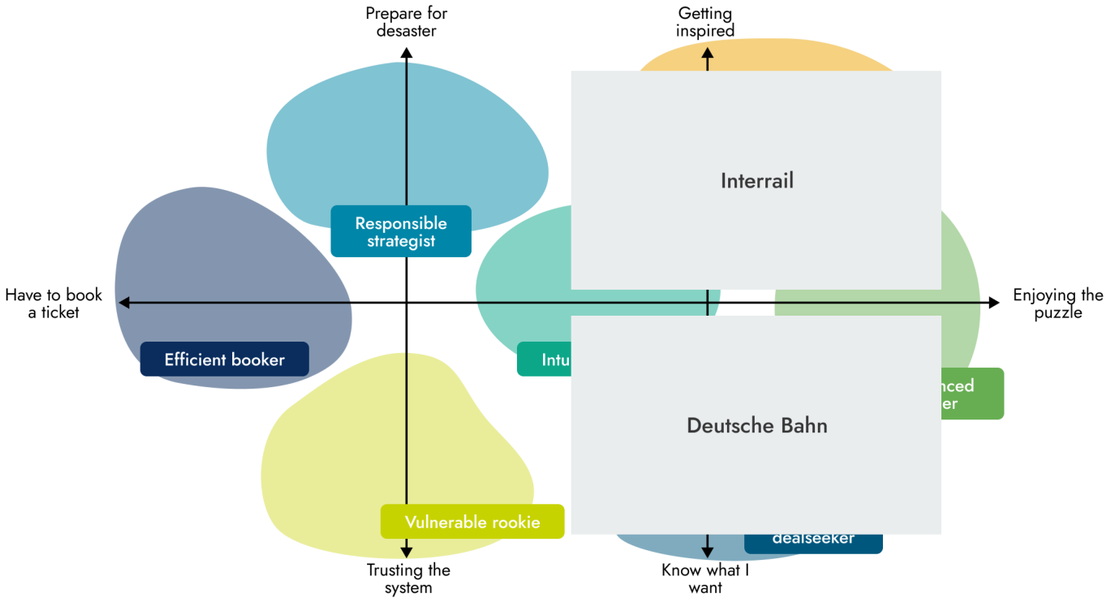


Figure 4.4: Market analysis; how current services comply with the need based persona's

4.3 User journey

Having gained an understanding for the different types of travellers, this subchapter maps the journey they go through. This also illustrates how the booking process relates to the overall user journey. Based on the work of Laura van Overhagen (2020) and Inge Boon (2017), and the insights gathered from interviews, user tests and field research, I compiled a user journey consisting of the following steps: Orienting, Booking, Preparing, Travelling, Transferring, Rescheduling and Arriving. Focussing on the ticketing related steps, this user journey delves into the booking and rescheduling in more detail. These two phases have been subdivided into substeps.

The booking phase includes: Search, Compare (for both outward and return journey if applicable), Checkout and Confirm. Interviews revealed that most travellers start their booking process on a computer or desktop. This way they are able to compare the different options on a large screen and even open multiple tabs. Occasionally, travellers do book a ticket through a mobile app, however interviewees expressed laptops being the default. Examining the user journey reveals a lot of emotional fluctuation and pains experienced by the traveller in the 'Comparing' step of the booking phase, showing potential for improvement in this stage. The booking platforms used in this phase are further analysed in the following chapter.

The rescheduling phase, which only occurs if the journey is disrupted, includes: Understanding and Planning. While not all travellers go through the rescheduling phase, those who do, experience a lot of pains and negative emotions, highlighting opportunities for improvement in this aspect as well. Currently there is not one clear touchpoint during this phase but rather a variety of potential touchpoints, including: apps, conductors, service desks and fellow travellers, etc. These touchpoints are also further analysed in the following chapter.

4.4 Conclusion

The aim of this chapter was to analyse the context of use. In order to do this, different types of travellers and bookers were created and analysed. This analysis showed that three booking personas have needs that currently are not met: the Efficient booker, Responsible strategist and Vulnerable rookie. These personas likely contain the large majority of users and are therefore selected as the main target group for this project. In addition, the user journey of these personas was mapped and analysed. This provided insights into two booking related phases: the initial booking process and the potential rescheduling process in the event of disruption. Travellers experience a lot of pains during these two booking moments and lack support from existing touchpoints. During the initial booking phase these touchpoints include booking platforms and the touchpoints during the rescheduling phase include apps, conductors, service desks and fellow travellers. The insights of this chapter are further explored in the following chapter that dives deeper into the usage patterns and usability of the current touchpoints in order to understand the user experience of booking and rescheduling an international train journey.

Phase	Orienting	Booking				Preparing	Travelling	Transfering	Rescheduling		Arriving
Sub-phase		Search	Compare Repeat for return journey	Checkout	Confirm				Understanding	Planning	
Actions	Get inspired Choose destination and modality Planning journey Find ticket platform	Enter departure location and destination Enter travel dates Enter amount of travellers and their age	Compare routes on prices, travel time and transfers Compare routes on different days and different platforms Select a route Select seats Select flexibility rate	Check details Enter personal information Pay	Receive booking confirmation through email	Pack luggage Prepare documents Preparing transport to train station	Going to the train station Entering paid area Going through security Finding train and seat Finding place for luggage Ticket check Spending time on train	Arriving at transfer station Spending time at transfer station Finding platform Waiting for connecting train Boarding connecting train	Ask for help at the service desk and conductor. Look for alternative routes. Ask fallow travellers what to do. Figure out if a new ticket needs to be purchased.	Request new ticket at service desk. Ask conductor for stamp on ticket. Select alternative route. Buy new ticket online.	Arriving at the station Exit paid area Travel to accommodation
Needs	I want to get inspired I want to know the different ways I can get to my destination	I want to be able to enter my search easily with no distractions I need to feel like I can trust the platform I want to be able to check al stations near my destination	I want to filter my search I need to be able to quickly compare different journeys I want to feel confident that I have the journey that fits my needs I want to be able to easily recognize the best journey	I want to be able to finalise my booking quickly and easily I want to be able to log in with my other accounts (e.g. Google)	I want to make sure that I receive the ticket I want to know what I need to do next	I need to know how I can prepare for my journey	I need to find my train I want to get to my train on time I want to relax and enjoy the ride I want travel updates along the way	I don't want to have to hurry I want to be able to easily find my connecting train	I want to be sure that I can arrive at my destination I need support, guidance and reassurance in what to do next I need to know my rights as a traveller	I need to reschedule my route I need to know what I must have to get on the next train (new ticket, stamp etc.) I need to know who to approach in order to get a new travel contract	I want to know how to get to my accommodation

UT - User Test Participant
RI - RHDHV Interviewee
TI - Traveller Interviewee

Figure 4.5: User journey

5.

Usability analysis

Understanding the user experience of booking & rescheduling a train journey

The previous chapters set the stage by analysing the system and the context of use surrounding international train tickets, already providing some insights into their effects on the booking experience. This chapter further explores the user experience of booking and rescheduling an international train journey through an in depth usability analysis of usage patterns and usability issues. After analyses, the insights are used to formulate a problem statement and design direction in the following chapter which helps to identify a solution space for the upcoming synthesis phase.

5.1 Ussage patterns

Through the interviews and user tests, certain usage patterns were uncovered. These usage patterns include decision making patterns like; comparing routes, outward and return journey selection, delaying commitment and booking termination. In addition some persona specific usage patterns were uncovered. These patterns heavily influence the booking behaviour and experience of travellers in booking and rescheduling their journey (Durand and Zijlstra, 2020).

5.1.1 Comparing routes

The user journey presented in chapter 4 illustrates the importance of the comparison step in the booking journey due to the amount of pains and emotional fluctuation for travellers. Here, further elaboration is provided on what travellers compare during this step. Typically, three factors are considered: ticket price, travel time and transfers. This observation is further confirmed by Chapuis, Lotz, Motyka, and Rupalla (2023), who emphasise the significance of travel time and transfers in decision-making. Regarding transfers, travellers consider both the amount and transfer time. Depending on the traveller's situation and preferences, certain factors may hold greater importance than others. For instance, a traveller with a flexible budget may prioritise time efficiency. Additionally, apart from comparing these aspects across different tickets, travellers frequently explore various ticketing platforms in hopes of securing the same ticket at a better price. Furthermore, when travel dates are not fixed, a variety of dates are compared as well.

5.1.2 Outward and return journey selection

For most of the current booking platforms, like NS International, Trainline and Deutsche Bahn, travellers have to go through the comparison process twice: once for the outward journey and once for the return journey. In doing so, travellers often have different preferences for each journey causing them to make different decisions.

For the outward journey, travellers often aim to optimise their first vacation day. Some do this by striving to arrive early at their destination to explore on the same day, while others opt for a more adventurous route with fun transfers. For return journey preferences vary amongst travellers, some preferring to leave later in the day to make the most of their last vacation day, while others prioritise getting home quickly.

"I consider the outward and return journey to be very different. I notice that I want very different options and make very different choices." - User test participant 2

"I really enjoy going on holiday, but I also really enjoy going back home and when I do I want to go home as fast as possible." - User test participant 5

5.1.3 Delayed commitment

During the user tests, I noticed some travellers being hesitant to commit to a journey. These travellers expressed being somewhat unsure of their choice and wanting to see the whole picture of both their outward and return journey before committing to it completely. Currently several platforms, like NS International and Trainline, require travellers to make detailed decisions about the outward journey, like flexibility rates and seat selection, before being able to look for return tickets. However, this is not in line with the expectations of travellers as they want to be certain there is a suitable return option before committing to the outward journey. During user tests, participants often expressed their confusion about the order of these steps. This shows the need for booking platforms to be aligned with the decision making patterns of users.

5.1.4 Booking termination

As the research conducted by St. Pölten University in Austria (2022) suggested, one third of the participants were unable to book their ticket. And although the user tests I conducted were on a much smaller scale, a similar result was found with 8 out 30 booking attempts being unsuccessful. There were a couple of reasons for these booking attempts to be terminated before completion. The main cause for termination was travellers giving up due to frustration. This frustration was often caused by tickets proving to be unavailable or more expensive than expected at checkout, causing travellers to not want to repeat the process after already investing substantial time and effort. Another cause for termination was travellers being unable to find suitable train tickets that meet their needs. Finally, website errors hindered travellers from completing their booking.

5.1.5 Persona specific usage patterns

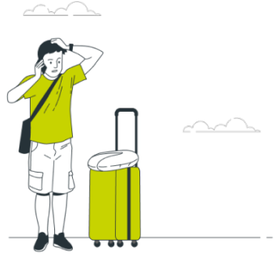
In analysing these user tests, I recognized certain persona specific user patterns as each user test participants fit one of the selected need based persona's: Efficient booker III, Responsible strategist IIII, Vulnerable rookie III

Efficient booker

The efficient booker typically skips detailed comparisons of each journey. They typically focus on one or two priorities, often related to price, travel time, or transfers. While they may briefly check for additional journey details, they swiftly proceed to the next step. These users are easily frustrated when the booking process takes longer than anticipated.

Responsible strategist

The booking process of the responsible strategist involves thorough risk assessment during the comparison. They meticulously analyse factors such as ticket price, travel duration, and transfers, carefully weighing the implications of each. For instance, when presented with a low-cost ticket option but with a short transfer time, they assess whether the savings outweigh the risk of missing the connection. Additionally, they evaluate the risks associated with nighttime travel and navigating unfamiliar train stations, particularly when travelling alone. Finally, the responsible strategist usually looks for more information about the terms and conditions before committing to the tickets.



Vulnerable rookie

Finally, the vulnerable rookie typically blindly trusts the provided suggestions without delving into further details beyond price and perhaps travel time. As the name implies, this tendency leaves this persona vulnerable to routes that are prone to disruption, such as opting for short transfer times, thereby increasing the risk of missing a transfer due to delays.

5.1.6 What we can learn from experienced travellers

Through interviews and many other discussions with RHDHV employees, I realised that a lot can be learned from experienced train travellers. Very experienced international train travellers often have certain tricks they apply during the booking process to find the best prices, create more security and get the ideal seat.

Reduce ticket price

In order to reduce ticket prices, the experienced travellers I interviewed used the following tricks:

- Check platforms like České dráhy as they occasionally offer cheap tickets for travel towards eastern Europe.
- Play around with transfer stations. Some trains run parallel routes before splitting up in different directions. Ticket platforms usually choose the biggest or most popular station for transfers, but considering a less crowded one could save money on your ticket (Donners, 2018).
- For NRT systems, choose cheaper tickets with short transfer times. If you miss the transfer, you can still catch the next train.
- Consider alternatives to high-speed trains like ICE to save on ticket prices. DB website offers filter options for different train types.

Increase security

When travelling, especially with children, you might prefer to find a route that offers the most security and certainty that you will arrive at the intended destination. The following tricks can be applied:

- Opt for direct trains if available. However, if there are no direct trains available and transfers are inevitable, consider planning for enough transfer time, at least an hour.
- Book tickets directly from the carrier you're travelling with to have direct access to customer service in case of issues. Independent ticket distributors may not provide travel updates or have the authority to provide access to alternative trains or solutions.
- Use the website Zugfinder.net to access data on past delays and cancellations of specific trains, offering insights into train reliability.

Select ideal seats

If comfort is a top priority, experienced travellers apply the following tricks in order to secure their ideal seat:

- Check the website VagonWeb to view information and photos of the traincarts and find the ideal seats. This could be valuable to check as quality and facilities might differ per train cart.
- Note that not all platforms allow travellers to select their own seat and some only offer seat preference options.
- In systems where seat reservations are optional, such as an NRT system, travellers can make seat reservations separately from their ticket on other websites.
- Use the České dráhy website to reserve seats based on cart and seat numbers.
- Note that with night trains, seats or bunks are usually assigned, but seat numbers are presented before checkout, allowing travellers to add and remove tickets until they secure their preferred seat. However, be cautious, as ticket prices may increase as popularity rises with this method.

5.2 Booking usability issues

Based on user tests, a variety of usability issues for different platforms were identified. The full analysis of NSI, Trainline and DB are presented in appendix F. The usage issues were grouped, rated and ranked based on the impact, frequency and persistence, in accordance with the severity rating of Nielson Norman group (Nielson, 1994). This resulted in the following top usability issues.

5.2.1 Not in line with decision making patterns

The tested platforms often did not align with users' decision making patterns. For instance, Trainline and NSI requires travellers to make detailed decisions about their outward journey before selecting a return journey, conflicting with travellers' preference for delayed commitment. Furthermore, various aspects of each website hinder the comparison phase, a crucial part of the booking process.

NSI's lack of flexibility in travel time and long loading times contribute to this issue, see figure 5.1. Additionally, both NSI and Trainline lack search filters, making it difficult for travellers to filter out irrelevant travel options. For all three websites, inconsistent ticket price disclosure and presentation of unavailable tickets hinders travellers in their comparison. Although DB offers a price comparison feature, many users struggled to find it, and it did not always function properly.

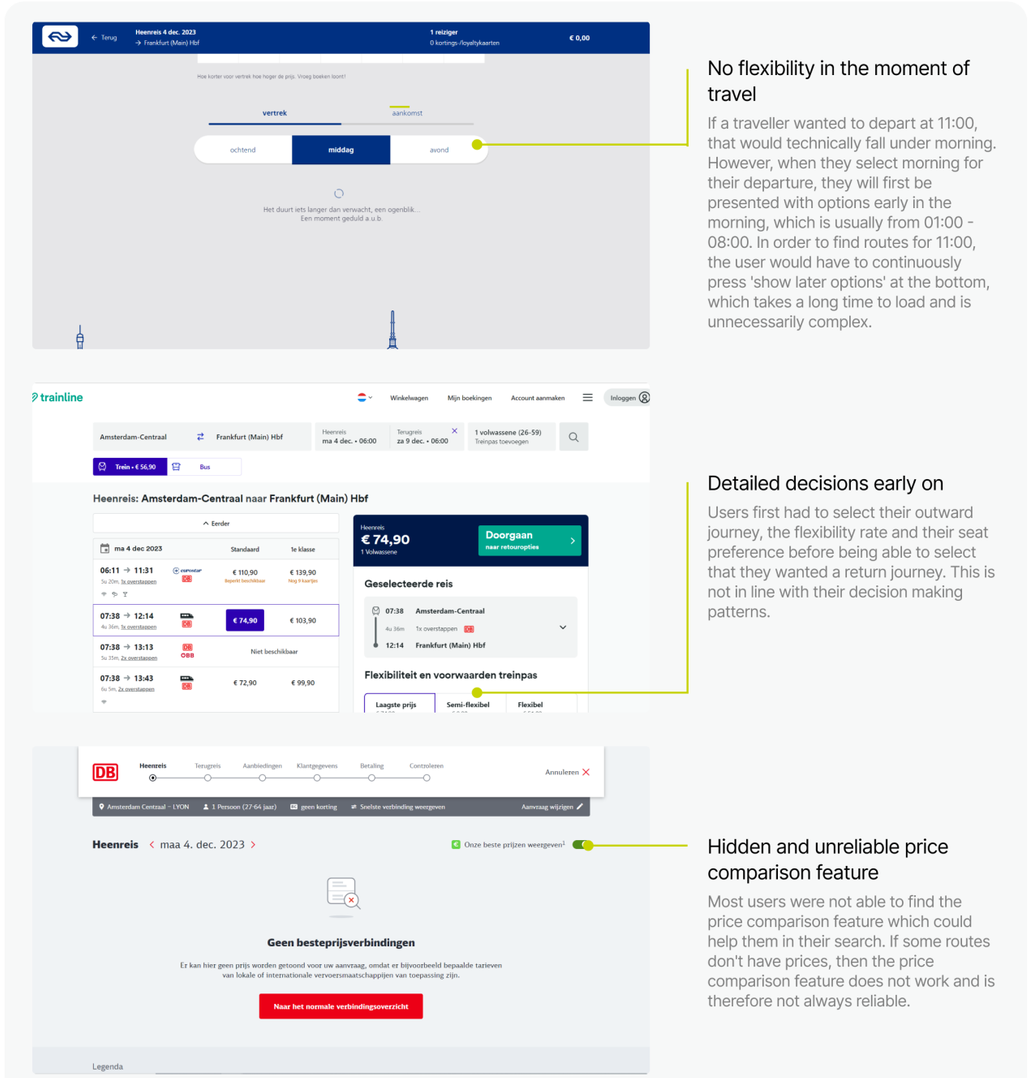
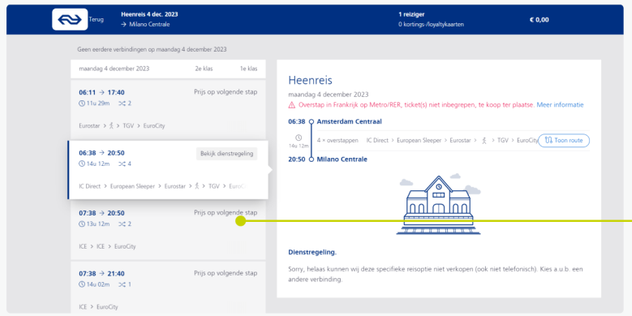


Figure 5.1: Platform analysis; Not in line with decision making patterns of users

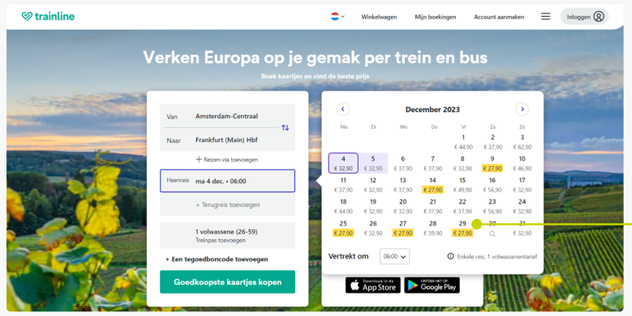
5.2.2 Lack of transparency and consistency

The platforms also exhibit a lack of transparency and consistency, further complicating the booking process for travellers. Firstly, despite some transfer warnings, there is little to no transparency about what travellers can encounter on their journeys. In addition, all tested platforms inconsistently disclose ticket prices. Moreover, both NSI and Trainline inconsistently display the cheapest ticket prices in their calendar when travellers select their travel dates and the ones that are presented often do not correspond with the cheapest available ticket. Additionally, routes on Trainline occasionally include bus or car transfers, even when users specifically search for train routes. Finally, certain buttons on DB unexpectedly redirect users to external websites, each with a different interface design, causing users to feel disoriented and confused.



Inconsistent with disclosing ticket prices

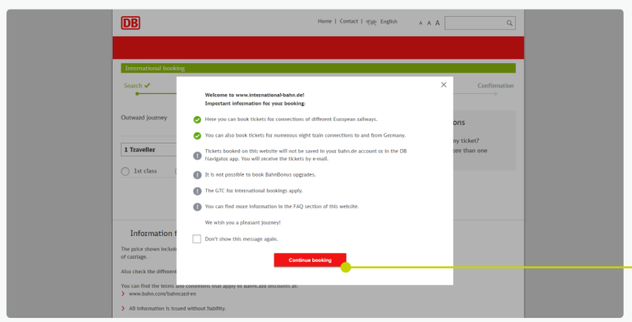
Sometimes users needed to select both the outward and return route, before being informed about the prices of the tickets. By this time users did not want to put in the effort of going through the whole process again and therefore often gave up at this point if they were not satisfied with the ticket price.



Inconsistent in showing prices in the calendar & prices don't match

"Strange that I can not see prices for all the dates." - User test participant 1

"I don't fully understand why before it said the cheapest price on this date was 27 euros and now suddenly 150 euro." - User test participant 2



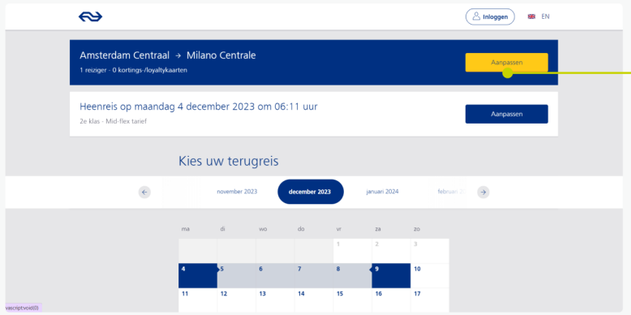
Unexpected link to alternative website

The 'Next' button brought users to a new website with a new interface, making them feel lost and disoriented.

Figure 5.2: Platform analysis; Lack transparency and consistency

5.2.3 Small choices with big consequences

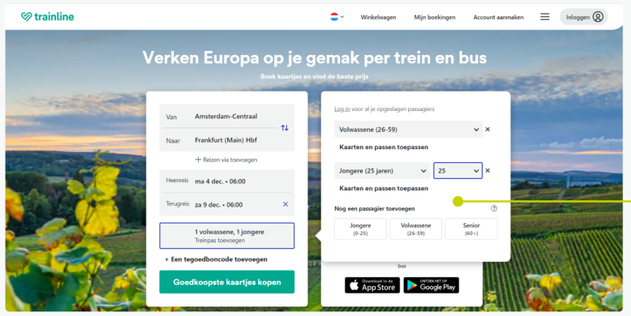
During the user tests, seemingly minor choices or selections often led to significant unforeseen consequences which complicated the booking process causing issues during their journey. For example, on the NSI unclear transfer warnings and confusing flexibility rates could cause travellers to select a route or ticket that may pose problems later on during their journey. Moreover, on the Trainline platform, confusing passenger selection caused multiple users to accidentally book a trip for multiple travellers. Furthermore, the misinterpretation of filters on the DB website caused travellers to use them incorrectly as presented in figure 5.3. Finally, on all platforms travellers were unable to change their selected outward journey without losing their selected return journey.



Difficult to adapt search later on

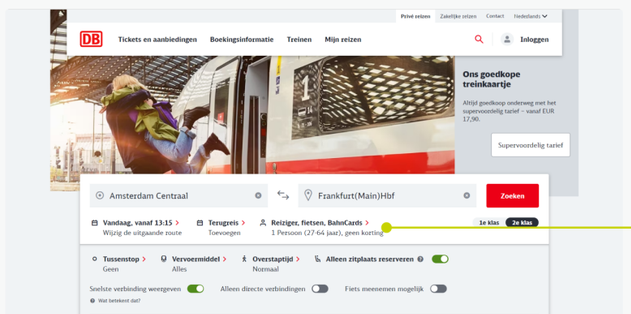
Users often accidentally go back to the beginning when they want to change their selection, since the yellow button is more prominent, and they loose their selected journeys

"I don't dare to go back to change things because I fear the I will lose everything."
- User test participant 9



Confusing passenger selection

When travellers wanted to select the age of the passenger, they often accidentally selected another passenger instead of changing the age. This seamingly small error had significant consequences as ticket prices appeared to have doubled when in fact it is the ticket price for two.



Confusing filters

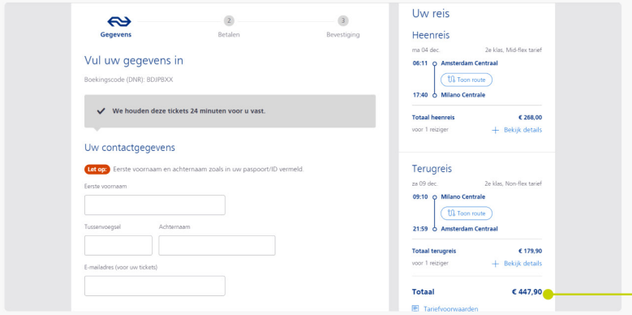
Filters were confusing to inexperienced users as they did not understand what they meant. For example, 4 out of 10 participants selected 'only seat reservation' at the start of their booking process which later caused for complications with pricing and return journeys and ultimately would not be a valid train ticket.

"Oh this only was the outward journey, but I also want a return. Why can't I book a return?... Oht! The return journey got deselected when I was changing the options."
- User test participant 5

Figure 5.3: Platform analysis; Small choices with big consequences

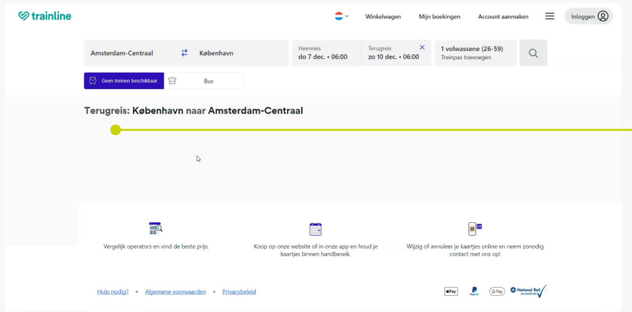
5.2.4 High effort with little reward

Another issue that users encountered during the user tests was having to put in a lot of effort only to not be able to complete the booking process. During several user tests, the selected tickets were suddenly unavailable at checkout. This often left them frustrated, unwilling to restart the entire process, leading them to abandon their booking altogether. Similar problems occurred when ticket prices were not. disclosed in the overview, leaving travellers disappointed with the unexpectedly high prices and once again causing them to terminate their booking.



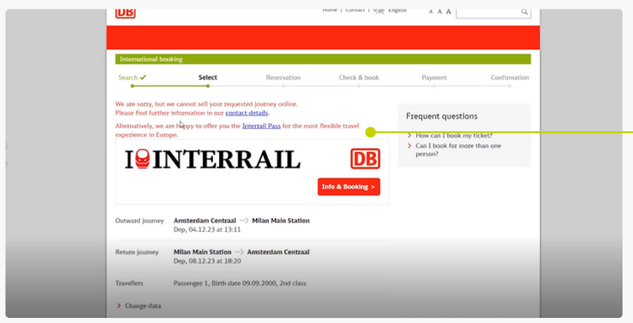
Price only available at checkout

"Oh, now I see the price. Pretty wierd that I only get to see this now... I think this is extremely expensive. Now I am thinking that I need to go all the way back to see if other dates are less expensive, but I don't want to." - User test participant 10



Not clear that no tickets are available

When there are not tickets available, travellers get to see a blank screen. Multiple travellers assumed that it was still loading only to wait a long time and figure out there were no available tickets.



Ticket unavailable at checkout

"I filled out everything only to find out that my ticket is unavailable." - User test participant 2

Figure 5.3: Platform analysis; High effort with little reward

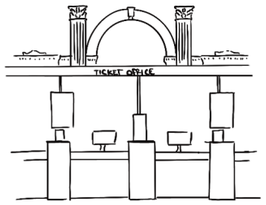
5.3 Rescheduling usability issues

Like the user journey in chapter 4 illustrates, there is a potential rescheduling moment for travellers. The interviews and field research provided some insights into the behaviour patterns and touchpoints of travellers during this phase.

Online support

Many travellers resort to downloading multiple apps to access route updates and information.

"That information [about the cause of disruption] never reaches the traveller." - RHDHV interviewee 5



Service desk

In the event of disruption, travellers can seek assistance from service desks. However, international ticket offices or service desks are not available at all stations, typically only at major ones. Consequently, consulting a service desk may not always be an option for travellers. Moreover, disruptions often lead to many travellers needing support, resulting in long queues and waiting times.

"It can get really busy when things go wrong. One time it was so busy that we stepped in a line that apparently didn't go anywhere and yeah then you are suddenly standing in the middle of the hall." - RHDHV Interviewee 3

There are a few touchpoints travellers can consult in case of disruption. These include searching online, consulting conductors, visiting service desks or seeking assistance from fellow passengers.

Conductors

In case of disruption, passengers can also seek assistance from conductors, either while on the train or on the platform. However, based on anecdotes from interviewees, some conductors are reluctant to provide guidance in such situations, with some even avoiding interaction altogether.

"I have seen conductors hide in their conductor booth." - RHDHV Interviewee 2

Fellow travellers

Interviews and observations during the field research revealed that currently, travellers primarily rely on each other for support and guidance in reaching their destinations. Experienced travellers often emerge as key points of contact, assisting others in determining their next steps.

"We have often become the contact point for other travellers when there was a delay, because we already knew what to do." - RHDHV interview 5

Despite these efforts, travellers often find themselves uninformed and without clear direction on what steps to take next when disruption occurs. This lack of guidance leaves travellers feeling disoriented, insecure, and distressed, resulting in an overall unpleasant travel experience. The limited guidance provided by existing touchpoints travellers struggle to navigate the rescheduling phase. This highlights a significant gap between the service provided by carriers and the needs of users, highlighting the need for improvement in this area.

“We already knew that our train was delayed, so we didn’t know anymore. Yeah, if a train has a lot of delays, then everything else on the track will also be delayed. So we weren’t sure if we should switch trains.” - Traveller interviewee 4

5.4 Conclusion

This chapter aimed to explore the user experience of booking and rescheduling an international train journey. In order to do this, user behaviour patterns were analysed, providing insights into the decision making processes when comparing routes. This analysis shows how risk assessment, their fear of commitments and preferences for outward and return journeys have a big impact. In addition, several booking platforms were analysed to gain insight into the user experience and usability issues. This analysis revealed that current booking platforms are not aligned with the decision making patterns of users, lack transparency and consistency, involve unforeseen consequences and require significant effort with little payoff. Moverover, the touchpoints in the rescheduling phase were analysed providing the insight that travellers are currently not sufficiently supported in this process. In order to improve the booking process, these usability issues should be considered as well as the decision making patterns of users, in the design process of potential solutions. The insights of this and the previous chapters are used to formulate a problem statement and define a design direction in the subsequent chapter.

6.

Design brief

Problem statement & design direction

The previous chapters analysed different aspects of international train travel and ticketing by diving into the system context, the context of use and the usability. This resulted in insights about why travellers experience difficulty while booking international train tickets. This chapter builds on these insights by scoping the problem, summarising it in a problem statement, defining a design direction and setting design criteria to guide the ideation and evaluation in the following synthesis phase.

6.1 Scope

The previous analysis uncovered numerous factors that negatively influence the bookability of international train tickets. However, considering the duration of this project, not all identified problems can be tackled. Some of these problems were caused by the system behind international train tickets, like the varying ticketing systems and booking horizon. Other projects, like the one from Laura van Overhagen (2020), created long term strategies for improving international train travel including the proposal for new ticketing systems. However, these strategies take time, require significant effort and collaboration between stakeholders who are reluctant in their collaboration. Therefore, more short term solutions should be explored.

In the short term it is difficult to change the system surrounding international train travel but we can help travellers navigate it. Therefore, the main focus for the following synthesis phase will be on improving the booking process in a way that allows travellers to easily book a train ticket that aligns with their needs and behaviour patterns. And a secondary focus on guiding travellers in the rescheduling phase in case of disruption.

6.2 Problem statement

The main issues that fall into the scope of this project are summarised in the following problem statement.

"Booking and rescheduling an international train journey is currently experienced as a complicated process as the current touchpoints are **not in line with user's expectations and patterns**, l**ack transparency & consistency** and **require prior knowledge** about international train travel, leaving the users feeling **uncertain and lost.**"

Not aligned with user's expectations and patterns

The steps of the booking platforms are mismatched from the patterns in decision making of users and their overall user flow, leading to a confusing and disjointed user experience. In addition, the system does not facilitate easy comparison between journeys or allow for users to easily modify previously made choices. Often small errors lead to big consequences causing travellers to waste a lot of time and effort. This evokes a lot of frustration in users, often causing them to give up and terminate their booking process.

Lack transparency & consistency

The platforms are inconsistent in showing available routes, tickets and their prices. The booking process does not provide insights into what can be expected of the journey and what should be done in cases of disruption. In addition, during their train travels, travellers are often not notified of disruption or what caused it. This lack of transparency and consistency leaves the users confused, uncertain and distrustful as they feel like to be on high alert during the booking process and while travelling.

Require prior knowledge

Currently, travellers require prior knowledge about international train travel in both the booking and rescheduling phase. During the booking process travellers need to know about booking horizons, ticketing systems and carriers in order to book a ticket. In addition, they often lack the knowledge to recognize risks of routes, like short transfer times, leaving them vulnerable to routes with a higher chance of disruption. In order for a traveller to book the ideal journey for the best price, users must know how to use filters, adapt searches and manipulate the system. This knowledge and skill set only applies to very experienced train travellers. Finally, in cases of disruption, travellers often lack the knowledge of what to do and what their rights are.

6.3 Design direction

Based on the problem statement and the needs expressed by travellers, a design direction is formulated to guide the following synthesis phase.

Booking platform and travel app

For this design direction, I decided to enhance the already existing touchpoints in order to improve the bookability of international train tickets, since travellers are already familiar with these touchpoints. In addition, travellers are currently confused with the amount of different touchpoints. Introducing new design interventions might add to this confusion. Furthermore, implementing redesigns to current touchpoints is more feasible in the short term.

Booking and rescheduling

The problem was scoped with the main focus on improving bookability of tickets with a reduced risk of encountering disruption and a secondary focus on guidance in case of disruption, encompassing both the booking and rescheduling phase of the user journey.

Intuitive

The booking process should be intuitive for travellers to align with their usage patterns even if they have no prior knowledge of international train travel. An intuitive booking process can be completed without extensive prior research, high mental load, instructions or analysis. Instead it contains a logical flow that resonates with the user, is easily understandable and can be used instinctively.

Clarity

To combat the current lack of transparency and consistency, the design direction should aim for a booking process to provide clarity. During the booking process, travellers should know what they can expect and in cases of disruption travellers should know what they can do.

Guidance

Currently, travellers feel uncertain and lost. Therefore the design direction aims to provide guidance in both booking and rescheduling the international train journey of travellers.

Confident and excited

Currently there appears to be a large focus on the complexity of international train travel. But travelling by train can be very fun and relaxing. Therefore I want to switch the focus and make travellers feel confident and excited about their journey ahead.

6.4 Design criteria

In order to ensure alignment between the design direction and ideas and concepts in the following phase, specific design criteria were established on a user experience, interaction and product level, see figure 6.1.

Product	Interaction	User Experience
The product should ...	**The interaction should ...**	**The user should ...**
... be understandable	... be intuitive	... experience the product as trustworthy
... be supportive	... facilitate easy comparison between tickets	... be excited about their journey ahead
... be adaptive to users needs	... provide a seamless booking process	... feel confident during and after the booking process
... spark excitement for the international train journey	... require no prior knowledge about international train travel	... feel in control
... align with decision making patterns of users		

Figure 6.1: Design criteria

6.5 Conclusion

The aim of this chapter was to define a design direction for the following design phase. In order to formulate a design direction, the problem was scoped. It is complicated to change a complex system such as the international railway industry, but we can help travellers navigate it. Therefore, this project primarily focuses on improving the booking process in a way that allows travellers to easily book a train ticket with a reduced risk of disruption and a secondary focus on guiding travellers in the rescheduling phase in case of disruption. In order to do this the project focuses on solving the problems of the current touchpoints, which include lack of alignment with usage patterns, lack of transparency and consistency and the need for prior knowledge about international train travel. The following phase will therefore revolve around redesigning a booking platform and app that support holiday travellers when booking and potentially rescheduling their international train journey in Europe with an intuitive booking process that provides clarity and guidance at every step leaving them feeling confident and excited about their journey. The outcomes of this chapter form the base for the following synthesis phase.

Part II
Synthesis

Design solutions and deliver a proposal

7. Design method
8. Concept evaluation
9. Final design proposal
10. Conclusion

7.

Design method

An iterative design process

Following the defined problem statement and design direction of the previous analysis phase, this synthesis phase focuses on the design process, concept evaluation, the design proposal and the final conclusions and recommendations. This chapter describes the design approach and corresponding methods that were used to iterate towards a desirable and usable booking process. The outcomes of these methods are evaluated in the following chapter. This chapter can also be consulted to understand the reasoning behind certain design choices of the final design proposal.

7.1 Design sprints

In order to reshape the booking process of international train tickets, an iterative design process has been applied in the form of three consecutive design sprints based on 'Sprint' by Jake Kapp, John Zeratsky & Braden Kowitz (2016). The benefit of design sprints is to quickly test ideas to fail fast and succeed sooner (Nielsen Norman Group, 2023). The sprints consist of four phases: Understand, Ideate, Prototype and Test. The test insights from each sprint kickstarts the understanding phase of the following design sprint, see figure 7.1. The initial two sprints involved informal tests with participants recruited through personal networks, while the final sprint concluded with a formal user test involving externally recruited participants. Each sprint has a specific goal and level of prototyping causing the design to become more detailed after each sprint. The following subchapters describe the methods applied in each sprint and the main insights in more detail.

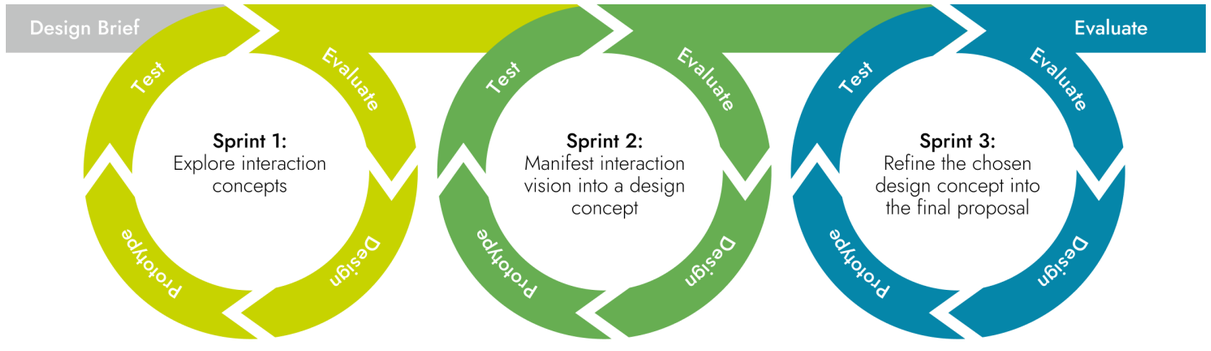


Figure 7.1: Design sprints

7.2 Sprint 1: Interaction design

Goal

Explore interaction concepts and evaluate based on user test and design criteria.

Design activities

Creative facilitation session with RHDHV - Brainstorm - Prototyping in Figma

Test participants

22 - 35 y.o.

7.2.1 Ideation: Interaction concepts

The goal of this first sprint is to explore interaction concepts and evaluate them through user tests and against the set design criteria. The ideation process involved a creative facilitation session with RHDHV employees (appendix G), drawing inspiration from existing booking and planning platforms and services served and brainstorming with fellow master students. All insights, ideas and concepts from these ideation activities were analysed, clustered, selected and refined in the following four interaction concepts.

Interaction concept 1: Guided search

The 'Guided search' interaction concept guides users through their search with step-by-step questions to pre-select their journey options. Aside from asking for the destination, travel date and traveller's information, this interaction concept also inquires about the traveller's preferences and priorities for their trip. This tailored selection aims to only offer relevant travel choices for comparison. Additionally, the concept provides information on train punctuality and potential delays, enabling travellers to make informed decisions and risk assessments. The interaction concept is presented in figure 7.2

Figure 7.2: Interaction concept 1 Guided search

Interaction concept 2: Digital travel guide

This interaction concept is inspired by the experience of purchasing a ticket at a train station with assistance from staff. Digitising this interaction creates a chatbot-like interface that asks guided questions to understand the traveller's needs before offering tailored travel suggestions. The chatbot suggests multiple tickets based on criteria such as price, travel time, and transfers, while also providing tips throughout the booking process. Figure 7.3 presents the interaction concept.

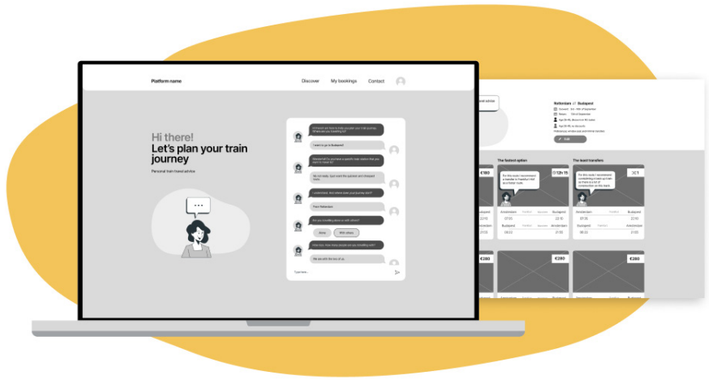


Figure 7.3 Interaction cocnept 2 Digital travel guide

Interaction concept 3: Railscanner

Based on the traveller and RHDHV interviews, there appeared to be a general consensus for a "Railscanner" platform (figure 7.4), similar to Skyscanner, to provide extensive filter options and personalised searches for train tickets. Therefore this third interaction concept embodies those elements of Skyscanner. Learning from the feedback provided during the user tests of DB in which filters were unclear, this interaction concept provides tips for how each filter can be applied to bridge that knowledge gap.

Figure 7.4: Interaction concept 3 Railscanner

Interaction concept 4: Ticket to ride

The last concept, "Ticket to Ride," (figure 7.5) presents the various train routes visually on a map. Instead of sorting through multiple tickets for each route, travellers select their desired route first, then view available tickets for it. Routes are categorised by labels like fastest, least transfers, and cheapest, streamlining the route selection process.

Figure 7.5 Interaction concept 4 Ticket to ride

7.2.2 User test setup

User tests were conducted with 6 participants to evaluate the different interaction concepts. The participants were recruited through my personal network. Specific details about the participants are presented in table 7.1.

The participants were provided with a scenario and a task to book a ticket on each of the interaction prototypes. After interacting with each prototype they are asked to fill out a short survey in which the design criteria are mapped on a likert scale. After the survey, the user experience is discussed. For a more detailed description of the user test setup, see appendix H.

Characteristics	# of participants
Travel history	
No international train travel experience in Europe	5
International train travel experience in Europe	1
Booking experience	
No experience booking international train tickets	6
Experience booking international train tickets	0
Booker persona	
Responsible strategist	2
Efficient booker	2
Vulnerable rookie	2
Age	
16 - 30	2
31 - 50	2
51 +	2
Gender	
Male	4
Female	2
Total number of participants	**6**

Table 7.1: Sprint 1 user test participants

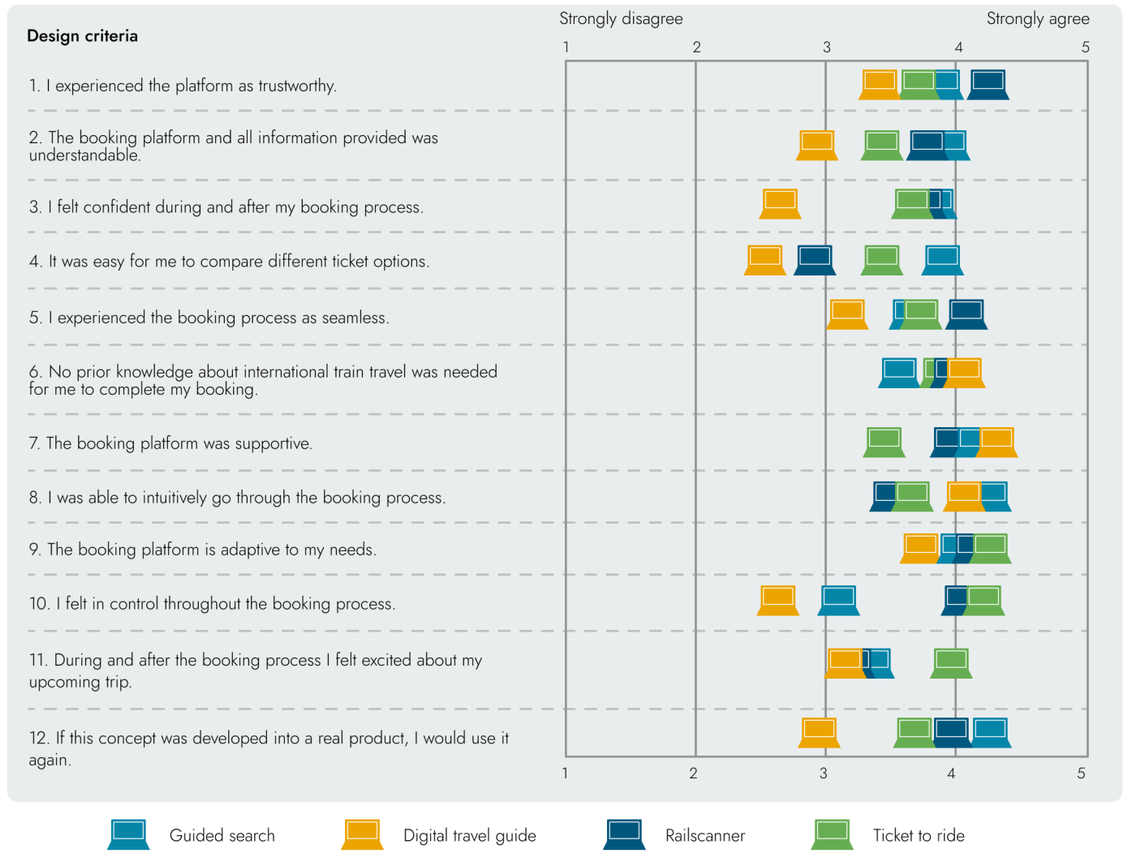


Figure 7.6: Design criteria survey results sprint 1

7.2.3 Main user test insights

The survey results are presented in figure 7.6. The ‘Guided search’ scores highest on most of the criteria. However, the discussion with participants revealed no clear favourite among the interaction concepts but rather a preference for certain features and qualities of each concept. In the first ‘Guided search’ concept, participants appreciated the ability to select route preferences and travel modes. Nonetheless, they felt a lack of control due to not understanding the criteria used by the system to select travel modes, and feeling uncertain about which routes may not be included in their search results. In addition, they found the process cumbersome due to the numerous steps required. Similarly, in the ‘Digital Travel Guide’ concept, participants felt the process was lengthy for repeated use but appreciated the supportive elements as it gave them something to lean on. The ‘Railscanner’ concept was deemed highly useful by participants who liked its filters and accompanying tips, although they found the presentation overwhelming. Finally, participants liked the visual aspect that the last ‘Ticket to ride’ concept provided, as it was an effective way for them to process information while also creating a sense of anticipation and excitement about their upcoming journey.

Overall, the participant feedback offers insights into what travellers value in a booking process. They value control, preferring to make their own choices rather than relying on algorithms. They also prefer having an overview of all travel options before making selections through filters or other user-driven selections. Additionally, participants further confirmed the importance of separately selecting outward and return journeys, as they often have distinct preferences for each. They desire a quick and simple search process that can be easily repeated for comparison. Lastly, visualising information helps in efficient processing of information and enhances the excitement for the journey ahead.

7.2.4 Interaction vision

The insights from the user test inspired the following interaction vision in a form of an analogy to be realised in the following design sprints. See figure 7.7 illustrates the analogy and figure 7.8 provides further explanation for the interaction and product qualities.

“Like preparing and going on a hike”

Figure 7.7 Interaction vision

	Intuitive *Learn by doing*	Adaptive *Being in control*	Supportive *Having something to lean on*	Exciting *Explore new things*
Analogy	Hiking involves intuitive navigation, where hikers adapt to challenges along the way, learning to trust their abilities as they progress.	Hikers maintain constant control and autonomy, allowing them to make their own decisions and change directions as desired.	When choosing a hike travellers are aided in their decision making with route details and during the hike they are guided by maps and signs.	Exploring new things and feeling anticipation and excitement for the journey ahead is part of what makes hiking fun.
User test	Participants preferred hands-on learning and didn't want to rely on the system's selection criteria.	Participants expressed the importance of control and the option to adapt the platform to their needs.	Guidance was an aspect that participants liked during the user test.	Exciting elements like the maps were appreciated by participants.
Product quality	The product should be intuitive to allow travellers to learn by going through the process and build confidence about their journey both at home and along the way. An intuitive product is informative, responsive and guiding.	To align with the travellers needs for control, the product should be adaptive to their needs. An adaptive product is flexible, responsive and unrestricting	The product should be supportive to guide travellers in their booking journey and throughout their travels to build trust and feel supported in their journey. A supportive product is consistent, considerate and guiding.	Travelling by train should be an exciting experience for travellers and the booking and rescheduling process should reflect that. An exciting product is pleasant, inspiring and anticipatory.

Figure 7.8: Interaction and product qualities

7.3 Sprint 2: Design concept

Goal

Manifest interaction vision into a design concept

Design activities

Brainstorm - Inspiration from existing services - Interaction vision - Prototyping in figma

Test participants

7.3.1 Ideation

The results from the previous design sprints showed that there was no preference for one specific interaction concept but rather a preference for a combination of elements from each. The insights resulted in an interaction vision that states that the product should be intuitive, supportive, adaptive and exciting. The ideation phase of this sprint focussed on exploring ways that these elements and qualities could be combined in a design concept. This was done by brainstorming on the formulated interaction vision and taking inspiration from existing booking platforms and apps. All ideas and interaction concepts were analysed, selected and combined to create the following concept.

7.3.2 Design concept

This redesigned booking platform introduces several new features aimed to create an intuitive, adaptive, exciting and supportive booking experience, figure 7.9.

One key feature is the implementation of route characteristics. Each train route has certain benefits and challenges which are easily recognised by experienced train travellers but not so easily by others. In order to bridge this knowledge gap for inexperienced travellers, route characteristics are assigned to each ticket.

These route characteristics include suggested experience level (like beginner route, intermediate route and advanced route) as well as warnings (like risk of delay, short transfer time, complex transfers), benefits (like scenic route, city transfer and dinner transfer) and general information (e.g., night trains). By highlighting the characteristics of each route, this concept aims to make comparing routes more intuitive, supportive and exciting.

Another feature is to compare routes either through a listed overview or a map. This way travellers are able to adapt the platform to meet their needs in their comparison process. The map is also presented to add to the excitement. To ensure further adaptability without overwhelming users, search filters are included, with the top three filters displayed prominently and additional options accessible through a “more filters” button.

Furthermore, travellers have the flexibility to change their selected outward and return journeys before proceeding to checkout without losing their selections. This enables them to fine-tune their itinerary until fully satisfied. In the checkout process, travel rate selection and seat reservation options are deferred to ensure travellers can make detailed choices confidently.

Additionally, a travel app was added to complement the booking platform (figure 7.10), creating a bridge between the booking process and the journey. The app provides digital tickets, a travel overview with station details, and a new feature for guiding travellers during disruptions. If a train is delayed, causing a risk of missing a transfer, travellers receive a notification with alternative route options to ensure they reach their final destination. This proactive approach not only updates travellers with relevant information but also provides clear guidance and updates their travel overview accordingly.

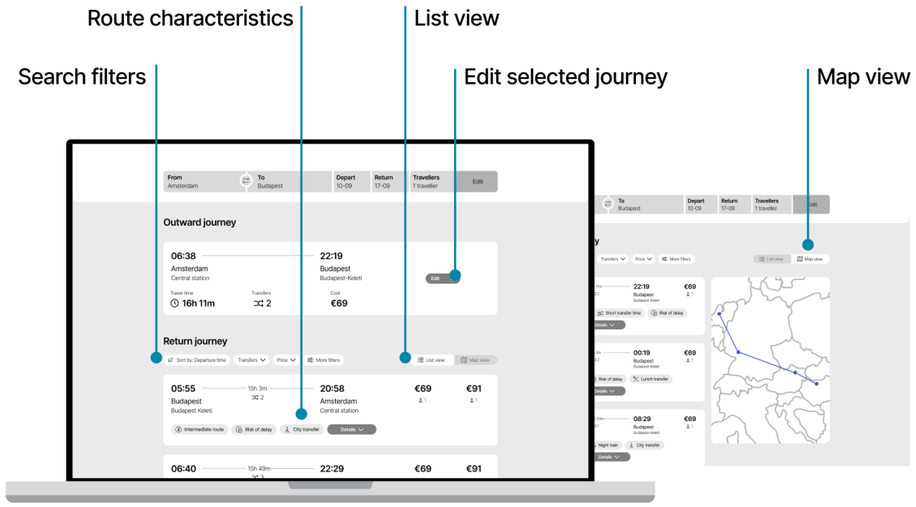


Figure 7.9: Design concept platform

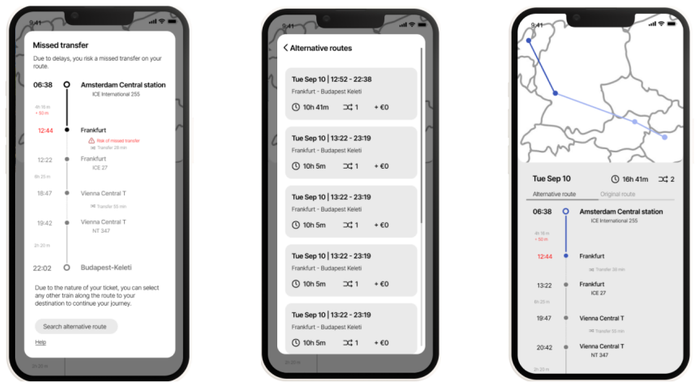


Figure 7.10: Design concept travel app

7.3.3 User test setup

In order to evaluate the concept, user tests were conducted with both novice and seasoned travellers: the former to evaluate its effectiveness in bridging the knowledge gap and the latter to assess its performance compared to existing booking platforms and services.These participants were once again recruited through my personal network and fit the characteristics as described in table 7.2. The participants are provided with a scenario and a task to book a train ticket with the booking platform prototype. Afterwards an additional scenario and task are provided to rebook a trip using the travel app prototype. The participants are observed and asked to speak their thoughts. After they have completed the tasks there is an open interview to dive deeper into their experience, followed by a survey on which the design criteria are once again mapped on a likert scale. For a more detailed description of the user test setup, see appendix I.

Characteristics	# of participants
Travel history	
No international train travel experience in Europe	3
International train travel experience in Europe	3
Booking experience	
No experience booking international train tickets	3
Experience booking international train tickets	3
Booker persona	
Responsible strategist	2
Efficient booker	1
Vulnerable rookie	3
Age	
16 - 30	3
31 - 50	2
51 +	3
Gender	
Male	3
Female	3
Total number of participants	**6**

Table 7.2: Sprint 2 user test participants

7.3.4 Main user test insights

The survey results are presented in figure 7.11. Overall the booking platform was experienced as clear and easy to use, but there were areas for improvement. Participants appreciated route characteristics and found them to be useful in the comparison between routes. However there was some confusion, particularly with categorizations like 'Beginner', 'Intermediate', and 'Advanced' since it is unclear what prompted these categorizations and participants experienced complications recognizing which one aligned with their experience level. This caused the booking platform to score lower on confidence, support, understandability and prior knowledge needed, see figure 7.11. In addition, participants expressed their desire for route suggestions with longer transfer times to compensate for route warnings like 'Risk of delay' and 'short transfer time'. Other suggestions were made to improve the checkout process by adjusting the order of travel rate and seat selection.

Regarding the travel app, participants were very excited and saw a lot of potential for the alternative route selection in case of disruption along the way. However, suggestions were given, like making comparison between alternative and original routes easier by showing them in the same frame and adding a seat rebooking option.

In conclusion, the overall concept of the booking platform and the travel app created a positive experience for travellers which could be further improved through clearer route characteristics, longer transfer suggestion, different checkout order and alternative route comparison. These insights will guide the final iteration in the following sprint.

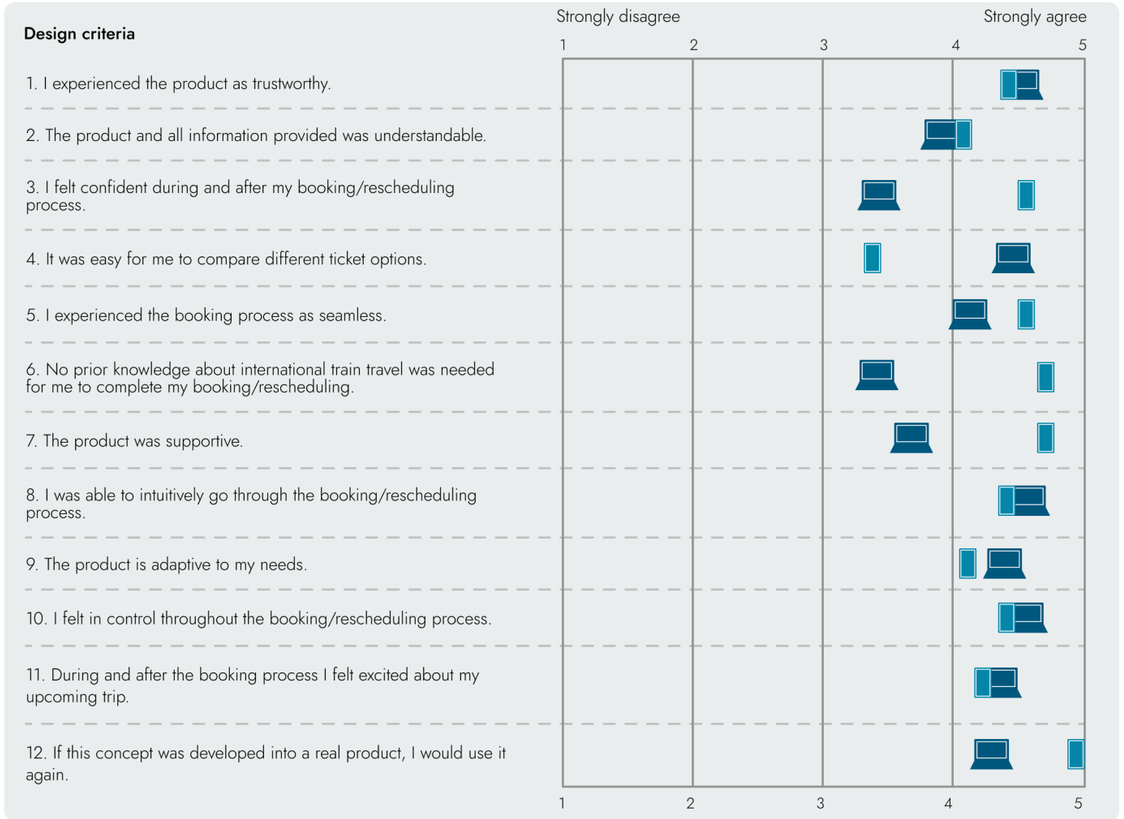


Figure 7.11: Design criteria survey results sprint 2

7.4 Sprint 3: Concept refinement

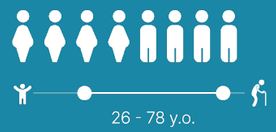
Goal

Refine the chosen design concept to develop into the final proposal

Design activities

Ideation - Brainstorm - Inspiration from existing services - Interaction vision - Prototyping in Figma

Test participants



7.4.1 Ideation

The results from the previous sprint showed that participants had an overall positive experience with both the booking platform and travel app, but there was room for improvement for route characteristics, route details, checkout and seat selection. These insights were used to brainstorm and iterate on the design. In addition, existing services and platforms served as inspiration as well as the interaction vision. The resulting ideas were refined and implemented in the design concepts.

7.4.2 Design concept

This subchapter explains some of the final design changes based on the insights from the previous sprints. These changes include route characteristics, route details, checkout and the app, see figure 7.12 en 7.13. Finally, visual UI design was included in this sprint.

Route characteristics

The route characteristics were redefined based on the insights from sprint 2 in order to make them more understandable. The ‘Beginner’, ‘ Intermediate’ and ‘Advanced’ route characteristics have been removed as they created some confusion for the users. However, a few other characteristics have been added such as: ‘Transfer between stations’, ‘No transfer guarantee’, ‘Transfer alternatives’.

Alternative transfers

In addition to changes on the route characteristics, transfer alternatives have been added to routes that have the ‘short transfer time’ or ‘risk of delay’ labels. This way travellers can easily reduce risks by selecting a transfer with more transfer time.

Checkout

The checkout process has been updated to facilitate class selection, seat selection, travel rate selection, travellers details and payment. Mainly the seat selection has been updated to fit different types of trains. In addition, a more obvious call to action was implemented since some participants unintentionally skipped the seat selection in the previous sprint.

Travel app

Finally, the app’s alternative route selection feature has been redesigned to facilitate easy comparison between original and alternative routes for users. This redesign allows users to assess their arrival time and compare their missed transfer with alternative options. Additionally, functionalities for rebooking seats and requesting compensation for delays have been incorporated to enhance the overall user experience at the end of the journey.

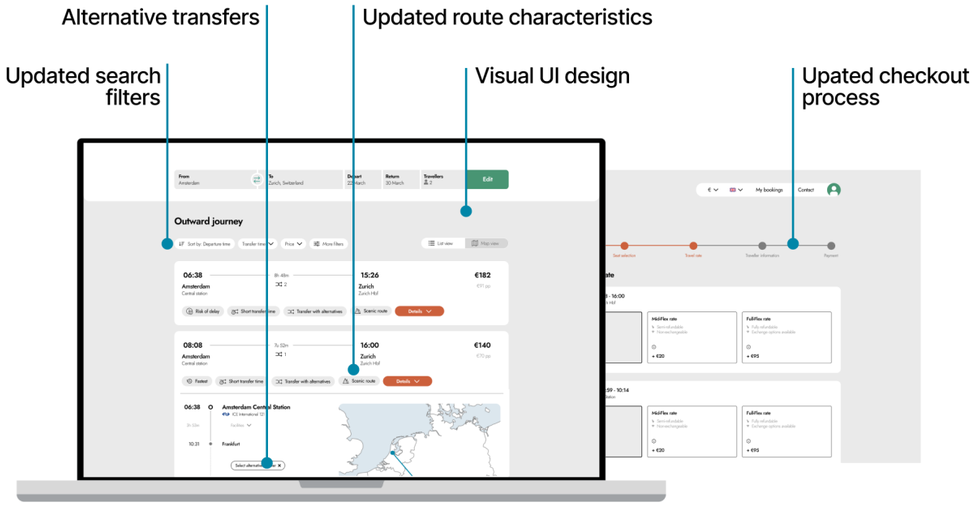


Figure 7.12: Refined design concept booking platform

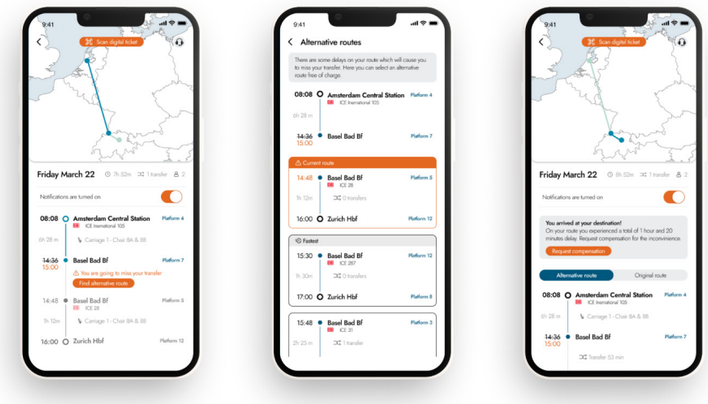


Figure 7.13: Refined design concept travel app

7.4.3 Formal user test

In order to evaluate the refined concept created during this final design sprint, a more formal user evaluation was conducted with externally recruited participants. The setup of this formal user test is presented in this subchapter and the main insights are discussed in the following concept evaluation chapter.

Goal

Similarly to the earlier concepts in the design phase, the final design proposal was tested with users. The goal of this final user test was to:

- Evaluate the final design proposal on its usability and desirability
- Evaluate to which extend the travellers needs are met
- Explore ways to improve

Setup

The user test was conducted online through Zoom, starting with a general introduction and short interview about the participants background and perception of international train travel. Afterwards participants were sent a link to the figma prototypes through which they were asked to complete a number of tasks. While interacting with the prototype, participants were asked to share their screen so the interaction could be observed. In addition, participants were asked to talk out loud to gain insights in their thoughts, consideration and reasoning. After completing all the tasks, their experience was further discussed through an interview. After the debriefing interview and discussion, the session is concluded with a survey to evaluate the prototype based on the design criteria and the System Usability Scale (SUS). A System Usability Scale is widely used to measure the perceived usability of a product or service (Albert and Tullis, 2022). For more details about the test setup, see appendix J.

Participants

Nielsen and Landauer (1993) argue that a sample size of 6 participants provides insights into 75% of usability issues in qualitative research. However, Faulkner (2003) argues that a larger sample size that is representative for the target group population will provide more data confidence. Therefore, the user tests were conducted with a total of eight participants. In order to achieve a representative spread of the target group, participants were recruited to fit a somewhat equal male to female ratio and a variety of different age groups. However, next to demographic requirements, participants should align into a certain travellers profile to fit the target group of this study. The participants for the user tests were externally recruited and therefore had no prior knowledge or bias about the project. Table 7.3 presents the characteristics of the test participants.

Characteristics	# of participants
Travel history	
No international train travel experience in Europe	5
International train travel experience in Europe	3
Booking experience	
No experience booking international train tickets	6
Experience booking international train tickets	2
Booker persona	
Responsible strategist	4
Efficient booker	2
Vulnerable rookie	2
Age	
16 - 30	3
31 - 50	2
51 +	3
Gender	
Male	4
Female	4
Total number of participants	**8**

Table 7.3: Externally recruited user test participants

7.5 Conclusion

This chapter outlines the design approach and corresponding methods that were used to iterate towards a desirable and usable booking process. The iterative design process consisted of three consecutive design sprints, where insights from each sprint guided the ideation phase of the subsequent one. The initial sprint aimed to explore interaction concepts, which were then tested with users. These test insights inspired the interaction vision: “Like preparing and going on a hike,” characterised by qualities such as Intuitive, Supportive, Adaptive, and Exciting. The second and third sprints focussed on manifesting the interaction vision and its qualities into a refined design concept. This design concept is further evaluated in the following chapter.

8.

Evaluation

Evaluating the design concept with users and stakeholders

This chapter aims to evaluate the refined design concept of the final sprint. This evaluation was done based on formal user tests of which the test setup is presented in the previous chapter. The user test provides insights into the user experience and usability. In addition, the concept was presented to stakeholders. The insights of this session are presented in this chapter along with some final recommendations. The following chapter presents the final design proposal.

8.1 User evaluation

The desirability and usability of the final design proposal were tested with the target group through user test. The participants for the user tests were externally recruited and therefore had no prior knowledge or bias about the project. The method is further explained in chapter 7.4.3. The user test provides insights into the usability and the user experience.

8.1.1 Usability score

The survey at the end of the user test provides some quantitative insight into the usability of the design proposal. This resulted in an average System Usability Scale score (SUS) of 94,1. According to the adjective rating scale of Bangor et al. (2009) this results aligns with an 'Excellent' usability score. Figure 8.1 presents these results in comparison to the SUS scores of NSI, DB and Trainline, acquired in the user tests of the Analysis phase of this project.

The average SUS scores of NSI, DB and Trainline translate to OK, Poor and Good usability, respectively. However, there is a larger deviation with these results with the usability ranging from Poor to Good with outliers in Excellent. In comparison, the usability of the design proposal demonstrates more consistency, as all SUS scores fall within the Excellent rating range. With these results, one could conclude that the usability and therefore bookability has significantly improved with the proposed design. However, it should be noted that both the design proposal and current booking platforms were tested with a user group of 8-10 participants. In order to gain more reliable quantitative insights into the usability of these services, user tests should be conducted with a larger sample size. Nonetheless, the consistency of the current results show great promise which should be further explored in large scale user testing. The explanation behind the SUS scores can be found in appendix K.

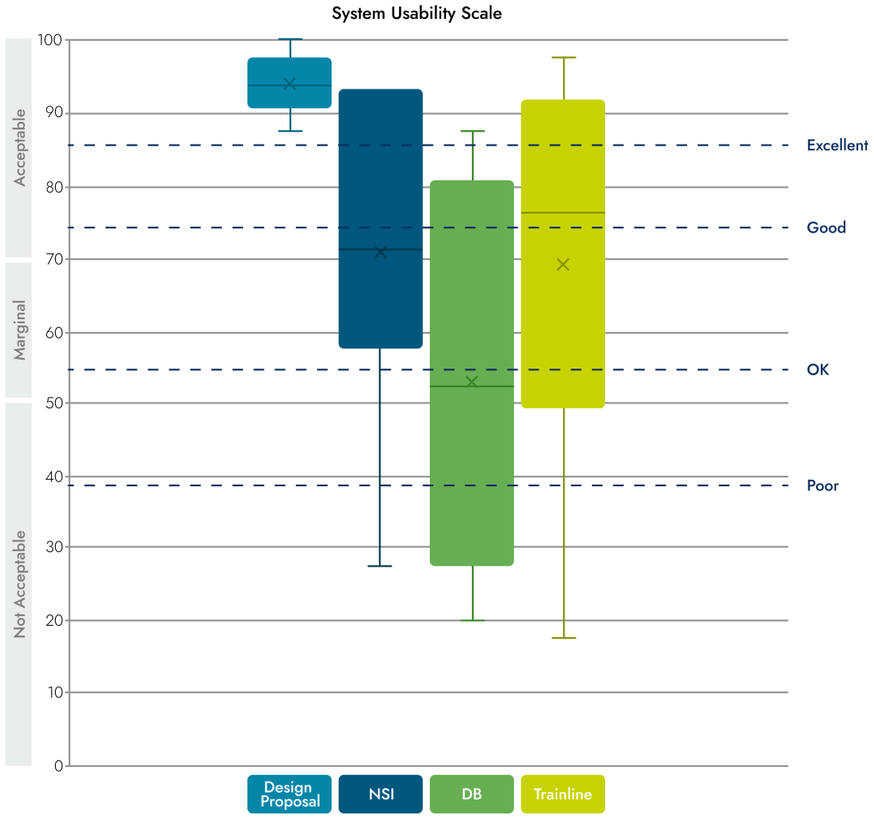


Figure 8.1: SUS scores of the design proposal, NSI, DB and Trainline

8.1.2 User experience

In addition to the usability, the overall traveller experience of the resigned booking platform and app is positive considering the overwhelming amount of positive comment from all participants. They perceived the booking process as easy, understandable and smooth. Some participants compared it to their previous booking experience and said it was much easier. The following sections will analyse the different features in depth.

"What I found funny is that for me there was actually nothing striking. So which is actually a good sign because everything went very smoothly and made sense." - User test participant 1

"That was very easy." - User test participant 3

"Clear! That's the first thing that comes to mind." - User test participant 4

"Compared to how I was struggling this week I did find it, yes the options were clear and the price. I actually found it quite clear now." - User test participant 5

"This works so nicely. Too bad it's not here yet." - User test participant 5

"I found it quite easy." - User test participant 6

"It was actually easy I must say. And clear." - User test participant 7

"Yes, exactly what you hope to expect from it." - User test participant 8

Route characteristics

The route characteristics were considered to be useful by most participants since it encouraged them to think about more than prices and time and they knew exactly what they were signing up for. Therefore, one could conclude that the route characteristics have the intended impact of bridging the knowledge gap.

"It encourages you to think about more than just price and time which allows you to make an even better considered choice. I liked that it was there actually." - User test participant 1

"You don't get any unforeseen surprises. Or you get what you don't want at all" - User test participant 2

However, participants varied in their response to the route characteristics and how it influenced their route selection. Some participants avoided routes with warnings like 'short transfer time' and 'risk of delay', instead opting for 'scenic routes' or routes with a 'city transfer'. In contrast, other participants barely considered the route characteristics and did not let them influence their ticket choice at all. These participants either assumed that the route warnings were not that serious or they did not mind taking the risk considering the price. Either way, all participants were making informed decisions which was the intended purpose of this feature.

"This seems like fun. That you can walk around in a big European city along the route." - User test participant 7

"Yes, that ['short transfer time'] would be a dealbreaker for me." - User test participant 4

"I'll see how it goes and kind of let it come to me." - User test participant 3

"Yes, well I am going to Switzerland so that should be fine." - User test participant 8

Transfer alternatives

Having the option to select a route but add more transfer time by opting for a later train is an appealing option to most travellers. Especially holiday travellers as they want to relax and take their time. However, participants initially didn't consider this feature as it is something they have not seen before and therefore don't expect this option to exist. This caused most participants to not be able to find this feature by themselves. Therefore, some participants were limited in their travel options as they avoided routes with 'short transfer time', not knowing that they could select an alternative transfer to avoid this risk. Therefore, if this feature were to be implemented in a booking platform, proper introduction or easy recognition would be required.

"I don't like that [short transfer time] when I am going on holiday." - User test participant 7

"I don't think I would go for more transfer time. We are still young so I can run if I have to. I would still take that risk." - User test participant 3

Filters

The filter options were appreciated by most participants, although some struggled with them. Specifically, the older participants (age group 50+) experienced challenges with the filters. This was primarily due to certain filters being concealed under the 'more filters' button, leading to participants not being able to find them or them not being aware of filter options. In addition, similarity in filter names further added to the confusion among this demographic. Therefore, for future designs, accessibility for all demographics should be considered.

Seat selection

A feature that was not necessarily a new introduction in this design proposal, but prompted many comments from participants, was the seat selection. In most cases it made sense to travellers that the seat selection was part of the checkout process. However, in the case of a night train, participants wanted more information about the seating options earlier in the booking process. For night trains there are various seating, bunk and cabin choices with great differences in prices. Therefore, this creates a much bigger impact on the decision making process in the comparison phase of the booking.

Travel app

Finally, participants were very excited about the travel app and the help it provides in the case of disruption, saying it was super easy and they would definitely use it if it were ever developed. During the user tests all participants were able to rebook their journey within just a few steps. Some participants even mentioned that it would lower the threshold for them to travel by train.

"It should be as easy as possible and I feel like the app makes it as easy as possible." - User test participant 3

"That such an app thinks with you is really a plus." - User test participant 5

"This is extremely easy so I would definitely want to use it." - User test participant 7

8.2 Stakeholder evaluation

In addition to validating the concept with users, it was evaluated with stakeholders. The design proposal was thoroughly discussed and presented across multiple sessions with the Dutch national carrier and ticket distributor, NS International. The Sales, Payment & Ticketing Specialist, Booking Platform Product Owner, UX designers and other members of the design team were included in these discussions. Overall the stakeholders were intrigued by the project findings and design concept. They recognized some of the travellers' pain points, yet were surprised by others. Some interesting discussion topics were raised.

8.2.1 Risk of information overload

Firstly, it is crucial to find the right balance in the information provided in a way that is empowering travellers but does not overwhelm them. This was a topic of discussion within NSI's design team as they are actively exploring this balance. With this design concept there is a risk of potentially overwhelming travellers with the amount of route information. Currently, in the design concept, this is tackled by only presenting essential information so that travellers are able to make informed decisions. For example, the concept does not dive into the intricacies of the various ticketing systems, but rather highlights risks and benefits of each route providing insights without overwhelming travellers.

8.2.2 Level of transparency

Another topic of discussion was the level of transparency. Currently, NSI makes certain behind the scene selections for travellers in the types of routes and tickets that are presented on the platform. For example, routes with a transfer time shorter than 10 minutes are not presented. Considering the travellers need for transparency and control, NSI wondered about the level of transparency required. Based on my research, I believe the transparency travellers want is more aimed towards what they can expect on their journey and they desire control over their route selection.

8.2.3 Wrong advice in case of disruption

Although theory might suggest certain travel rights, practice often proves to be different. For example, travellers who miss their transfer with an IRT ticket, might still be allowed on the next train depending on the conductor. This sparked a topic of discussion with the product owner and UX designers of NSI, highlighting the risk of providing travellers with the wrong guidance that does not work in their benefit. Therefore, in order to properly guide travellers during their travels, there needs to be a clear disruption protocol.

8.3 Future recommendations

Based on the evaluation with users and stakeholders there are some final recommendations for improvement for future development of the designs.

8.3.1 Feature introduction

The user evaluation showed that new features like 'Transfer alternatives' should be properly introduced or easily findable by users. Since travellers are not familiar with these features, they require a clear introduction in order to use and find them as currently these features can get overlooked.

In addition, user test participants expressed how the app would lower the threshold for them to travel by train. Therefore travellers could benefit from learning about this supportive travel app feature even before the booking process.

8.3.2 Night train seat selection

The analysis revealed that travellers prefer not to make detailed decisions about their journey until they can see the overview of both the outward and return trips together. However, there is an exception for night trains, as the significant cost difference between seat, bunk, and cabin options may influence travellers' decisions. Therefore, how and when this seat selection option for night trains is presented should be further explored in future research and designs.

8.3.3 Inclusive design

The user test indicated that individuals aged 50 and above encountered difficulties with using filters. Thus, future designs should take this age group into account.While all user test participants had no issues with the travel app, it's important to note that some elderly travellers may not be as comfortable relying solely on digital tools like travel apps. Therefore, enhancing or developing additional service touchpoints to support these travellers during their international train journeys is recommended.

8.3.4 Travel information

Considering the discussion topics of potential information overload and balance in transparency, it is advised to further explore what information travellers require to confidently make a well informed decision.

8.2.5 Disruption scenarios

Finally, in order to ensure travellers are properly guided in the event of disruption, more research should be conducted on the disruption cases in which traveller's rights are not as straightforward and don't have simple solutions such as getting on the next train or buying a new ticket.

8.4 Conclusion

This chapter aims to evaluate the refined design concept of the final sprint. This evaluation was done based on formal user tests of which the insights show a positive user experience excellent usability score. In addition, the concept was evaluated and discussed with stakeholders who expressed intrigue for the findings and design concept. Based on the evaluation, it is recommended for future research and design to properly introduce new features like transfer alternatives and the travel app. In addition, the moment of seat selection for night trains should be further explored. Furthermore, designs must accommodate the difficulties faced by users aged 50 and above with filters and digital tools, while also ensuring inclusive design for all travellers. Lastly, further research is needed to determine the essential information required by travellers for confident decision-making and to address disruption scenarios where travellers' rights are not straightforward. Now that the design concept has been validated, the following chapter presents the final design proposal.

9.

Final design proposal

Reshaping the booking process of international train tickets in Europe

The iterative design process and subsequent evaluation led to the final design proposal. This design proposal consists of a redesigned booking platform and travel app which aim to improve the bookability of international train tickets in both the initial booking and potential rescheduling phases of an international train journey. This chapter introduces the final design proposal and the redesigned user journey. Then the core features are presented that facilitate the user journey. Finally, a service blueprint is used to further investigate the on stage and backstage action required to support this design proposal. The following chapter presents the final conclusion, discussion and recommendations.

9.1 Reshaping the booking process of international train tickets in Europe

The final design proposal aims to reshape the booking process of international train tickets in Europe. This includes improving the initial booking process as well as guiding travellers through a potential rescheduling phase in the event of disruption along the way. In order to do so the redesign includes a booking platform and travel app.

Created to be intuitive, supportive, adaptive and exciting, this redesign booking platform aims to ensure that travellers, regardless of their prior travel experience, can easily book a suitable train ticket, leaving them feeling confident and excited about their journey ahead. The booking platform is structured to align with the decision making patterns of travellers. Features such as route characteristics, alternative transfers and search filters were created to support travellers to easily recognise suitable tickets and provide the options to reduce risks of disruptions along the way.

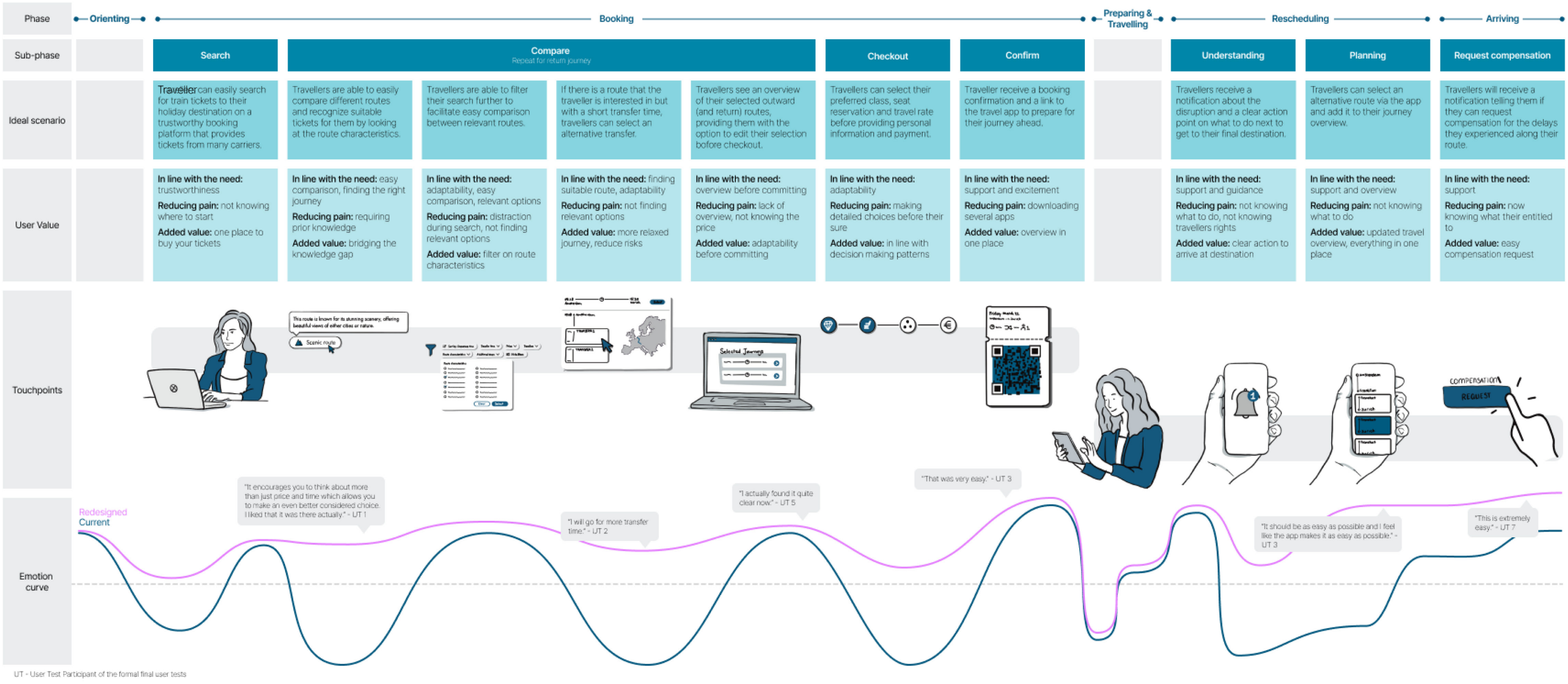
In case disruption does occur, the travellers are supported by the travel app that provides clear guidance for how they can continue their journey. The app's proactive approach and intuitive steps ensure that travellers know how they can reach their final destination.

Figure 9.1: Final design proposal

9.2 Redesigned user journey

The redesigned user journey communicates the design proposal. Figure 9.2 illustrates the redesigned user journey through the ideal scenario, how each step brings value to the user, which touchpoints accommodate the scenario and finally, how the emotional curve compares to the current design journey. The emotion curve is based on the results from the user tests as discussed in the previous chapter.

The proposal is designed to align with the user needs and decision making patterns. The booking platform interaction flow is mainly structured around facilitating easy comparison of the outward and return journey combined before committing to them and moving onto checkout. Within the checkout process, travellers can make more detailed decisions regarding their journey, such as selecting their preferred class, seat, and travel rates. The travel app was designed to complement the booking platform, creating a bridge between the booking process and the journey. The interaction flow of the travel app is dependent on what travellers encounter along the way. This is further explained in the following section. The full booking platform and travel app flows are presented in appendix L.



UT - User Test Participant of the formal final user tests

Figure 9.2: Redesigned user journey

9.3 Core features

This section discusses the design features of the booking platform and travel app in more detail. First the features are introduced after which this section delves into how each component tackles existing challenges, meets travellers' needs, and aligns with the personas.

9.3.1 Booking platform

Starting with the booking platform, the core features include route characteristics, transfer alternatives and search filters. Figure 9.3 illustrates the prototype with each feature.

Search filters

Provides support in finding suitable routes by filtering out irrelevant options.

Alternative transfers

Reduce risks of a potential missed transfer by selecting an alternative transfer.

Route characteristics

Provides insights into the risks and benefits of each route for users to make well informed decisions.

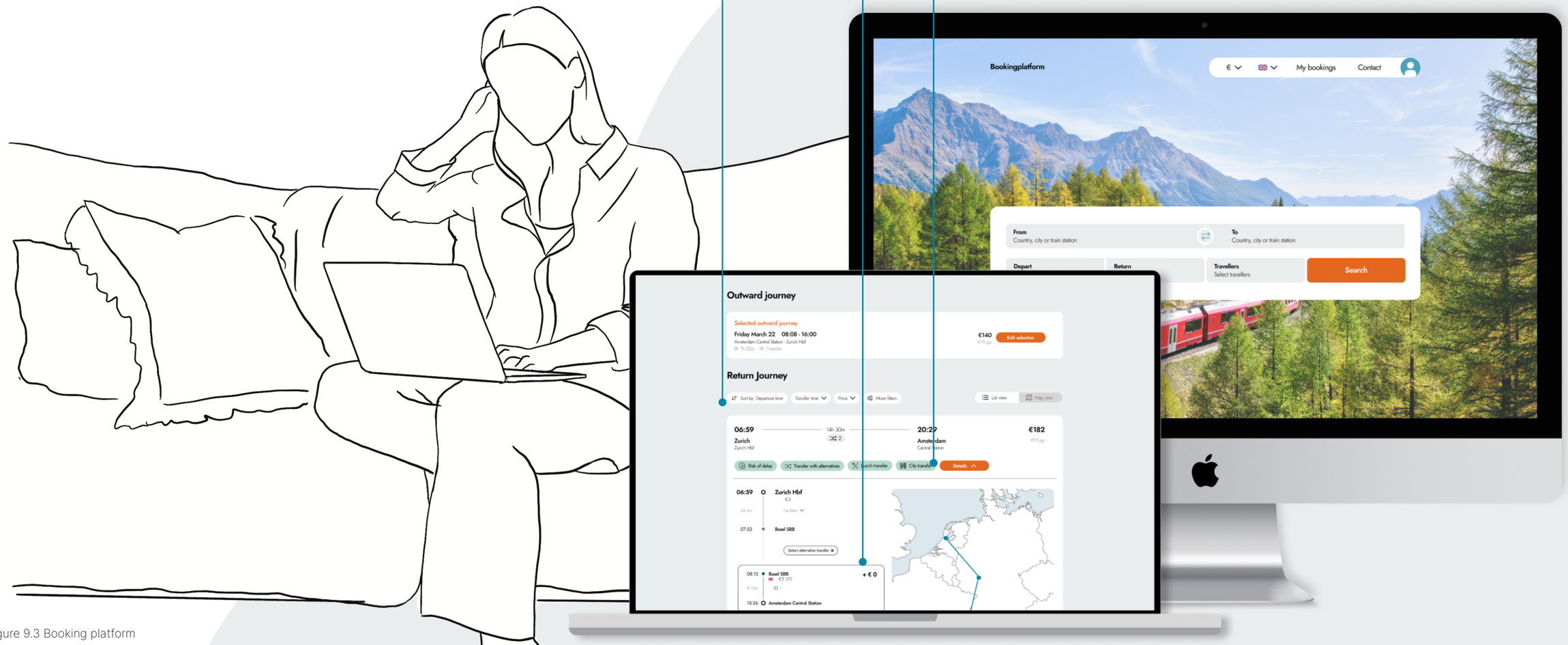


Figure 9.3 Booking platform

Route characteristics

Each route is presented with labels highlighting characteristics of that route. These characteristics include both potential route risks and benefits, see figure 9.4. This feature aims to encourage travellers to consider more than just the ticket price and travel time. With this new feature, all travellers are able to recognize the risks and benefits of each route, regardless of their previous travel experience. For a full list of all the characteristics, see appendix M.

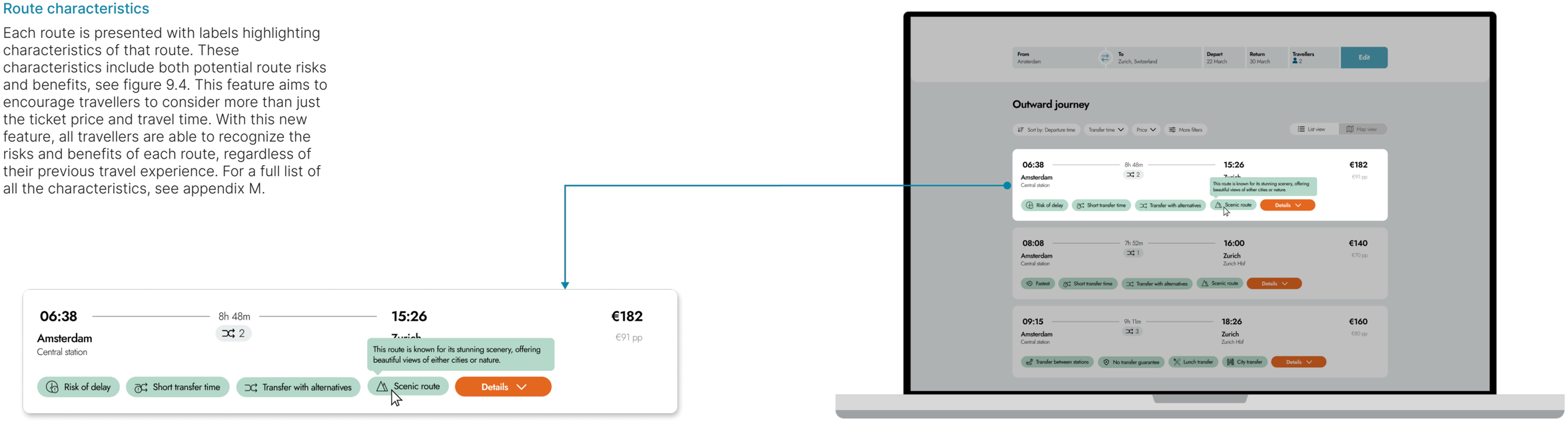


Figure 9.4: Route characteristics

Reduce pains

Currently, travellers require prior knowledge about international train tickets and the system behind it in order to book a suitable ticket. Route characteristics aim to resolve this issue by providing insight into what travellers can expect of their journey without overloading them with the intricacies of the complex international train system. Transparency about the risks and benefits of each route, empower travellers to make well-informed decisions.

Align with need

In addition to resolving the pain of requiring prior knowledge and lack of transparency, route characteristics can support travellers in their comparison process. Through route characteristics, travellers are able to easily recognize suitable routes and anticipate their journey.

Responsible strategist

Certainty - Control - Autonomy

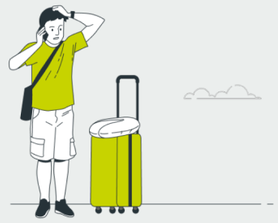
The responsible strategist is able to fully prepare and anticipate all potential risks of each route.

Efficient booker

Efficiency - Overview - Clarity

This feature helps the efficient booker to effectively compare routes without too much effort.

Vulnerable rookie

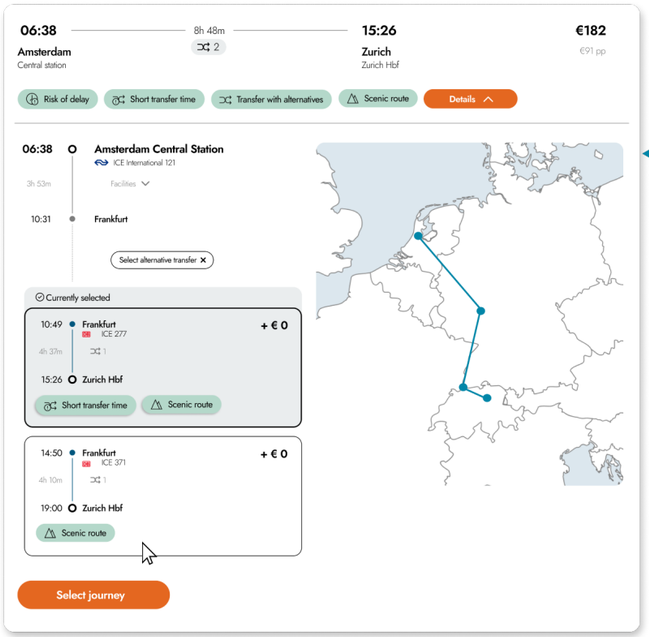


Support - Guidance - Trust

The vulnerable rookie is encouraged to consider more than just price and travel time when selecting routes.

Alternative transfers

In the case travellers are interested in a route but would prefer more transfer time, some routes provide alternative transfer options. Especially for routes with short transfer times and risk or delays, these alternative transfers could provide more security for travellers and lower the barrier for them to select that route.



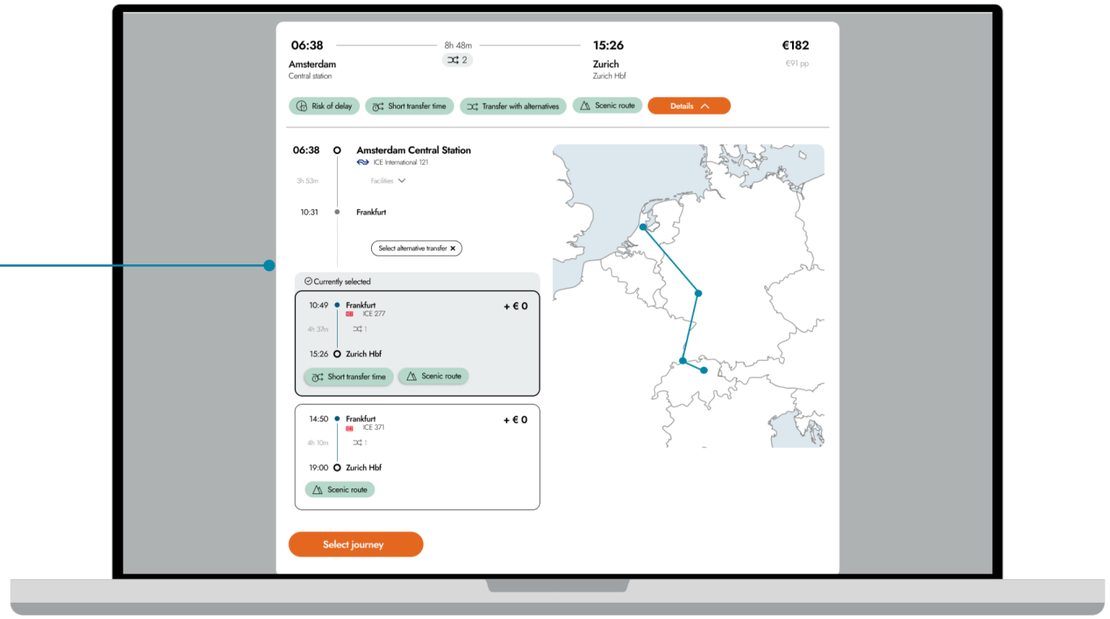


Figure 9.5 Alternative transfers

Reduce pains

Currently, travellers are not always aware of the potential risks of each route but also are not always able to select more transfer time if they want to reduce that risk. This leaves a large group of travellers vulnerable to encountering disruption along their route through missed transfers, making it more difficult for them to find suitable routes. The option to select an alternative transfer reduces these pains.

Align with need

Through user tests of the early design sprints, it became apparent that travellers want to be able to adapt to the insights provided by the route characteristics. By selecting alternative transfers, travellers are able to reduce some of the risks of routes they are interested in. This also aligns with the need for control and adaptability.

Responsible strategist

Certainty - Control - Autonomy

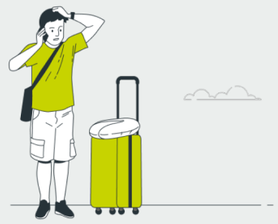
By selecting alternative transfers, the responsible strategist is able to adapt their journey and reduce risks.

Efficient booker

Efficiency - Overview - Clarity

The efficient booker is able to easily and quickly find a route with fewer risks by selecting an alternative transfer.

Vulnerable rookie

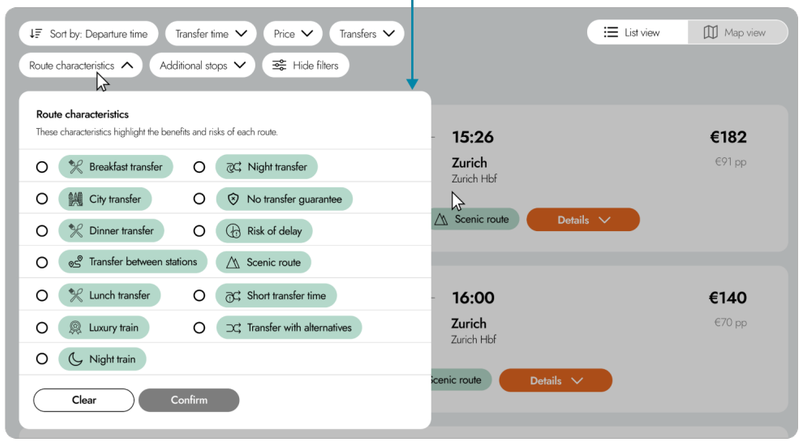


Support - Guidance - Trust

The vulnerable rookie is encouraged to consider more transfer time and reduce the risk of missing transfers.

Search filters

To support travellers in finding relevant travel options, search filters are included in the design. The top three most popular filter options are prominently displayed and additional filters can be accessed through the “more filters” button. In order for all travellers to be able to use these filters, clear language is used.



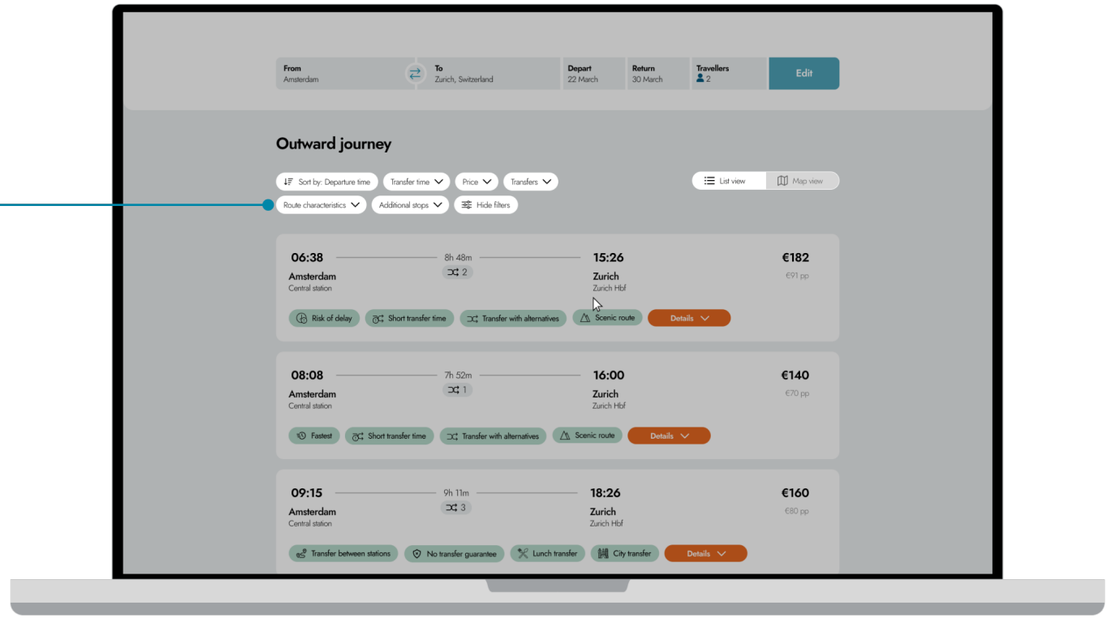


Figure 9.6: Filters

Reduce pains

Currently, booking platforms do not always facilitate easy comparison and this is partially due to the lack of filter options causing the overview to be cluttered with irrelevant routes. In order to reduce the pain of not being able to find suitable routes, travellers are able to apply filters.

Align with need

The filters align with the travellers’ need for easy comparison. Given the importance of the comparison stage during booking, it’s crucial to facilitate seamless comparison. The filters are tailored to aspects travellers commonly consider, such as departure time, travel duration, price, number of transfers, and transfer duration. Additionally, this feature offers the added benefit of adding extra stops along the route and filtering based on route characteristics.

Responsible strategist

Certainty - Control - Autonomy

The responsible strategist is able to adapt their overview to only present journeys with little risks by selecting more transfer time and filtering on route characteristics.

Efficient booker

Efficiency - Overview - Clarity

The efficient booker is able to easily filter out all irrelevant travel options, allowing them to quickly find their ideal journey.

Vulnerable rookie

Support - Guidance - Trust

The vulnerable rookie is guided in their search for their ideal journey by filtering based on their priorities.

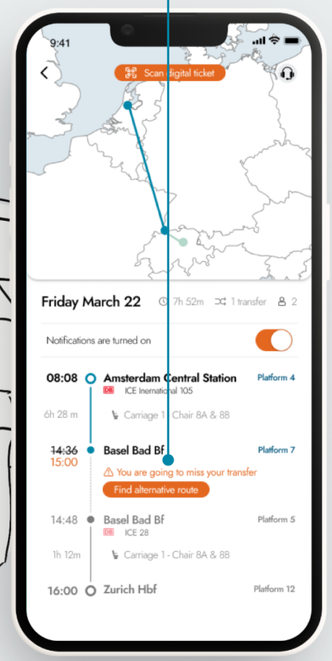
9.3.2 Redesigned travel app

A travel app was redesigned to complement the booking platform, creating a bridge between the booking process and the train journey. The app provides digital tickets, a travel overview with station details, and a new feature for guiding travellers during disruptions.

If a train is delayed with a risk of a missed transfer, travellers receive notifications and alternative route options to ensure they reach their final destination. This proactive approach not only updates travellers with relevant information but also provides clear guidance and updates their travel overview accordingly. Consequently, travellers receive updates about this newly selected route.

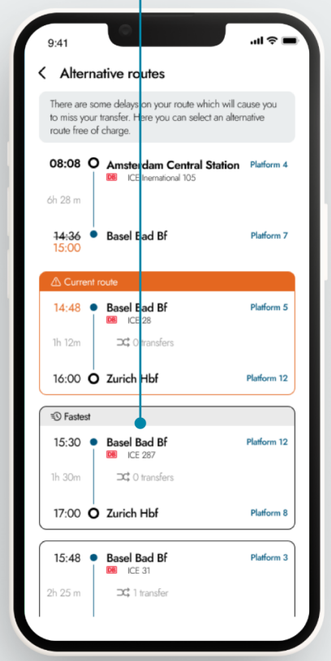
Disruption warning

The app proactively warns the traveller about upcoming disruption and provides clear directions for how to continue.



Alternative routes

Adapt the travel plan by selecting an alternative route to reach the final destination.



Updated journey overview

The journey overview is updated based on the selected alternative route.

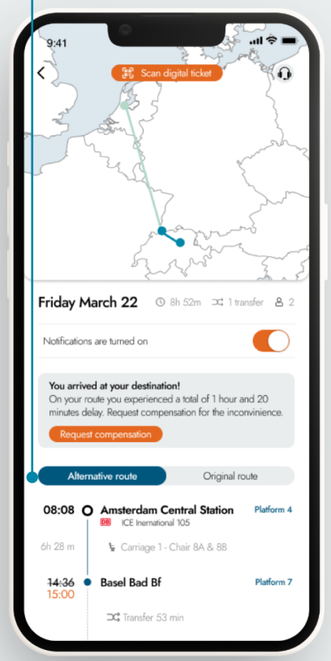


Figure 9.7: Travel app

Disruption scenarios

The interaction flow of the travel app is dependent on what travellers encounter along the way. If their journey is disrupted and needs to be rescheduled or rebooked, the interaction flow is built to intuitively guide them through this process to ensure they get to their final destination. A few different disruption scenarios are explored.

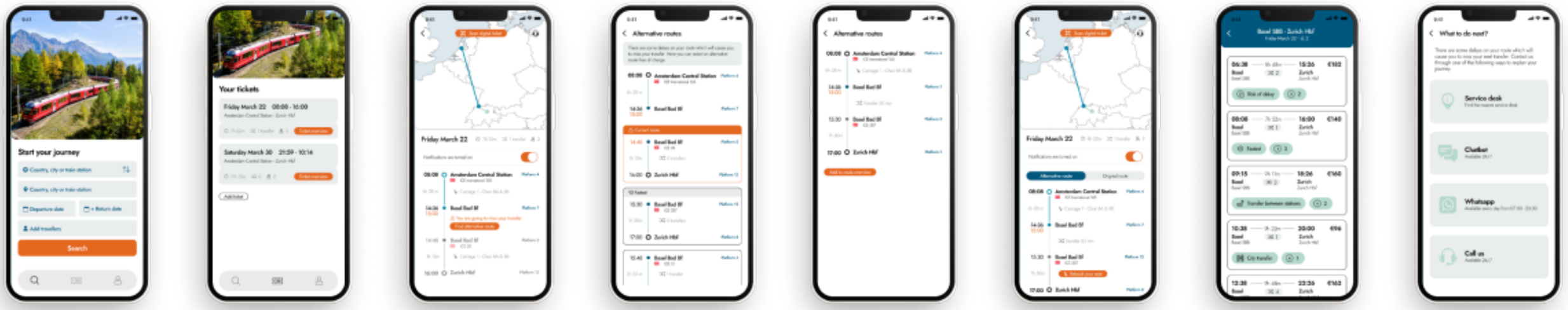


Figure 9.7: Travel app screens

Reduce pains

Currently, travellers experience a lot of pains when they have to reschedule their train journey. They often are not aware of their rights and have no idea how to continue. The existing touchpoints, like conductors and apps, are not sufficiently supporting them in this process. The travel app aims to reduce these pains by providing clear directions for how to continue their journey.

Align with need

The guidance of the travel app in the event of disruption aligns with the travellers' need for support in these moments. The clear action points provide perspective and security for travellers to continue their journey which ultimately helps travellers feel confident during their travels. The updated overview provides the additional value of having everything in one place and receiving notifications and travel information for the updated route.

Responsible strategist

Certainty - Control - Autonomy

The responsible strategist is supported in their efforts to safely reach their final destination.

Efficient booker

Efficiency - Overview - Clarity

The efficient booker is able to seamlessly continue their journey.

Vulnerable rookie

Support - Guidance - Trust

The vulnerable rookie is able to trust the guidance of the app to reach their final destination.

Scenario 1: Select alternative route

In this first scenario, the traveller travels with a singular travel contract with an NRT ticketing system. If they encounter disruption along the route they can select an alternative route through the app to get to their final destination. Figure 9.8 presents the user flow of this scenario.

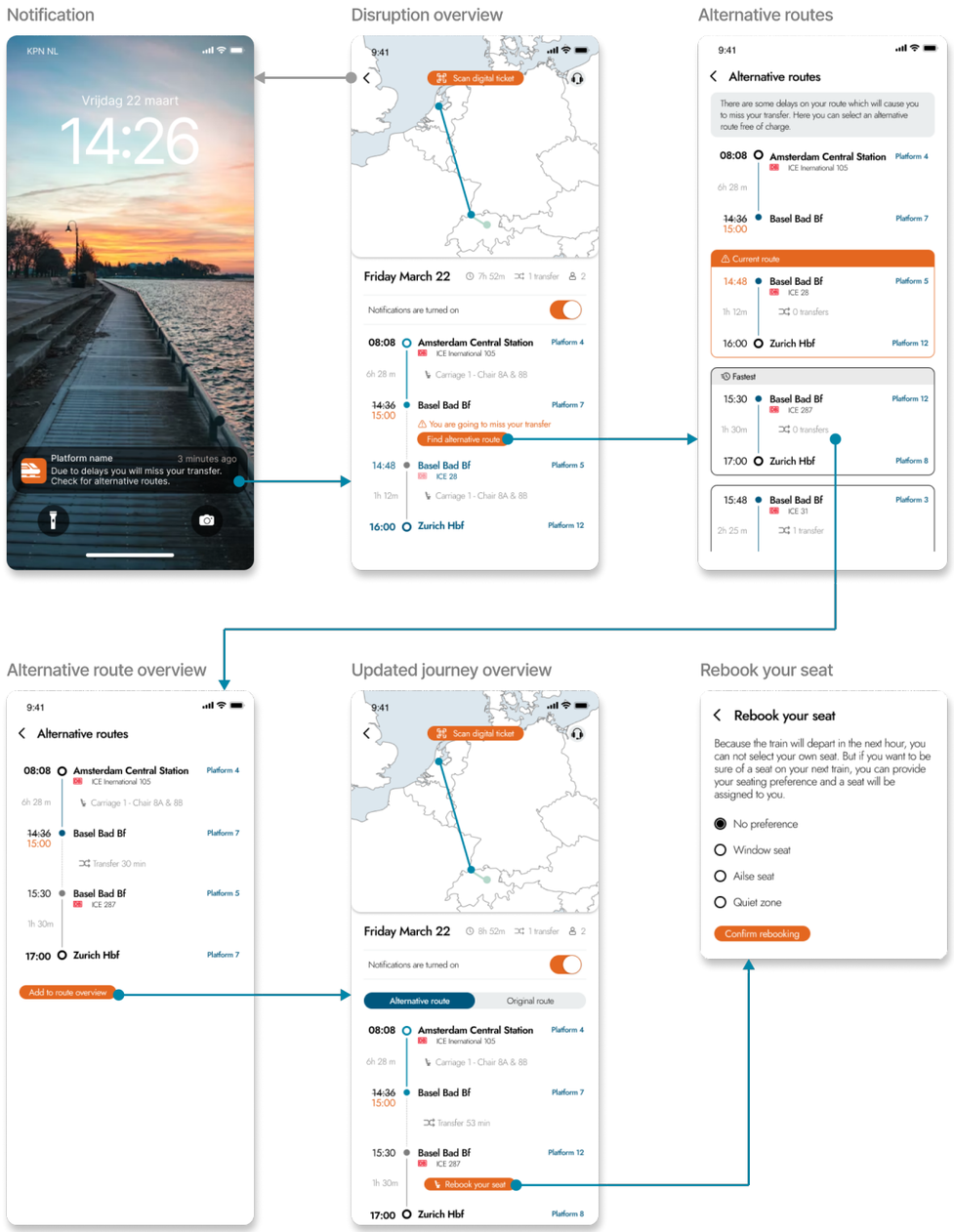


Figure 9.8: User flow scenario 1

Scenario 2: Book a new ticket

In the second scenario, travellers either travel with multiple travel contacts or with IRT tickets. If they encounter disruption along the route they unfortunately must purchase a new train ticket to reach their final destination.

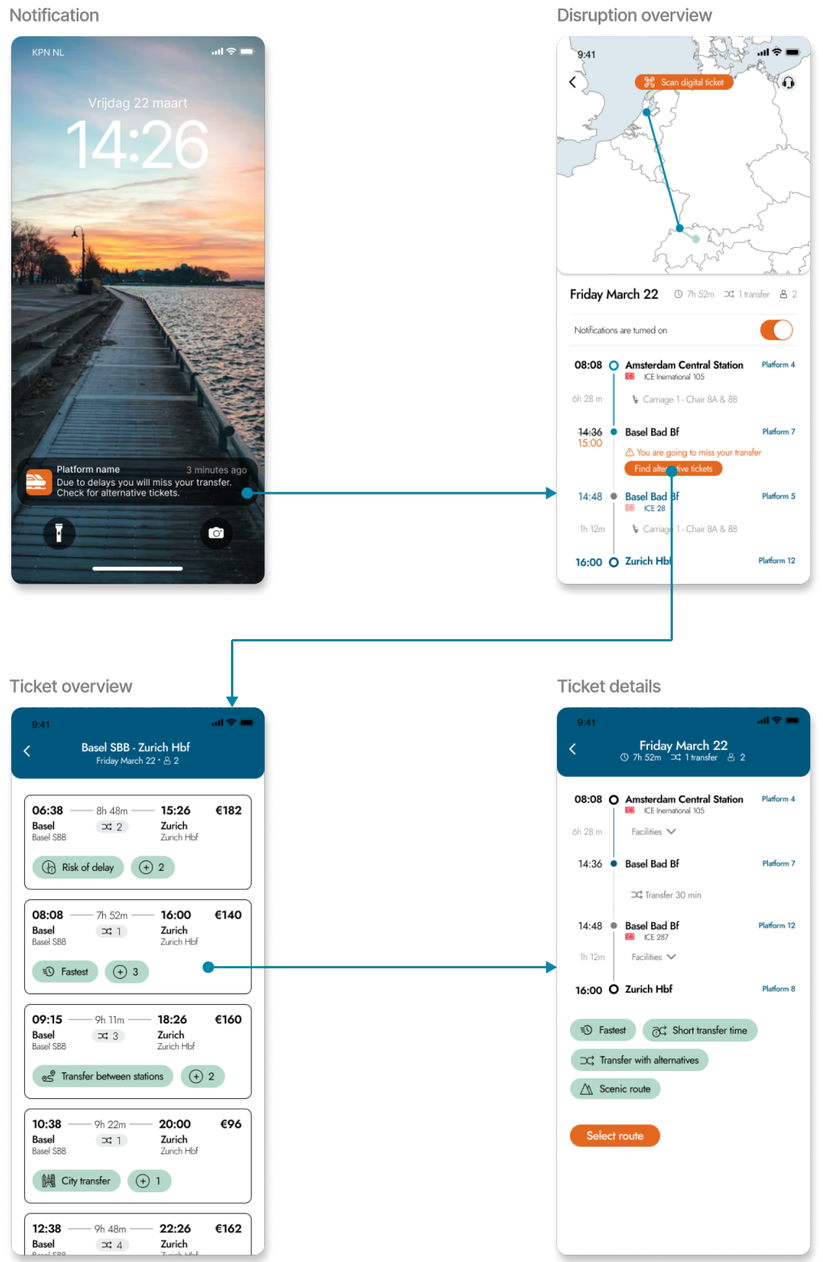


Figure 9.9: User flow scenario 2

Scenario 3: Request compensation

Travellers are entitled to compensation after a certain amount of delay or in case a train got cancelled. Currently, travellers are often unaware of this aspect, and even if they are it is typically considered to be a cumbersome process. The travel app addresses this by notifying travellers of their eligibility for compensation at the end of their train journey and enabling them to request it through the app. To streamline this process, the app automatically fills out most required information based on the ticket and travel data.

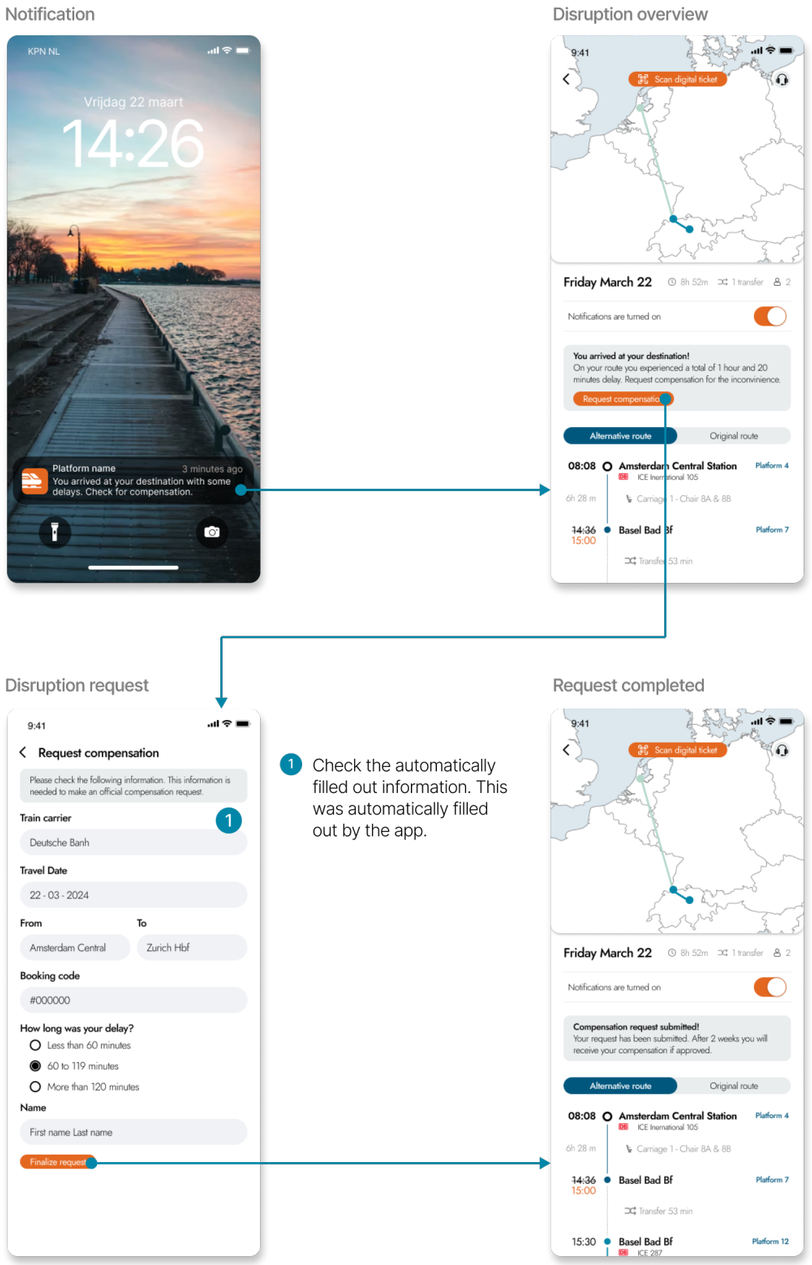


Figure 9.10: User flow scenario 3

Scenario 4: Ask for help

There are some cases in which the situation is rather complex, travellers will need to contact the carrier or ticket distributor. These cases include severe weather, strikes, technical complications or if there are no available alternative routes for that day. The app guides travellers in these complex situations by providing easy access to potential contact points to further support them in their journey.

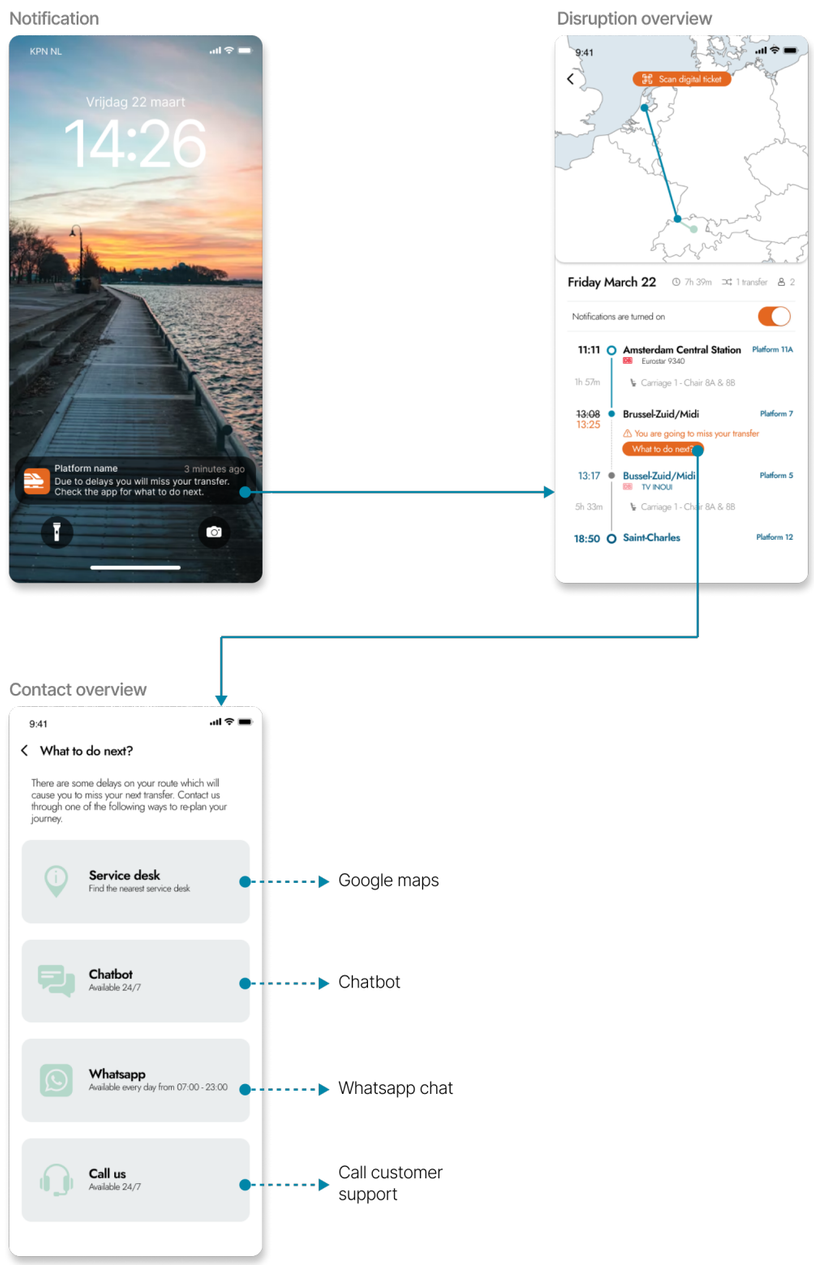


Figure 9.11: User flow scenario 4

9.4 Service blueprint

It is important to consider the feasibility of the proposed designs as well, as it is important to evaluate the practicality behind the scenes. In order to evaluate this, I created a service blueprint by mapping which on-stage actions, back-stage actions and supportive processes are required to facilitate the redesigned user journey (figure 9.12) (Gibbsons, 2017). The service blueprint was further discussed with the Sales, Payment & Ticketing Specialist of NSI, Bob Vinke. These discussions provided insights into the feasibility of the design proposal.

9.4.1 Open communication and collaboration

The topic of collaboration and information exchange between carriers was extensively discussed in chapter 3.3.3, showing the need for improvement in order to improve the bookability of international train tickets. The service blueprint further confirms this need. In order to realise the redesigned user journey with a trustworthy booking platform that provides tickets from many carriers, collaboration between carriers is necessary. Discussions with NSI revealed OSDM as a potential way to improve this.

OSDM (Open Sales and Distribution Model),an initiative led by the railway sector, aims to simplify data management to ultimately improve the bookability for both users and ticket distributors. This data management system can improve collaboration and information exchange by centralising data and advocating for interoperability through open standards. With OSDM, carriers can easily share real-time information on schedules, fares, and seat availability, empowering ticket distributors to provide passengers with comprehensive and up-to-date booking options. This streamlines ticket distribution processes, reduces inconsistencies, and promotes better coordination between stakeholders. (UIC, 2010)

9.4.2 Information database for route characteristics

In order to effectively identify and assign route characteristics, route databases must incorporate relevant information about these features. The discussion with Bob Vinke (Sales, Payment & Ticketing Specialist of NSI) revealed two potential approaches. The first is updating the MERITS database (UIC, 2019) with data directly provided by carriers. This would require significant modifications to the current database and extensive collaboration with carriers. The second approach is for distributors to identify and assign characteristics using their own algorithms. However, this comes with the risk of a lack of quality control when each distributor is responsible for assigning characteristics.

9.4.3 EU wide disruption protocol

A discussion with Wouter Leyds (Railadvisor at RHDHV) provided the insight that although theory might suggest certain travel rights, practice often proves to be different. For example, travellers who miss their transfer with an IRT ticket, might still be allowed on the next train depending on the conductor. This sparked a topic of discussion with the product owner and UX designers of NSI, highlighting the risk of providing travellers with the wrong guidance that does not work in their benefit. Therefore, in order to properly guide travellers during their travels, there needs to be a clear disruption protocol for all carriers in Europe.

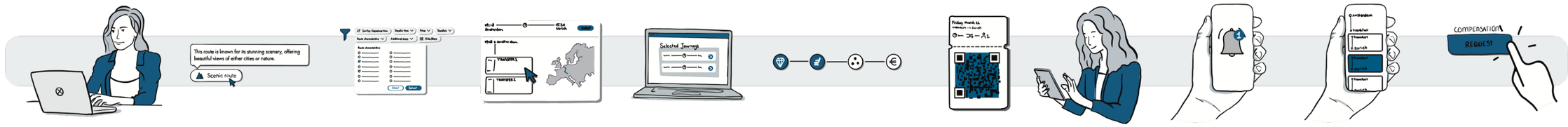
There are efforts to support travellers in case of disruption. Currently, a HOTNAT (Hop on the next available train) service is provided if a Railteam Alliance train is delayed (Railteam, n.d.). This alliance includes NS, DB, Eurostar, SNCF, OBB, SBB and NMBS. In addition, there is an Agreement on Journey Continuation (AJC) that more and more carriers are signing, which states that travellers are allowed to continue their journey with other carriers or modes of transportation in cases of disruption (CER, n.d.). These efforts show that the industry is willing and currently already working on improving the travellers support in cases of disruption.

9.5 Conclusion

The goal of this chapter was to present the final design proposal of the redesigned booking platform and travel app. The final design proposal aims to reshape the booking process of international train tickets in Europe. This includes improving the initial booking process as well as guiding travellers through a potential rescheduling phase in the event of disruption along the way. In order to do so the redesign includes a booking platform and travel app.

Created to be intuitive, supportive, adaptive and exciting, this redesign booking platform aims to ensure that every traveller, regardless of their prior travel experience, can easily book a suitable train ticket, leaving them feeling confident and excited about their journey ahead. The booking platform was designed to align with the user needs and decision making patterns. Core features to support this include route characteristics, transfer alternatives and search filters. A travel app was redesigned to complement the booking platform, creating a bridge between the booking process and the train journey. In case disruption does occur, the travellers are supported by the travel app that provides clear guidance for how they can continue their journey. In order to facilitate this redesigned user journey, some supportive processes need to be improved, including open communication and collaboration between carrier and ticket distributors, updated route information database and an EU wide disruption protocol. The following chapter presents the final conclusions, discussion and recommendations.

Phase	Orienting	Booking					Preparing & Travelling	Rescheduling		Arriving
Sub-phase		Search	Compare Repeat for return journey		Checkout	Confirm		Understanding	Planning	Request compensation



Traveller actions		Enter search	Compare different routes based on: Price, Travel time, Transfers and Route Characteristics	Filter search	Select alternative transfer	Edit selected routes	Checkout by selecting class, seat reservation and travel rate before payment	Receive email and download app	Download the app	Receive notification about disruption	Planning the route to get to their final destination	Request compensation
Line of interaction												
Front stage actions		Facilitate search	Present routes with route characteristics	Update overview based on filter	Show alternative transfers for a route with short transfer time and/or risk of delay	Provide option to edit the selected routes	Go through class, seat reservation and class selection, and facilitate payment	Send confirmation email and link to download the app		Send notification about route disruption	Facilitate replanning an rebooking of the route and update travel overview	Facilitate easy compensation request
Line of visibility												
Backstage actions		Access ticket and route database	Recognize route characteristics and label them accordingly	Access ticket database and recognize which routes apply to the filter	Recognize which routes have short transfer times and if they have alternative transfers options		Payment infrastructure and customer database			Track location and route information, recognize disruption on route	Recognize the terms of the travel contract and the corresponding travellers rights	Calculate total delay along route and determine if traveller is entitled to compensation
Supportive processes		Open communication and collaboration between carriers	Clear characteristic boundaries and statistics about routes punctuality and reliability							EU wide disruption protocol, collaboration between carriers to accommodate each others passengers		

Figure 9.12: Service blueprint

10.

Conclusion

10.1 Conclusion

The goal of this project was to design a service proposition that enables travellers to easily find and book a train ticket and create an overall positive travel experience in Europe. This goal stemmed from insights revealed in a study conducted by the University of St. Pölten in Austria (Preslmayr, 2022), which discovered that one third of individuals attempting to book international train tickets in Europe encounter difficulties completing their booking. Therefore, with the need for more sustainable travel options, the bookability of international train tickets has been identified as a key point for improvement.

In order to reshape the booking process, research was conducted through which two key booking moments were identified: the initial booking process prior to the journey and a potential rescheduling process in case of disruption. The research shows that these booking moments are experienced as difficult and cumbersome by travellers as current touchpoints are not in line with user's expectations and patterns, lack transparency & consistency and require prior knowledge about international train travel, leaving the users feeling uncertain and lost. To address these challenges, the goal of the design phase was to design a booking platform tailored to support holiday travellers with an intuitive booking process that provides clarity and guidance at every step, leaving them feeling confident and excited about their international train journey.

These insights led to the final design proposal which aims to simplify the booking process of international train tickets, ensuring that all travellers are able to complete their booking and feel confident and excited about their travels. To achieve this, the risks and benefits of each route are presented through route characteristics, empowering users to make informed decisions and anticipate what they may encounter on their journey. Furthermore, users are able to reduce the risk of a delay by selecting alternative transfers. Additionally, the booking process is structured to align with user decision-making patterns, aided by search filters and journey overviews prior to checkout.

Beyond facilitating booking, the travel app supports travellers throughout their journey by offering guidance in the event of disruption. Through proactive notifications, the app informs travellers of disruptions and provides clear instructions to ensure seamless continuation of their journey, thereby minimising inconvenience and ensuring arrival at their final destination.

The user evaluation of the final design proposal shows promising results with an excellent score on its usability and positive responses from participants. Although its significance may be limited by the small sample size of the user test, these scores strongly suggest that the design proposal is heading in the right direction and warrants further exploration.

In conclusion, it is difficult to change a large complex system such as the international train industry, but we can help travellers navigate it. While the railway system is expected to evolve, impactful changes may take time. Meanwhile, optimising services through redesigns can have a significant immediate effect on the travellers experience and provide access to a sizable potential customer segment. Therefore, implementing design as proposed in this report will improve the bookability of international train tickets in Europe.

10.2 Discussion

Dutch perspective

This research was conducted from a predominantly Dutch perspective with all interviewees, test participants and stakeholders involved in the study having mainly Dutch backgrounds. In order to improve the bookability of international train travel in Europe, other nationalities should be considered since there could be cultural differences that influence the travellers needs and desires, ultimately impacting the user experience.

Quantitative research

All user tests were conducted with 6-10 participants which is sufficient for formative testing to find usability issues and improve the design concept. However, in order to acquire more reliable data for the quantitative results, a larger sample size should be tested.

Participant recruitment

Apart from the final user test, which involved participants recruited via an external agency, all other participants were recruited by me through my personal connections and networks. This approach carries the risk of potential personal biases of participants and bias influencing participant selection and interpretation of results. However, given the positive outcomes observed in the final user test with externally recruited participants, it appears that the majority of design issues were identified and addressed during the preceding user tests.

Stakeholder involvement

Aside from RHDHV, NSI was the main stakeholder involved in this study, having had multiple meetings, presentations and discussions with NSI employees. However, like chapter 3 described, there are many more stakeholders to consider in the international rail sector.

Desirability

The user test resulted in positive feedback, indicating a positive user experience, and a high System Usability Score. These findings suggest strong user satisfaction and a high level of desirability for the proposed design changes.

Feasibility

While the proposed design changes may be relatively straightforward to implement, certain considerations are necessary to facilitate the design proposal. These include fostering collaboration between carriers, updating databases, and establishing clear disruption protocols. These additional steps are essential to ensure the successful execution and effectiveness of the proposed design changes.

Viability

Implementing design changes of booking platforms and travel apps is much more manageable than changing an entire sector. Furthermore, user tests indicate promising results for enhancing booking processes with these design adjustments. Taking both of these factors into account, the proposed design changes have the potential to generate significant impact with relatively minor efforts.

10.3 Recommendations

Throughout my research, I uncovered a variety of opportunities to improve international train travel and ticketing in Europe. Due to the limited time frame and scope of this project, only a few could be further explored. Therefore, this subchapter is dedicated to presenting some recommendations for either continuing with the outcomes of this project or other ways the international train travel experience could be improved.

Large scale testing

The research by the ST. Pölten University in Austria (2022) is widely referenced in the industry, showing a need for knowledge and insights into the topic of bookability of international train tickets. The findings of both this and the Austrian research show that there is a lot of room for improvement. Therefore, I would recommend further testing on this subject. In addition, the user tests of this project were conducted with a small sample size which is sufficient for qualitative research, but for more reliable quantitative results, large scale user testing should be conducted.

Support in case of disruption

Although some cases of disruption could be prevented with booking the 'right ticket' with sufficient transfer time, currently disruption is nearly inevitable when travelling by train in Europe. During this project I explored different ways travellers could be supported and guided in cases of disruption. However, only a few scenarios were tested with users in a controlled environment. But there are many other challenging scenarios that could be further explored and tested in more realistic settings. Therefore I would recommend a further exploration of this specific rebooking moment in the user journey to ultimately ensure all travellers reach their intended destination. Additionally, in order to guide travellers in cases of disruption there needs to be a clear disruption protocol for all carriers in Europe.

Europe wide bookability research

This research was conducted from a mainly Dutch perspective with all parties and test participants involved being either Dutch or living in the Netherlands. However, international train travel in Europe should be accessible for all travellers in Europe. Therefore, my recommendation would be to conduct research on the bookability of international train tickets across Europe and potentially explore opportunities for non-European travellers as well.

Research business travellers

One type of traveller that was excluded in this study was the Business traveller since they might be limited in their booking options or might not even be responsible for their own booking, depending on the company's business travel policy. However, this target group could be considered for future studies on this topic.

Improve collaboration and information exchange

The system context analysis showed that some of the challenges around ticketing are caused by the lack of collaboration and information exchange between carriers. This is expected to be even worse with the rise in competition as a result of the open access market. In order to strive for a unified European rail sector, the collaboration and information exchange need to be improved.

Uniform ticketing rules in Europe

Another risk of the open access market and the rise in competition is the increase in different types of international train tickets and their terms and conditions, further adding to the already existing complexity of the booking process for travellers. Therefore there is a need for uniform international train ticketing rules in Europe.

Continue user-centred design

Finally, leading up to this project, it appeared that infrastructural, operational, organisational and political factors formed the main obstacles in the bookability of international train tickets. This raised questions about the potential impact of design intervention in this area. However, this project demonstrates that although effecting change in a large industry like the railway sector takes time, there are opportunities to assist travellers in navigating this complex landscape in the meantime. Therefore, I would recommend further emphasis on user-centred design in future projects.

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