

Aalborg University

Department of Communication and Psychology

Designing for Group Travel Planning

A Human-Centred Application with AI-Powered
Personalised Recommendations

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Summary

This master's thesis explores how AI technologies, particularly personality-aware recommendation systems, can be used to improve the digital planning experience for group travel. Focusing on young adults aged 18–35, the study identifies the persistent challenges travellers face when organising trips with others: fragmented tools, coordination difficulties, and decision-making friction due to different personal preferences and overwhelming number of options. Despite the rise in AI-driven services like ChatGPT, current solutions lack collaborative features, contextual awareness, and intuitive interfaces tailored for group settings.

The research applies the Design Thinking (DT) framework and Human-Centred Design (HCD) principles to develop and evaluate a digital Group Trip Planning Hub. The process includes a literature review across UX, HCI, tourism, and AI research; five semi-structured user interviews and one expert interview; a large-scale survey (N=94); and usability testing of a functional, high-fidelity prototype (N=8). Insights from the Empathise and Define phases led to the formulation of three design challenges, each addressed by a dedicated feature: (1) availability coordination, (2) collaborative itinerary planning, and (3) personality-driven recommendations via LLM prompt abstraction.

The prototype, realised as a functional MVP, combines GUI input with LLM-based text-generation of travel itineraries tailored to user traits and trip context. The introduced hybrid interaction model enables personalised AI responses without requiring users to manually write prompts. Usability testing showed that all tasks were completed successfully, with features rated highly in ease of use ($M > 6.5/7$). Participants preferred the personalised itineraries over generic ones, finding them more relevant to group needs and more likely to be followed.

The thesis contributes original insights to the fields of HCI, UX, IS, recommendation systems, and travel technology. It proposes a privacy-conscious approach to RS by relying on explicit personality input rather than behavioural data. However, limitations include the simulated nature of group interaction, lack of real-world deployment, and minimal transparency of AI outputs.

Abstract

This thesis investigates how human-centred design can enhance the digital group trip planning experience for young adults through the integration of artificial intelligence and personality-based recommendations. Grounded in the Design Thinking framework, the study applies a mixed-methods approach including qualitative interviews (N=6), a quantitative survey (N=94), and usability testing (N=8) to identify key user pain points and inform the design of a digital planning application. The proposed solution, a Group Trip Planning Hub, combines collaborative features such as availability coordination with a novel AI-powered, personality-aware itinerary recommendation system. By leveraging prompt abstraction, the application enables natural-language-based personalisation without requiring users to write prompts themselves. Usability testing demonstrated high task success, ease of use, and a clear user preference for personalised over generic itineraries. The findings contribute to the fields of Human-Computer Interaction, UX, and tourism technology by demonstrating how hybrid GUI–CUI systems and personality-aware recommender strategies can reduce planning friction. The study also highlights ethical considerations in AI transparency and data use. While the solution shows promise, limitations include simulated group setting and a lack of longitudinal testing. This thesis offers actionable design insights for AI-integrated planning tools and suggests directions for future research in ethical, personalised, and collaborative travel technologies.

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Abbreviations

AAU	Aalborg University
AI	Artificial Intelligence
CB	Content Based
CF	Collaborative Filtering
CUI	Conversational User Interface
CIS	Collaborative Information Seeking
DT	Design Thinking
FFM	Five Factor Model of Personality (Big Five)
GenAI	Generative Artificial Intelligence
HCI	Human-Computer Interaction
HMW	How Might We (questions)
GUI	Graphical User Interface
MVP	Minimum Viable Product
NLP	Natural Language Processing
TA	Thematic Analysis
TIPI	Ten Item Personality Inventory
UI	User Interface
UX	User Experience
SD	Standard Deviation
SDT	Self Determination Theory
PoV	Point of View (statements)
RAG	Retrieval-Augmented Generator (framework)
RS	Recommendation System
WCAG	Web Content Accessibility Guidelines

1 Introduction

People often travel between various geographic locations throughout their lives. These movements, referred to as trips, can range from local journeys to international travels including extended stays. Trips often entail the use of a variety of facilities and services, such as transportation services, hotels, restaurants and activities. The motivation for travelling can stem from a variety of sources, from business, leisure, exploration, migration, to personal fulfillment driven by a desire to discover new places (Chaudhari & Thakkar, 2020).

Before recent advancements in digital technologies, travellers relied on the experiences and opinions of their relatives and friends, or turned to travel agencies when planning trips. Today, most travellers can find all necessary information for their travels online, allowing them to explore various destinations, accommodation options, restaurants and activities. However, with the high volume of available resources, manually reviewing the available options and finding the most suitable one has become more difficult, time-consuming and overwhelming than ever (Chaudhari & Thakkar, 2020 and Fardous, 2021).

As most people do not travel on their own, but often in the company of their family or friends an additional layer of complexity is introduced into the planning process: having to collaborate in the planning and navigate the personal preferences of everyone involved (Chaudhari & Thakkar, 2020 and Fardous, 2021).

In this thesis project, I investigate the current landscape of research in tourism, group travel planning, personalized Recommendation Systems (RS), and emerging Artificial Intelligence (AI) supported solutions within tourism. Through a Design Thinking (DT) approach grounded in Human-Centered Design (HCD) principles, I conduct both quantitative and qualitative user research to gain a deeper understanding of the behaviours, experiences, and pain points of group travellers. Based on these findings, I propose, prototype and test a solution that aims to address identified challenges, employing state-of-the-art knowledge and technologies to support group travel planning.

The contribution of this research is both theoretical and practical. Theoretically, it expands on the existing literature in tourism technology, AI technologies, and group recommendation systems (GRS) by applying them in a new context. Practically, it delivers a prototype that demonstrates how personality-based AI recommendations and a custom interface design can improve the group trip planning experiences.

1.1 Problem Area

As previously presented, group trip planning is a complex task that requires making collective decisions about destinations, accommodations, activities, and schedules. These decisions must reflect the preferences of multiple individuals while staying within logistical and budgetary constraints. Users often find themselves switching between various applications, none of which are designed to support co-planning as a cohesive workflow (Fardous, 2019; Nguyen & Ricci,

2018). This fragmented process often results in misunderstandings, planning fatigue, and delays. AI-powered solutions may offer potential relief by aggregating planning tools, offering personalised suggestions, and streamlining interactions (Nguyen et al., 2022; Virvou, 2023, Ribeiro, 2024). To investigate this problem further and guide the potential solution design process, the following research questions have been formulated:

1.2 Problem Statement

How can a user-friendly group trip planning application be designed to improve group trip planning efficiency?

Research Question 1: What does existing research reveal about the design challenges and opportunities in supporting collaborative group trip planning through digital tools and interfaces?

Research Question 2: What are the key needs, behaviours, and pain points of users when planning group trips using digital tools?

Research Question 3: How can design thinking guide the development of a solution that integrates personality-based AI recommendations and supports coordination in group trip planning?

Research Question 4: To what extent do the proposed features enhance the group travel planning experience?

2. Literature Review

2.1 Purpose, Scope and Technique

In order to create a theoretical foundation for the study a systematic literature review was conducted based on Randolph's *Guide to Writing the Dissertation Literature Review* (2009). The main focus of the literature review was to identify, review and analyse relevant literature for answering the first research question (RQ1) of this study, ultimately contributing to the investigation of the problem statement and creating a theoretical foundation for this research. Additionally, it aimed to uncover current gaps in research related to collaborative group trip planning and to position this study within the broader context of UX design and AI-powered personalisation in travel planning.

2.1.2 Literature Search and Selection

A systematic search was conducted primarily through Google Scholar and AAU Primo, targeting peer-reviewed articles and conference papers published in English, with a focus on the past three years. The interdisciplinary nature of the topic led to iterative searches across tourism, UX design, AI, and recommendation systems. Snowballing techniques were also applied to identify foundational and emerging work. Approximately 400 papers were reviewed; 31 were selected based on

relevance to the research objectives and alignment with inclusion criteria. Following Bryman's (2016) guidance, a two-stage screening process was applied: first by reviewing titles and publication types, and then, where necessary, by examining abstracts or full texts. To maintain feasibility, only the top 150 most relevant results per search query were reviewed.

2.2 Evolution of Artificial Intelligence Technologies

2.2.1 Definition of Artificial Intelligence

Lai and Hung (2018) define artificial intelligence (AI) as technologies that imitate human sensing, reasoning, and action, enhancing problem-solving through machine learning. For the purposes of this thesis, AI refers to systems capable of making autonomous or semi-autonomous decisions based on user input. Kim et al. (2024) describes Generative AI (GenAI) as a technology that uses various models of AI to generate text, images, voice, action, and other forms of media.

Virvou (2023) discusses that Natural Language Processing (NLP) is a field of AI that allows machines to comprehend and interpret human language, enabling more natural and intuitive interactions between humans and technology. NLP facilitates the processing of natural language through text or voice input (Bulchand-Gidumal, 2022).

2.2.2 Current Advancements and Trends

The latest improvements in data processing capabilities, algorithms and big data allowed for significant advancements in the development of AI and GenAI in the past years. Due to the versatility of AI, it is applicable across various domains including, but not limited to, healthcare, banking, education, energy, media, entertainment, tourism and hospitality (Virvou, 2023, p. 73, Kim et al., 2024 & Bulchand-Gidumal et al., 2022).

Thereby, AI supported tools and services have become an integral part of our daily lives and the interaction with AI is changing the way users interact with computers compared to previous HCI practices (Virvou, 2023). These insights highlight the potential in the application of AI for solving problems in various domains, suggesting the importance of considering the application of AI within travel planning.

2.2.3 Artificial Intelligence in User Experience Design

In her study Virvou (2023) also discusses the intertwined relationship of UX and AI, both affecting one another. She emphasizes the importance of considering UX while developing AI-driven systems and the impact of AI on the UX of products. The incorporation of AI into products gives the possibility to designers to create personalized experiences that are more accessible, effective and engaging (Virvou, 2023). Similarly, Kim et al. (2024) highlights the importance of AI and UX collaboration in order to create intuitive experiences when interacting with AI systems. The author emphasises that the design of the UI should effectively

communicate the output of AI. A poorly designed UI negatively affects the UX and therefore often leads to user frustration or even results in disengagement with the system. The above discussed findings underscore the importance of careful consideration of HCD principles whenever designing HCI with AI systems.

2.2.4 Artificial Intelligence in Tourism and Hospitality

Tourism and hospitality are particularly relevant sectors for the application of AI, as travel planning typically involves complex decision-making processes across multiple categories, including destination selection, accommodation, transportation, and activities (Fardous et al., 2019). These decisions often require coordination among several individuals, introducing further complexity. AI technologies are particularly suited to support such complex tasks by e.g. offering personalised itinerary planning and real-time assistance (Bulchand-Gidumal, 2022).

Bulchand-Gidumal (2022) discusses that AI-based solutions in tourism may function independently or be embedded into broader platforms, thereby extending their capabilities. Common applications include smart travel agents, conversational systems, recommendation systems (RS), forecasting tools, and language translation services. These systems are mentioned separately, however tourists might find themselves interacting with a combination of these technologies within the same system. For example, a conversational assistant might use NLP to offer context-aware suggestions, utilising RS or personalisation systems (Bulchand-Gidumal, 2022).

Bulchand-Gidumal (2022) emphasises that while the tourism sector is usually a forerunner in adaptations of new technologies, commercial adaptations of advanced AI technologies are still scarce. At the same time, recent studies emphasise GenAI's potential in this domain. Singh et al. (2024) describe AI agents as increasingly capable of managing multi-step planning tasks, while Kim et al. (2024) and Virvou (2023) underline their value in improving personalisation and responsiveness in service delivery. These insights underline the importance of further research in the area.

2.2.5. From Conversational Agents to AI Agents (5, 13)

Conversational agents (CA), also referred to as chatbots, conversational/dialog systems, or virtual agents, facilitate information search through human-like conversations between users and the system (Bulchand-Gidumal, 2022; Nguyen et al., 2022). These systems utilise NLP technologies to understand queries and generate responses, communicating with users via chat or speech interfaces and performing tasks such as search and question answering (Nguyen et al., 2022). The launch of ChatGPT in 2022, built on GPT-3.5, marked a turning point by making LLM-powered conversational agents publicly accessible (Al-Amin, 2024).

LLM agents, also referred to as AI agents (Singh et al., 2024), represent a recent progression in GenAI technologies, extending the capabilities of LLMs beyond text generation towards real-world task execution (Schmidgall et al., 2024).

These agents operate within structured frameworks that allow autonomous and semi-autonomous behaviour, using techniques such as chain-of-thought prompting, iterative refinement, self-improvement, and tool integration (Schmidgall et al., 2024). This shift marks a transition from static conversational outputs to dynamic agents capable of performing complex, multi-step tasks.

As LLM agents are increasingly applied across domains such as software engineering, cybersecurity, medical diagnosis, robotics, web automation, and scientific research, it is important to examine their potential within tourism and recommendation systems as well (Schmidgall et al., 2024).

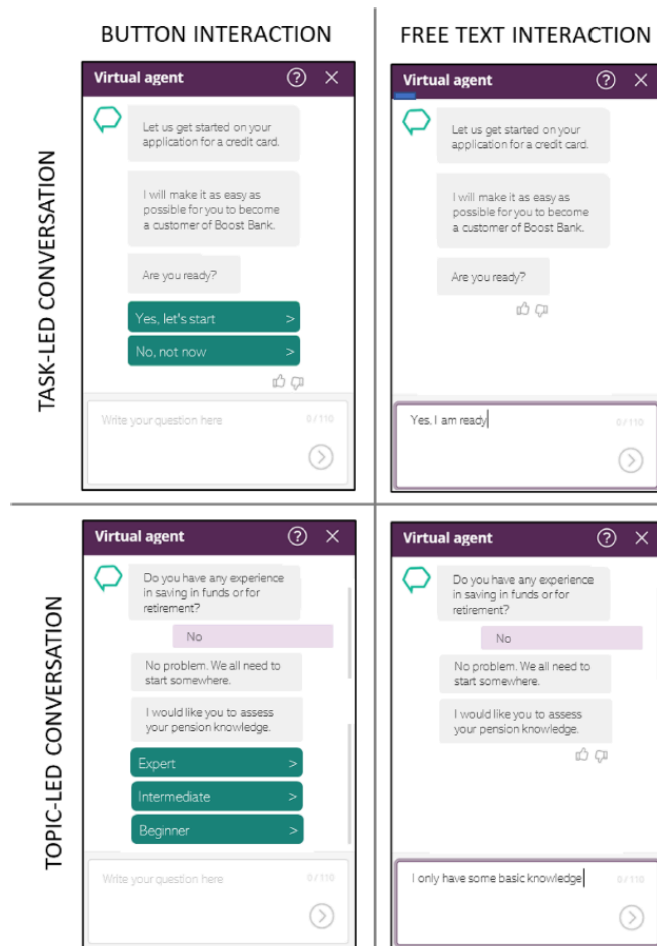
2.3 Conversational User Interface Design

With the recent developments in LLM technologies, the application of Conversational User Interfaces (CUI) has become increasingly widespread again. CUI serves as the primary interface for users to interact with LLMs (Sugisaki & Bleiker, 2020), making the area increasingly important to understand and study.

Through Ryan and Deci's (2000) Self Determination Theory (SDT), Nguyen et al. (2022) investigate the differences in UX between AI-powered CUI and traditional menu-based GUI. Their findings reveal that users perceive less control over the system when interacting with a CUI compared to a GUI, suggesting that traditional UI elements such as buttons, hyperlinks, icons, and checkboxes provide a greater sense of autonomy. This aligns well with SDT, which states autonomy is a critical factor in user satisfaction and engagement. In addition to autonomy, the study explores cognitive effort and its impact on user experience. The results indicate that interacting with a CUI requires significantly greater cognitive effort than using a GUI. However, these findings should be interpreted with caution, as multiple factors may have influenced them. One possible explanation is that most participants were experienced with GUIs, whereas only 12.34% had prior experience using a CUI for the given task. This difference in familiarity could have affected users' ease of interaction and perception of effort. Another explanation stems from the nature of CUIs, which necessitates users to formulate commands, interpret system responses, and respond to follow-up questions to achieve their desired outcomes. This process, while potentially more flexible and naturalistic, also increases cognitive load compared to the structured, visually guided interactions of menu-based interfaces (Nguyen et al. 2022).

Despite the increased cognitive effort, the study finds that perceived autonomy and competence remain significant predictors of user satisfaction. When users feel in control and capable of completing their tasks, they tend to report higher satisfaction with both their performance and the system itself. However, the relationship between cognitive effort and satisfaction is less straightforward. While higher cognitive effort negatively impacts system satisfaction, it does not significantly diminish performance satisfaction, suggesting that users may still value the outcome of their interactions despite the additional mental effort required. These findings by Nguyen et al. (2022) are a significant contribution to HCI research and emphasise the importance of further research within this area..

In their study, Haugeland et al. (2022) explored how chatbot interaction design influences user experience in customer service, focusing on task-led and topic-led conversations as well as button and free text interaction. Their findings indicate that task-led conversations, designed for efficient goal completion, improve pragmatic quality (e.g. simplicity, practicality, straightforwardness, predictability and structuredness), while topic-led conversations encourage engagement and enhance perceived human-likeness, contributing to hedonic quality (e.g. connectivity, stylishness, premiumness, integration, novelty, and captivation). Similarly, button interaction provides a structured and intuitive experience by guiding users through predefined options, improving efficiency and reducing cognitive load (see figure 1). In contrast, free text input, despite offering greater flexibility, often results in usability challenges due to chatbot limitations in natural language processing, leading to misinterpretations and user frustration. Users found button interaction particularly useful for task-led conversations, whereas free text input was preferred in topic-led interactions that required exploration.



(Figure 1 | Illustrations exemplifying the four chatbot conditions | Source: Haugeland et al. 2022 p. 6)

These findings suggest that a combination of structured GUI interactions and free text input could enhance user experience, allowing for both efficiency and conversational adaptability. The study highlights the trade-offs between efficiency

and engagement in chatbot design, emphasising the importance of balancing structured interactions with flexible input methods to improve usability and user satisfaction.

2.4 Tourist Behaviours and Travel Planning

Tourist behaviours have been studied for decades and numerous theories and models were discovered that are essential for understanding tourist motivation and decision making processes. Jackson and Inbakaran (2006, pg. 2.) say: “[...] personality is one of the best known, and potentially the most useful, psychological concepts in tourism.”. Understanding tourist behaviour is critical for this study, because it provides the theoretical and practical foundation for designing effective travel planning systems, improving UX and user satisfaction. Therefore, in this section, I present a brief review of the most essential and relevant concepts and theories at the intersection of tourism and psychology.

2.4.1 The Five Factor Model (Big Five)

The Five Factor Model of Personality (FFM), also known as the Big Five (BFF), was introduced by Costa and McCrae in 1992. Today it is one of the most widely accepted frameworks for describing human personality traits within psychology. The model identifies five core dimensions, which are consistently present across cultures and contexts. These traits are listed by the authors as follows: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. These traits are considered relatively stable throughout a people's lifecycles and provide a reliable base for predicting preferences, behaviours, and emotional tendencies. Due to its reliability and universality, the FFM has become a common tool in behavioural research and consumer profiling (Costa & McCrae, 1992). The model, in recent years, has also been widely adopted within tourism research, showing consistent results for predicting traveller preferences, risk tolerance, and activity selection (Jani, 2014; Alves et al., 2023).

2.4.2 Travel Motivations and Traveller Typographies

Pearce (2005) presented a comprehensive overview of tourist psychology, including the Travel Career Pattern (TCP) model. This framework introduces five different tourist needs from bottom to top as follows: relaxation needs, security and safety needs, relationship needs, self-esteem and development needs and self-authorization, self fulfillment needs. The theory suggests that motivations evolve from simple needs (e.g. relaxation) to more complex goals (e.g. self-actualisation) and argues that tourists' motivation change according to their age, travel experience, thus resulting in a “travel career” (Pearce, 2005 and Alves et al., 2023). Pearce (2005) further discusses personality-based typologies, such as Plog's allocentric-psychocentric continuum, which categorises tourists by risk preferences.

Gretzel et al. (2004) explored how self-identified travel personalities improve RS. They found that personality types significantly influence destination and activity preferences. While travel persona models offer a useful foundation,

research highlights their limitations. Travellers often struggle to relate to a single fixed persona (selected 3.9 on average), suggesting that the selection of just a single identity might not be a preferred method in future products (Gretzel et al., 2004; Alves et al., 2023). Moreover, predicting preferences based on a single trait oversimplifies behaviour and fails to capture the complexity of personality profiles compared to the FFM personality dimensions (Alves et al., 2023). These findings underscore the importance of the consideration of travellers' personalities in the development of systems within tourism.

2.4.3 Co-planning Behaviors

Many leisure trips are planned collaboratively by families or friend groups. Research shows that pre-trip planning is often a shared process, where travellers collect, verify, and exchange information together (Fardous et al., 2019). This practice, known as Collaborative Information Seeking (CIS), involves jointly gathering and synthesising data through different media formats to support group decision-making.

CIS is described as an inherently social process, shaped by factors such as group awareness, division of labour, and persistence. In tourism, where planning requires a wide range of decisions, social dynamics (both within and outside the group) play a significant role. Fardous et al. (2019) identify four main stages of CIS in travel: planning, information gathering, sharing, and decision-making. These findings highlight the importance of designing travel planning tools that support collaborative behaviours for group contexts.

2.5 Recommendation Systems

Recommendation systems (RS) are information search tools designed to reduce users' cognitive overload by providing them with items that are likely to suit their needs and preferences (Nguyen & Ricci, 2018). Within the realm of tourism, RSs are often used to suggest trip details, itinerary items, hotels or restaurants among others (Chaudhari & Thakkar, 2020).

2.5.1 User Modelling

Personalised UX is usually created through a technique called user modelling by encapsulating user related information into a so-called *user model* (Singh et al. 2024). This technique is applied to create personalised RS and adaptive UIs, tailoring the UX to the needs and interest of each individual user (Virvou, 2023). As described by the author, "user modelling is the process of creating representations or profiles of users based on their behaviour, preferences, goals, and other relevant characteristics." (Virvou, 2023, pg. 77). User models generally include data associated with a specific user, including their profile and preferences. These models encapsulate some individual characteristics of the user, including, but not limited to age, gender, interests, and geographic location (Singh et al., 2024).

2.5.2 Recommendation Techniques

Chaudhari & Thakkar (2020) conducted a comprehensive literature review on RS and user modelling techniques in RS used within the realm of tourism. Collaborative filtering (CF) based RSs analyse content that have been liked by similar users and make recommendations based on those to the target user. In contrast, content based (CB) RS study the content that has been viewed and favoured by the target user and recommend similar content to those. CB and CF are typically applied at the individual user level, and their outputs are later aggregated to form group recommendations as later discussed in sec. 2.6.1 (Chaudhari & Thakkar, 2020 and Virvou, 2023).

The implementation of such RSs poses two main limitations: 1) The data sparsity issues; 2) Cold-start problem. The former issue is present in CF based RSs when there is a large number of missing values in the available user dataset. The latter issue in CF based systems stems from the lack of sufficient values provided by other users, while in CB systems the accuracy and effectiveness of the RS is reduced due to the lack of user data upon new user sign-up. To mitigate these limitations CF and CB systems are often used combined, referred to as hybrid RS (Chaudhari & Thakkar, 2020).

2.5.3 Group Recommendation Systems

In some real-life situations the output of RS is consumed not only by a single user, but a group of users, where RS have to satisfy a broader audience. This scenario is particularly relevant in group trip planning as decisions are often made collaboratively, influenced by a number of participants in the trip. For these use cases GRS were developed, utilising different aggregation strategies aiming to satisfy the collective needs of the group (Nguyen & Ricci, 2018 & Fardous et al., 2019). Masthoff et al.(2015) emphasises that while there have been significant advancements in RSs for individual preferences, the development of effective and reliable GRSs remains a difficult challenge to tackle, while emerging AI technologies provide promising new approaches (Singh et al., 2024). These findings underscore the importance of the investigation about the effectiveness of the latest technologies in the development of GRS.

2.5.4 Preference Aggregation Techniques

Preference aggregation is the process of combining individual user preferences into a unified model that can inform group recommendations. There are two general approaches to group recommendation techniques: profile aggregation and recommendation aggregation (Masthoff, 2015; Nguyen & Ricci, 2018). The former strategy creates a joint profile for the user group by aggregating the individual user profiles. To this joint profile recommendations can be given through conventional recommendation techniques. The latter strategy creates a list of individual recommendations, then combines those into a single list of recommendations for the whole group. These techniques might be used in combinations as well, forming a hybrid approach (Nguyen & Ricci, 2018).

Grounded in Social Choice Theory, Masthoff et al. (2015) discusses the most common preference aggregation strategies, which are the specific methods applied at the group aggregation level. The authors summarise eleven aggregation strategies as follows: plurality voting, average, multiplicative, border count, copeland rule, approval voting, least misery, most pleasure, average without misery, fairness and most respected person (also referred to as dictatorship). Each strategy reflects different fairness assumptions and trade-offs between individual and collective satisfaction. All three authors stress that no single aggregation strategy performs best in all scenarios, suggesting that their application highly depends on the context of use. The consideration of these insights is essential when designing a GRS.

2.5.5 Personality Aware Recommendation Systems

Alves et al. (2023) emphasise that personalisation is the key for providing the best recommendations in RS. The recent advancements in AI, mobile, and wearable technologies, in addition to the widespread use of social-media and gaming platforms, make it easier than ever to collect detailed user information. A few examples of this data may be contextual information, identity, preferences and interactions with various devices. The authors discuss that individuals' personalities are inherently linked to their potential behavioural patterns, which are considerably stable over time (Alves et al., 2023). Costa and McCrae (1992) mapped these behavioural patterns into the FFM as discussed in [Sect. 2.4.1](#).

The consideration of personality in RS can help mitigate user modelling issues and thus provide more reliable and relevant recommendations from initiation. User personality based RS are often referred to as personality aware RS. These systems can help overcome the previously discussed initial “cold-start” problem of more traditional RS (Alves et al., 2023).

2.5.6 Generative AI Powered Recommendation Systems

Conventional approaches, such as CB and CF based RS, are often limited in capturing the nuance nature of travellers' preferences, resulting in suboptimal recommendations and UX (Aribas & Daglarli, 2024). The authors discuss new emerging trends and technologies within the realm of RS, emphasizing the increasing role of social media data mining. With the rise of GenAI technologies new frameworks and approaches emerged to GRS. The authors discuss that the combination of GenAI techniques, like the Retrieval-Augmented Generator (RAG) framework, with personality models has the potential to revolutionise the way RS function today, offering more relevant, efficient and personalised recommendations in the future.

RAG combines the generative power of LLMs with retrospective models, enabling systems to generate rich, context-aware travel recommendations from natural language queries. When integrated with personality models, such systems can adapt to user feedback and evolving preferences over time enhancing both personalisation and responsiveness to changing trends or user needs (Aribas & Daglarli, 2024).

Singh et al (2024) explored a non-parametric approach to personalised travel recommendations utilising an LLM-Agent (also referred to as AI-Agent) based approach, evaluating the efficiency of various prompting strategies using an LLM-as-a-judge technique. Their findings reveal that while general recommendations were well-perceived, AI generated personalised plans were significantly preferred (up to 87.3%) over the generic ones. The authors discuss that Direct and Chain-of-Thought planning strategies outperformed more complex ones, such as ReAct and Reflexion, in constrained travel planning tasks.

The findings of this section highlight the applicability and complexity of RS, underscoring the importance of careful consideration when selecting strategies for RS. Additionally, authors highlight the importance of further research in the area, positioning this paper as a valuable contribution to this new and emerging field of research (Aribas & Daglarli, 2024).

At the time of this research, there were no additional available papers discovered utilising AI-agent based personalised RS for group trip planning, which again positions this paper as a valuable contribution to this increasingly important field of research. Aribas & Daglarli (2024) stress the importance of further research around privacy and data protection in GenAI powered RS. Privacy and ethical considerations are further discussed in [Sect. 2.7](#).

2.6 Challenges Introduced by the AI Revolution

2.6.1 UX Design and Usability Challenges

GenAI systems are only useful if end users can efficiently complete their tasks, placing significant responsibility on UI/UX designers. While developers often focus on system functionality and performance, neglecting UI can negatively affect user satisfaction and retention (Kim et al., 2024).

Ribeiro (2024) evaluated ChatGPT's CUI and identified four key usability challenges. He found that users find the UI difficult to navigate as responses are often lengthy, making it complicated to find relevant information and retrieve earlier conversations. Further his findings show that text only output is not engaging, presenting high cognitive load on the user, making it more difficult and time consuming to read and evaluate responses. The author critiqued the UI for unintuitiveness, as the capabilities are not obvious to the users, failing to assist users to take advantage of the full potential of the system (Ribeiro, 2024). These findings are highly relevant for this research, as they underline key design shortcomings of ChatGPT's CUI. In the context of group travel planning, such usability issues can significantly hinder the planning process and the UX.

The second theme introduced by Ribeiro (2024) discusses challenges in communication with ChatGPT. The participants of his study expressed that prompt writing is time consuming and requires skill and high focus, in contrast with more traditional search engines. Further, he discusses that it is difficult for some users to learn how to prompt and to clearly define the problem or the question, therefore receiving dissatisfactory responses. Kim et al. (2024) support this, highlighting that

new users face a steep learning curve. These findings are critical for the development of AI powered tools that rely on CUI and user prompting. Further investigation on how the burden of prompting could be removed from the user, could be a valuable contribution to this area of research.

In the third theme, Ribeiro (2024) discusses limitations in output reliability. Although ChatGPT produces well-structured responses, those are often generic and delivered with high confidence, creating a misleading sense of accuracy. The system's limited contextual awareness and memory further hinder transparency, as users cannot determine which prior prompts influenced the current response. Although these limitations are technical in nature and mainly concern AI engineers, they also affect the UX and their effect may be mitigated through better UI and interaction design. Ribeiro's findings (2024) support the idea that clearer feedback, more transparency, and better contextual cues are necessary to make AI tools more useful and trustworthy in real-world applications.

The last theme identified by Ribeiro (2024) regards the lack of transparency in the system. The responses of ChatGPT lack feedback as no information is provided about the reason for error or long response time. Further his findings show that information verification and trust issues are present, requiring users to perform a second round of verification using alternative search tools, such as Google. Lastly, participants also expressed privacy concerns. These findings are in line with previous research in the area emphasising the need for transparency and addressing data privacy concerns in AI systems (Aribas & Daglarli, 2024, Ricci et al., 2010 and Singh, 2024)

Kim et al., (2024) discusses additional important challenges that lie within user control and error handling, which are two of the ten important usability heuristics defined by Nielsen et al. (1994a). In most currently available GenAI applications, users have to perform an iterative trial and error cycle, until they receive the desired result, due to the lack of a halt command. The author discusses that the UI of some GenAI products might be overly minimalistic (Kim et al., 2024), without offering appropriate level of help and guidance to unfamiliar users, violating yet another heuristic principle (Nielsen et al., 1994a).

Virvou (2023) identifies eleven key UX challenges that arise in the development of AI-driven systems. A major concern is the unpredictability of AI behavior, which often conflicts with user expectations for consistency. This is compounded by the lack of explainability, commonly referred to as the black box problem, which undermines user trust and system transparency. The author discusses that trust is fragile in AI systems and may be distorted by either overreliance or skepticism, depending on how users perceive system intent and reliability. While personalisation is a central approach to user engagement, it faces challenges in building accurate and adaptive user models over time. An additional important critique is that AI systems risk the reinforcement of societal biases embedded in training data, raising concerns about fairness and inclusivity.

Furthermore, the author discusses that traditional usability principles in these systems are often neglected, leading to poor feedback, limited control, and frustrating UX. Attempts to humanize AI through anthropomorphism or emotion recognition can also create false expectations, especially when emotional responses are poorly timed or inaccurate (Virvou, 2023). Further concerns arise around autonomy and control, as users may feel disempowered when AI acts independently. CUI, while more accessible, still struggles with ambiguity and contextual nuance. Finally, the use of personal and inferred data for personalization introduces significant privacy and security risks (Virvou, 2023).

All in all, these findings underscore the critical issues introduced into UX design by the emerging AI technologies. Together, these issues emphasise the need for a HCD approach to AI systems, which prioritise transparency, control, fairness, and ethical data use (Virvou, 2023; Kim et al., 2024, Singh et al., 2024).

2.6.2 Tourism and Hospitality

Bulchand-Gidumal (2022) discusses three main challenges in relation to the adaptation of AI technologies within the tourism and hospitality industry. The first challenge stems from consumers' attitudes and perception of AI technologies. Fear of surveillance, AI divide and a society guided entirely by technology are the three main concerns of tourists when it comes to the adaptation of AI technologies. The author emphasises that AI services can pose a threat to privacy as they not only collect massive amounts of data of the users, but are also capable of deriving patterns and information from that data. Scepticism in AI systems can also lead to an AI-divide, where some users reject AI environments. Regarding the fear of a society guided entirely by technology, travellers will face the decision to choose between more automated (cost effective) and less-automated (more luxurious) services. Secondly, the substitution of humans with machines poses a significant threat as it is estimated that 25% of the workforce within tourism could be replaced by robots in the next decade alone (Bulchand-Gidumal, 2022). This poses a significant challenge to the industry as it could result in a significant decrease in the perceived sense of hospitality, which is the main feature of the sector. The third main challenge in the industry is regarding the ethics and biases of AI systems. This issue is discussed in more detail in the following section.

2.7 User Privacy and Ethical Considerations

2.7.1 AI Supported Products

Ethical considerations in GenAI are increasingly crucial, particularly regarding data privacy, consent, and bias mitigation (Kim et al., 2024). All humans have inherent biases, including the designers and developers of AI systems. These biases can manifest in various ways, particularly concerning factors such as race, gender, age, and economic status (Bulchand-Gidumal, 2022). AI systems have the potential to perpetuate and amplify biases related to gender, race, and socioeconomic status, necessitating fairness-focused frameworks and ethical AI development practices.

Additionally, transparency and accountability are essential to align AI technologies with societal values. The capabilities of GenAI services pose significant threats when it comes to the generation of fake news and disinformation, severely challenging information integrity and reliability (Bulchand-Gidumal, 2022; Virvou, 2023). In academia, plagiarism and excessive reliance on AI are increasingly alarming concerns, threatening to undermine students' critical thinking and problem-solving skills. Ensuring appropriate level of training and access to AI technology, particularly in developing regions, is critical to preventing an expanded digital divide.

Beyond ethical concerns, GenAI presents significant social and economic challenges as well. Unregulated implementation of AI could allow the automation of various skilled and unskilled jobs in many industries. This could severely impact the current global employment landscape, resulting in potential widespread job displacements (Bulchand-Gidumal, 2022; Kim et al., 2024).

Researchers in the area call for ethics being a base feature in GenAI products (Bulchand-Gidumal, 2022) and warn that addressing these challenges requires a multidisciplinary effort involving technologists, ethicists, policymakers, and society at large (Kim et al., 2024).

2.7.2 Recommendation Systems

Ricci et al. (2010) discusses some of the most essential privacy and ethical considerations in RS. The authors describe that systems utilizing RS technologies collect extensive amounts of information about users and their behaviour online in order to provide them with personalised recommendations. These data collection practices may be considered invasive and negatively impact users, giving the impression that they are under surveillance by the system. They stress the vitality of user data collection and utilization in a delimitable and sensible manner in RS, while ensuring that the gathered data is protected from malicious users. Singh et al. (2024) add that privacy and user data protection could be enhanced by design by running LLM agents locally on user devices.

2.8 Summary of Literature Review

This literature review examined four interrelated domains: the evolution of AI systems, evolving GUI and CUI design practices, tourist behaviour and personality modelling, and RS, with an emphasis on group-based and personality-aware approaches.

The review uncovers that AI technologies have undergone rapid development, enabling sophisticated natural language interaction and personalised content generation (Schmidgall et al., 2024; Singh et al., 2024). In the context of tourism, these technologies offer promising potential for travel planning, where decision-making is often collaborative and cognitively demanding (Fardous et al. 2019).

Research on CUI highlights usability limitations, including reduced perceived autonomy and higher cognitive load compared to GUI (Nguyen et al., 2022), suggesting that hybrid UIs combining GUI and CUI elements can improve user control and satisfaction (Ribeiro, 2024).

At the intersection of Tourism and Psychology, theories such as the FFM and the TCP model illustrate how stable personality traits and evolving motivations shape travel behaviour, allowing for the development of more personalised and engaging RS (Costa & McCrae, 1992; Pearce, 2005; Alves et al., 2023). Group trip planning introduces additional complexity due to the need for preference aggregation and fair consensus-building among travellers (Masthoff, 2015; Nguyen & Ricci, 2018).

Furthermore, integrating AI in this domain raises important challenges, including lack of explainability, black-box decision-making, and ethical concerns such as surveillance, fairness, and job displacement (Virvou, 2023; Bulchand-Gidumal, 2022; Kim et al., 2024). While recent advances in GenAI-powered RS and hybrid interfaces show great potential, research remains scarce on how to design trustworthy, group-oriented travel planning tools that are both intelligent and human-centred. This thesis aims to fill this gap by exploring how DT can guide the creation of collaborative, personality-aware, AI-supported solutions that prioritise usability, transparency, and ethical integrity.

3. Methodology

3.1 Research Philosophy

This section outlines the methodological approach adopted in this thesis project. While the practical steps of research, such as choosing methods and collecting data, are essential, they do not occur in isolation. As Bryman (2016) emphasises, research methods are not merely neutral tools, but are shaped by the researcher's philosophical orientation and the broader intellectual context of the social sciences. Therefore, here not only the methods used are presented, but those are also placed within a specific research philosophy, acknowledging that assumptions about reality (ontology) and knowledge (epistemology) influence both the design and interpretation of a study.

3.1.1. Pragmatic Worldview

This research adopts a pragmatic philosophical worldview, which prioritises solving real-world problems through action and experimentation (see philosophy Overview on figure 2.). Pragmatism views truth as shaped by experience and measured by practical outcomes (Bryman, 2016). This aligns with the thesis's aim to design a user-centred solution for group travel planning through the iterative DT process. Rather than separating theory from practice, pragmatism treats them as interconnected: theory informs action, and action refines understanding (Dalsgaard, 2014). It supports an active role for the researcher in constructing and evaluating

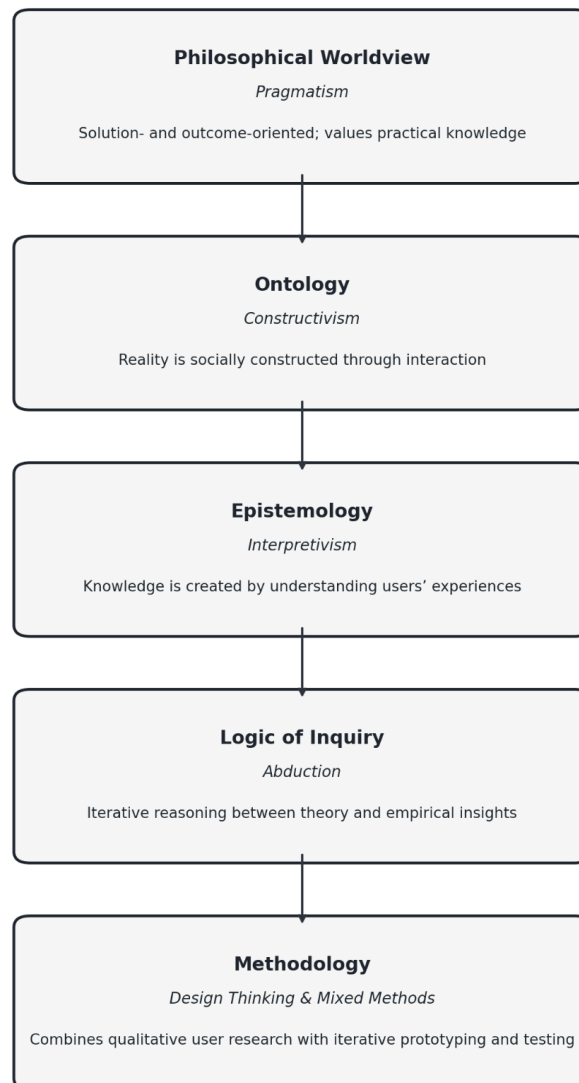
solutions (Goldkuhl, 2012), making it particularly relevant for design related research.

By taking a pragmatic point of view, this thesis applies a flexible and user-centered research process which combines practical experience with theoretical insights to guide the development of a contextually relevant solution. It also lays the foundation for using DT, abductive reasoning, and a mix of methods throughout the project.

3.2 Ontology

Ontology concerns how we understand the nature of reality: what exists and how we perceive it (Bryman, 2016). This thesis takes a constructivist ontological position, which means it views reality not as something fixed or objective, but as something shaped through human experiences, interactions, and social contexts (Bryman, Chapter 2). In this study, focused on user experience and group travel planning, users' needs and behaviors are seen as dynamic and influenced by their environment, the tools they use, and the people they collaborate with. What users perceive as "real" or meaningful in their experience is understood to be subjective, varying from person to person and shaped through context. This perspective aligns closely with DT principles, which emphasises empathy, deep user understanding, and the recognition that people's experiences and interpretations matter when designing meaningful solutions.

Research Philosophy Overview



(2. figure - Research Philosophy Overview | Source: Own creation.)

3.3 Epistemology

Epistemology is about how we come to know things. What counts as knowledge and how we generate it (Bryman, 2016). This thesis follows an interpretivist epistemological stance, which means it focuses on understanding the world through the perspectives and experiences of the people involved. Rather than trying to uncover objective truths, the aim is to explore how users make sense of group travel planning, and how their needs and behaviors emerge in real-life contexts (Bryman, 2016).

3.4 Logic of Inquiry

The study reflects elements of abductive reasoning, as it moves back and forth between data and theory, using theoretical concepts to help interpret findings, while allowing new data and patterns to emerge from the user research itself (Bryman, 2016). By combining user insights with theory in an iterative way, this epistemological stance supports the development of a grounded, relevant, and user-centred design solution.

3.5 Research Design

3.5.1 A Wicked Problem

The wicked problem approach was first introduced in the 1960s by Horst Rittel. He discussed that most challenges faced by designers are so-called “wicked problems”, where requirements are ill-formulated, descriptions are confusing, there is not a clear solution and there are numerous stakeholders and decision-makers involved with conflicting values and interests (Buchanan, 1992).

Buchanan (1992) argues that wicked problems lie at the center of DT, because design has no fixed subject matter of its own; rather, it draws from and integrates diverse domains to address indeterminate situations. He emphasises that unlike scientific problems that can be defined and solved through linear processes, design problems require ongoing negotiation and reinterpretation to develop context-specific solutions. Understanding wicked problems therefore not only repositions design as a core liberal art in technological culture but also highlights its unique value in addressing the uncertainties of modern life (Buchanan, 1992).

3.5.2 The Design Thinking Framework

In their article *Design Thinking for Social Innovation*, Tim Brown and Jocelyn Wyatt (2010) discuss how the main role of designers has changed over the years, changing their focus from enhancing the look and functionality of products to creating entire systems to deliver products and services. This shift in responsibility calls for a more creative, thoughtful and human-focused approach to solving these new challenges, with the DT framework offering a practical solution. The authors describe the characteristics of the framework as follows:

“Design thinking incorporates constituent or consumer insights in depth and rapid prototyping, all aimed at getting beyond the assumptions that block effective solutions. Design thinking—inherently optimistic, constructive, and experiential—addresses the needs of the people who will consume a product or service and the infrastructure that enables it.”

(Brown & Wyatt, 2010, pg. 32)

Over the years, DT has evolved into a globally influential approach to innovation, known for its human-centered methodology that emphasises empathy, creativity, and iterative problem-solving (Auernhammer & Roth, 2021 & Luchs, 2015).

“As an approach, design thinking taps into capacities we all have but that are overlooked by more conventional problem-solving practices. Not only does it focus on creating products and services that are human centered, but the process itself is also deeply human.”

(Brown & Wyatt, 2010, pg. 33)

Use of Design Thinking

These above discussed qualities of the DT framework make it an exceptional method for projects aiming to address “*wicked problems*” (Luchs, 2015). Therefore DT is widely applied in innovation projects, where a breakthrough idea or concept is expected as a solution. The DT framework reduces the risk of costly product failures by encouraging teams to explore multiple ideas early in the process and refine them through iterative testing. Instead of heavily investing in a single solution from the start, DT promotes experimentation and user feedback, helping to identify and improve the most promising direction before significant resources are committed (Luchs, 2015).

The Design Thinking Process

Based on IDEO’s model the DT process was described as a “system of overlapping spaces, rather than a sequence of orderly steps” by Brown and Wyatt (2010, p. 33). These three spaces are *inspiration*, *ideation* and *implementation*. The main focus of the *inspiration* space is to understand the problem and identify an opportunity that drives the search for innovative solutions. The *ideation* space focuses on the generation and testing of diverse ideas of possible solutions, while the *implementation* space translates these ideas into practical applications that positively impact people’s lives.

Stage	IDEO	Continuum	Stanford Design School	Rotman Business School	Darden Business School
Stage I data gathering about user needs	Discovery and interpretation	Discover deep insights	Empathize and define	Empathy	What is?
Stage II idea generation	Ideation	Create	Ideation	Ideation	What if?
Stage III testing	Experimentation and evolution	Make it real: prototype, test, and deploy	Prototype and test	Prototyping and experimentation	What wows? What works?

Sources:

IDEO.com. 2014. Available at <http://designthinkingforeducators.com/>.

Continuum.com. 2014. Available at <http://continuuminnovation.com/whatwedo/>.

Stanford Design School. 2014. Available at <http://dschool.stanford.edu/use-our-methods/>.

University of Toronto Rotman School DesignWorks. 2014. Available at <http://www.rotman.utoronto.ca/FacultyAndResearch/EducationCentres/DesignWorks/About.aspx>

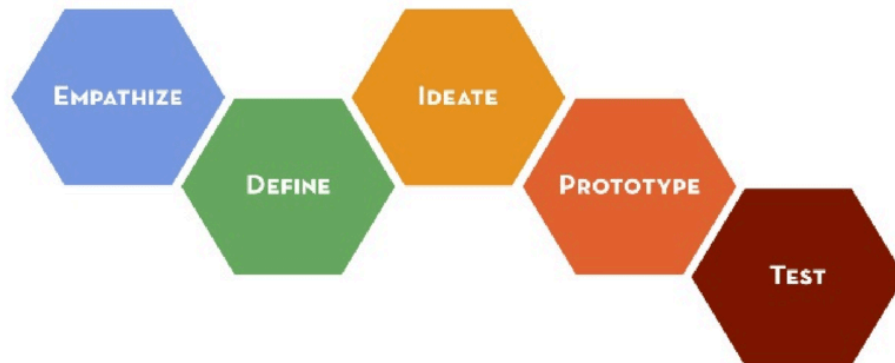
University of Virginia’s Darden Business School Design at Darden. 2014. Available at <http://batten.squarespace.com/>.

(3. Figure - Models of Design Thinking Process in Practice |

Source: Liedtka, 2015, p 928.)

Today, numerous practical implementations of the DT model exist as illustrated on figure 3. (Liedtka, 2015). Building on the three original phases introduced by Brown and Wyatt (2010), the process has evolved into five practical steps. These five steps align with the original three spaces, as outlined by the Hasso Plattner Institute of Design at Stanford in their *Design Thinking Process Guide*

(2010). These five steps (see figure 4) are as follows: Empathise, Define, Ideate, Prototype, and Test.



(4. figure - Stanford d.school Design Thinking Process Diagram
| source: decisionanalytics.com)

The Stanford DT model was chosen as the overarching framework for this project, because of its structured yet flexible approach. DT is highly applicable to both academic and professional innovation projects, due to its above discussed qualities. As described by Auernhammer & Roth (2021), the model is based on humanistic psychology theories and emphasises creativity, collaboration, and problem-solving as central components of the innovation process. This approach embraces creative thinking and facilitates innovation by addressing the actual human needs through practical, human-focused solutions, which make it suitable for this project.

3.5.3 Activities and Tools in Design Thinking

The DT framework provides a diverse set of tools and activities that can be applied at various stages of the process (Luchs, 2015). While some tools are tailored to specific steps (such as empathy mapping during the *Empathise* phase or brainstorming in the *Ideate* phase) others are more flexible and can be applied across multiple stages depending on the context and goals of the project. Relevant DT activities and tools are introduced at corresponding sections for each phase. In addition to DT activities and tools, other social research methods and UX activities have been employed throughout the different phases of the project. For clarity, the relevant activities and tools used throughout the project are discussed in detail within each chapter corresponding to a specific phase of the DT process.

3.5.4 Mixed-methods Approach

Throughout this study, a mixed-method approach was applied, which refers to the combined application of qualitative and quantitative research methods (Bryman, 2016). While the DT framework emphasises the importance of qualitative data collection, to validate the qualitative findings the study was complemented with quantitative research methods as well. Specific data collection and data analysis activities are discussed in the section corresponding to the given DT phase that

they were applied in. A significant part of the data collection happened in the “Empathise” phase of the project.

3.6 Ethical Considerations

Ethical considerations are a fundamental part of any research project, helping to ensure that participants are treated with respect and that the study is conducted responsibly and in accordance with academic ethical guidelines. Bryman (2016) defines four key ethical principles that are essential to consider in any research project as follows: “avoiding harm to participants and researchers, ensuring informed consent, protecting privacy, and avoiding deception.” (Bryman, 2016, p. 106). This research was conducted in accordance with the European General Data Protection Regulation and AAU’s Research Ethical Principles. In this section, it is discussed how these standards were upheld.

3.6.1 Research Ethics Principles at Aalborg University

Throughout the study, practical steps were taken to ensure compliance with the ethical research principles set out by Aalborg University. Ethical considerations were integrated into every stage of the process. Participation in all parts of the study, including surveys, interviews, and workshops, was entirely voluntary. Before involvement, participants were informed of their rights, including their autonomy, how their data would be used, and their unconditional right to withdraw at any time without consequences. Survey participants who opted in could enter a raffle for a 100 DKK voucher, with the winner selected at random and compensated via MobilePay. The study did not pose any form of harm, whether physical, psychological, or reputational.

Following Bryman. (2016), harm was understood broadly, and every effort was made to ensure a safe, respectful, and sustainable research process. Participants were recruited fairly and transparently, based solely on relevance to the research objectives, with no preferential treatment or unjust exclusion. The study was conducted independently, without external funding or sponsor influence, apart from the standard Danish state educational grant (SU). All participant data was anonymised, treated confidentially, stored securely, and only shared with the supervisor and examiner.

4. Empathise (User Research)

Before diving deeper into the first phase of the DT model, Empathise, it is essential to understand what empathy means. A great definition of empathy is provided by Köppen and Meinel (2015) as follows:

“Empathy is an ability that allows us to comprehend the situations and the perspectives of others, both imaginatively and affectively (Rogers 1975). It is therefore not about how I would feel in the certain situation of the other. Empathy is the attempt to reconstruct the specific perspective of the other and how he perceives the situation. The aim of empathy is to construe mutual understanding.”

(Köppen & Meinel, 2015, pg. 16-17; and Rogers, 1975 in Köppen & Meinel, 2015)

The Empathise phase focuses on exploring the problem space and developing a deep understanding of user needs and pain points (Köppen & Meinel, 2015). DT offers a practical set of tools that support empathy-building through qualitative data collection from stakeholders (Luchs, 2015).

This chapter presents the Empathise phase, which employed qualitative methods such as semi-structured user interviews and an expert interview, analysed using reflexive Thematic Analysis (TA). A quantitative survey was also conducted to validate and complement these findings. The chapter outlines the data collection and analytical methods, presents the results, and concludes with a synthesis of insights that inform the next design stages.

4.1 Data Collection

4.1.1 User Interviews

In order to gain understanding of the target groups' current habits, needs and pain-points, semi-structured interviews were carried out with travellers, from diverse backgrounds, within the target group of AI travel planning apps.

Semi-Structured Interviews

For this study a semi-structured interview approach was selected as it provides an overall frame for the interview, while allowing for flexibility in the collection of context-specific insights (Bryman, 2016). Semi-structured interviews allow the interviewer to have an interview guide with a set of topic areas and some predefined interview questions prepared, while giving them the freedom to slightly deviate from that to adjust to the context and to ask follow-up questions as well. The full list of questions of the semi-structured user- and expert interviews can be seen in the [Appendix L1](#).

Participant Sampling

This study employed a purposive sampling strategy, commonly used in interpretative research to recruit participants with relevant experience (Bryman, 2016; Magnusson & Marecek, 2015). Screening questions were used to ensure that all participants met three inclusion criteria: being aged 18–35, having taken part in or organised a group trip in the past year, and being comfortable speaking English. Participants were recruited through online channels within the researcher's professional network, providing timely access to participants with relevant experiences. While Magnusson and Marecek (2015) caution against interviewing close personal contacts, the selected participants were professional acquaintances rather than close friends or colleagues.

The aim was not statistical representation, but the collection of depth and richness of insight into group travel planning. As recommended in qualitative research, the number of participants was determined by the study's analytical goals and scope rather than fixed standards. A minimum of five interviews was planned to ensure diverse perspectives, while maintaining a manageable and robust dataset (Bryman, 2016).

Online and In-Person Interviews

To make participation as easy as possible and to reach relevant individuals, this study employed a hybrid approach, conducting interviews both in-person and online. As some participants were not located in Denmark, moving the interview into a digital environment greatly increased the reachability of this study, while acknowledging the strengths and benefits of in-person interviews (Bryman, 2016).

4.1.2 Questionnaire

In order to validate and extend the findings of the user interviews an online survey was developed for the collection of quantitative insights. By translating key themes into measurable indicators, the aim was to assess whether the patterns identified in interviews were reflected more broadly among the target audience. Employing this approach allows for triangulation, enhancing the overall validity of the study. (Bryman., 2016).

Online Questionnaire

As Bryman (2016) discusses, self-completion questionnaires can minimise external influence and may encourage more honest responses to certain topics. Choosing an online format assured that a wider range of target users could be reached in a timely manner, in comparison to traditional paper based surveys. Additionally it allowed for a more targeted and cost effective delivery, almost instantaneous response delivery, increased accessibility and overall a more comfortable approach for participants.

Among the numerous advantages there are also some limitations that must be considered when using online surveys for research. One important consideration is that by moving the survey to the online space some parts of the population or

some specific demographic groups, that are not present online, may be unintentionally excluded from the study (Bryman, 2016). As the target audience of this study was young adults utilising digital trip planning tools for group travels it is fair to assume their presence in the online space, thus this method does not present significant limitations in the reach of the target participants.

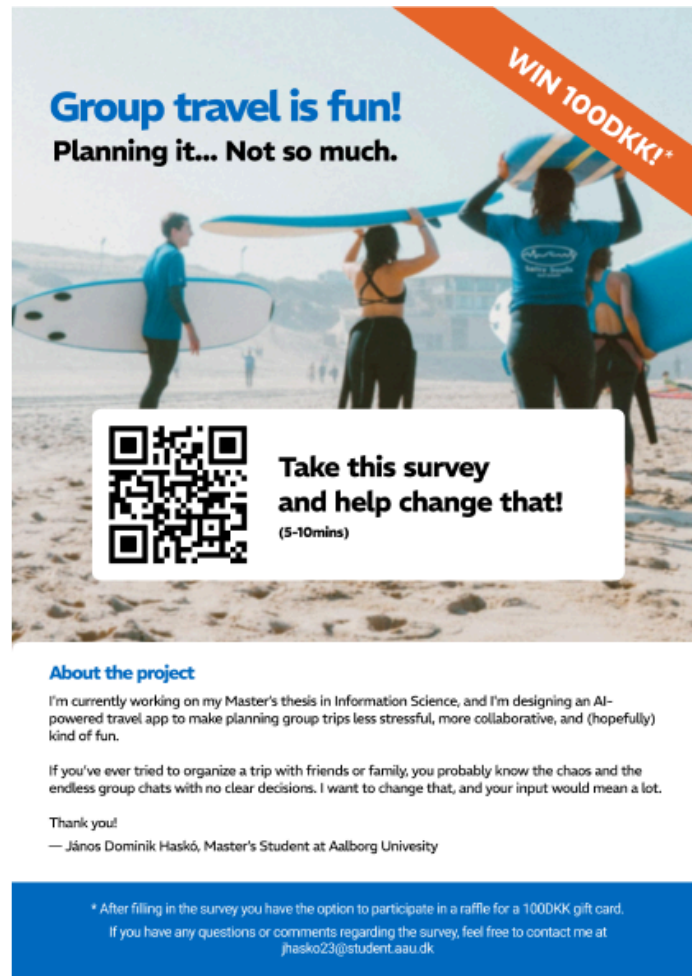
Target Audience

Similarly to the user interviews, the target audience of the questionnaire consisted of young adults (between the age of 18-35) who had experience planning or participating in group travel within the past 12 months. This included travellers coordinating with friends, family members or colleagues, ideally utilising some digital tools during the process.

Participant Recruitment

Participants were recruited using a combination of non-probability sampling techniques, more specifically convenience-based and internet-mediated recruitment methods (Bryman, 2016). The survey was distributed on online channels, including my private and professional social media networks (e.g. Facebook, Instagram and LinkedIn), online survey-sharing platforms and through a collaboration with a travel influencer, who shared the survey on his Instagram Story for 24 hours. In addition, printed posters (see figure 5) with QR codes linking to the survey were distributed in cafés, universities and public libraries within Copenhagen.

The distributed content (see in detail at figure 5) aimed to draw the attention of the target audience using colourful visuals, tagline and provide a brief overview of the study. Bryman (2016) discusses that even modest monetary incentives are known to positively influence response rates and also serve as a booster for extrinsic motivation while preserving participants' sense of autonomy as described by Ryan and Deci (2000). Therefore as a compensation for participants' time, respondents had the option to enter a raffle for a 100 DKK gift card upon completing the survey.



(5. figure - Design of Survey Poster | source: own creation)

Structure and Questions

The questionnaire was designed following key principles of social research to ensure data quality, participant engagement, and ethical compliance (Bryman, 2016). The full list of survey questions can be reviewed in [Appendix C](#). The landing page provided clear information on the study, participants' rights, data privacy, and the conditions of the optional 100DKK raffle. Informed consent (Q0) was required to proceed.

To minimise drop-out rates and cognitive load, the survey was divided into five manageable, thematic sections. The first section (Q1–Q6) introduced participants through relatable questions on travel planning habits, including frequency, role, tools, and devices used. These questions were primarily closed-ended to ensure clarity and ease of completion, in line with Bryman's (2016) recommendation for self-completion questionnaires, with an optional open-ended item (Q6) allowing for additional tool input.

The second section (Q7–Q12) addressed participants' experiences with group travel planning tools. It assessed perceived ease of planning (Q7), frustrations (Q9), and usefulness of AI-powered features for suggestion (Q11) and

coordination (Q12). Open-ended questions (Q8, Q10) offered depth, while a forced-choice format in Q9 encouraged item-level reflection, following Bryman's (2016) guidance to avoid "tick-all-that-apply" options, reducing the likelihood of skipping items.

These questions aimed to validate insights from earlier interviews, such as coordination difficulties and tool fragmentation. They also explored the perceived usefulness of AI-supported planning features to inform future design decisions. The questions were arranged to start with general experiences and gradually move toward more reflective and opinion-based input, keeping the flow natural and easy to follow for respondents.

Section three (Q13–Q14) focused on attitudes toward AI-powered travel tools. A Likert scale measured agreement with statements related to trust, frustration, and openness to AI (Q13). An open-ended item invited personal concerns not captured by fixed responses (Q14). This helped build understanding on the general perception around the use of AI in a familiar and often personal context.

The final section (Q15–Q18) collected demographic data (age, residence, education), and prior experience with GenAI (e.g. ChatGPT or Gemini), helping contextualise responses and confirm relevance of the target group

4.2 Data Analysis

4.2.1 Thematic Analysis of User Interviews

Braun and Clarke first introduced a practical guide for performing TA in 2006, which gained widespread recognition in academic research and since has become a commonly used method for qualitative analysis. Over time, various adaptations of their approach emerged, some of which, according to the authors, misrepresented or misunderstood key aspects of their method (Braun & Clarke, 2021). In response, the authors published a more comprehensive book in 2022, offering a detailed classification of different TA approaches and clarification of their own approach to TA, addressing common misconceptions, and providing updated guidance for its correct application.

Reflective Thematic Analysis

“At a very basic level, TA is a method for developing, analysing and interpreting patterns across a qualitative dataset, which involves systematic processes of data coding to develop themes – themes are your ultimate analytic purpose. TA is – more or less – a method for data analysis, rather than a methodology.”

(Braun & Clarke, 2022, pg. 4)

Braun and Clarke (2021) presents a revised version of their six-phase approach to TA, originally published in 2006. In this updated version they

introduce *their* intended approach to TA, which they named “*Reflective TA*”, and clarify some misconceptions that were made following the publication of their previous work in 2006.

Analysis Process

In 2006, the researchers defined the TA process with a six-phase model (Braun and Clarke, 2006). While the number of steps remained the same, for clarity, slight modifications were introduced to these phases, in their 2021 work. The authors emphasise that this approach is non-linear and iterative, but with clear guidelines. The six-phases are defined as follows: (1) Familiarisation with the data, (2) Coding, (3) Generating initial themes, (4) Developing and reviewing themes, (5) Refining, defining and naming themes, and (6) Writing up (Braun & Clarke, 2021).

This approach to TA emphasises that the researcher plays an active role in identifying patterns of meaning across the dataset and constructing themes that answer the research questions (Braun & Clarke, 2021). The analysis process (with the exception of the recording transcriptions) was performed manually to allow for a deeper understanding of the data, rather than a superficial understanding. The process was not strictly linear but more iterative and recursive, involving continuous engagement with the data.

The first phase of the process involved a review and deeper engagement with the collected dataset. Voice recordings were transcribed, then read multiple times to gain an overall sense of the material. At the second read, initial notes and comments were added to record early impressions, ideas, and potential points of interest. This stage was essential for noticing both the obvious and more nuanced aspects of the data and formed the base for further analysis (Braun & Clarke, 2021).

In the second phase, the data was examined in a more systematic and detailed manner. Relevant segments of the transcripts were identified and labelled with short and relevant codes that captured the content or significance of each quote. This process was iterative, flexible, and guided by the research question.

Once coding was complete, all quotes and codes were moved into a table in phase three. Here, the similar or related codes were grouped together to begin forming themes. Themes have broader meanings that aim to provide a potential answer to the research question. Codes were clustered based on conceptual similarities, rather than frequency alone in accordance with Braun & Clarke’s (2021) approach to TA.

The fourth phase involved revisiting the data to evaluate the coherence and validity of the initial themes. Each theme was checked against the coded extracts and then against the full dataset to ensure consistency. Some themes were merged, split, or discarded, depending on their relevance and clarity. This recursive step helped refine the structure of the analysis and ensured that each theme reflected meaningful patterns in the data.

Once a satisfactory thematic structure was reached, each theme was carefully defined to clarify its central meaning and its connection to the research question.

The final phase involved integrating the analysis into a coherent narrative. Writing was not simply a reporting stage, but a continuation of the analytical process. The goal was to present a clear account of the findings and their relevance to the research goals.

Participants

In total five persons (N=5) participated in the semi-structured interviews.

ID	Age	Background	Education	Nationality	Travel frequency (times/year)
P1	24	Master Student	BSc ¹	Danish	3
P2	23	Service Worker	AP ²	French/Danish	4-6
P3	29	Sustainable Urban Transportation Engineer	MSc ³	Venezuelan/American	6
P4	24	Linguist	MSc	Danish	12-24
P5	25	Software Engineer	MSc	Romanian	6

(Table 1. | Overview of Participants)

Analysis and Discussion

This section presents the results of the TA of the user interviews, organised by the main themes and sub-themes constructed during the analysis. Each theme is discussed in detail and supported by direct quotes from participants. Finally, a brief interpretation is provided for each finding, explaining its significance in relation to the research.

The first main theme is **Digital trip planning tools are an integral part of travel planning, however they have significant limitations.**

1) Trip planning is scattered among many different apps, which do not connect with each other.

The current digital travel planning landscape was described as highly fragmented, with no single platform offering an end-to-end solution. Most tools focus on specific tasks such as booking flights, itinerary or accommodations, which forces users to combine multiple services manually. Even multi-purpose platforms like Momondo fall short of delivering a complete experience and are not always

¹ BSc - Bachelor of Science Degree

² AP - Academy Profession (Danish word “Erhvervsuddannelse”)

³ MSc - Master of Science Degree

trusted. As one participant (P2) noted: “I go directly to the airline’s website to compare. But Momondo is my go-to because I don’t trust a lot of other travel websites.”

Participants reported using different tools for each planning stage, often having to navigate up to 8 different platforms. In total, they referenced over fifteen distinct services, highlighting a fragmented UX that complicates group coordination. These findings underscore a clear demand for an integrated platform to support group travel planning.

P1: “I always travel with other people, so if we could have a shared space where we all add things to the same trip, that would be great.”

P3: “I don’t like to plan too much, and I like to learn as I go. That being said, it is a bit chaotic — there are a lot of tabs open, a lot of things going on at once. It would be nice to be able to simplify the process somehow.”

P3: “I don’t think any specific product is frustrating — I feel like the products are quite good at their niche. But they don’t communicate with each other, which makes it difficult. For example, if I choose a hotel, I have to manually check its proximity to the airport or its accessibility. [...] the lack of integration between tools is the frustrating part.”

List of mentioned tools: Google Search, Google Maps, TrainLine Google Flights, Momondo, Skyscanner, Booking.com, Hotels.com, HostelWorld, AirBnB, AmiGo, TripAdvisor, Excel, Google Sheets, Notes App, Messaging platforms.

2) Redundant searches are required for finding the best deals.

Travellers are not only required to use different tools at the various steps of the planning process, but are often required to search on multiple platforms even at the same stage of planning to find the most suitable or affordable results. This current process is inefficient and frustrating for travellers, costing them valuable time.

These findings suggest that there is a need for an integrated platform that not only connects the different steps of planning but also combines price comparisons in one place. It highlights a clear gap in the current ecosystem for a central and trustworthy tool that can reduce repetitive tasks and streamline the search for affordable travel options.

P1: “It can be overwhelming looking at multiple websites for the same flight or trip. You want to compare different prices, so you end up checking so many sites.”

3) It is difficult to plan trips with flexible dates or to multiple locations using currently available tools.

Participants reported difficulties when planning trips with flexible dates or multiple destinations. While some platforms allow limited date flexibility, they often lack support for travelers seeking the cheapest options within a broader time range. Similarly, multi-destination planning is often not supported by tools that assume a

single destination. As a result, users are forced to search manually across platforms to find optimal solutions, increasing their workload. These findings reveal a design gap in current travel tools, which mainly only support fixed and linear travel patterns. Furthermore, indicate a need for flexible planning tools that allow users to explore options freely.

P4: "I think that when I plan my trips, I'm quite flexible, um, and I think that when you are quite flexible, you have to manually search for a lot of different things."

P5: "Maybe you know that you have an explore tab on Google, that only allows you to select either maximum, like three days a week or it doesn't allow your free range exactly."

4) Social media platforms are also an integral part of travel planning.

Many participants reported that social media platforms such as TikTok and Instagram now play a central role in their trip planning. Travellers use them not only for communication but also to discover destinations, activities, restaurants, and accommodations, often through direct searches or algorithm-driven content. This highlights a shift toward more visual and content-driven planning. Future travel tools could benefit from exploring the incorporation of inspiration-based features that reflect these behaviours on social media.

P1: "I usually plan with another person, so we plan together. I typically have an idea of where I want to go, then I look at social media for hotel recommendations"

P2: "(How do you find restaurants?) Probably a lot through Instagram or TikTok."

P1: "I like getting inspiration, so it should have a section for travel ideas—maybe something like TikTok or Instagram Reels."

The second theme, **Group travel planning is a social activity with shared responsibilities, which further complicates the planning process**, gives insights into the practical process steps of the trip planning among different traveller groups. The following sub-themes were identified:

1) Planning does not always happen in person, but is usually a collaborative process, where all travellers have some responsibilities.

The interviews revealed that although one person may act as the main organiser, group trip planning is inherently collaborative and requires input from all participants. While individual contributions may vary, the process can get blocked if even one member fails to contribute. These findings support Fardous et al., (2019). and are important for understanding the underlying process of planning group trips. They highlight the need for a planning tool that supports planning together with a group of people, allows for shared input and helps manage uneven contributions, without blocking the planning process.

P2: “I like planning in person — it’s fun. You can make it a cozy experience, like invite friends over for a glass of wine or coffee and plan together. I don’t want it to be stressful — I want it to be fun and exciting.”

P4: “Usually, we tend to either meet up in person or do a video call if we’re not near each other. But definitely face-to-face in some way.”

P3: [talking about the problem] I think part of it is that you assign everybody something to research, and sometimes people do it, sometimes they don’t. I also think that conflicting information can be frustrating because it doubles the work.

2) It is difficult to find a time for the trip that works for everyone.

One of the main challenges in planning group trips is finding a time that suits everyone. Aligning schedules to find a time that works for all participants poses a major challenge, especially because travellers availability varies a lot due to work, school and other personal commitments. These insights imply that future planning tools should include features that help coordinate availability across group members, making it easier to identify dates that work for everyone.

Interviewer: What challenges did you face when you were planning this latest trip?

P5: Finding a good time for all of us.

3) The number of options to select from are overwhelming.

One participant described the planning process as overwhelming due to the high number of available activities and the challenge of coordinating them with others. The currently available tools, rather than simplifying decisions, propose an overload of choices that increases the mental load of the users and makes it more difficult to create a clear and enjoyable itinerary for groups.

This finding shows that too many options can lead to decision fatigue, especially in group settings. Future products should aim to reduce the user’s cognitive overload by offering smart filtering, prioritisation, or personalised suggestions that simplify choices supporting an easier decision-making process.

P5: “but it was overwhelming (to build the itinerary) with the amount of activities and exact timing.”

4) Aligning preferences and expectations of the trip can be confrontational and inconvenient.

Participants noted that aligning individual preferences and expectations during group trips can lead to tension and compromises. Differences in interests, energy levels, and priorities often require negotiation, which can be inconvenient or even confrontational in some situations. Travellers address these situations by dividing choices to ensure fairness and shared satisfaction.

This suggests that travel planning tools should provide more support for collaborative decision-making, helping groups divide responsibilities, personalise parts of the itinerary, and ensure everyone's interests are considered fairly.

P2: "when you and your friend want to do different things—like different energy levels. One person wants to go out for drinks, the other wants to stay in. If you don't know anyone else in the city, you might end up not doing something you wanted to do."

P2: "For activities, I think it's important to split it so that everyone gets to do what they want. So maybe, throughout the day, I pick a museum I want to go to, and then my friend picks the restaurant where we eat. The next day, they pick a daytime activity, and I pick something for the evening. It's just important that everyone gets to do what they want, and we puzzle it together."

The third theme "**Additional features could make travel planning easier for groups**" highlights the potential areas for improvement. Travellers shared their opinions and ideas how current tools could be enhanced to create a more optimal planning experience. Five sub themes were identified as follows:

1) Price Calendar (Price Tracking and Budget Planning)

Price is a key factor for most travellers when planning a trip, and several participants emphasised the importance of having access to a price calendar. This feature allows users to compare prices across different dates and make informed decisions based on budget and flexibility. A price calendar was described not only as a helpful planning tool but also as one of the first things travellers look for when booking. These findings suggest that incorporating a reliable and transparent price tracking feature could add significant value to future travel planning tools.

P1: "I always check a price calendar for flights first. That way, I can see which days are cheaper. I usually book flights before accommodation."

P2: "The price calendar is a must-have. And the app needs to feel trustworthy—people should feel like the company actually has their back instead of just trying to upsell them."

2) Traveller profile for preferences

Participants expressed a desire for travel tools that take their personal preferences into account from the beginning. Instead of starting from scratch each time when planning a trip, they imagined a profile feature that would ask a few key questions, such as preferred accommodation type, budget, and proximity to transport or attractions, and then tailor recommendations accordingly. This kind of personalized input could help streamline the planning process and reduce users time spent filtering through irrelevant options.

P3: "I think it would have a simple entry questionnaire—not a long form, but something that asks key questions about the type of accommodation I want, the

accessibility to transportation (like train stations or airports), and the accessibility to places I want to see.”

P3: “An ideal feature would be budget planning, where I could set what I’m willing to pay for housing, flights, activities, and food, and then get recommendations accordingly.”

3) Smart and Collaborative Itinerary Building

Participants expressed a need for smarter tools to help organise their trips. They wanted support in estimating travel time, activity duration, and how to structure each day the most efficiently. An ideal app would offer suggestions based on timing, distance, price, or local conditions, and include a personalized list of suggestions and must-see spots. These insights point to a need for more personalised and context-focused itinerary planning that accelerates the planning process.

P3: “I wish I could better understand the distance between locations, the time it might take to eat, the time it might take to complete an activity, and so on, so I can plan better.”

P5: “And I would like to have that in an app, like to kind of pinpoint what activities I should do on a specific day because they are cheaper or because rules allow or whatever.”

P4: “Maybe some sort of collection of must-see sites in a city.”

The last theme “**The integration of AI technologies into travel planning tools could enhance the group travel planning process**” explores how AI technologies could improve the group travel planning process.

1) AI Could Be a Reliable Partner in Planning

Participants expressed that the integration of GenAI technologies into their current trip planning method could potentially enhance their process. People found these technologies useful for their capability to provide the user with personalised results and recommendations, better than traditional search engines. While not all participants had prior experience using AI tools for travel, they recognised its potential benefits, particularly the ability to customise searches based on individual preferences. Unlike generic travel platforms, AI tools were seen as capable of understanding personal travel styles and offering more tailored, relevant suggestions. These findings suggest travellers would be open to an AI supported planning flow, if that offers a more efficient and preference-driven planning experience.

P1: “I haven’t, but to be honest, it sounds like a good idea. I just haven’t thought about it before.”

P3: “I haven’t really used AI tools like ChatGPT for travel, but it seems like it would be interesting to put in different parameters — since I don’t do many

touristic things — to tailor the search more to what I like rather than just general recommendations.”

P4: “I could imagine it being useful because you can explain your preferences, like avoiding museums, and it could filter information for you.”

2) Products utilizing GenAI technologies must be transparent and provide sources to gain the trust of users

Although most participants talked in favor of applying AI technologies, they emphasised the importance of transparency and credibility of sources. It was pointed out that AI recommendations would only gain credibility if the sources are directly linked to the suggested content, so that users can validate the provided information if necessary. Without this transparency, some participants expressed concerns about misinformation or discomfort with entering personal data. These findings suggest that to gain user trust, GenAI-powered products must prioritise transparency and openness about how and where information is sourced from.

P1: “If AI helped book flights and hotels in one place, I wouldn’t feel comfortable entering personal details into it. I’d prefer to be redirected to the official website instead of inputting my data on the platform itself.”

Interviewer: “If it provided links to official sources, would that reassure you?”

P4: “Yeah, because then you can double-check.”

P3: “AI has a habit of making up information — pulling different things together in a way that isn’t always true. I’d be concerned about that. If an AI recommends something, I’d want it to be tied to a legitimate source or a link.”

Conclusion

The user interviews explored the challenges and expectations of young group travellers. Through the TA of the user interviews, four main themes were described, revealing travellers' frustrations with the fragmented UX of trip planning, the complexities of coordinating with others, the need for smarter planning features, and a cautious optimism toward AI-supported applications.

These findings highlight the importance of designing more integrated, collaborative, and customisable travel planning solutions. Tools that take user preferences into account, support group dynamics, and incorporate transparent AI features, which have the potential to significantly improve the group travel planning experience. In the following steps these findings should be validated in a quantitative manner, in order to evaluate if those are relevant at a scale as well.

4.2.2 Thematic Analysis of Expert Interview

Expert Background

To complement user insights with professional expertise, an expert interview was conducted with a participant who has several years of experience in the travel

industry. He previously worked as a travel consultant, helping clients plan and book trips based on personal preferences, and also held roles at four different hotels where he observed common guest challenges and planning mistakes.

At the time of the interview, he was working as a cabin crew member for a major Scandinavian airline, regularly interacting with travellers during flights. This background across travel consulting, hospitality, and customer service provided valuable insights into traveller behaviours, needs, and pain points across different user groups.

Analysis and Discussion

In this section the findings of the TA of the expert interview will be discussed, organised into main themes, each including various sub-themes. For brevity the supportive quotes of each theme can be found in the [Appendix E](#).

The first theme is as follows: **Social media plays a central role in travel-inspirations and sets expectations**

1) Social media serves as a main source for travel inspiration

The expert interview uncovered that social media platform (e.g. Instagram and TikTok) now serve as a main source of inspiration for travellers, especially in the younger demographics. These findings align with the insights gathered from the users, indicating a new trend in tourist behaviour. The consideration of these findings is essential when designing a future travel planning solution.

2) Social media can set false expectations about travel destinations

The expert discussed that while social media platforms can serve as a source of inspiration for travel destinations, they can also create a false image and set false expectations in travellers. He emphasised that while influencers' content might be organic, travellers do not consider that the content creators might have special access to sights, hotels and beaches and they might travel in low-seasons where the beaches and attractions are not crowded. These findings underscore the importance of cautious, clear and ethical usage of viral content from social media platforms, avoiding misguiding travellers.

The second theme **Most common issues and frustrations in group travel planning** discusses the insights of the expert on the most common pain-points of travellers.

1) People struggle aligning with their travel partners

The analysis of the interview revealed that one of the most common frustrations of group travellers is aligning with their travel companions on travel dates, travel destinations, budget and other expectations regarding the type of experience that they would like to get out of the trip. These frustrations often impact the outcome of the trip and hinder the overall experience.

These findings suggest that travellers need assistance aligning their expectations prior to the trip. It is essential to consider these insights when developing a future solution in order to mitigate these frustrations.

2) People get overwhelmed due to lack of experience in travel planning

Another major source of frustration identified by the expert was travellers' lack of planning experience. While travel agencies offer packaged solutions, those planning independently often face unexpected challenges. Without expert guidance, travellers must sort through countless options, which can quickly become overwhelming, underscoring the findings of the user interviews. The expert also noted that some travellers, in an effort to save on agency fees, book flights and hotels separately but forget key details, such as airport transfers, leading to stressful situations upon arrival. These insights highlight the need for tools that provide personalised support across the entire planning process.

3) People are unaware of local customs and events

The expert highlighted that travellers often face frustration when arriving in unfamiliar cultures unprepared. Failing to consider local customs can negatively impact their experience. For instance, some expect a week of partying, only to discover upon arrival that alcohol is restricted due to religious holidays. These insights emphasise the value of personalised planning support. AI technologies discussed in the literature review (Aribas & Daglarli, 2024; Singh et al. 2024) could help mitigate such issues by providing culturally relevant information tailored to individual expectations.

The third theme **Expert recommended features for an ideal travel planning platform** covers the recommendations of the expert.

1) There is a need for a smart, personalised travel assistant and itinerary builder.

The expert discussed that a future travel planning solution should help travellers easily find the most relevant accommodation, flight, restaurant and activity options for their preferences from across different platforms. A system that filters options based on user preferences could save time and reduce information overload.

He also recommended an integrated itinerary builder that supports both group and individual preferences. Such a tool could suggest shared activities while allowing for personal itineraries and ensure that all group members have a veto right to keep the experience inclusive. These findings underscore the importance of investigating the feasibility of such a solution and investigating if AI technologies could provide a potential solution.

2) Traveller profiles could help travellers find out about their compatibility prior to the trip.

The expert interview revealed that many travellers face frustrations during their trip because they discover that they are not compatible with their travel companion. He explained that people might be best friends, but can end up having a terrible experience travelling together as they might not realise before the trip that they have different travel styles. Learning your companions travel style can be challenging and confrontational, which most travellers try to avoid.

He expressed that creating a solution that facilitates the discovery of participants' travel style could help achieve alignment among travellers and increase the potential for an enjoyable trip for everyone involved.

3) Integration of viral social media trends could drive inspiration.

An additional suggestion of the expert was to consider the integration of viral social media trends in a familiar way to users, in order to motivate and inspire them for their future trips.

The last theme is **AI technologies could be a partner in planning, but they have limitations.**

1) AI platforms can offer more precise answers to some questions than traditional search engines.

The expert discussed that, based on his professional experience, GenAI tools exceed traditional search engines in some particular cases, providing prompt answers to questions. This finding highlights the importance of careful consideration of where AI technologies could be applied to enhance user task execution and user satisfaction.

2) AI platforms are limited in functionality.

The expert warned against over-reliance on GenAI technologies, as those are still limited in capabilities and are currently unable to replace some manual work such as booking accommodations and flights on behalf of a user. He also highlighted that GenAI models have the tendency to hallucinate. Considering these findings in the design of a potential solution is essential. Integration of any AI technologies must be carefully considered.

3) Trust in AI technologies is still vary.

When asked about the reliability of AI technologies, the expert discussed that AI models tend to be biased and might be trained on data that could have included paid promotions, giving unfair advantage to certain results. He emphasised the importance of clarity and transparency when employing such technologies.

Conclusion

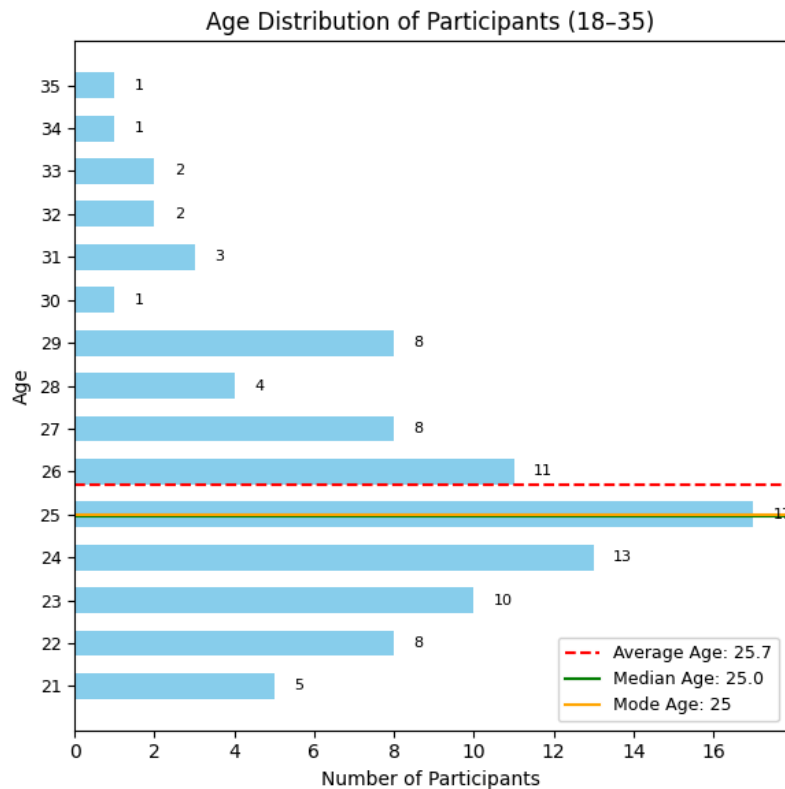
The expert interview provided invaluable insights on current travel behaviours, revealing the central role of social media, common pain points in organising group travel, and the promise and limitations of AI solutions. The findings indicate that travellers commonly experience conflicting expectations, being overwhelmed by the planning process, and may be surprised by cultural contrasts when travelling.

Additionally, the expert provided his views on useful future features that could enhance the planning experience, guiding the user through the entire planning procedure. While AI has great potential in enhancing UX, its implementation must be approached with care, assuring that transparency and trustworthiness are highly prioritised. These insights provided a foundation for the design of a future travel planning solution, supporting some of the findings of the user interviews.

4.2.3 Analysis and Discussion of Questionnaire

Participant Overview and Response Rate

A total of 104 responses were collected through the online questionnaire. After excluding six participants above the age of 35 (5.8%) and four who failed the attention check in Q22, the final dataset consisted of 94 valid responses from the target group aged 18–35.

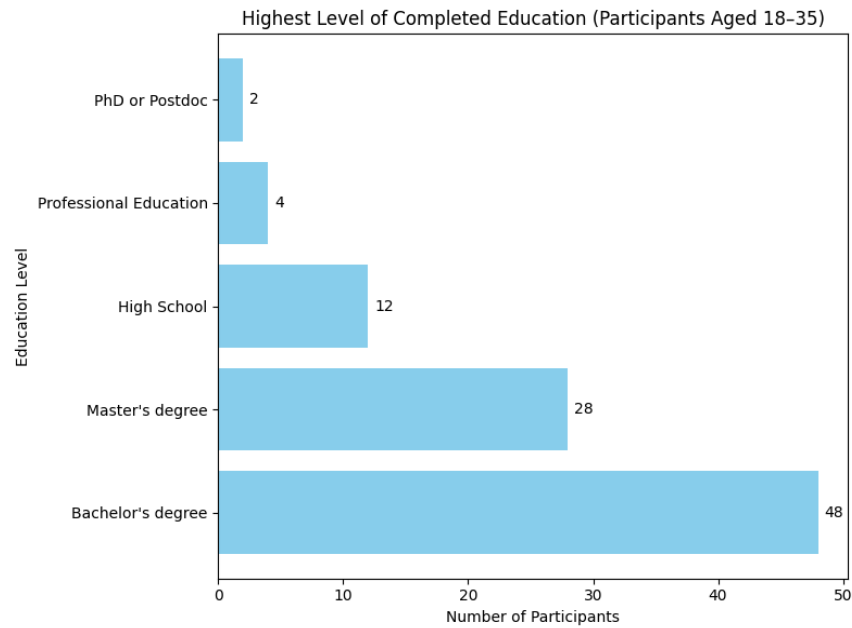


(Figure 6. - Age Distribution of Participants)

The distribution of participants by age is shown on figure 6. The average age was 25.7 years ($M=25.7$), while both the mode and the median was 25, suggesting a strong concentration of respondents in their early to mid-twenties. This indicates that the sample mainly consists of students and young professionals, which is an audience that is likely to engage in group travel and adopt AI technologies for their trip planning. This also shows that the questionnaire distribution strategy was successful in reaching the target audience, strengthening the validity and applicability of the results to the target user group.

Participants by Highest Level of Education

Figure 7 shows the distribution of participants by education level. It shows that 48 participants (51.1%) held a bachelor's degree, followed by 28 (29.8%) with a master's. Twelve (12.8%) had completed high school, four (4.3%) had professional education, and two (2.1%) held a PhD or postdoctoral degree.



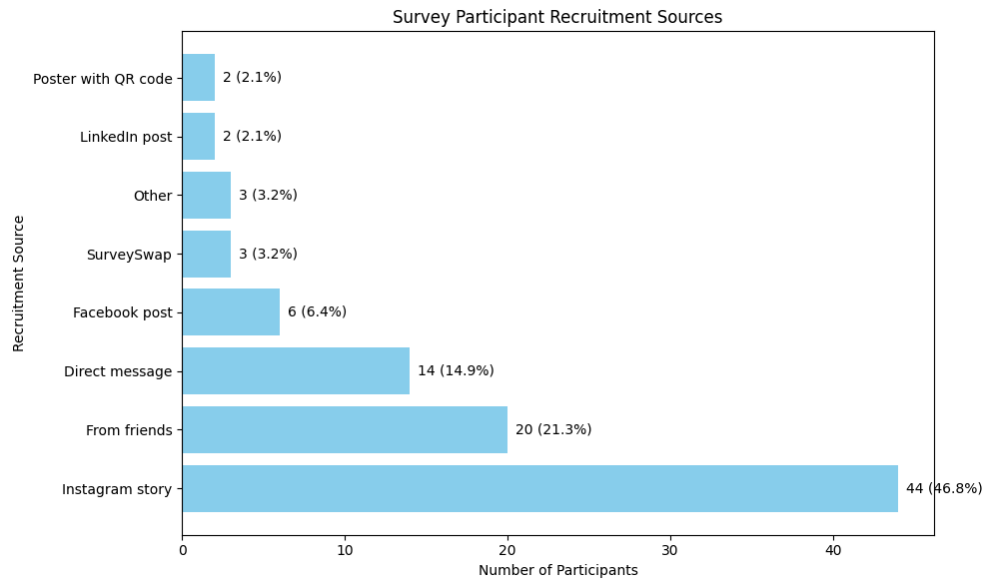
(Figure 7. - Distribution of Participants by Education Level)

Participants' Country of Residence

There were participants from a wide range of countries, with a strong concentration from Denmark, where 44 participants (46.8%) resided. Followed by Hungary with nine participants (9.6%), the United States with eight participants (8.5%), and Spain and Poland, each with six participants (6.4%). Following that there were four participants (4.3%) from Germany and France, the Netherlands, and Norway each with two participants (2.1% each). Additionally, there were other countries with single respondents, such as the United Kingdom, Portugal, Austria, Ireland, Mexico, South Africa, Croatia, and Belgium (~1.1% each).

Participant Recruitment Sources

To assess distribution effectiveness, participants were asked how they discovered the survey. As shown in Figure 8, the majority were reached via Instagram stories (44 participants, 46.8%), followed by referrals from friends (20, 21.3%) and direct messages to travellers (14, 14.9%). Fewer responses came from Facebook posts (6, 6.4%), SurveySwap (3, 3.2%), LinkedIn (2, 2.1%), and physical posters in Copenhagen (2, 2.1%). Three participants (3.2%) reported participation from other sources. These findings highlight the value of social media as a recruitment tool and suggest that engaging influencers may increase reach, while traditional methods such as posters were less effective for reaching the target audience.

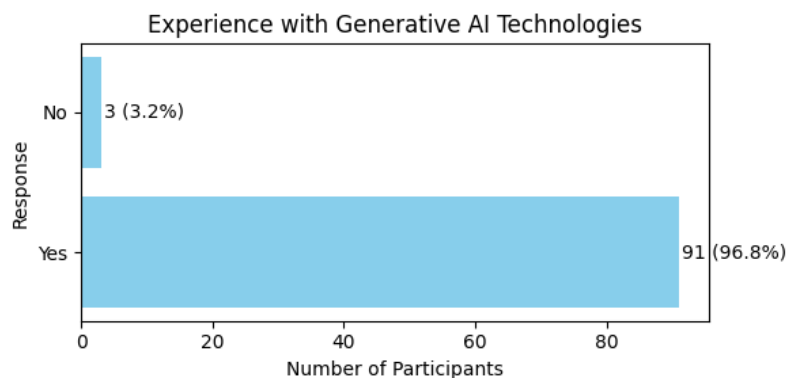


(Figure 8. - Distribution of Participants by Recruitment Source)

Prior Experience with GenAI

91 participants (96.8%) reported to have prior experience with GenAI technologies (see Figure 9.) such as ChatGPT, Gemini or similar. Only 3 participants (3.2%) indicated that they had not used such tools before.

Participants reporting having prior experience with GenAI technologies supports the relevance of their feedback for AI-driven travel planning tools. This high level of GenAI familiarity among participants aligns with the digital habits of young adults, who are frequent users of online travel planning tools (Fardous et al., 2019; Ribeiro, 2024). However, it is important to note that this may skew results slightly towards more positive or confident perceptions of AI than would be expected in a broader population.

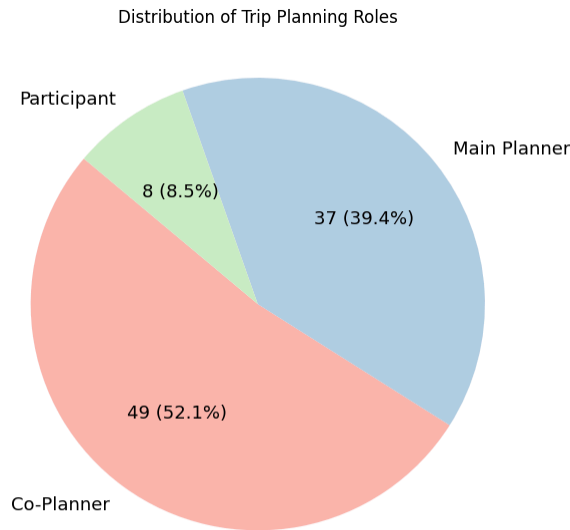


(Figure 9. - Participants' Prior Experience with AI)

Main Role in Group Trip Planning

Participants were asked to report on their main role in group travel planning (see figure 10). The findings show that a majority, 49 participants (52.1%) participate in group trips as co-planners. Followed by 37 participants (39.4%) who act as the

main planner of the trip, while only 8 participants (8.5%) reported to be passive participants in the process.

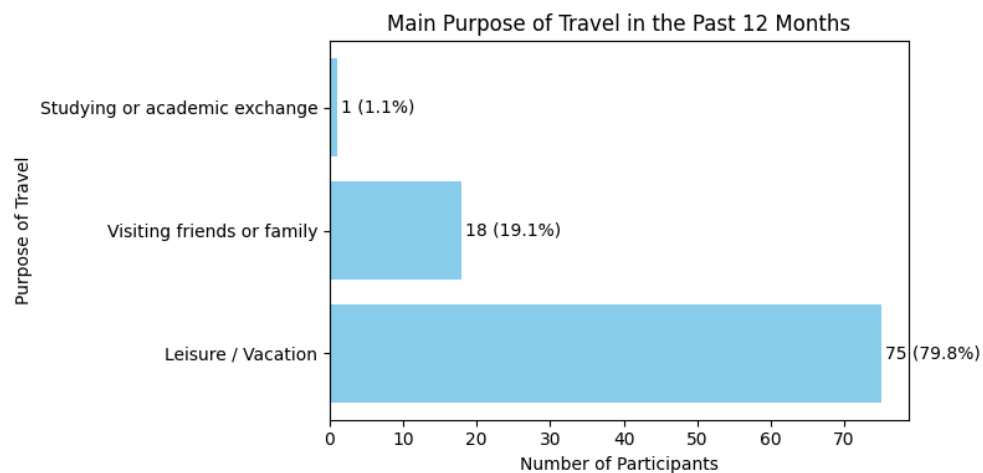


(Figure 10 - Distribution of Participants by Main Role in Planning)

These findings confirm the findings of the qualitative analysis, suggesting that group trip planning is a collaborative process, as written earlier: “*Planning does not always happen in person, but is usually a cooperative process, where all travellers have some responsibilities.*” Further, it underscores a need for trip planning tools that support co-planning, not just single-user control.

Purpose of Travel

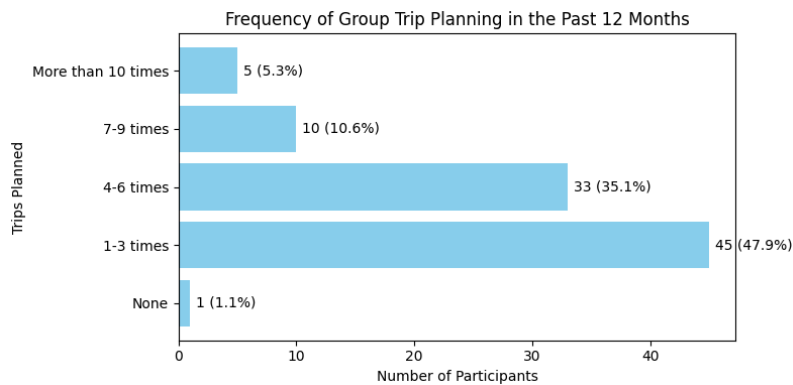
75 participants (~80% of sample) reported that their main purpose of travel is for leisure or vacation (see figure 11.), while 18 participants selected visiting friends and family as their main purpose of travelling. A single participant indicated study- or academic exchange as his/her/their main reason for travel, while no participant marked business or work related activities as their main purpose of travel.



(Figure 11 - Distribution by Main Purpose of Travel)

Frequency of Travel

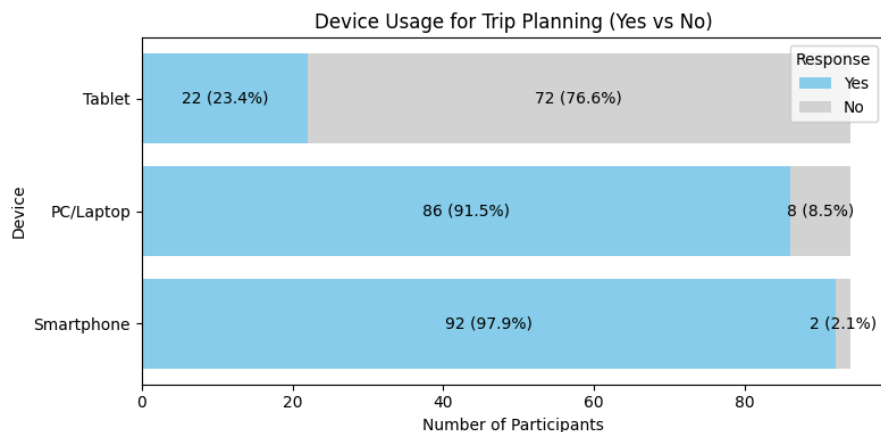
45 participants (47.9%) reported having planned trips with others (see Figure 12) in the past twelve months, while 33 participants (35.1%) said that they planned group trips 4-6 times. Among the more frequent travellers, ten participants selected that they travelled 7-9 times in the past twelve months and five that they planned over ten trips with others. A single participant reported not traveling in the past 12 months.



(Figure 12 - Distribution by Frequency of Travel)

Use of Devices

Figure 13 shows the distribution of devices used by travel planners. The analysis reveals that 97.9% use smartphones and 91.5% use PCs or laptops, demonstrating a strong reliance on both mobile and desktop platforms. On the other hand, tablets are not utilised to the same extent, with only 23.4% of participants reporting having used a tablet for trip planning. These findings underscore the significance of designing travel planning tools that are adaptive and functional across both desktop and mobile interfaces.

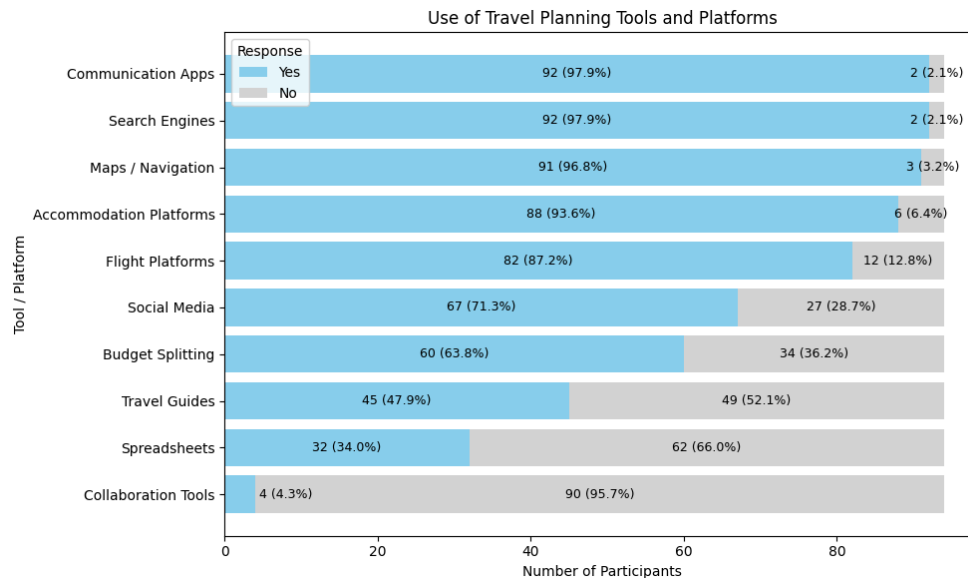


(Figure 13 - Use of Devices in Trip Planning)

Use of Travel Planning Tools and Platforms

Travellers were asked about the different digital tools that they have utilised for planning group trips in the past. Figure 14 shows the distribution of tools used for group travel planning. The results indicate that participants make use of a wide range of tools. The most commonly used platforms include communication apps

and search engines, each selected by 92 respondents (97.9%), followed closely by maps or navigation apps with 91 participants (96.8%) and accommodation platforms with 88 participants (93.6%). Flight search platforms are also widely used, with 82 participants (87.2%) indicating usage. A surprisingly high number, 67 participants (71.3%) reported using social media platforms for trip planning, while 60 participants (63.8%) reported using budget splitting applications. A smaller portion of participants indicated the usage of spreadsheets with only 32 participants (34%) and solely four participants (4.3%) reported to use collaboration tools for the planning.



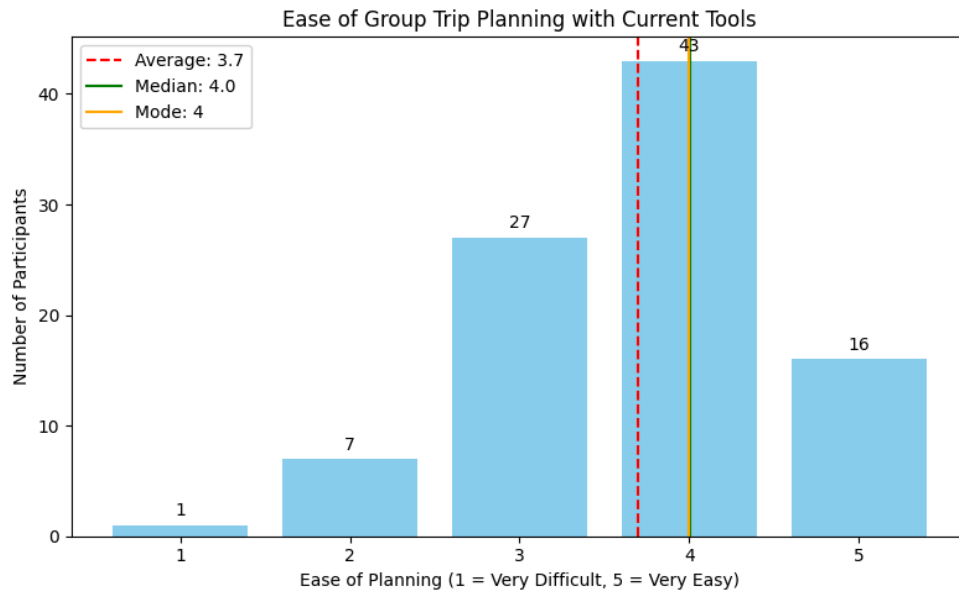
(Figure 14 - Use of Tools and Platforms in Trip Planning)

The qualitative analysis of the answers for Q6 revealed that three respondents reported to use ChatGPT (or similar) for itinerary planning, while an additional participant highlighted the usage of Canva for creating a visually appealing itinerary.

On average travellers use ~7 (6.95) different types of tools to organise a group-trip. Therefore findings underscore that travellers often combine many general-purpose apps to manage trip planning, validating the findings of the user interviews: *“Trip planning is scattered among many different apps, which do not connect with each other.”*

Easy of Group Trip Planning with Currently Available Tools

Figure 15 shows how participants rated the ease of planning group trips using currently available tools, on a scale from 1 (very difficult) to 5 (very easy). As the data shows 16 people reported the process to be “(5) very easy”, while the majority, 45 participants selected “(4) easy”. The median score is four, while average rating lands slightly lower at 3.7, suggesting that while many users are generally satisfied, there is space for improvements. Interestingly, a noticeable portion, 27 participants, gave a neutral rating of 3, indicating that although the tools work, they might not fully support the group planning process. Only seven respondents rated the experience as difficult and only a sole respondent selected very difficult.



(Figure 15 - Ease of Group Trip Planning)

The qualitative analysis of the answers of Q8 revealed similar patterns as the previous user interviews. Participants rating the current process from difficult to neutral (2-3) explained their frustrations about having to navigate multiple apps while planning trips: *“Have to navigate too many different websites and apps to plan a trip. A central hub would save time.”*; *“The different platforms I use do not communicate with each other, creating a barrier to planning.”*; *“Many platforms scattered around”*.

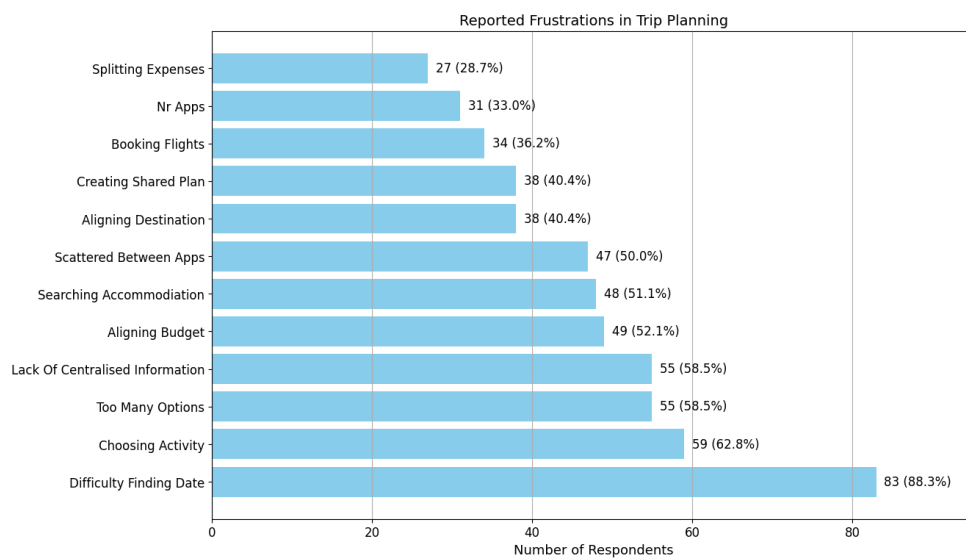
Additionally the analysis revealed that travellers' face difficulties finding a date that works for everyone: *“The biggest problem is agreeing on the date when everyone is available, more than creating a plan itself.”*; *“I always need to do excel sheet and ask people to put availability”*; *“Finding dates are always hard and also planning food!”*.

Further findings indicate that travellers face difficulties building itineraries, aligning on personal expectations, find group chats inefficient for planning, lack personalised recommendations, lack support for flexible travel options and get confused or overwhelmed by the high volume of available resources (See all quotes in [Appendix D](#)). Additionally, one participant who rated his/her/their current process as “(5) very easy” discussed: *“I have everything I need especially with use of AI”*, which indicated the willingness for employing AI technologies and supports the relevance of the development of an AI-supported solution.

Overall, these insights show that while current tools are working for most, there is still a clear opportunity to improve the experience, especially for users who responded “(3) neutral” or below. A solution that reduces planning frustrations, simplifies coordination, and adapts to group dynamics could move the average closer to 5.

Frustrations in Trip Planning

Participants were asked to reflect on common challenges in group trip planning. As shown in Figure 16, the most frequently reported frustration was aligning schedules, reported by 83 respondents (88.3%). This was followed by difficulty choosing activities that appeal to everyone (62.8%), and both information overload and a lack of centralisation, each reported by 55 participants (58.5%). Other commonly selected issues included coordinating budgets (52.1%), booking accommodations (51.1%), and juggling between different apps (50.0%). Additional frustrations included difficulty creating a shared plan (40.4%), agreeing on a destination or booking flights (around 33%), and managing expense splitting (28.7%).



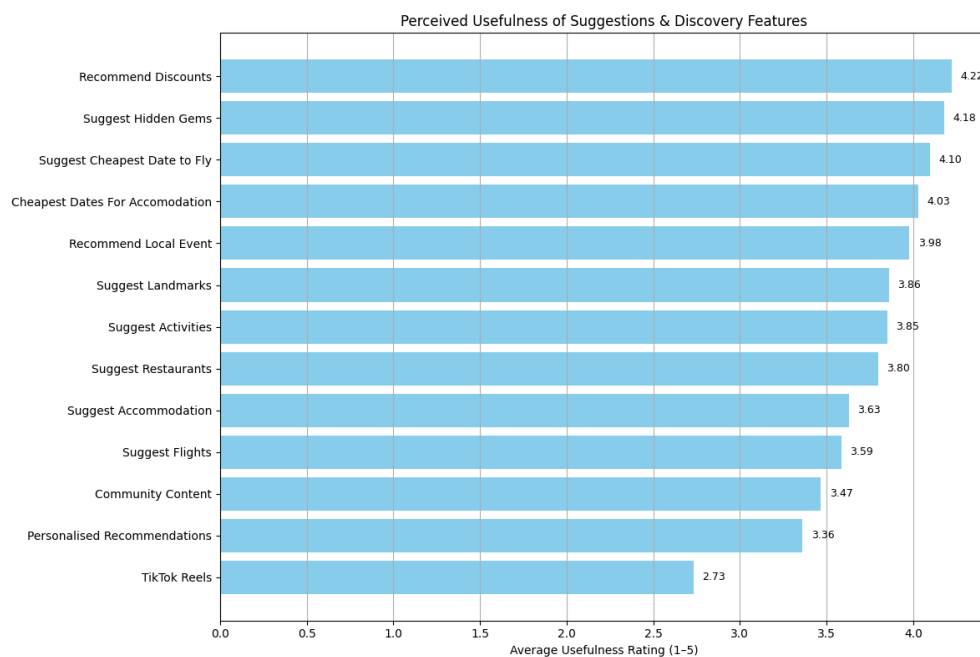
(Figure 16 - Reported Frustrations in Group Trip Planning)

The survey findings clearly validate the following insights from the user interviews. The most commonly reported frustration: “difficulty finding a date that works for everyone” (88.3%) directly supports the qualitative finding: “It is difficult to find a time for the trip that works for everyone.” Additionally, the high percentage of respondents who felt overwhelmed by the number of options (58.5%) reinforces the insight that “The number of options to select from are overwhelming.” Finally, the challenges around choosing activities (62.8%), aligning budgets (52.1%), and destinations (40.4%) reflect the social complexities noted in the interview quote: “Aligning preferences and expectations of the trip can be confrontational and inconvenient.”. The relatively low proportion of participants (33%) reporting difficulties with managing multiple tools suggests that users may benefit more from a streamlined integration hub than from a comprehensive, all-encompassing application.

Perceived Usefulness of Suggestions & Discovery Features

Travellers rated the usefulness of various planning features on a 1–5 scale (Figure 17), showing a clear preference for practical, cost-saving tools. “Recommend

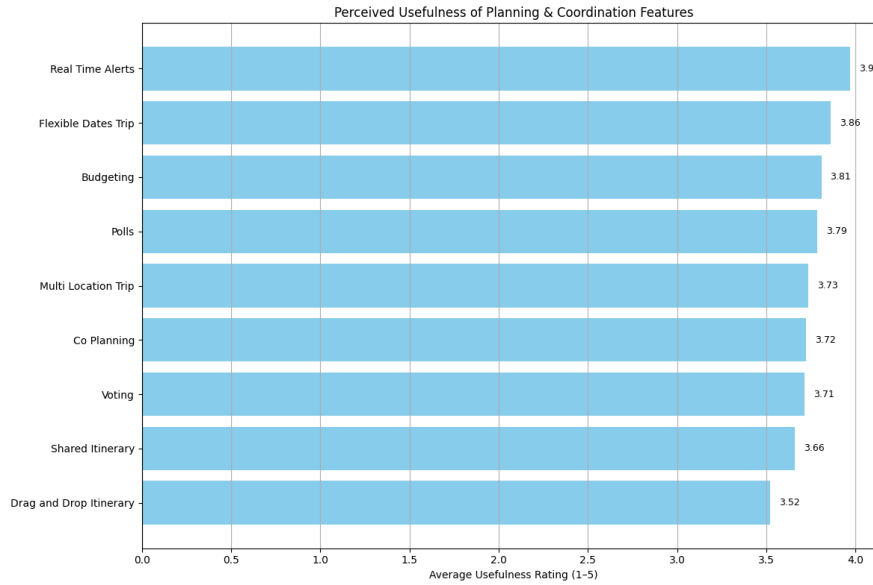
Discounts” received the highest score ($M = 4.22$), followed by “Suggest Hidden Gems” ($M = 4.18$) and “Suggest Cheapest Dates to Fly” ($M = 4.10$). Features like “Cheapest Dates for Accommodation” ($M = 4.03$) and “Recommend Local Event” ($M = 3.98$) were also rated highly. Features suggesting landmarks ($M = 3.86$), activities ($M = 3.85$), and restaurants ($M = 3.80$) were positively received, while flight ($M = 3.59$) and accommodation suggestions ($M = 3.63$) received moderate ratings. More personalised features such as “Community Content” ($M = 3.47$), “Personalised Recommendations” ($M = 3.36$), and especially “TikTok & Reels like content” ($M = 2.73$) were perceived as less useful. These findings informed the prioritisation of features. Interestingly, these findings do not fully align with the previously reported frustrations, despite the fact that personalised recommendations could directly address issues such as option overload and difficulty selecting activities.



(Figure 17 - Perceived Usefulness of Features (Suggestions & Discover))

Perceived Usefulness of Planning & Coordination Features

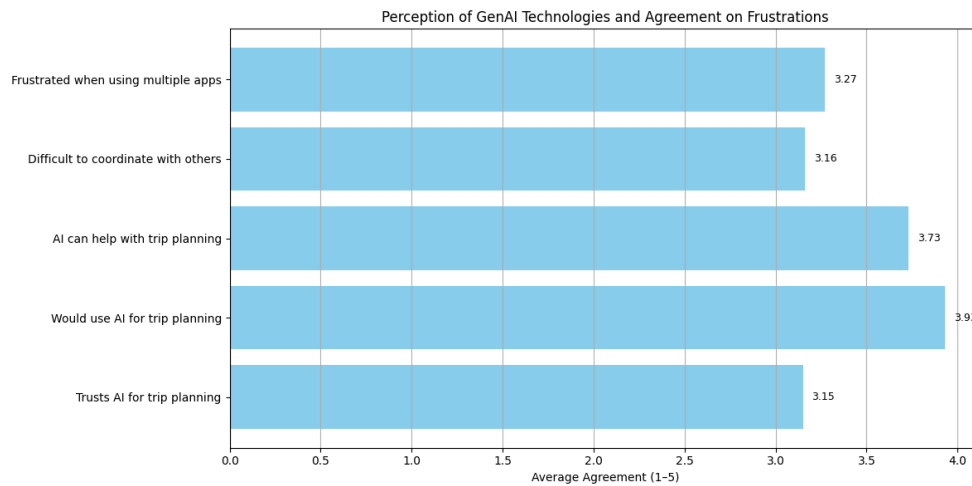
Participants rated the usefulness of various planning and coordination features for group trips. As shown in Figure 18, “Real-Time Price Alerts” received the highest average rating (3.97), followed by “Support for Flexible Dates” (3.86) and “Support for Budgeting” (3.81). Features like “Polls” (3.79), “Multi-Location Support” (3.73), and “Co-Planning” (3.72) were also rated positively. Slightly lower ratings were given to “Voting” (3.71) and “Shared Itinerary” (3.66), while the “Drag-and-Drop Itinerary Builder” scored lowest (3.52). Although all features were generally well received, these ratings can help prioritise functionality in future design decisions.



(Figure 18 - Perceived Usefulness of Features (Planning & Coordination))

Perception of GenAI Technologies and Agreement on Frustrations

Travellers were asked to indicate their level of agreement with the following five statements listed below. Figure 19 shows the average agreement ratings (on a scale from 1 to 5), while Figure 20 shows the distribution of agreement levels among participants.



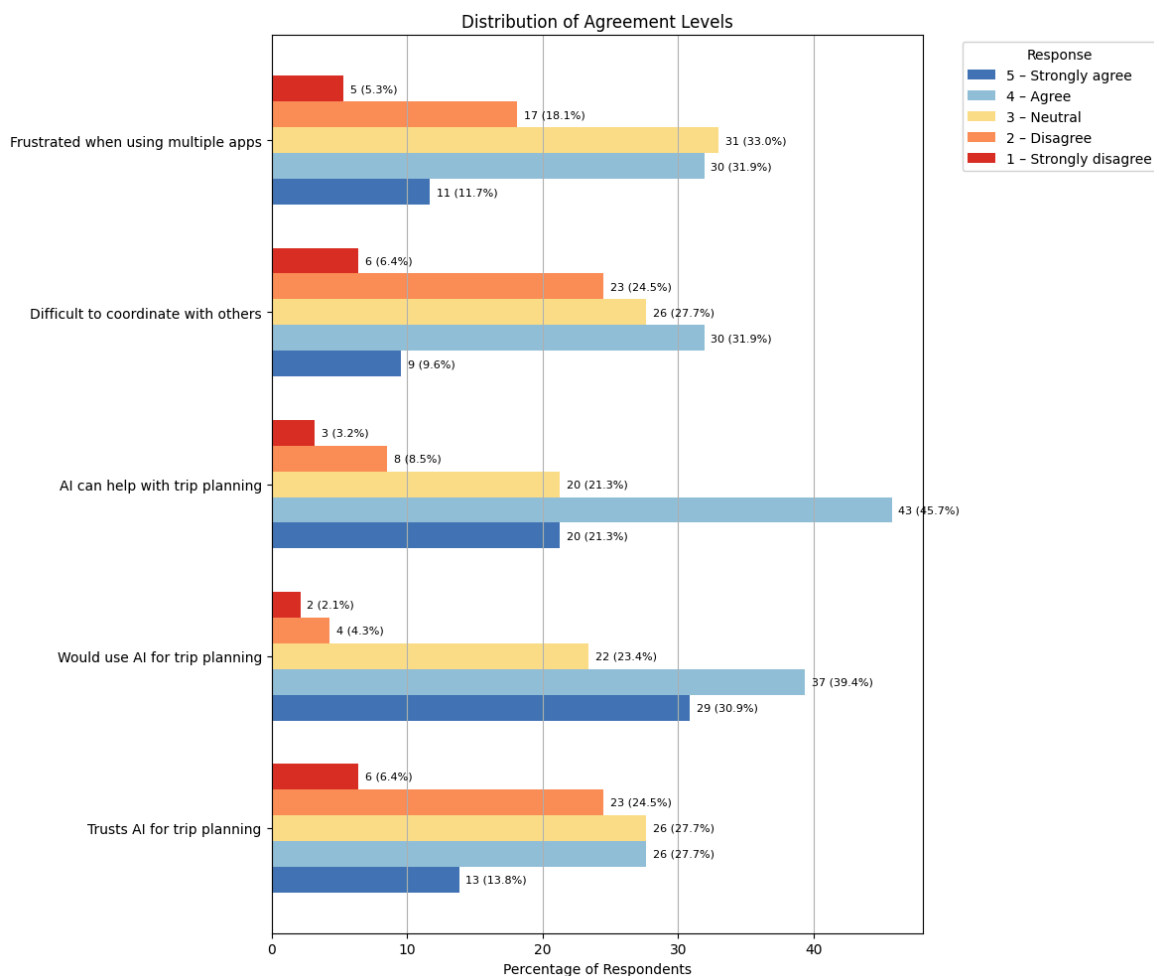
(Figure 19 - Average Agreement Among Participants on AI and Frustrations)

The first statement, “*I feel frustrated when I have to use multiple apps and platforms to plan a trip.*” received moderate support ($M = 3.27$). About 33.0% agreed and 11.7% strongly agreed, while 33.0% were neutral. A smaller portion disagreed (18.1%) or strongly disagreed (5.3%). These results suggest that although not universally challenging, the need to switch between platforms remains a recurring frustration for many, supporting the value of integrated planning tools.

The second statement, “*I find it difficult to coordinate trip planning with fellow travelers.*” showed a slightly lower agreement ($M = 3.16$). About 31.9% agreed and 9.6% strongly agreed, while 27.7% remained neutral. In contrast, 24.5% disagreed and 6.4% strongly disagreed. This indicates that, while coordination is not an issue for all, it still affects a substantial portion of travellers.

The third statement, “*I believe an AI-powered assistant could help improve the trip planning process.*” received higher average agreement ($M = 3.73$). A majority either strongly agreed (45.7%) or agreed (21.3%), with 21.3% neutral. Only 11.7% expressed disagreement. This indicates support for AI tools in enhancing the efficiency and organisation of trip planning, supporting the further exploration and development of AI-based travel tools.

The fourth statement, “*I would be interested in using an AI-powered trip planner in the future.*” received the highest overall agreement ($M = 3.93$). Most respondents agreed (39.4%) or strongly agreed (30.9%), while 23.4% were neutral and just 6.4% disagreed. These results highlight a significant level of willingness for adopting AI planning tools, underscoring the importance of further investigation on the integration of these technologies in trip planning.



(Figure 20 - Average Agreement Among Participants on AI and Frustrations)

The final statement, “*I generally feel that I can trust products that use AI technologies.*” had the lowest agreement ($M = 3.15$), reflecting a more cautious stance. While 27.7% agreed and 13.8% strongly agreed, another 27.7% were neutral, and 30.9% disagreed or strongly disagreed. Although openness to AI is evident, trust remains a barrier, supporting interview findings that call for greater transparency, reliability, and user control in AI tool design.

5. Define

5.1 Overview of Define Phase

In the DT framework the focus of the Define phase is to synthesise the findings of the empathise phase, assisting the definition of the problem space. As defined by Kolko “Synthesis is an abductive sensemaking process. Through efforts of data manipulation, organization, pruning, and filtering, designers produce information and knowledge.” (Kolko, 2010, page 17).

The author emphasises the central role of visual artifacts in synthesising research findings. The high volume of data collected during the empathise phase can be overwhelming to navigate for designers and researchers. To facilitate sensemaking, he argues for the externalization of insights through visual tools such as models, diagrams, and maps (Kolko, 2010). This chapter of the thesis presents the various visual tools applied during the Define phase, including personas and user journey maps, followed by the formulation of Point-of-View (PoV) statements and How-Might-We (HMW) questions. At the end of this chapter design guides are described to outline the most essential aspects of a future solution. “Problem setting is a process in which, interactively, we name the things to which we attend and frame the context in which we will attend to them” (Schön, 1983, p. 40).

5.2 Personas

User personas are widely used in UX design to humanise research insights and inform design decisions (Miaskiewicz & Kozar, 2011; Goodman, 2012; Pruitt & Grudin, 2003). Based on the qualitative and quantitative findings, three personas were developed as follows: The Planner (see figure 21.), The Co-Planner and The Easy-Goer, each representing key user types identified during the research. While not discussed in detail due to space limitations, these personas remained central throughout the design process. All personas can be viewed in [appendix J](#).



(Figure 21. | User Persona | Source: own creation | Image source: pexels.com |
Persona template: [Figma community](https://figma.com))

5.3 User Journey Map

The user journey map (see figure 22.) helped discover and map unmet user needs, wishes and inefficiencies in the current planning process (Kolko, 2010; Samson et al., 2017). Based on the qualitative and quantitative insights gathered from the survey, user- and expert interviews, the current steps of group trip planning were identified. Synthesizing these findings a user journey map was created. It was later presented to and validated by participants within the target group, ensuring accuracy and relevance.

USER JOURNEY MAP / Trip Planning



(Figure 22. | User Journey Map of Trip Planning)

5.4 Design Principles

Design principles, also referred to as design guidelines or directives, are concise statements that propose a strategic approach to solving design problems without prescribing a particular solution. They provide actionable design directives building on user needs and insights (d.school, 2018 & Nunez, Dirckinck-Holmfeld, & Tabo, 2023). Guiding the development of a solution, six design principles were defined based on the synthesized research findings. For brevity, these principles are discussed in detail in [Appendix K](#).

5.5 Point of View Statements (Problem Framing)

Point of View (PoV) statements are a core tool in the DT process, used to frame and reframe user-centred problem definitions that guide ideation and solution development. A well-crafted PoV articulates a specific user, their need, and the underlying insight, allowing designers to generate more targeted and innovative solutions (d.school., 2018 & Caeiro et al. 2019). Building on these three dimensions PoV statements were described using the commonly applied structure, described by Caeiro et al. (2019, pg. 2) as follows:

“ [Description of a person] **needs** [need] **because** [insight (something irresistible or inevitable)] ”

Following multiple iterations the following three PoV statements were created to capture the core problem definitions:

PoV1: Group travellers **need to** align on their availability **because** without a shared timeframe, they cannot begin making concrete trip arrangements.

PoV2: Group travellers **need to** collaboratively manage trip details in one place **because** managing the trip via multiple apps creates confusion, delays, and makes coordination inefficient.

PoV3: Group travellers **need to** easily find activities and build itineraries that suit everyone's preferences **because** manually comparing options is overwhelming, time-consuming and often fails to meet group expectations.

Based on the qualitative and quantitative findings of this study, more problems could have been framed and discussed, however due to the scope and limitations of this project the above mentioned three most relevant problems were framed.

5.6 How Might We Questions (Problem Reframing)

HMW questions are another key DT tool, facilitating the reframing of the problem space, supporting the translation of user needs and insights into actionable design opportunities. Preparing for the following Ideation phase, HMW questions open up the space for the creative exploration of ideas (d.school., 2018, Knapp et al. 2016).

HMW1: How might we assist group travellers to efficiently find a date that works for everyone?

HMW2: How might we streamline group trip planning to make the process more efficient and less fragmented?

HMW3: How might we support travelers in building itineraries that align with the group's needs and preferences?

These questions served as starting points for the ideation phase and were used to inspire multiple directions for potential solutions.

6. Ideate

The third phase of the DT framework is Ideate, which serves as a bridge between problem understanding and solution generation (Brown & Wyatt, 2010; Liedtka, 2015). Building on the Empathise and Define stages, this phase focused on translating user needs into a wide range of potential solution directions through divergent thinking (Brown, 2009).

Ideation was guided by HMW questions set in the previous phase and supported by creative methods such as a DT workshop, Crazy 8s sketching, and thematic clustering. Design judgement (Nelson & Stolterman, 2012) was used to evaluate ideas based on user relevance and context, while the desirability–feasibility–viability framework (Chasanidou et al., 2015) ensured selected concepts were meaningful, feasible, and within scope.

6.1 Ideation Activities

To explore diverse solution directions, a combination of collaborative and individual ideation methods was employed, supporting divergent thinking (Brown, 2009). This approach allowed for a structure and creative exploration grounded in user needs.

6.1.1 Design Thinking Workshop

DT workshops are structured sessions that bring together participants from diverse, multidisciplinary backgrounds to collaboratively address complex problems through iterative, user-centred methods. DT workshops guide participants through the core phases of the DT process to encourage creativity and generate actionable outcomes (Brown, 2009; Plattner, 2011).

Six travellers participated in a DT workshop, contributing user perspectives to the ideation process. The session began with an icebreaker and a brief warm-up, which research has shown to support creativity in group ideation (So et al., 2016). Participants worked in pairs to conduct mini-interviews and reviewed insights from earlier user interviews, helping them build empathy with fellow travellers. Insights were then presented and synthesised into thematic groups (see figure 23.). Participants then collaborated on selecting PoV statements and generating HMW questions, further immersing themselves in the problem space.

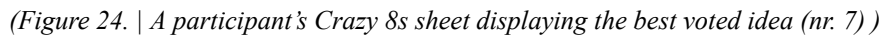


(Figure 23. | Thematic Groups of Insights)

This was followed by an eight-minute individual ideation session, called Crazy 8s, focused on generating as many ideas as possible. Participants then presented two ideas each and voted on the most promising ones. The top-voted ideas and thematic insights from this workshop contributed directly to the development of the final design concepts.

6.1.2 Individual Brainstorming (Crazy 8s)

Crazy 8s is a quick brainstorming exercise (see example results on figure 24.) designed to stimulate creative thinking and the generation of diverse ideas to a problem under time pressure. Participants receive a paper divided into eight sections and they have eight minutes to describe or sketch as many ideas (or variations of an idea) as they can. The time constraint pushes participants to move beyond their first, most obvious ideas, encouraging quantity over quality, helping unlock more original concepts (Knapp et al., 2016; So et al., 2016). So et al.'s (2016) findings underscore the effectiveness of short, time restricted sessions in boosting quantitative idea generation.



Sketching is a core DT tool, which facilitates the externalisation of thoughts, exploration of ideas and discovery of new insights. Goldschmidt (2003) notes that sketches “backtalk” to designers, revealing unintended possibilities and expanding the problem space. Buxton (2007) adds that the quick, low-fidelity and disposable nature of sketches encourages iteration and discussion, positioning sketching as an essential tool for creative exploration early in the design process. The visual outputs from both individual and group sessions were later grouped and discussed to support synthesis.

Following ideation, a synthesis process was carried out to organise and make sense of the wide range of generated ideas. Instead of evaluating individual ideas, the aim was to identify recurring themes, concepts and design opportunities that could inform later prioritisation. Ideas were reviewed and grouped based on similarity in purpose or functionality. As a result of this process four main thematic directions were presented as follows: (1) Availability and Coordination Tools; (2) Centralised Trip Planning Hub; (3) Personalised Recommendations; (4) Supportive Tools for Group Communication and Decision-Making; These themes reflected consistent user pain points across findings and offered varied levels of complexity and innovation. This synthesis process helped identify which problem–solution areas were most promising, forming the foundation for the reflective prioritisation process described in the following section.

6.3 Idea Prioritisation

Following idea synthesis, the next step involved selecting concepts for further development. This process applied design judgement as a method for a reflective, practice-based decision-making grounded in empathy, contextual awareness, and creative intent (Nelson & Stolterman, 2012). Design judgement is particularly valuable in complex domains, where quantitative metrics may overlook experiential or emotional value.

The Desirability–Feasibility–Viability framework as introduced by Chasanidou et al. (2015), was adopted to support the idea evaluation process. This approach encourages a comprehensive assessment of the presented design concepts by balancing user needs, technological constraints, and contextual fit. The desirability aspect considers whether a concept effectively addresses a given user pain point. Feasibility refers to the practical implementation of the idea, particularly in relation to available technologies, while viability concerns the alignment of the concept with the project's scope, resources, and academic context. The consideration of these three perspectives supports the selection of ideas that are not only relevant to the identified user needs but also feasible to develop within the academic and technical constraints of this thesis.

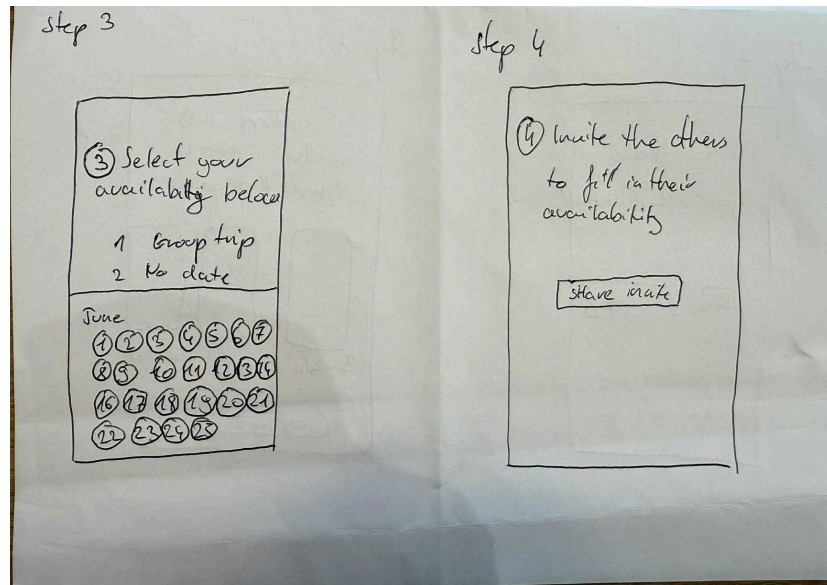
As an outcome of the prioritisation process, three concepts were selected that aligned best with the discussed criteria. These concepts are introduced in the following section. While other ideas generated during the workshop showed creativity, they were not included due to limited relevance, implementation complexity, or redundancy with existing tools. The selected concepts balanced user value, technical opportunity, and design originality, serving as the foundation for the prototyping phase that follows.

6.4 Concept Proposal

As discussed in the previous section, the outcome of the synthesis and evaluation process was the selection of three concepts for further development. In this section these three, final concepts are presented.

6.4.1 Coordinating Availability Coordinator

To address the most reported frustrations among group travellers, finding overlapping free time, a digital availability coordinator feature was proposed (see sketch on figure 25). The feature would enable travellers to indicate their availability individually, using a shared digital calendar. By aggregating individual inputs, the system would allow the group to identify the most optimal travel dates without prolonged discussions.



(Figure 25. | Digital Availability Coordinator Feature)

6.4.2 Group Trip Planning Hub

In response to the second HMW question, focused on streamlining the fragmented planning process, the idea of a Group Trip Planning Hub was presented. This platform would combine the most essential aspects of trip planning, such as flight, accommodation and restaurant search and itinerary building, facilitating group collaboration and decision making in one place. Due to the limited scope of this project, flight and accommodation recommendations were not included at this phase, however could be included in further iterations.

6.4.3 Personalised Recommendations via Traveller Profiles

To address the third major user pain point, the cognitive overload from the overwhelming number of planning options, a personality-driven recommendation system was proposed. This solution could significantly increase the efficiency of the planning, reducing cognitive load of users, while enhancing the overall planning experience. The concept builds on prior research suggesting that personality can be a strong predictor of user preferences and choice behaviour (Singh et al., 2024; Aribas & Daglarli, 2024; Alves et al., 2023; Virvou, 2023), and aims to simplify group decision-making by offering more relevant and personalised suggestions. Unlike traditional RS that rely on search history or behavioural tracking, this approach preserves user privacy by drawing on voluntarily shared personality input, thereby preserving privacy (Virvou, 2023).

7. Prototype (Solution Design)

The fourth phase of the Design Thinking framework, Prototype, focuses on translating concepts from the Ideate phase into tangible design artifacts that can be tested and refined based on user feedback (Brown & Wyatt, 2010; Buxton, 2007).

This iterative process began with low-fidelity sketches and progressed through mid- and high-fidelity wireframes, each iteration integrating insights from prior research and user feedback to ensure alignment with user needs. To facilitate usability testing, a functional minimum viable product (MVP) was developed based on the refined high-fidelity design.

This chapter outlines the evolution of the prototype through these stages, including the rationale behind key design decisions and the practical implementation of the AI-driven personalisation feature. It concludes with a reflection on the usability and accessibility principles that informed the final design.

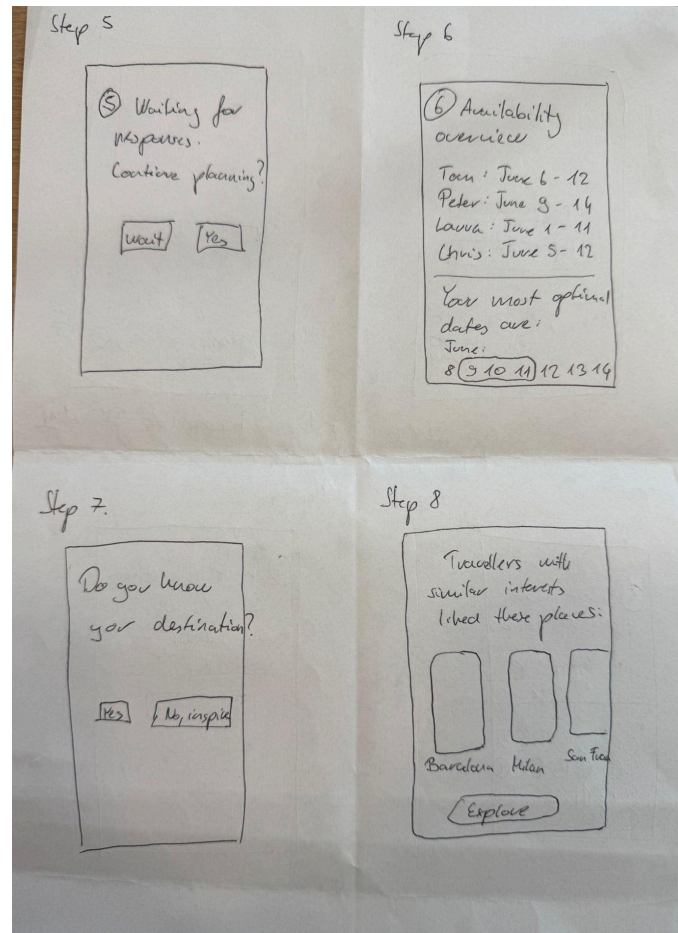
7.1 Iterative Prototyping Process

7.1.1 Low-Fidelity Prototyping

The initial sketches developed during the Ideate phase (see figure 26) served as a starting point for the prototyping process. These sketches were revisited and refined with greater focus on user flow, clarity and functionality. This step represents the transition from open-ended idea exploration, towards a more deliberate and focused UI design, in line with Buxton's (2007) view of sketching. He discusses that sketches are a continuously evolving part of the DT process, providing greater detail in later stages, thereby opening up for further insights. These sketches supported early stage decision-making regarding overall user flows, layouts and screen hierarchy, setting the ground for a more detailed, digital wireframing process in the next iteration.

Feedback and Changes

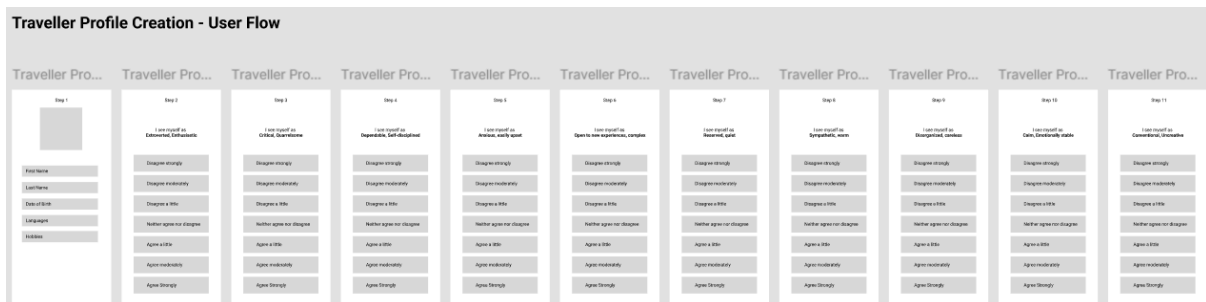
Feedback on the low-fidelity prototype highlighted that while the presented user flow was clear, it felt too linear, giving the impression of a long survey, rather than a flexible app. Users expressed that the process consisted of too many steps before getting a trip overview.



(Figure 26. | Sketches of Initial Trip Creation Flow)

7.1.2 Mid-Fidelity Prototyping

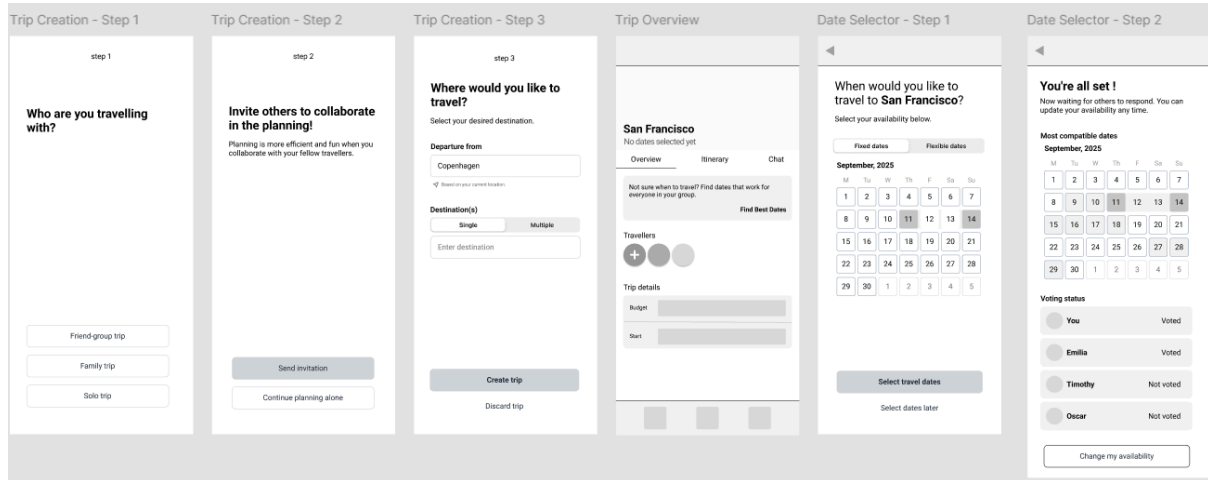
Mid-fidelity prototypes were developed in Figma, introducing a more structured, digital representation of the solution. The visual design of the prototypes were intentionally kept in grayscale to de-prioritise aesthetics and encourage feedback focused on functionality and structure rather than style (Buxton, 2007).



(Figure 27. | Low Fidelity Prototype of Traveller Profile Creation Flow (Figma Screenshot))

As a response to the feedback on the low-fidelity designs, the initial single user flow got broken down into two separate traveller profile- (see figure 27) and trip creation (see figure 28) flows, adopting a step-by-step structure. Breaking complex tasks into smaller, sequential steps helps reduce cognitive load, allowing

users to focus on one decision at a time without becoming overwhelmed, a principle supported by cognitive load theory (Sweller, 1988).



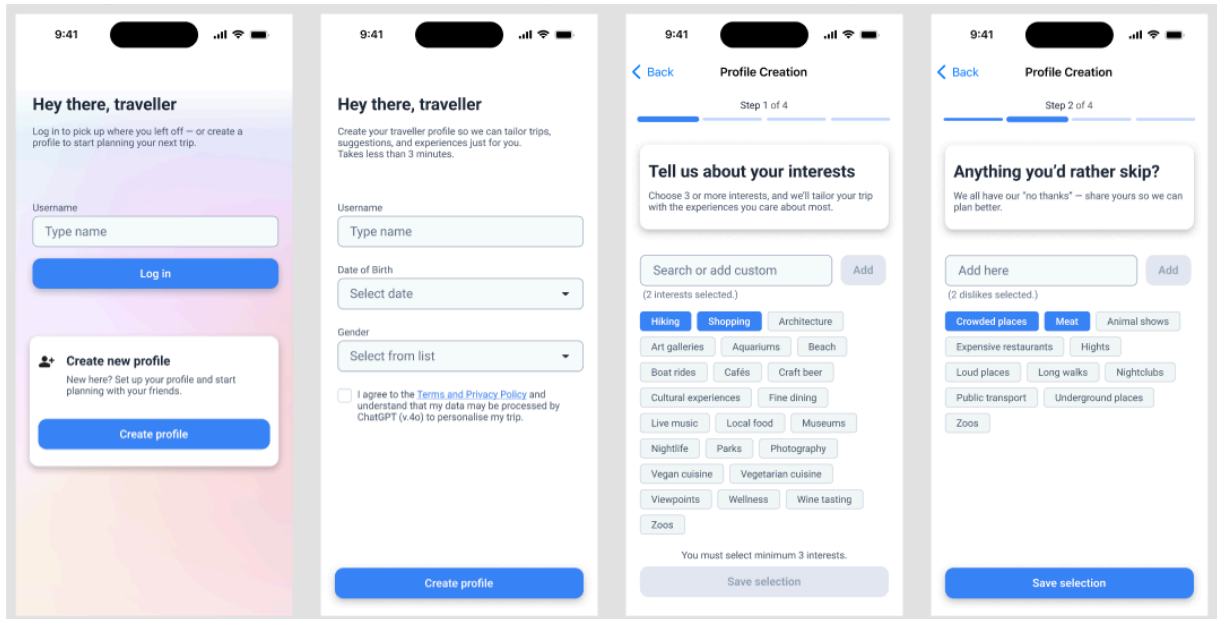
(Figure 28. | Low Fidelity Prototype of Trip Creation Flow (Figma Screenshot))

Feedback and Changes

Upon reviewing the mid-fidelity prototype, users highlighted that the traveller profile creation flow felt too long. Initially, each question was presented on a separate screen, making users perceive the process as more time-consuming and complex than it was. Although the number of inputs was appropriate and necessary, the segmented presentation of questions added unnecessary complexity.

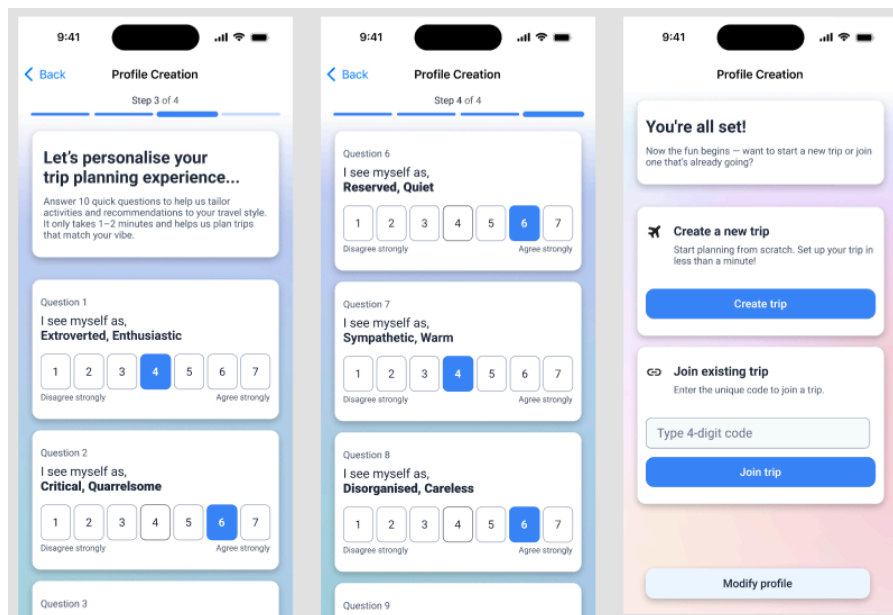
7.1.3 High-Fidelity Prototyping

Building on the mid-fidelity designs, the high-fidelity designs were the final iteration before the implementation of the MVP and the usability test. This stage focused on the critical evaluation of previous user feedback and the definition of colours, typography, visual design details, UI elements and the overall UX.



(Figure 29. | High Fidelity Prototype of Traveller Profile Creation Flow, Step 1-2.(Figma Screenshot))

The profile creation process was broken down into four simple steps (see figure 29-30.), with the TIPI questions grouped onto two screens to reduce perceived length and complexity (figure 30). Building on Miller's Law (1956), suggesting that people can comfortably process 5-7 items at a time, the personality questionnaire displayed five questions per screen. Visual hierarchy and navigation were refined to enhance clarity and usability, drawing on established principles from Nielsen (1994) and Norman (2013). This high-fidelity prototype served as the foundation for the MVP used in usability testing, described in the following section.

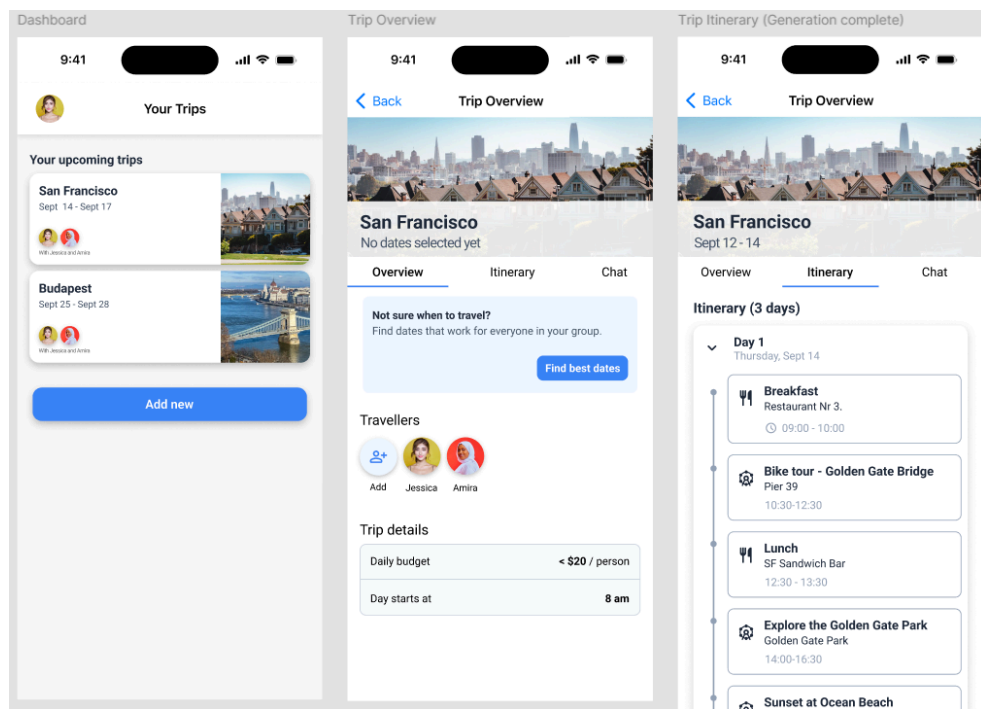


(Figure 30. | High Fidelity Prototype of Traveller Profile Creation Flow, Step 3-4. (Figma Screenshot))

7.1.4 Minimum Viable Product Development

To enhance the quality of the usability test and facilitate real interaction with the proposed solution a Minimum Viable Product (MVP) was developed (see Trip Overview screens in figure 31.). The MVP was implemented as a web-based mobile application using the React framework in a Next.js environment. To support the user flow, a simulated JSON-based backend was built to imitate system behaviours without requiring actual system deployment. The MVP integrated real-time LLM-based itinerary recommendations and functional interactions.

It is important to highlight that the purpose of the MVP was not to evaluate the technical performance of the solution, but to test the usability and perceived value of the product. As this thesis focuses on UX and HCD and not on software implementation, technical details of the MVP architecture are not discussed further. The results of the usability test based on this MVP are presented and analysed in [Chapter 8](#).



(Figure 31. Screenshots of Finally Design of MVP - Trip Overview Pages)

7.2 System Design and Architecture

7.2.1 System Goal and Design Rational

Aiming to address the identified challenges in group trip planning, the final solution was designed to generate personalised travel itineraries utilising a user- and group modelling technique ([Sect. 7.2.2-3](#)), a prompt abstraction layer ([Sect. 7.2.4](#)), and a hybrid UI. The architecture combines structured GUI inputs with LLM-generated text outputs, removing the need for users to manually engineer prompts, while offering personalised recommendations based on the shared profile of the group.

7.2.2 User Modelling for Personalisation

Building on the user model introduced by Singh et al. (2024), this thesis proposes a modified adaptation of their model that incorporates demographics, user personality scores, interests and dislikes. In addition to the traveller profiles, in order to capture trip-specific factors, trip profiles are introduced to support a more efficient personalised itinerary generation. Thereby the *traveller profile* and the *trip profile*, each serves a distinct but complementary function in the recommendation logic.

Traveller Profile

The traveller profile represents the stable characteristics of an individual user. It includes their personality traits, based on Ten Item Personality Inventory (TIPI) (Gosling et al. 2003), which is a validated short-form assessment of the Five-Factor Model (Costa & McCrae, 1992). In addition to personality, the traveller profile captures basic demographic information, such as age and gender, as well as travel interests and dislikes. This structured input allows the system to infer motivational patterns and decision-making styles, consistent with the findings of Alves et al. (2023), who discussed the applicability of personality-aware models in tourism recommendation contexts. The full structure of the traveller profile model is detailed in [Appendix F3](#).

Trip Profile

In contrast, the trip profile captures contextual variables that often vary from one trip to another. These include the following information: destination, group type (family, friend or solo), budget constraints, preferences for time of day to start activities. This separation reflects the understanding that while individual traits tend to remain stable, preferences often shift significantly depending on the nature of the trip. By distinguishing between long-term and context-specific factors, the model supports an adaptive personalisation strategy that is both user-centred and situationally relevant.

7.2.3 Group Modelling Strategy

In order to be able to inform group recommendations, the application of a preference aggregation strategy is necessary as discussed in [Sect. 2.5.4](#). For creating the unified group model, a profile aggregation strategy was employed (Masthoff et al., 2015), where individual user characteristics are combined into a unified group model. See the aggregated group model in [Appendix F4](#). While existing studies on personalised LLM agents focus on reasoning over individual user profiles (Singh et al., 2024; Schmidgall et al., 2024), I extend that approach by applying a heuristic aggregation strategy across multiple user profiles to generate group-level recommendations.

7.2.4 Prompt Abstraction Strategy

In an effort to enhance usability and make CUI-based LLM technologies more accessible to a wider audience, including inexperienced users, the application employs prompt abstraction. This strategy allows users to interact with a GUI

composed of structured form fields, toggles, and calendars, while these interactions are automatically translated into coherent natural-language prompts injected into the LLM behind the scenes. This approach removes the burden of prompt writing from the user, reducing cognitive load and addressing key usability challenges discussed in previous research (Nguyen et al., 2022; Virviou, 2023; Ribeiro, 2024). Furthermore, the prompt abstraction strategy in this system aligns with Nielsen's (1994a) principles of "recognition rather than recall" and "error prevention," by offering input constraints that reduce ambiguity and miscommunication with the model.

7.2.5 Prompting Strategy and Prompt Engineering

The core itinerary generation process is enabled through a non-parametric prompting strategy. Unlike model fine-tuning or parametric adaptation, this approach performs personalisation at inference time by injecting structured data into task-specific prompts, while the underlying model remains unchanged (Singh et al., 2024).

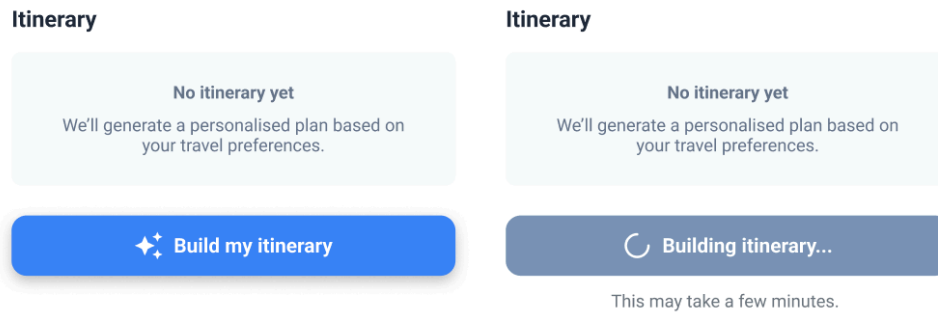
The system uses a chain-of-thought prompting strategy, which has been shown to outperform more complex strategies such as ReAct or Reflexion in related planning tasks (Singh et al., 2024). This strategy allows the model to reason through activity selection, especially when justifying trade-offs between group preferences or daily activities. All itinerary outputs are generated in a one-shot prompt, without memory or external tool use.

The itinerary generation prompt includes the following key segments: a system prompt, chain-of-thought guidance, an one-shot example response, the relevant dataset and the actual user query. These segments are designed to collectively guide the LLM's reasoning, constrain its output to a reference dataset, and ensure alignment with group-level preferences and trip constraints. The prompt utilised for the generation of generic itineraries followed the same structure, however excluded the group profile model from the prompt. The full architecture of the itinerary generation prompt can be seen in [Appendix F1](#)

7.3 Usability and Design Standards

The solution design was informed by usability and interaction design principles widely recognised in both industry and academic practice. These principles aim to support intuitive navigation, reduce users' cognitive load, and ensure a consistent and efficient UX across the product.

Thereby, key design decisions were grounded in Nielsen's (1994a) ten usability heuristics, which guided the application's approach to consistency, system visibility, user control, and error prevention. For instance, the principle of visibility of system status (Nielsen, 1994a) was addressed by providing immediate feedback during system action. Progress indicators and dynamic button states informed users that the system was processing their request aiming to reduce uncertainty and enhance perceived responsiveness (see figure 32.).



(Figure 32. | Informative states of “Build itinerary” button:
active state (left), “in progress” state (right))

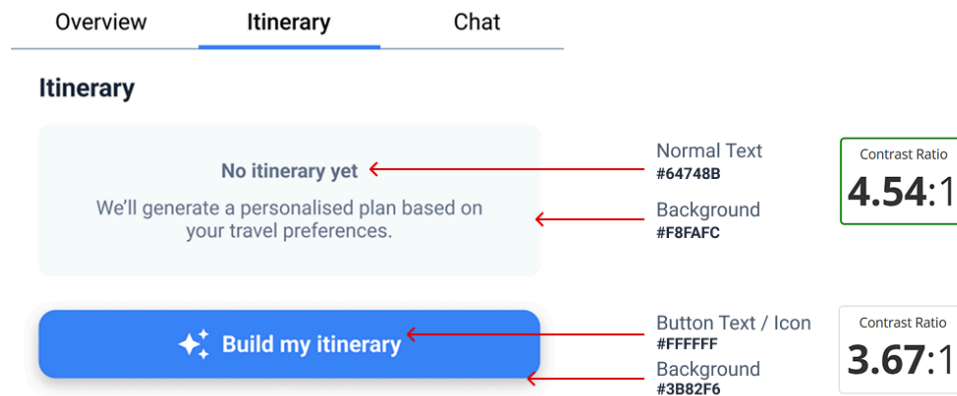
7.4 Accessible and Inclusive Design Practices

In addition to usability, accessibility was also a critical consideration during the solution design process to ensure that the product could be used by a wide audience, including individuals with diverse abilities. Therefore the design process was guided by the Web Content Accessibility Guidelines 2.1 2025 (WCAG).

WCAG serves as an internationally recognised standard, defining how to make web content more accessible to individuals with diverse abilities. It builds upon four main principles, shortly described as follows: 1) Perceivable: Users must be able to perceive the information presented; 2) Operable: Users must be able to interact with all components using diverse input methods.; 3) Understandable: The interface and content must be easy to understand and behave in predictable ways. 4) Robust: The content must be compatible with a range of user agents, including assistive technologies (W3C, 2025). WCAG provides actionable and measurable recommendations to address these four principles, which were carefully considered throughout the design process. While the prototype does not aim for full WCAG compliance, the goal was to adopt inclusive design practices early in the process and lay the foundation for further improvements.

7.4.1 Minimum Colour Contrast Ratio

All texts, visuals and UI elements were designed and selected to meet or exceed the WCAG-recommended contrast ratios. In practical terms it means 4.5:1 contrast ratio was expected of normal text colour to background colour ratio, while 3:1 contrast ratio was assured for icons, buttons, and other non-text UI components (see figure 33.)



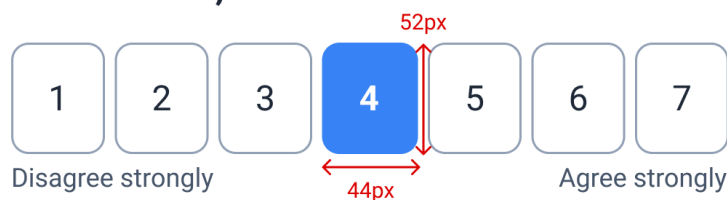
(Figure 33. | Example of Colour Contrast Ratio between UI elements.)

7.4.2 Large Clickable Areas

All interactive elements of the UI were designed to be large enough for touch interaction, aligning with the WCAG recommended target size at minimum $\sim 44 \times 44$ px (W3C, 2025). The smallest interactable component (see figure 34) of the design was the survey-response indicator button at 44×52 px, exceeding the minimum requirement. This guideline closely aligns with another industry-standard design principle Fitts' Law, that states that the time to click a target is a function of its size and distance (Xiao et. al, 2024 & Fitts 1954). Therefore it was an important consideration to make interactable elements large enough, spaced out, and easy to hit without precision .

Question 1

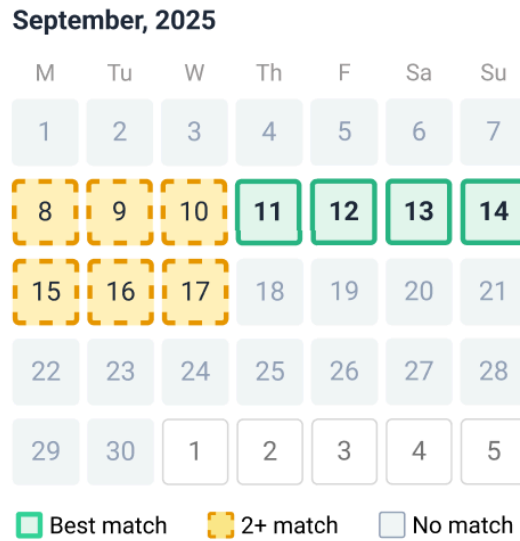
I see myself as,
Extroverted, Enthusiastic



(Figure 34. | Screenshot of Survey Item UI | Showcasing Minimum Clickable Area Size.)

7.4.3 Clear Action and Meaning Indication

WCAG guidelines advise against using colour as the sole indicator for an action and meaning (W3C, 2025). A practical example for this principle is the date-selector calendar UI (see Figure 35). In this component the results of the most compatible travel dates can be seen, indicated not only by different colours, but also by the type of margin that is applied at the elements. This allows for an easier distinction between the various results, even among users with disabilities, specifically regarding correct perception of colour.



(Figure 35 | Screenshot of Availability Calendar Component)

8. Test

The fifth and final phase of the DT framework is Test, where assumptions are validated and solutions are evaluated through direct user interaction. This phase plays a crucial role in assessing whether the proposed prototype meets user needs, expectations and mitigates the identified user frustrations and pain-points (Goodman et al., 2012; Brown, 2009). The testing phase is essential, as it sets the ground for further iterative refinement by allowing designers to observe real user behaviour and gather feedback early and often (Goodman et al., 2012).

8.1 Test Design and Objectives

8.1.1 Objectives and Focus

Aiming to address Research Question 4: “*To what extent do the proposed features enhance the group travel planning experience?*”, the goal of the test was to evaluate both the usability of the digital group trip planning hub and the effectiveness of the AI-powered itinerary recommendations.

8.1.2 Test Design

The test followed a test-based approach, where each participant was given realistic tasks and two travel scenarios to common European destinations (Goodman et al., 2012). Accordingly, the study consisted of two main parts: (1) a usability evaluation of the core user flows of the system (including traveller profile setup, trip creation, and assisted travel date selection), and (2) an assessment of user perception and preference of the AI-generated itineraries. The formative usability test (Lazar et al., 2017) was carried out on a locally deployed version of the MVP. Participants used their own personal mobile devices to fill in the self-reported questionnaire for privacy and to reduce bias originating from the presence of the

test coordinator (Bryman et al., 2016). The complete list of self reported survey questions can be seen in [Appendix M1](#).

Part	Task Nr	Task Name	Task Description
Part 1 Usability Test	0	Friends' Traveller Profile Survey	Participants shared a survey containing the traveller creation questions to imitate group travel setting, by providing the following: <ul style="list-style-type: none"> - Age, Gender, Interests, Dislikes, TIPI questions.
	1	Profile Setup	Participants were tasked to create a traveller profile in-app. They answered the following questions as part of the profile creation flow: <ul style="list-style-type: none"> - Age, Gender, Interests, Dislikes, TIPI questions. <i>Participants evaluated their experience.</i>
	2	Trip Creation	Participants were tasked to create a new trip to the assigned destination (see table. 4) by providing the following information: <ul style="list-style-type: none"> - Destination, Group Type, Budget, Start Time. <i>Participants evaluated their experience.</i>
	3	Date Selection	Participants were tasked to find the most suitable travel dates using the application by providing their availability. <i>Participants evaluated their experience.</i>
Part 2 Recommendation Evaluation	4	Review Itinerary A	<i>Participants reviewed and evaluated the first itinerary generated.</i>
	5	Review Itinerary B	<i>Participants reviewed and evaluated the second itinerary generated.</i>
	6	Evaluation Survey	<i>Participants chose their preferred itineraries and evaluated the tool as a whole.</i>

(Table 2. Overview of Test Phases and Tasks)

8.2 Participants

8.2.1 Testing Context and Design Rationale

While the solution is designed to support collaborative group trip planning, usability testing was conducted with individual participants in a simulated group context. This approach reflects both practical constraints and realistic usage patterns, as group planning often occurs asynchronously, with individuals contributing from different locations, a pattern supported by the earlier qualitative findings. Testing collaborative systems introduces coordination and logistical challenges that are difficult to resolve in early-stage evaluations (Grudin, 1994). To

preserve the validity of the group-based recommendations, real group profile data was collected via surveys sent to participants' actual travel companions. By simulating the group dynamic and incorporating authentic input, the test environment remained well-suited for identifying usability issues and assessing the perceived value of recommendations in a socially relevant context.

8.2.2 Sampling and Recruitment Criteria

The recruitment employed a convenience sampling strategy, where participants were recruited via email or direct messaging (Bryman, 2016). Participants were selected from the pool of survey respondents, who indicated their interest in further involvement in the project. In order to assure neutrality and reduce bias, only those who had no involvement in the design process of the solution were invited to participate in the test. The goal was to involve participants that closely resemble the target audience of the solution: (1) Aged 18-35; (2) Participated in group travel planning in the past 12 months; (3) Comfortable communicating in English. In line with Nielsen's (1994c) recommendation for early-stage usability testing, a small sample of eight participants were recruited as he found that this number is sufficient to uncover over 80% of usability issues.

8.2.1 Participant Characteristics

The study involved eight participants (see table 3), four female and four male, between the age of 21 and 33 years, with an average age of 27.4 years. The sample well-represents the target user group of the study (young adult travelers). Participants presented wide diversity in their national backgrounds, including two participants from Hungary and Denmark, and one participant from Bangladesh, Mexico, Norway, and Czechia, ensuring cultural diversity.

ID	Age	Gender	Nationality
1A	21	Female	Hungarian
1B	33	Female	Danish
1C	28	Male	Bangladeshi
1D	27	Male	Mexican
2A	26	Male	Hungarian
2B	24	Female	Norwegian
2C	32	Male	Czech
2D	28	Female	Danish

(Table 3. Overview of Test Participants)

The sample was gender-balanced and purposefully diverse, reflecting the real-world variability in user backgrounds that travel tools are likely to encounter. All participants had previous experience in group travel planning, met the inclusion

criteria, and were comfortable communicating in English. This demographic profile made them well-suited to evaluate both the usability and the personalisation aspects of the proposed solution.

8.3 Part 1) Usability Testing

8.3.1 Test Design and Methodology

The test employed a mixed-method approach by combining direct observation of user behavior with self-reported evaluations (Tullis & Albert, 2013). This triangulation of data sources aims at enhancing the credibility of the results, as it does not rely solely on a single perspective of the observer or the participant. While the observational data provides insight into how users interact with the system in real time, subjective feedback reveals how they interpret and value those interactions. This dual approach aligns with pragmatic research principles (Bryman 2016, Goldkuhl, 2012) and helps to ensure that the findings are both empirically grounded and experientially meaningful (Tullis & Albert, 2013; Lazar et al., 2017).

As participants were completing each task, they were observed and asked to speak-aloud. Observations and quotes from participants were noted, along with the success rates, number of errors, and the completion time for each task (See table 4). Users evaluated their experience with the product after each task through a Single Ease Question (SEQ) and depending on the task additional post-task questions in forms of Likert scales (Tullis & Albert, 2013). Participants were requested to provide an explanation for their choice whenever possible, allowing for better understanding of their perceived experiences.

8.3.2 Tasks and Test Process

Part 1, the usability test, consisted of 3 (+1) tasks representing realistic scenarios, (see table 2 above) that the participants had to complete. Prior to the tests, participants were requested to send a survey to two of their friends who they would realistically travel together with. The survey collected the friends' interests, dislikes and their big-five personality scores through the TIPI questionnaire. This step is indicated as task 0 as it took place before the actual user test has begun.

In the first task, users had to set up a user profile, indicate their interests and dislikes and fill in the TIPI questions through a custom, in-app survey UI. In the second task users created a new trip to an assigned destination. In task three, users were tasked to find the most suitable travel dates for their group, using the assisted travel date selection feature. The remaining tasks were related to the recommendation evaluation.

8.4 Part 2) Recommendation Evaluation

8.4.1 Test Design

Building on prior research (Singh et al., 2024), it was expected that participants would prefer the personalised itinerary over the generic one, both in terms of

perceived relevance to group preferences and willingness to follow the plan. In contrast with Singh et al. (2024), who relied on LLM-as-a-Judge for evaluating recommendation quality, this study employed empirical testing with real users, thereby strengthening external validity and offering human perspective on the AI-generated content.

Therefore, the second part of the test employed a within-subject design (Bryman, 2016; Tullis & Albert, 2013), where each participant was exposed to two conditions: a generic itinerary and a personalised itinerary in a varying, controlled order (See table 4). In order to minimise order effects, such as learning, fatigue, or preference bias caused by personal bias towards the given destination or the order in which those were presented, the test was counterbalanced accordingly (Bryman, 2016).

Case	Order	First Trip		Second Trip	
		City	Itinerary Type	City	Itinerary Type
A	Generic → Personalised	Warsaw	Generic	Barcelona	Personalised
B	Generic → Personalised	Barcelona	Generic	Warsaw	Personalised
C	Personalised → Generic	Warsaw	Personalised	Barcelona	Generic
D	Personalised → Generic	Barcelona	Personalised	Warsaw	Generic

(Table 4. - Overview of Test Design)

8.5 Results

This section presents and discusses findings of the test phase. The results are organised thematically and interpreted in relation to the research questions and design objectives, combining both observed behaviours and self-reported feedback to provide a holistic view of the performance of the tool.

8.5.1 Usability of Features

This subsection presents the combined findings for each task, to evaluate the usability of the presented solution. All participants successfully complete the three assigned tasks, resulting in a 100% task completion rate (see table 5.), which indicates a high level of functional usability across the tested features.

Task Performance Metrics				
Task	Feature	Success Rate	Avg. Nr. Errors	Avg. Time (min:sec)
1	Profile Creation	100%	1.13	4:13
2	Trip Creation	100%	0	1:29

3	Availability Coordinator	100%	0.13	1:39
4-5	Itinerary Generation	100%	0	N/A

(Table 5. - Overview of Test Performance Metrics)

Task 1) Profile Creation

The results presented a high average ($M=6.75/7$) on the perceived ease of use of the feature (see table 6) with low standard deviation scores ($SD=0.46$), indicating that the participants highly agreed that the task was very easy to complete. One participant added that the profile creation was “straightforward and made sense”.

However, it is essential to highlight that the average number of errors was 1.13, indicating that on average each participant encountered at least one error throughout the task. The two most commonly observed issues were confusion between the login and registration areas, and a lack of clarity around the requirement to read the Privacy Policy before accepting it.

The average task completion time was 4:19, involving the navigation of six screens, which indicates that users on average spent 43seconds on each screen. These patterns suggest that while the overall profile creation flow is easy, the interface should be improved to better guide users in those two specific scenarios.

Additionally, the observations also showed that no participants read the Privacy Policy, despite that the solution required them to open that. This indicates that while simply requesting users to access and accept the policy may be legally sufficient, it is not an effective way to communicate the use of their data. To ensure transparency, the product should explore alternative methods for informing users about data collection and usage.

Task Nr.	Feature	Mean (1-7)	Standard Deviation
1	Profile Creation	6.75	0.46
2	Trip Creation	6.88	0.35
3	Availability Coordinator	6.50	1.07
4-5	Itinerary Generation	6.88	0.35

(Table 6 | Perceived Ease of Use of Features)

Task 2) Trip Creation

The average of the perceived ease of use of the trip creation feature was at 6.88 with very low SD at 0.35, suggesting that the feature was very easy to use, with very high agreeableness among participants. There were no errors noted throughout this task. While the average score on perceived clarity of trip creation questions was 5.0 (out of 5), the observations showed that some users were confused about the exact meaning of the following question: “How much is your daily budget for experiences?”. Questions such as “Does this include the hotel?” and “Is this the

budget only for the activities?” were encountered. This indicates that this particular question should be rephrased or supplied with supportive text for more context and clarity. The average task completion time was 1:29 for the navigation of two screens, resulting in similar completion time per screen as Task 1, at 44.5 seconds. Participants added “Easy questions to answers. The questions seem relevant in addition to creating a trip with my interests” and “Super easy and quick set up” indicating that the proposed UI is easy to navigate.

Task Nr.	Feature	Mean (1-5)	Standard Deviation
1	Profile Creation	4.88	0.35
2	Trip Creation	5.0	0

(Table 7 | Perceived Clarity of Profile and Trip Creation Questions)

Task 3) Availability Coordinator

The availability coordinator feature, while rated the lowest among the three tasks, still received a notably high average score on perceived ease of use at 6.50 with slightly higher SD at 1.07, indicating that the feature was very easy to use, with moderate agreement among participants. The average number of errors was 0.13, indicating a very low error rate. The average task completion time for this task was 1:39, resulting in 49.5 seconds average time per screen, similarly to the previous tasks.

Task 4-5) Itinerary Generation

The itinerary generation task was rated as very easy ($M=6.88$) with a high agreement ($SD=0.35$) among participants. Due to the required qualitative evaluation of the itinerary, task completion time was not recorded for this task as that highly varied among participants. There were no errors observed during the completion of this task, all participants successfully completed the task, indicating that the itinerary generation was very easy to perform using the solution.

8.4.2 Perceived Improvement in Date Coordination

To address Research Question 4, participants were asked to evaluate the usefulness of the feature following Task 3, in addition to completing the SEQ questionnaire. Specifically, they responded to two statements: “*This feature would improve how I currently coordinate travel dates with others*” and “*This feature would be useful when planning group trips*.” These questions aimed to assess whether the feature effectively addressed the identified pain point and led to perceived improvements in the group trip planning process.

Table 8. shows the results of the analysis, where 50% of participants strongly agreed, while another 50% agreed, that using the introduced date coordination feature would improve their current date coordination process. When it comes to the usefulness of the feature, 60% of participants strongly agreed while

40% agreed that the date coordination feature would be useful when planning group trips.

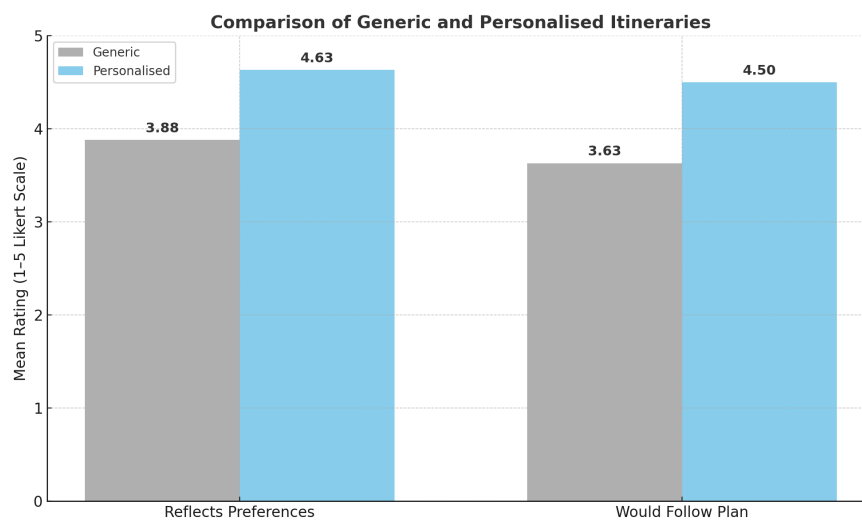
Evaluation Item	Mean (1-5)	SD	Agree	Strongly Agree
Perceived improvement	4.5	0.53	50%	50%
Perceived Usefulness	4.6	0.52	40%	60%

(Table 8 | Results on Perceived Improvement in Planning and Usefulness of Feature)

Overall, the results demonstrate that the introduced feature was perceived as both useful and effective in addressing the most reported challenge in group travel planning, date coordination. Therefore the proposed feature has the potential to significantly improve users' planning workflows and provide a strong foundation for further refinement and development.

8.5.3 Perception of Generic and Personalised Itineraries

Participants rated each itinerary on two Likert-scale items (see Figure 36). On the first item "This itinerary reflects my group's preferences," the personalised itinerary received a higher average rating ($M = 4.63$; $SD = 0.52$) than the generic version ($M = 3.88$; $SD = 0.35$). Similarly, for "I would follow this plan if I was on a real trip," the personalised plan outperformed ($M = 4.50$; $SD = 0.53$) the generic version ($M = 3.63$; $SD = 0.52$). These results suggest a consistent pattern, that participants tended to evaluate the personalised itinerary more positively on both dimensions.



(Figure 36. | Scores of Generic and Personalised Itineraries)

In addition to the individual rating scales, participants were asked to choose which of the two itineraries they preferred. Four out of either participants preferred the personalised plan, while three participants indicated that they liked both itineraries equally. One participant reported not liking either plan, and no participants preferred the generic itinerary.

Participants, who preferred the personalised plan, explained their choices as follows: P1B said: *“It fit very well with my preferences and I could see myself do this trip.”*, while P1A added: *“It reflected more the preferences I chose when creating the profile.”*. P1B explained: *“I like this a lot, this feels very close to the preferences I put in in the start”*.

Additional comments on the generic plans provided explanation for the users’ hesitation towards the generic plan. P2A explained that *“Personal preferences or habits are missing, like starting with a coffee every day.”*, while P2D discussed that *“There might be a bit much architecture for my taste on the daily plans”*. Another notable comment on the generic plan was provided by Participant 2B: *“[Friend’s name] put that she does not like walking long distances, but there were put several walks for activities. All three friends put nightlife, but there was no night time activities suggested. Finally, no coffee shops were suggested, even if two friends put coffee / cafés as an interest.*

Synthesising these insights, there is clear evidence for the preference of the personalised itinerary over the generic ones, suggesting the effectiveness of the proposed personalisation strategy. The findings align with the Singh et al.’s (2024) results, further strengthening the observed trend in data discussed above. These results provide additional evidence that the proposed approach to creating personalised itinerary recommendations enhances the perceived value and relevance of travel itineraries.

It is important to note, that although the personalised itinerary was rated more favorably, the generic itinerary still performed well in both dimensions, in line with Singh et al.’s (2024) findings. These results underscore that AI-generated plans, even without explicit personalisation, can provide value to users in the itinerary creation process.

8.4.4 Evaluation of Itinerary Overview Interface

To evaluate the usability and effectiveness of the Itinerary Overview UI, participants were encouraged to comment on their experience with the presented Itinerary Overview UI, in addition to the noted observations of the user-system interaction. Based on the synthesis of the qualitative findings the five themes constructed are presented in the following. Additionally, each theme includes supporting quotes from the participants.

Alternative Options and Voting

The most repeated request was the introduction of alternative options for activities and restaurants, so that travellers can choose from a selection of options.

Supporting group decision making processes an integrated voting system was requested.

P1B: *"I would still love the option of voting on options."*;

P1C: *"It would be good to see which place is liked by how many groupmembers;"*

P2C: *"Would like to have a couple of alternative options for some of the activities."*

Distance and Transportation Options

Participants expressed that while the itinerary provides a great overview of the daily plan it should provide further details on the distance between activities and transportation options.

P1A: *"Would like to have a couple of alternative options for some of the activities."*

P2B: *"[...] also some travel times between activities or even suggestions for transport (should be included)."*

Images and More Details on Activities

To assist decision making, participants requested further information about the restaurants and activities suggested to them. They expressed the need to see images of the places and to know more about the specific activity or restaurant and their opening hours.

Setting the pace

Users expressed their desire to gain ability to specifying their preferred number of activities per day. This would allow them to receive itineraries that are even better aligned to their preferences.

P2A: *"The pace is missing, the user do not have impact on the number of programs, activities."*

P2B: *"I love the plans made in this itinerary, it is however very filled up. Maybe some days there could be a looser plan / less set suggestions"*

Direct Prompting and Customisability

While the findings suggest that the employed prompt abstraction strategy, in combination with the presented GUI, resulted in successful and perceived very easy task completions, participants highlighted that they would like to have more control over the customisability of their itinerary. They expressed that they would like to be an active part of the planning process, contributing with custom prompts to refine daily plans to their preferences..

P2A: *"Make it more customisable, changing the plan"*

P1B: “*I would love flexibility to feel like you are a part of creating the itinerary*”

– The participant added that she would like to be able to add short instructions to update the daily plan.

8.4.5 Overall Perception of Tool

In order to gain understanding on the overall perception of the solutions and the likeliness of adaptation in a real-world scenario, participants were requested to evaluate the product according to the following two Likert items: (1) “Overall, this tool improved my group trip planning experience.”; (2) “I would consider using a tool like this for future group trips.”. See results in table 9.

Statement	Mean (1-5)	SD	Neutral	Agree	Strongly Agree
Overall, this tool improved my group trip planning experience	4.38	0.74	12.5% (1)	37.5% (3)	50.0% (4)
I would consider using a tool like this for future group trips	4.5	0.53	0% (0)	50% (4)	50% (4)

(Table 9 | Results on Overall Evaluation of Tool)

Regarding the first statement, focused on perceived improvement in trip planning experience, 50% of participants strongly agreed, 37.5% agreed, while a sole participant (12.5%) remained neutral. Thereby the average scoring of the first question is high ($M=4.38$; $SD=0.74$), with moderately high agreement among participants. All responses on the second statement demonstrate either moderate or strong support for the adaptation of a similar product in the future for group trip planning. 50% of participants agreed, while the remaining 50% strongly agreed, that they would use a similar tool in the future. The average rating of the second statement is very high ($M=4.5$; $SD=0.53$), with high agreement among participants.

These findings indicate a strong perceived value in the presented solution and functionality. The overall trend supports the idea that the tool meaningfully contributes to planning efficiency and is perceived as a viable aid in future group travel planning contexts. With that said, it is important to note that the study was conducted with a small sample size ($N=8$), recruited through convenience sampling. Therefore, the results should be interpreted as exploratory and cannot be generalised to a broader population without further validation through a larger-scale study.

9. Discussion

This chapter presents a critical discussion of the most significant findings and the overall outcome of the DT process. It evaluates how the final solution addressed the core challenges identified in collaborative group trip planning and reflects on the strengths and limitations of both the design process and the resulting prototype. Furthermore, the chapter discusses the broader implications of the findings for the future development of AI-supported trip planning tools. The discussion is situated within the theoretical frameworks and related literature on RS, AI-technologies, HCI and DT.

9.1 Key Contributions and Findings

9.1.1 Group Trip Planning Hub

The main contribution of this project to HCI, IS and UX research is the Group Trip Planning Hub, which is a direct output of the undertaken DT process identifying and addressing user pain-points in group travel planning. The suggested solution was designed based on the challenges identified through both the literature and empirical research.

Previous studies have underscored the complexity of group travel planning (Alves et al. 2023; Fardous et al., 2019), where travellers must navigate varying preferences, and constraints in a socially interdependent process. The conducted user research further supported these findings and uncovered the most frequent frustrations reported among young adults (aged 18-35) in group trip planning. Survey results (N=94) validated the previous findings, that time coordination was one of the most challenging aspects of the trip planning process ([Sect. 4.2.3](#)), while choosing activities, navigating an overwhelming number of options, and the lack of centralisation of trip related information followed as other significant frustrations.

Addressing these issues was the Group Trip Planning Hub proposed, serving as a centralised space for collaborative planning. It was designed to include the most essential functions necessary for early-stage trip coordination: a simple and easy traveller profile and trip creation process, an assisted date selection tool, a personalised itinerary generator, an overview of group travel details, and an integrated group chat. This approach ensured that users could coordinate, discuss, and make decisions in one place, reducing friction caused by tool-switching and misalignments.

The profile and trip creation user flows had a 100% success rate, where both related tasks were rated very easy to complete, indicating a user friendly, easy-to-use solution design. While error rates in the profile creation flow were higher (M=1.13), based on the observations and qualitative findings the recorded issues could be easily mitigated in a future iteration.

A key feature introduced within the platform was the assisted travel date selection tool. Based on the individual availability inputs from group members, the system highlighted overlapping date ranges, helping travellers collectively identify

suitable travel periods. The results of the testing demonstrates that the feature was perceived as useful by all participants (N=8) and reportedly improved travellers current date coordination processes.

The overall solution received strong support from participants. Seven out of eight participants agreed or strongly agreed that the proposed solution improved their overall planning process, while all participants reported that they would use such tools in the future for group trip planning.

Overall, the Group Trip Planning Hub translated research insights into a concrete design solution. It addressed the early-stage coordination issues identified in the literature and user research by offering structured, shared access to critical planning functions. This not only supported group decision-making but also laid the foundation for more efficient and less fragmented collaboration throughout the planning journey.

9.1.2 Personality Based Itinerary Recommendation System

This study also contributes to the growing research field of personality-aware RS, particularly within the underexplored domain of group travel planning. The review of previous research has shown that the use of personality traits offers a meaningful base for predicting traveller preferences in tourism (Alves et al., 2023). This study demonstrates how user Big Five personality scores and transparent, user-provided information can be used to generate effective personalised itinerary recommendations using LLM technologies.

The presented solution builds on the non-parametric personalisation strategy proposed by Singh et al. (2024), which avoids behavioural tracking or the fine-tuning of the LLM model. In the presented approach the personalisation is achieved through prompt engineering and the injection of structured user data, collected through user onboarding, into the prompt.

In the presented solution, users create a short profile by providing the following information: age, gender, interests, dislikes, and personality traits through TIPI questionnaire (Gosling et al. 2003), which is a validated short-form measure of the Five-Factor Model (Costa & McCrae, 1992). Compared to categorical personas (Gretzel et al., 2004), this five dimensional model allows for a more nuanced and flexible representation of personality (Alves et al., 2023).

The proposed approach proved effective in avoiding the “cold-start” problem present in traditional RS (Masthoff et al., 2015; Alves et al., 2023), and notably improved the perceived itinerary quality. During the test, participants rated the personalised itinerary higher on both measured dimensions: 4.63 vs. 3.88 mean scores for perceived alignment with group preferences, and 4.50 vs. 3.63 for willingness to follow the plan. This difference, however based on a small sample (N=8), suggests a meaningful preference for the personalised version. No participant preferred the generic itinerary, and four out of eight explicitly chose the personalised one when asked to indicate preference. These findings support the value of utilising personality scores (Alves et al., 2023) in RS to enhance itinerary

item recommendations. Furthermore, these findings directly support the findings of Singh et al. (2024), who demonstrated that utilising user models can deliver high perceived relevance in LLM powered RS.

Additionally, it is essential to highlight that unlike traditional RS that often passively collect behavioral data of users in the background (Virvou, 2023), this system only relies on information that users consciously and explicitly provide. Considering the effectiveness of the presented approach, it could provide a more privacy-conscious and user-controlled alternative to current RS, directly addressing ongoing concerns around the fear of surveillance and lack of user agency (Ricci et al., 2010; Ribeiro, 2024; Virvou, 2023).

In summary, the system presents a novel, ethical and effective alternative to behaviour-based RS, achieving personalisation without compromising user privacy. However, this approach also comes with limitations. The static nature of the traveller profile means that recommendations do not evolve over time, only through the variety of the trip profiles. Furthermore, the system currently does not explain how user models influenced the generation of the itinerary, similarly to the discussed black-box problem (Virvou, 2023), limiting its interpretability and trust in more complex scenarios. This problem could be addressed in future iterations.

9.1.3 Prompt Abstraction as a Design Strategy

A key design challenge in integrating GenAI into digital tools is ensuring that its capabilities remain accessible to users without requiring expert knowledge of prompting (Ribeiro, 2024). Prior research has highlighted that effective use of GenAI systems through CUI often demands a level of skill in formulating prompts, interpreting system responses, and engaging in iterative command refinement (Nguyen et al., 2022; Ribeiro, 2024). Nguyen et al. (2022) found that users interacting with CUIs perceived less control compared to those using GUIs, and experienced higher mental effort due to the open-ended nature of input.

Addressing this issue, the solution employed a prompt abstraction strategy, enabling users to interact with the AI system through structured GUI components rather than natural language input. The input provided through the GUI were integrated into natural language prompts, which were then passed to the underlying LLM. This approach maintained the expressive capabilities of the LLM while shielding users from the burden of prompt engineering. Thereby, the solution represents a hybrid GUI–CUI interface, instead of a traditional chatbot UI, where the user benefits from GenAI outputs without needing the technical skills.

This design decision is supported by existing HCI literature. Nguyen et al. (2022) argue that hybrid interfaces combining structured GUI input with natural language processing can help reduce cognitive load and increase usability, especially for goal-oriented tasks. Similarly, Haugeland et al. (2022) observed that users found task-led, button-driven interfaces to be more predictable and easier to use than free-text interactions. Ribeiro (2024) further critiqued current CUI systems such as ChatGPT for being unintuitive and cognitively demanding, particularly for users without prompting experience. By abstracting prompting into

structured GUI forms, the design directly mitigates these barriers, aiming to increase accessibility, consistency, and trust.

The results of the usability testing support these findings. All participants were able to successfully generate personalised travel itineraries through the suggested UI without needing to formulate natural language queries. They perceived the task of itinerary generation as “very easy” ($M=6.88/7$) and no errors were recorded throughout this task. This indicates that prompt abstraction strategy allowed for a very easy use of the AI-powered feature, positioning a tool as a more usable and accessible solution for users unfamiliar with generative AI systems and prompting strategies.

Importantly, the abstraction approach also imposes constraints. Some participants expressed that they would like to be a more active part of the itinerary generation process and provide custom commands for the generation or refinement of the itinerary. A limitation of the current solution is that, while it offered a hybrid UI by accepting user input via the GUI and displaying the LLM’s response in text format, it lacked support for direct prompt customization. As a result, users could not make direct, user-driven changes to the underlying prompt. While it increases predictability and reduces user error, it can limit flexibility for more advanced users who might benefit from free-form input. This trade-off between control and expressiveness is a recognised issue in hybrid interface design (Nguyen et al., 2022), and suggests opportunities for future work. A potential improvement would be to offer an optional conversational layer for users who wish to override or extend the generated results, while retaining the GUI defaults for general use.

In summary, prompt abstraction in this project served as a pragmatic solution to the challenges identified in both literature and empirical research. By translating GUI input into natural language behind the scenes, the system enabled easy interaction with the underlying LLM, supporting an accessible, predictable and guided planning experience.

9.2 Reflections on the Design Thinking Process

The DT framework offered a structured and flexible approach to addressing the complex challenges of group trip planning. The iterative nature of the framework enabled continuous alignment between user needs, theoretical grounding, and evolving design decisions, reflecting Goldkuhl’s (2012) view of design-oriented research as a pragmatic, reflective process where knowledge emerges through action. Abductive reasoning guided the project, allowing theory and empirical insights to shape and refine the solution iteratively. As Dalsgaard (2014) discusses, DT allows researchers to intervene in real-world situations while continuously refining both understanding and outcome. User feedback informed both conceptual and practical development throughout the process. Early engagement with the target user group allowed the collection of valuable qualitative and quantitative insights, while later testing identified usability issues that led to concrete refinements. Overall, the DT process facilitated the creation of a grounded and context-sensitive design.

However, two main limitations of the framework were noted throughout the process. Firstly, continued user engagement, which is a cornerstone of DT, proved difficult, with cancellations causing delays and often requiring additional recruitment. Secondly, while multiple prototype iterations were informed by feedback, only one formal usability test followed the high-fidelity prototype, limiting opportunities for further validation. Despite these constraints, DT provided a strong foundation for developing a user-centred solution.

9.3 Ethical Considerations

This study followed established research ethics, including informed consent, anonymity, and voluntary participation, in line with Bryman's (2016) and AAU's ethical research principles and GDPR requirements.

Furthermore, the study acknowledged broader ethical concerns raised in the literature regarding the development and deployment of AI technologies. These include the risk of algorithmic bias, surveillance-like data collection and lack of explainability (Kim et al., 2024; Bulchand-Gidumal, 2022; Singh et al., 2024). In response, the prototype was intentionally designed to minimise invasive data use by relying on explicit, voluntary inputs rather than behavioural tracking. Despite this, the issue of meaningful consent remains problematic. Although participants were required to open and accept the privacy policy before using the tool, observations during testing revealed that none read it in detail. This suggests a need for more transparent and user-friendly approaches to communicating data usage.

Product designers should prioritise transparency and user agency by clearly communicating what data is collected, how recommendations are generated, and whether AI outputs are based on verified sources. To reduce privacy risks, future industrial implementations should consider running LLM agents locally on users' devices, as proposed by Singh et al. (2024). Lastly, the environmental consequences of large-scale data processing must be thoroughly considered and assessed prior to system scaling.

9.4 Use of Generative Artificial Intelligence

Generative AI tools were used throughout the project. In addition to the core use cases discussed in the main chapters, for transparency, a detailed overview of how GenAI was applied is provided in [Appendix H](#).

10. Conclusion

This chapter summarises the main findings of the project in relation to the four research questions. It reflects on how the literature review, empirical research, and iterative design process contributed to the development and evaluation of a user-centred solution for group trip planning, and discusses its implications and limitations.

10.1 Research Question 1

RQ1: What does existing research reveal about the design challenges and opportunities in supporting collaborative group trip planning through digital tools and interfaces?

The conducted literature review (Randolph, 2009) revealed several gaps in literature and underscored challenges in designing for group trip planning. The findings highlighted that group trip planning is a complex task (Fardous et al., 2021) and discussed the high potential applicability of emerging AI technologies within tourism (Virvou, 2023; Kim et al., 2024; Bulchand-Gidumal et al., 2022), while adaptations are still scarce (Bulchand-Gidumal, 2022). Furthermore, it was discussed that due to the sudden and wide application of LLM technologies in systems, CUI driven systems are on the rise again, presenting new challenges within HCI (Virviou, 2023). Research on CUIs and LLM-assisted systems (Nguyen et al., 2022; Ribeiro, 2024) highlighted the cognitive demands and perceived loss of control users experience with open-ended CUI. Moreover, literature revealed the potential effectiveness of utilizing personality based (Alves et al., 2023; Masthoff et al., 2015), LLM powered (Aribas & Daglarli, 2024; Singh et al., 2024) RS for trip planning. Notably, the review presented a gap in literature focusing on AI-supported group travel planning tools, reinforcing the relevance and originality of this project.

10.2 Research Question 2

RQ 2: What are the key needs, behaviours, and pain points of users when planning group trips using digital tools?

The empirical findings of this study from five semi-structured interviews, one expert interview, and an online survey with 94 valid responses, revealed that group trip planning is often experienced as a fragmented and overwhelming process. The user interviews revealed that group trip planning is often experienced as disorganised and difficult to coordinate. Participants reported relying on multiple disconnected tools, facing challenges in agreeing on dates and activities, and struggling to keep all group members engaged throughout the process. They expressed their desire for an integrated, intuitive platform that simplifies coordination and reflects group diversity in preferences. Literature similarly supports that current tools are designed for individuals, not groups, and often neglect social coordination (Fardous et al., 2019; Nguyen & Ricci, 2018).

These findings were validated by the quantitative data. Users reported to typically rely on an average of 7 different tools (e.g., communication apps, spreadsheets, booking platforms), which lack integration and do not support shared decision-making or collaborative planning workflows. 88.3% of survey respondents reported difficulty aligning on dates, while 62.8% found choosing mutually interesting activities challenging. Other frequently reported frustrations included the difficulty of navigating an overwhelming number of options and the lack of centralised information (58.5%). The expert interview further reinforced these findings, pointing to common struggles with coordination, cultural mismatches, and the inexperience of many group travellers.

Collectively, these results underscored the need for intelligent, flexible systems that can facilitate group decision-making, integrate core planning features, and support personalised preferences.

10.3 Research Question 3

RQ3: How can design thinking guide the development of a solution that integrates personality-based AI recommendations and supports coordination in group trip planning?

DT proved as a suitable framework for addressing the complexity of this design challenge, sharing characteristics with what Buchanan (1992) calls a "wicked problem." Through iterative empathy, define, ideation, prototyping, and testing phases, the project maintained a user-centred focus while drawing on HCI theories and navigating ambiguity. The empathy phase helped uncover user pain points; the define phase helped frame and reframe the problem to define scope and focus; ideation and early prototyping explored how AI and personalisation could meaningfully address the identified challenges. The evolving fidelity of the prototype through iterations reflected the principle emphasised by Luchs (2015), that iterations are critical for tackling complex design problems. Although limited to one round of high-fidelity testing, the iterative process enabled substantial progress toward a solution that integrated coordination features with personality-based AI recommendations into a Group Trip Planning Hub.

10.4 Research Question 4

Research Question 4: To what extent do the proposed features enhance the group travel planning experience?

Usability testing and the user evaluation of recommendations demonstrated that the proposed solution significantly enhanced the group travel planning experience, both in terms of user satisfaction and task performance. All participants (N=8) completed the core planning tasks successfully, with high SEQ ratings across features ($M > 6.5/7$). Reportedly, 50% strongly agreed while 37.5% agreed that the tool improved their planning experience ($M = 4.38/5$, $SD = 0.74$), with only one participant responding neutrally. The availability coordination feature was perceived as highly useful ($M = 4.6/5$; $SD = 0.52$), directly addressing the most

frequently reported pain point. The personalised itinerary was rated more positively than the generic one in terms of alignment with preferences ($M = 4.63$ vs. 3.88) and willingness to follow the plan ($M = 4.5$ vs. 3.63). Additionally, 100% of participants reported that they would consider using a tool like this in the future. These findings suggest that the combination of personality-based recommendations and the Group Trip Planning Hub meaningfully improved the group travel planning workflow, validating the design decisions and offering a promising foundation for further development and real-world implementation.

10.5 Limitations

While the study provides valuable insights and contributions to the fields of UX, IS, RS, HCI and AI in tourism, several limitations should be acknowledged.

The qualitative part of the user research relied on semi-structured interviews with a small number of participants recruited through personal networks, which may limit the diversity of perspectives. While the survey sample pool is larger, it also utilised convenience-based sampling and skewed towards the target group: younger and more educated travellers. Therefore the results of the survey may not generalise to other demographics or cultural contexts. Furthermore, the expert interview added industry insights to the process, however represented only a single viewpoint, which limits the generalisability of the findings and highlights the need for further expert perspectives to validate and complement the findings. Moreover, the usability testing was carried out with eight participants, following established guidelines for early-stage evaluation (Nielsen, 1994a), however, the limited sample size and simulated group context may not fully capture the complexities of real-world group behaviour. Therefore, real-world evaluations of the solution might reveal additional issues or behaviours.

Additionally, the prototype focused only on a mobile interface and a limited set of tasks. Therefore, it did not include a separate desktop design or integration with external platforms (other than ChatGPT) for live data. Furthermore, the AI recommendation algorithm relied on a predefined dataset and was not compared against alternative group recommendation strategies. Lastly, the itinerary generation process relied on a single-shot approach and did not investigate the potential for iterative refinement through repeated prompting.

10.6 Future Research

Future studies could test the proposed solution with larger and more diverse populations to validate its effectiveness across different demographics and cultural contexts. Additional research could explore the most suitable GRSs and preference aggregation strategies in travel planning and compare the performance of personality-based models with other methods.

Field studies or longitudinal deployments of the platform could provide important insights into how the tool is used over time and its impact on group dynamics. Additionally, the long-term environmental and sociological effects of

such solutions could be explored. The integration of the solution with live booking platforms could be explored, potentially enhancing accuracy and ecological validity. Finally, further work on the solution should investigate the integration of flight search and personalised group recommendations for accommodation and restaurants, potentially using RAG technology, to deliver more comprehensive and up to date recommendations, addressing additional important user pain-points.

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Appendices

A Approval of Literature Requirement

As part of the academic requirements set for Information Studies, this thesis must demonstrate engagement with a minimum of 2000 pages of academic literature. The following appendix contains written confirmation from my thesis supervisor, verifying that this requirement has been fulfilled. The confirmation is included in the form of a screenshot, documenting the supervisor's approval.

Figure A1



Lone Dirckinck-Holmfeld

Címzett: ☺ János Dominik Haskó



2025. 07. 31., Cs, 22:34

Dear János,
Thanks for your list of literature for your master thesis.
Hereby approved.

Best regards

Lone Dirckinck-Holmfeld



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B Literature Search Queries

B1 - Search Query for Literature on Conversational UI in Tourism

("conversational user interface" OR "conversational UI" OR "AI assistant" OR
"AI-driven assistant" OR "LLM-based interface" OR "AI-powered assistant")

AND

("best practices" OR "design principles" OR heuristics OR guidelines)

AND

("artificial intelligence" OR "AI" OR "large language model" OR "LLM")

AND

("usability" OR "user experience" OR "human-centred design" OR "usability
testing" OR "UI Design")

B2 - Search Query for Literature on Travel Planning Apps

("AI-powered travel planning" OR "AI travel assistant" OR "AI trip planner" OR
"AI itinerary planner" OR "AI travel recommendation system" OR "smart travel
assistant")

AND

("artificial intelligence" OR "machine learning" OR "natural language processing"
OR "LLM" OR "recommender system")

AND

("user experience" OR "usability" OR "human-centered design" OR
"conversational UI" OR "personalization")


AND

("evaluation" OR "empirical study" OR "systematic review" OR "usability
testing")

C Group Travel Planning Survey

Figure C1 - Survey Description


Group Travel Planning Survey

 **Complete the survey for a chance to win a 100 DKK (~€13) gift card!**

Welcome to the Survey
Thank you for taking the time to participate in this survey!

I'm a Master's student in Information Science at Aalborg University, Copenhagen, currently working on my thesis, which explores how people plan group trips and how we can improve their experience through digital solutions. Filling in the survey should take around 5-10 minutes.

Your input will help shape the design of a better and smarter travel planning tool.

 **About Your Data & Privacy**
Your participation is entirely voluntary, and your responses are anonymous. No personal information is collected unless you choose to share your email address at the end — and even then, your email will be stored separately and will not be linked to your responses.

All data will be stored securely and used exclusively for academic research, in compliance with the General Data Protection Regulation (GDPR). You may skip any question or exit the survey at any time.

☐ **Why You Might Want to Leave Your Email (Optional)**

At the end of the survey, you'll have the option to provide your email address if you:

- Want to **enter the raffle** for a 100 DKK gift card
- Would like to **join short co-design workshops** and actively shape the project

The workshops will be held weekly from April 23 (Week 17) to May 16 (Week 20). You can participate in just a single session or in all sessions if you are interested in contributing to the project. The session will be casual and creative sessions (held online or hybrid), and your contribution would be incredibly valuable!

Providing your email is **optional** and will not be associated with your survey responses.

☒ **Consent to Participate**
By continuing, you confirm that:

- You understand the purpose of this research
- You voluntarily agree to participate
- You are at least 18 years old
- You understand your data will be used anonymously for academic purposes only.

If you have any questions regarding the survey or your data, do not hesitate to reach out to the researcher at jhasko23@student.aau.dk. The winner of the raffle will be notified over email.

P.S: This survey contains Karma to get free survey responses at SurveySwap.io

Table C1 - Survey Questions (Travel Planning Habits)

Survey Questions (Section 1 Travel planning habits)		
Code	Question	Answers
Q0	Do you agree to participate in this research and allow your (anonymous) responses to be used for academic purposes?* <ul style="list-style-type: none"> • Yes, I agree to participate. 	Mandatory checkbox
Q1	How many times did you plan trips with others in the past 12 months (friends/family/colleagues)? <ul style="list-style-type: none"> • None • 1-3 times • 4-6 times • 7-9 times • More than 10 times 	Multiple-choice
Q2	What is your typical role when planning a group trip? <ul style="list-style-type: none"> • Main Planner: I usually take the lead and plan most of the trip. • Co-Planner: I help with planning, but share the responsibility. • Participant: I mostly just participate in the trip and let others handle the planning. 	Multiple-choice
Q3	What was the main purpose of most of your travels in the past 12 months?*(Please select the one that applies most often to you.) <ul style="list-style-type: none"> • Leisure / Vacation • Business / Work-related • Visiting friends or family • Studying or academic exchange • Other... 	Multiple-choice
Q4	Have you used any of the following devices while planning a trip? <ol style="list-style-type: none"> 1. Smartphone 2. Laptop/Mac/PC 3. Tablet 	Yes/No
Q5	Do you use any of the following types of tools or platforms when planning a trip with others? <ol style="list-style-type: none"> 1. Search engines (e.g. Google, Bing) 2. Map or navigation apps (e.g. Google Maps, Apple Maps) 3. Accommodation platforms (e.g. Booking.com, AirBnB) 	Yes/No

	<ol style="list-style-type: none"> 4. Flight search platforms (e.g., Skyscanner, Google Flights, Kayak) 5. Travel guides or recommendation platforms (e.g. Trip Advisor) 6. Budgeting or expense-splitting tools (e.g. Splitwise, MobilePay, Venmo or Tricount) 7. Social media platforms (e.g., Instagram, TikTok, Facebook) 8. Spreadsheets (Google Sheets, Excel) 9. Communication apps (iMessage, Whatsapp, Messenger, etc.) 10. Collaboration tools (e.g., Notion, Trello, Miro) 	
Q6	(Optional) Please write down any other tools or platforms you use for trip planning that weren't listed above, if there's any.	Open answer (Optional)

Table C2 - Survey Questions (Experience with Travel Planning Apps)

Survey Questions (Section 2 Experience with Travel Planning Apps)		
Code	Question	Answers
Q7	On a scale from 1-5, where 1 is very difficult and 5 is very easy, how easy do you find it with the currently available tools to plan trips with others? (Very difficult 1 - 5 Very easy)	Likert-scale
Q8	(Optional) Would you like to elaborate on your previous answer?	Open answer (Optional)
Q9	Have you ever felt frustrated by any of the following when planning a trip with others? <ol style="list-style-type: none"> 1. Difficulty finding a date that works for everyone 2. Difficulty aligning with others on a destination 3. Difficulty aligning budget with the others 4. Searching for and booking flights 5. Searching for and booking accommodations 6. Choosing activities that everyone is interested in 7. Having to navigate too many options 8. Planning feels scattered across apps 9. Creating a shared itinerary or schedule 10. Tracking and splitting expenses 11. Feeling overwhelmed by the number of tools and apps 12. Lack of centralized information 	Yes/No
Q10	(Optional) Have you experienced any other frustrations when planning a trip with others that were not listed above?	Open answer

Q11	<p>Suggestions & Discovery Features</p> <p>How useful would you find the following features in an AI-powered group travel planning app?*</p> <p>(Please choose an answer, 1 = Not useful at all, 5 = Very Useful)</p> <ol style="list-style-type: none"> 1. Suggest flights based on preferences 2. Suggest accommodations 3. Suggest landmarks to see 4. Suggest activities based on preferences 5. Suggest restaurants based on preferences 6. Suggest hidden gems and alternative activities beyond typical tourist spots 7. Suggest cheapest dates to fly 8. Suggest cheapest dates for accommodations 9. Community-recommended content 10. TikTok or Reel-style intro videos of destinations 11. Personalized AI suggestions based on past trips or group behavior 12. Recommend local events 13. Recommend available discounts (e.g. student discount, free entry) 	Likert scale
Q12	<p>Planning & Coordination Features</p> <p>How useful would you find the following features in an AI-powered group travel planning app?*</p> <p>(Please choose an answer, 1 = Not useful at all, 5 = Very Useful)</p> <ol style="list-style-type: none"> 1. Create a shared itinerary 2. Co-planning with others 3. Collaborative decision-making (e.g., voting, comments) 4. Quick group polls (e.g., vote on date or destination) 5. Support for multi-location trip planning 6. Support for trip planning with flexible dates 7. Support for budgeting 8. Drag-and-drop itinerary builder 9. Real-time price alerts for flights/accommodations 	Likert scale

Table C3 - Survey Questions (Attitudes and Opinions)

Survey Questions (Section 3 Attitudes and Opinions)		
Code	Question	Answers
Q13	<p>How much do you agree or disagree with the following statements?</p> <p>(1 = <i>Strongly disagree</i>, 5 = <i>Strongly agree</i>)</p>	Likert scale

	<ol style="list-style-type: none"> 1. I feel frustrated when I have to use multiple apps and platforms to plan a trip. 2. I find it difficult to coordinate trip planning with fellow travelers. 3. I believe an AI-powered assistant could help improve the trip planning process. 4. I would be interested in using an AI-powered trip planner in the future. 5. I generally feel that I can trust products that use AI technologies. 	
Q14	Do you have any concerns about using AI for trip planning? If yes, please share them below (Optional)	Open answer (Optional)

Table C4 - Survey Questions (Demographic Questions)

Survey Questions (Section 4 Demographic Questions)		
Code	Question	Answers
Q15	What is your age (in years)?	Open answer
Q16	What is your country of residence?	Open answer
Q17	What is your highest level of completed education? <ol style="list-style-type: none"> 1. Master's degree 2. Bachelor's degree 3. Professional Education 4. High School 5. Primary School 6. None of the above. 	Multiple choice
Q18	Have you ever used generative AI technologies before (e.g. ChatGPT or Google Gemini)?	Yes/No

Table C5 - Survey Questions (Design Workshop and Raffle Participation)

Survey Questions (Section 5 Design Workshop and Raffle Participation)		
Code	Question	Answers
Q19	Where did you hear about this survey? <ol style="list-style-type: none"> 1. Instagram story 2. Facebook post 3. LinkedIn post 4. Direct message 5. Poster with QR code 6. From friends 7. SurveySwap 	Multiple choice

	8. Other	
Q20	(Optional) Please provide your email address if you would be interested in participating in the design and testing of a new travel planning application between April 23 - May 16.	Open answer (Optional)
Q21	(Optional) Please provide your email address if you would like to participate in the raffle for 100DKK	Open answer (Optional)
Q22	Attention Check What was the main focus of this survey? 1. Dinosaurs and their modern relatives. 2. Improving group trip planning through an AI-powered app. 3. Quantum physics and parallel dimensions. 4. Secret codes used by squirrels.	Multiple choice

D Thematic Analysis of the Qualitative Findings of the Questionnaire

Table D1 - Ease of Planning with Current Tools

The various themes constructed are highlighted with different colours to improve readability. Colours are reused within the table, however this does not indicate dependence or connection between the themes.

Q8 Ease of planning		
Ease of Planning (1 to 5)	Supporting quote	Theme
2	The different platforms I use do not communicate with each other, creating a barrier to planning.	Need for central hub
2	I think it's cumbersome to do all steps in an easy, every planning involves many pages/apps to find the best solution.	
3	Have to navigate too many different websites and apps to plan a trip. A central hub would save time.	
3	In need of platform to share links etc. instead of WhatsApp Group	
3	Many platforms scattered around	
3	I would like to search for flights and accommodations in one website	
2	I always need to do excel sheet and ask people to put availability	Difficult to find date that works for everyone
2	Schedule of when to travel is very difficult both personal and availability of flights, accommodation etc	
2	Finding dates are always hard and also planning food!	
3	The biggest problem is agreeing on the date when everyone is available, more than creating a plan itself.	
4	I think the most challenging thing is just getting the date, otherwise it's not difficult to plan	
3	navigating around and booking tickets is okay (sometimes very frustrating if travelling from different places), but planning out details and plans on the trip is always more stressful	Difficulties building itinerary
4	when you know when everyone is available it is quite easy to plan where to stay but can be hard to know what to do	
4	I mean it is very easy, only times or reasons when it gets harder it is because of people having specific personalities or habits and are not willing to adapt	Aligning personal expectations
3	I find it hard to find locations of accommodations that are up to my standards (not in super touristy areas). This takes a lot of time and could be improved.	Personalised recs

3	azair and other flight platforms didn't take into consideration possible bus transits, or changing the airports in return flights	Lack of support for flexible travel.
4	There's a lot of resources available, which can be helpful. But finding a huge variety of options can also cause confusion about what would be the best plan, and this can make us feel a bit overwhelmed.	Overwhelming volume of resources
4	I think with social media, blogs you can easily make your own trip. You don't need to go through agency while before with less access to information you might had to.	Use of SoMe
4	Sometimes it's easier to have a call or a real life conversation instead of planning something on WhatsApp groups which is super messy and consumes much more time than a talk	Group chats are not sufficient for trip planning.

Table D2 - Concerns about AI

Q14 Concerns about AI			
ID	Quotes	Codes	Themes
Q14/F1	I've used current AI apps/chatbots for trip planning. The quality is decent but not great. They still hallucinate a lot, especially with numbers such as duration between locations, producing infeasible itineraries.	Infeasible itineraries suggested by AI, Hallucination, data accuracy.	Concerns About AI Reliability and Information Accuracy
Q14/F2	Whether I can trust its suggestions to be accurate (e.g. booking tours)	Hesitant about accuracy	
Q14/F4	i want to share that i already use chatgpt for all of this. it's not always trust worthy but i don't see how another app would be more. so im not sure there's a lot of additional functionality it could provide	Hesitant about accuracy, Cannot see how an app would add value	
Q14/F5	To find updated information about restaurants and specific things about the restaurant	Hesitant about AI giving up to date information	
Q14/F6	I sometimes question the capacity of AI. I don't always trust the information it provides.	Hesitant about accuracy and capabilities of AI	
Q14/F9	I find it quite often that using AI it estimates the price wrong (it's usually much more expensive)	AI overestimates the price	
Q14/F20	Sometimes it provides information that isn't true.	Data accuracy issue, Hallucination problem	
Q14/F21	I have recently tried to use ChatGPT in my capital city to help me find transport and it was telling me information that was several years old, so I'm distrustful towards it always giving relevant answers	Data accuracy issue	

Q14/F22	truthfulness of information, search capabilities based on articles that are advertisements for products, limited reach, outdated information	Data accuracy issue, outdated information	
Q14/F19	Maybe to standardized options... or issues with giving my personale data...	Data Security concern	Concerns about data security
Q14/F8	Maybe data security in terms of location tracking	Worried about data security	
Q14/F10	Data privacy, data authenticity and if it is relevant enough	Worried about data security, and accuracy	
Q14/F13	The saving of my data / financial information	Worried about data security	
Q14/F14	Yes, I believe that AI should help but not book everything. Something with rights, payments and insurance. AI is not a natural person	Worried about data security	
Q14/F11	I think it would not be able to recommend me good enough things. Or at least such thats suitable for me	Don't believe that AI can give relevant recommendations	Doubt in AI's Capabilities
Q14/F12	Mostly just around trusting that AI can help with providing helpful suggestions	Don't believe that AI can give relevant recommendations	
Q14/F18	I like to discover and go on hikes off the beaten track - something that is not always well recorded. I'm afraid AI will not be as good as me in planning hikes, trails, generating gpx, analyzing closed trails, elevation gain, heat maps, choosing what i want (somethime i dont want popular trails), I'm afraid it will not pick up interesting locations visible on street view or satellite maps and it will be kinda like mcdonalds, it will be tasty for everyone but not actually something that i would choose if I had full control.	Hesitant about the efficiency of AI	
Q14/F23	A lot of times AI does not really consider all the good and useful opportunities, only some basic recommendations, not sure if AI is really capable of finding all the best solutions that someone can with hours of digging on different sites	Don't believe in the capabilities of AI	
Q14/F3	I'm concerned that AI cannot understand the human experience of travel, the value of choosing locations, travel times, pace of travel based upon experience.	AI cannot understand the value of human experiences	
Q14/F15	Especially hidden sights/local events - those are the best ones that someone local just recommends to you. If they become to population they won't be hidden or local anymore	Impact of AI	Perceived Societal, Environmental, and Ethical Risks of AI in Travel

Q14/F16	The environmental damages that data center cooling and energy usage is creating do not add enough value for every app, extension, browser/feature to have a AI function. Plus the potential GDPR violations for a third party app to access the data required for the suggestion would also be a red flag	Environment impact of AI, Data privacy	
Q14/F17	Yes I have many concerns when using AI, it is not very sustainable at all and I am quite scared of how the usage of AI has spread so quickly where nowadays people can't even write emails on their own... i would rather there be an app or a website that can help with some of these things	Environment impact of AI, Sociological impact of AI	
Q14/F24	That data collection is going to drive up prices for accommodation and flights	Impact of AI Drive up prices	

E Thematic Analysis of Expert Interview

Table E1 - Themes, Sub-Themes and Quotes of Expert Interview

Quote	Sub-themes	Theme
People are influenced a lot by what they see on social media. For example, when I was working as a travel agent, a lot of people would say, “I want to go see these specific rocks in Thailand.”	<i>Social media serves as main source for travel inspiration</i>	Social media plays a central role in travel-inspirations and sets expectations
People complain more, I think. Because their expectations don’t always match reality. Like, they expect the beaches to be empty—but they travel during high season, when every hotel room is booked, and then they expect to be alone on the beach. That’s just not realistic.	<i>Social media can set false expectations about travel destinations</i>	
And that’s because people see influencers going during off-season or on special tours, or going on days when places are otherwise closed. So they think they can have that same experience. But then they end up queuing for two hours to get to a certain viewpoint in Bali just to get a photo of a beach with a rock.		
Coordinating travel dates. Budget. Kind of need to align with the others on the budget.	<i>People struggle aligning with their travel partners</i>	Most common issues and frustrations in group travel planning
Also aligning on what expectations are — like, activities. How many days are you going to want to go explore? How many days are you going to want to be at the hotel, at the pool, at the beach? If someone wants to go on a beach vacation and just chill at the beach every day, maybe you should not be going on a three-week trip to Vietnam. Going from north to south in Vietnam — because you’re going to have a lot more cultural experiences. And you probably only have like four or five days at the beach, and that would be in the middle of the trip.		
So, you have a group of six friends who want to travel. Then they should go and create a profile for themselves on the type of traveller they are. Like: Am I okay to stay at a hostel? Or do I need to have my own room? Can I share a room with another person that I’m travelling with? Do I want to be cultural and get a lot of experiences on like how locals live where I’m going? Or do I just want to relax and have great service and like be fed shrimp and grapes all day, just laying on a couch? Or do I want to go meet local people where they live and see how their life is? Or do I just want to see the touristy things? Like — do I go to Paris to see the Eiffel Tower, or do I go there to go		

clubbing all night at some underground venue?		
<p>So I'd always have to argue with people and explain these things because people don't know that. It just seems cheaper. It looks like a single ticket—especially if you buy it from Ticket.dk. It looks like one ticket, but actually, it's several separate tickets booked individually. And your travel insurance is not going to cover it if you get delayed. So people end up paying a lot of money out of pocket.</p> <p>Yeah, like not having the experience. Not knowing what's good. And they've seen things on Instagram or TikTok or whatever, and they want to get some of these experiences, but they don't know how to do it.</p> <p>If you've only ever been on a chartered holiday with your parents, like one week at a resort where the transfer is included, then I see it can be overwhelming—like trying to book a round trip where you want to go to five, six different places.</p> <p>Like, how do I get from here to there? How do I get from the airport to the hotel? Which hotel should I stay at?</p> <p>Like learning those first steps in planning your own trip—I see that that can be overwhelming.</p> <p>All these people standing at the airport yelling, "Taxi! Taxi!"—like, do I trust these people? Am I going to get robbed now?</p> <p>If you're not a seasoned traveller, that can be very overwhelming.</p>	<p><i>People get overwhelmed due to lack of experience in travel planning</i></p>	
<p>Like people wanting to do excursions on days where the things are closed. Like, if you didn't research and you're in a religious country and you go and want to do something on holy days — like, if you go to Germany on a Sunday, all the shops are closed.</p> <p>You have to know that. If you don't know that — like, if you go to Bali on the Day of Silence — everything will be closed for five days.</p> <p>Expert: If you don't know that, and you're expecting to party for five days, and alcohol is not allowed for five days, you're not going to have a very nice trip.</p>	<p><i>People are unaware of local customs and events</i></p>	
<p>Yeah. So like everyone has veto rights. It's not like you have to suffer through something. If four out of five people want to do something, then the fifth person is probably going to say, "Yeah, okay, then I can follow and do this. It's not going to be a terrible experience." But if someone really doesn't</p>	<p><i>All participants should have veto-rights when planning.</i></p>	<p>Expert recommended features for an ideal travel planning platform</p>

want to do something, of course you're not going to force them to. That person can also just stay at the hotel for that day. Or do something else—at the pool.		
It would be helpful if it could search on all the different search engines — but also within the knowledge that I have, I would not want to book any flights on like ticket.dk or Kiwi or any of those sites. I would only want to book direct. So I would want to like filter out or only book directly with the airlines, and then compare the prices.	<i>Tool should search on various platforms to gather most relevant options.</i>	
If everybody had their own profile with their specific wishes and needs, and then you could compare how well we would travel together. Like, say, I'm very easygoing — I don't like to have everything planned ahead. I just need to know the place I'm going to stay at, the dates, and then I'll figure it out when I get there. Compared to someone who needs to have all the restaurants planned, all the activities planned — like, we need to go see this temple, then we need to eat at this restaurant, then we need to go here, then we need to go there. Those two people would probably not have an equally good time. Because the person who wants everything planned is going to get stressed that the other person doesn't have anything planned and doesn't have any wishes. So that's going to be frustration for both parties.		
So, you have a group of six friends who want to travel. Then they should go and create a profile for themselves on the type of traveller they are. Like: Am I okay to stay at a hostel? Or do I need to have my own room? Can I share a room with another person that I'm travelling with? Do I want to be cultural and get a lot of experiences on like how locals live where I'm going? Or do I just want to relax and have great service and like be fed shrimp and grapes all day, just laying on a couch? Or do I want to go meet local people where they live and see how their life is? Or do I just want to see the touristy things? Like — do I go to Paris to see the Eiffel Tower, or do I go there to go clubbing all night at some underground venue?	<i>Traveller profiles could help travellers find out about their compatibility prior to the trip.</i>	
So then you can kind of compare the profiles of the people that are travelling. And then the AI would align those expectations and find somewhere in the middle. Or maybe, you know, when you put the group together, it could break out: "Hey, do I want to have like three days on my own to do nothing?" "Do I want to be with the		

<p>people that I'm travelling with all the time?"</p> <p>And then people can put in specifics — like, "On the first day when I get somewhere, I want to do nothing" — so that it's calculated into the plan that you have some downtime. For example, if you're travelling with someone who's autistic and they need every second day to do nothing, to comprehend all the input that they get. Or if you're travelling with someone who's ADHD and they need to be active all the time. Or you're travelling with someone who's training for a marathon and they need to go run 10 kilometres every morning — then maybe you shouldn't plan late evenings for that person. Yeah. And no clubbing for that person.</p> <p>Yeah, like the features where everyone can give their input to what they want out of the trip, and that you can then compare it — right — compatibility with these people. Because you might be really good friends at home, but when you're travelling for the first time, you find out that you're...</p>		
<p>Makes sense. Because it would be super easy then to ask for a plan: "If we were all doing everything together — if everybody compromised a little — what would be the ideal itinerary for us?" Or the personal plans, if we just do individual itineraries, but then we just happen to be in the same location.</p>	<p><i>Alternative "personal itinerary" option could help achieve satisfaction among all travellers</i></p>	
<p>It could be like the trip planning board: "Here are the most popular things to do in the area that you're going to." Like, recommendations for how many days do you need to spend in the same place if you wanted to do a round trip somewhere. Because I don't imagine this being a very useful tool to go on, like, a one-week holiday and just stay in the same hotel.</p> <p>And then it could like compose an itinerary that takes everyone's needs into consideration.</p> <p>Like suddenly one person gets sick — can we just change the trip plan for the next day? Can we swap things around? Like, where is the availability? How do we do this easily without causing too much inconvenience?</p>	<p><i>There is a need for a smart, personalised itinerary builder.</i></p>	
<p>Like, what do you get for your money at the different hotels? It could be nice to have suggestions of: this is a three-star hotel where you can stay in your own rooms within the budget and there's no breakfast included. There may be a</p>	<p><i>Personalised help with activity and accomodiaton search</i></p>	

four-star hotel with breakfast included if you share — two people in the same room. If you don't mind sharing rooms, you can do this within the budget. Or if you just go a little bit over budget, you can get a much nicer hotel — like a five-star resort.		
Yeah — the options, but simplified. So maybe not, you know, not like when you go on Booking and you have a million options, but already kind of giving an idea — from the general idea going to the more specific. So like: people who have the same kind of profile as you, they typically like this place. Then this should be what you do.		
It could be nice to have a feature like: this place is popular on TikTok and Instagram. This place is popular — and like, this one is a good alternative to this. And...	<i>Integration of viral Social Media trends could drive inspiration</i>	
Because you get more information and more detailed answers, like for the specific time that you're looking at going. Because yeah, as a travel agent, you know about the challenges with things being closed on certain days and stuff, and you usually get that on an AI chat. You don't get that information straight away if you just Google something.	<i>AI platforms can offer more precise answers to questions than traditional search engines.</i>	
I mean, you do get all the information available online served on a silver platter. Like if you're looking for, say, a restaurant in town, you can ask for the ten highest-recommended places, right? And then you can ask, where is it most likely that they're going to have a table available? And then you can start from that end, instead of just searching randomly.		
Challenges could be that you can't use it to book anything. You can get an itinerary — like a suggestion for it — and you can give it inputs to change it according to your wishes and your needs, but you can't actually do any reservations with it.	<i>AI platforms are limited in functionality.</i>	AI technologies could be a partner in planning, but they have limitations
So you'd have to go and find everything somewhere else anyway. So you can use it as a suggestion of what to do, but then you still have to go and book everything on the other sites.		
Interviewer: Yeah. Thank you. What would make an AI assistant feel more human, trustworthy, or helpful in your opinion? Expert: That it doesn't give you too many options. It says, like: people who like the things that you like typically like this place. Or: within your budget, it's not possible.	<i>Trust in AI is still vary</i>	

<p>I wouldn't trust it completely. Because it looks typically at reviews. Some places pay to have people review it. Like: "If you give us the first recommendation on Google, we'll give you a free beer."</p>		
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F Prompt Engineering

Table F1 - Prompt Structure

The following table presents the structure of the prompt used for generating the personalised itinerary recommendations based on the prompt provided by Singh et al. (2024). Highlighted elements indicate changes made to the original prompt presented by Singh et al. (2024).

Prompt Segment	Content
System prompt	<p>You are a proficient planner with a keen understanding of personal preferences, group dynamics, and travel styles. Based on the provided group profile, trip preferences, and query, please give me a detailed and personalized {nr_of_days}-day itinerary, including specific restaurant and experience names.</p> <p>All the information in your plan should be derived only from the provided reference data and aligned with the group profile and trip constraints. You must adhere to the format given in the example. Additionally, all details should align with common sense.</p> <p>Always prioritize the query constraints first — such as preferred start time, group type, and daily budget per person — especially when they conflict with personal preferences. Incorporate personal and group preferences (e.g. interests, personality traits) as secondary considerations.</p> <p>Use only the provided restaurants and experiences when generating the itinerary. Do not invent content or provide external suggestions.</p>
Chain-of-Thought Instruction	Break down the instructions into a sequence of logical steps that build upon each other to guide the planner through creating a personalized plan. Each step should follow from the preceding one, leading the planner to consider all necessary details systematically, ensuring that all details are logically sequenced and align with requested constraints.
One Shot example	(see Appendix F2 .)
Data set	(Pre-defined dataset of 60 experiences and 30 restaurants.)
Added information	<p>Here is an explanation for the price levels in the data set:</p> <p>1 = Inexpensive, usually \$10 and under</p> <p>2 = Moderately expensive, usually between \$10-\$25</p> <p>3 = Expensive, usually between \$25-\$45</p> <p>4 = Very Expensive, usually \$50 and up</p>
Group User Model	[Aggregated Group Profile (see Table F4)]
Trip Details Model	(see Appendix F5)
Query	Using the group profile, trip details, and reference data provided

	<p>above, create a personalized {{trip_duration}}-day travel itinerary for the city of {{city}}.</p> <p>Plan each day starting from the preferred start time. Each day should include:</p> <ul style="list-style-type: none"> - A morning activity - Lunch restaurant - An afternoon activity - Another afternoon activity (if there's time) - A dinner restaurant <p>Base all recommendations strictly on the provided reference data. Consider group preferences and dislikes, budget, and group type. Avoid repeating locations and maintain variety across days. When planning meals and activities, consider walking distance and reasonable sequencing.</p> <p>Return the result in the same structured JSON format shown in the example. Do not include any reasoning or explanation — only the final plan.</p>
System end	<p>Let's think step by step.</p> <p>Personalized Travel Plan:</p>

Table F2 - One Shot Example of Expected Output

The following prompt section presents the one shot example that provides the expected output structure for the LLM. Restaurant names were anonymised.

***** Example *****

```
{
  "personalized_travel_plan": {
    "city": "Berlin",
    "duration_days": 3,
    "days": [
      {
        "day": 1,
        "schedule": [
          {
            "time": "08:00",
            "title": "Breakfast",
            "name": "Café",
            "location": "Prenzlauer Berg",
            "type": "restaurant",
            "price": "€"
          },
          {
            "time": "09:30",
            "title": "Walking Tour",
            "name": "Alternative Berlin Street Art Tour",
            "location": "Friedrichshain",
            "type": "experience",
```

```

    "price": "€",
    "duration": "2.5h"
  },
  {
    "time": "13:00",
    "title": "Lunch",
    "name": "Restaurant X",
    "location": "Kreuzberg",
    "type": "restaurant",
    "price": "€€"
  },
  {
    "time": "14:30",
    "title": "Museum Visit",
    "name": "Urban Nation Museum",
    "location": "Schöneberg",
    "type": "experience",
    "price": "€",
    "duration": "1.5h"
  },
  {
    "time": "17:00",
    "title": "Art Gallery Visit",
    "name": "Galerie König",
    "location": "Kreuzberg",
    "type": "experience",
    "price": "€",
    "duration": "1h"
  },
  {
    "time": "19:00",
    "title": "Dinner",
    "name": "Restaurant X",
    "location": "Mitte",
    "type": "restaurant",
    "price": "€€€"
  }
]
}
}
}
***** Example Ends *****

```

Table F3 – User Model Structure (Example)

```

{
  "demographics": {
    "age": "24",
    "gender": "Female"
  },
  "interests": [

```

```

    "Visiting markets",
    "Photography",
    "Shopping",
    "Local food",
    "Nightlife",
    "Going to bars",
    "Hiking ",
    "Relaxing in nature",
    "Beaches",
    "Learning about history",
    "Museums"
  ],
  "dislikes": [
    "Following a tight schedule",
    "Visiting too many places in one day"
  ],
  "tipi": {
    "extraversion": 3,
    "agreeableness": 6,
    "conscientiousness": 6,
    "emotional_stability": 5,
    "openness_to_experience": 5,
    "reserved": 6,
    "critical": 3,
    "disorganised": 1,
    "anxious": 6,
    "conventional": 2
  },
  "bigFive": {
    "extraversion": 2.5,
    "agreeableness": 5.5,
    "conscientiousness": 6.5,
    "emotional_stability": 3.5,
    "openness": 5.5
  }
}

```

Table F4 - Group Model Structure (Example)

```

"group_profile": {
  "average_personality_traits": {
    "extraversion": 5,
    "agreeableness": 5.17,
    "conscientiousness": 5,
    "emotional_stability": 4.33,
    "openness": 5.83
  },
  "demographics": [
    27,
    24,
    23
  ],
  "shared_interests": [
    "Architecture",

```

```
"Beaches",
"Coffee",
"Hiking",
"Museums",
"Nightlife",
"Nature walks",
"Photography",
"Local food",
"Fine dining",
"Historical sites",
"Scenic viewpoints",
"Wine tasting"
],
"shared_dislikes": [
  "Public transport",
  "Crowds",
  "Underground spaces"
]
}
}
```

Table F5 - Trip Profile Model (Example)

```
{
  "city": "Barcelona",
  "duration": 3,
  "group": "friends",
  "budget": "20-50€",
  "startTime": "11+",
  "number_of_members": 3
}
```


G Design Thinking Workshop Participants

Table G1 - Overview of Design Thinking Workshop Participants

ID	Age	Nationality	Background
P101	28	Hungary	BSc in International Business Economics
P102	21	Hungary	BSc student in Global Humanities
P103	27	Bangladesh	MSc student in Information Studies
P104	27	Bangladesh	MSc student in Information Studies
P105	29	Italy	BSc in Computer Science; MSc in Technology Entrepreneurship
P106	27	Germany; Poland	MSc student in Geography and Geoinformatics

H Transparent Use of Artificial Intelligence

This appendix provides a transparent overview of how AI tools, most significantly GenAI tools, were used throughout the development of the thesis. The use of AI is becoming increasingly common in academic and professional contexts, and its responsible application requires openness and reflection. In this document, I explain the specific ways in which AI-supported tools contributed to various stages of the research process.

The intention behind including this document alongside my thesis is to maintain academic integrity by clearly outlining the role of AI, and to reflect on its value and limitations within a research setting. Examples are provided to illustrate how these tools were used in practice, alongside reasoning for when and why they were employed. All final decisions regarding content, structure, and analysis were made by the researcher. In this section I provide practical examples of the prompts used.

Table H1 - List of Generative Artificial Intelligence Tools

Tool	Context of Use
ChatGPT 4.o	Ideation, Itinerary Generation, Data Organisation, Persona Description
Grammarly	Support writing process (assisting with grammar, clarity, and tone)
Cursor	Code Documentation Support, Code Refactoring, Code Generation

H2 Transcription of Interview Recordings

Throughout the study voice-recordings were created in order to capture and document important research data. AI technologies were used to optimise and organise this data. In this section the process and the practical steps taken to process these recordings will be discussed.

H2.1 Rationale

The reason for using ChatGPT in this part of the process was to help organise the raw transcript data to a clearer and more structured format. Manually sorting through long interview transcripts can be both time-consuming and overwhelming, especially when trying to identify themes or patterns across multiple conversations. ChatGPT was used as a support tool to help speed up this part of the work and make the content easier to review and work with.

The goal was not used for the data analysis and interpretation, but rather for structuring and organising the material. The output was always reviewed and compared with the original transcript to make sure nothing was misrepresented or

taken out of context. This helped maintain the accuracy and reliability of the data while still making the process more manageable.

H2.2 Process

The user interviews were recorded using Apple's built-in Voice Memos application, then the auto-captured transcripts were exported into a Microsoft Word file. In the next step, the data was anonymised. Following, the transcript was uploaded to ChatGPT for data organisation. The processed interview transcript then was uploaded into a Google Docs file, where all interview transcripts were collected and then manually reviewed and compared to the original transcript to assure consistency and data accuracy.

H3 Structuring Transcript Data

Figure H3.1 - Prompt example for Data Structuring

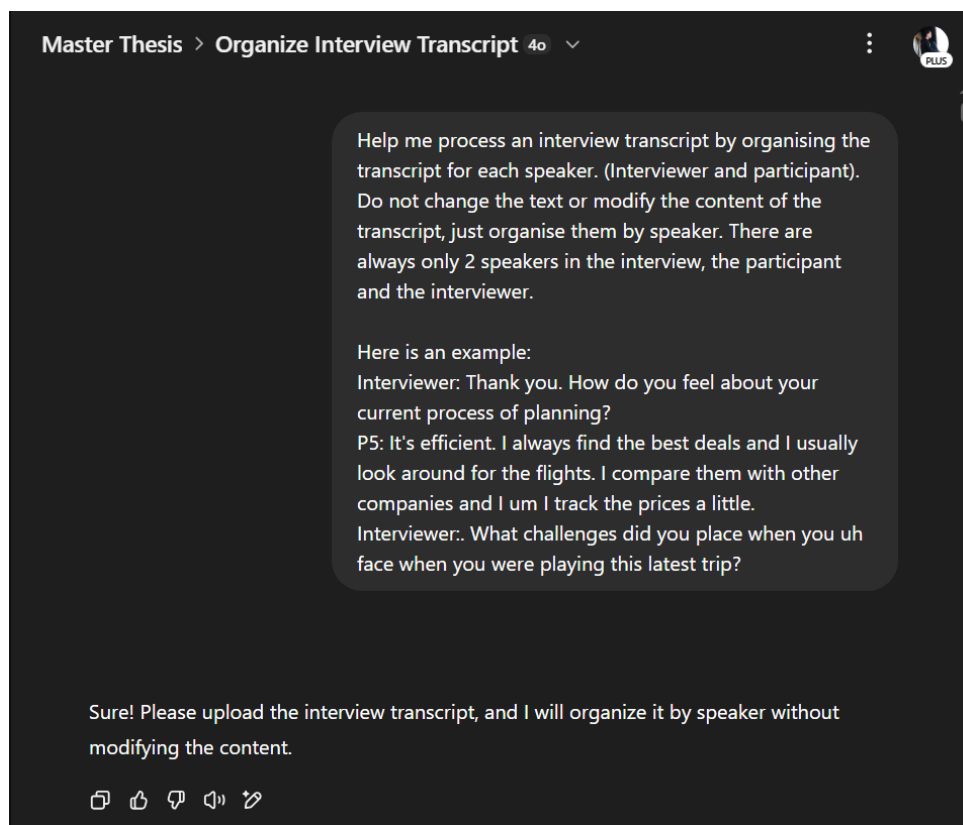


Figure H3.2 - LLM Response

Here is the organized transcript by speaker:

Interviewer: Finding a good time for all of us. Accommodation was a bit tricky because we planned it uh only, I think, two or three weeks in advance, so most of the accommodations were full already. and finding an activity in common that we can enjoy all of us.

Interviewer: Yeah, I can understand that it can be frustrating. Which part of the trip planning do you find the most frustrating?

P5: I would say finding accommodation always takes the longest.

Interviewer: Is there any particular reason for that?

P5: Oh, good places are taken like weeks, months in advance. So I think if you plan a trip almost last minute, it's very hard to find something good, like value price.

Interviewer: I understand that. Um, do you ever feel overwhelmed by the number of tools that you have to use for your planning?

P5: No, I think I stick to like four tools, so I think it's fine. I tried to use Triplet, I think, once for a trip in Italy, but it was overwhelming with the amount of activities and exact timing. And I like to keep a schedule, but not that much.

Interviewer: Cool. Um, if you could imagine the perfect trip planning tool or application, what features would that application have?

P5: Let me think about it.

Interviewer: When you were seeing a trip planning tool, you' also picturing it in that tool. We don't need to live in reality, so it could, you know, if you could have like an app or a product or a, you know, a website that can do essentially anything, what would you expect from it? That you know, anything that could help you with this whole planning process and, you know, planning with your friends, um yeah, down that line.

P5: I mean, finding the best time to book flights and accommodation at the same time, uh the best time to have that, that would be very useful because that will cut down a lot from it. And whenever I search flights, uh, I search first on the way there and also on the way back, but not in the same query. So I would usually have two tabs open when I look at return flights and one to go there. So, yeah.

Interviewer: So you kind of have to repeat this process.

P5: Exactly. So, uh also Google—so you know that you maybe you know that you have an explore time on Google, that only allows you to select either maximum, like three days a week or it doesn't allow your free range exactly.

H4 Structuring Transcript Data

Write a short (max 5 sentences), descriptive and realistic profile about a fictive persona who is a 24 years old woman, who works as a Social Media Manager called Emily. Consider that all the information provided here is already presented on the Persona Card, focus on giving her some personality and put it in the perspective of a human.

She is "The planner" when it comes to organising group trips, fitting the role of the "Main-planner". She is proactive, structured and detail oriented. Her main goals are to smoothly align the others and organise a trip. She wants to avoid endless chats and would like to plan efficiently. She wants to efficiently compare options in one place, instead of having to use 7 different apps. She is tired of having to navigate so many different tools, and also frustrated by the fact that there is no clear overview of the trip details, data is lost in group chats. Additionally, Price changes ruin her careful planning.

She would like a trip planning hub with assisted search functionalities, an Easy-to-use poll system for group decisions and a Price calendar and alerts about price changes in the app.

Emily is the kind of friend who naturally takes the lead when a trip is being planned—partly because she loves it, and partly because no one else will. As a Social Media Manager, she's used to juggling details and keeping things on track, so bringing structure to group travel feels second nature. But even she gets overwhelmed when plans are scattered across chats, spreadsheets, and booking sites. She's tired of chasing people for answers and reworking plans because of sudden price hikes. What she really wants is one smart, streamlined space to plan trips smoothly, align the group, and keep everything—from decisions to deals—in one clear overview.



I Privacy and Data Security

II – Personal Data

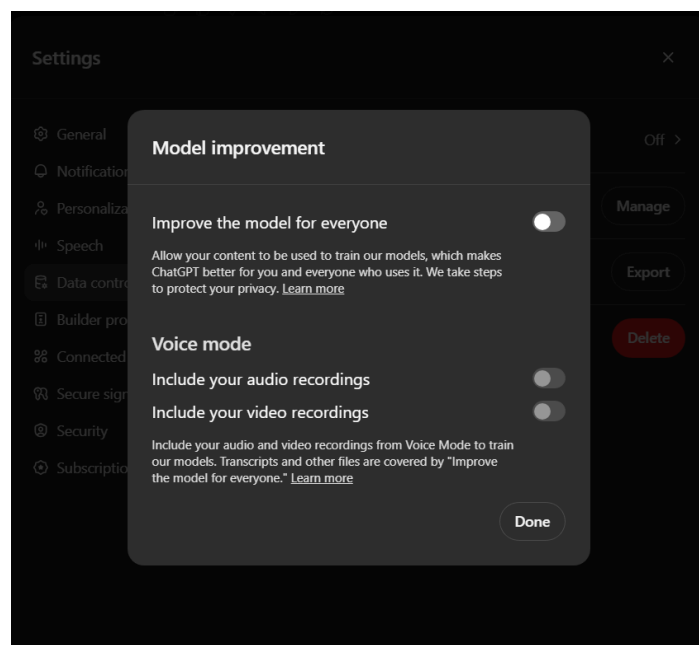
Throughout the study personal data such as name, age, occupation, educational background, nationality, gender, country of residence and country of residence were recorded in some cases, which were kept confidential and stored in accordance with the European Data Protection Regulation (GDPR). Following the collection of such data the dataset was manually anonymised immediately, prior to any procession of the dataset, to guarantee the protection of the participants anonymity. Participants' sensitive personal data was not shared with third party GenAI tools such as ChatGPT, other than when explicitly stated in the experiment.

II – Privacy and Data Security Settings

Whenever using ChatGPT v4o. additional security settings were configured to enhance privacy and data protection. More specifically, content sharing for the development of the AI models of ChatGPT were disabled, along with audio- and video recording sharings. These settings assure that no data input will be used for the training of AI models.


Figure I3 – Screenshot of Privacy Settings Page of ChatGPT

The screenshot below illustrates that “Improve the model for everyone” option was turned off, preventing data to be shared.



J Personas

Figure J1 – The co-planner persona



Fred the co-planner
24, Environmental Scientist, Berlin

BUDGET TRAVELER SPONTANEOUS SELF-RELIANT

“ I love the freedom of traveling solo—but a little smart help goes a long way when you're constantly on the move. ”

ABOUT

Frederik is passionate about authentic experiences, traveling sustainably, and making the most of a tight student budget. While he enjoys the spontaneity of solo travel, he knows that planning everything alone can sometimes be draining.

Frederik is resourceful and self-reliant, but he's also open to joining group activities when it makes sense—whether it's finding affordable places to stay or teaming up for a day trip. For him, the perfect travel tool feels like a smart companion: offering personalized suggestions, keeping his plans organized, and leaving enough room for unexpected adventures along the way.

GOALS

- Travel the world on a budget, efficiently.
- Visit multiple destinations as part of the same trip.
- Explore new destinations with like-minded people


PAIN-POINTS

- It is frustrating to plan trips with multiple destinations with the current tools.
- It takes a lot of time to build itinerary and plan out activities for each destination.

NEEDS FROM APP

- Customisable itinerary builder
- Discover local and must-see places efficiently.
- Coordinate with others.

Figure J2 – The easy-goer persona



Marc the easy-goer
28, Software Engineer, San Francisco

SPONTANEOUS INDEPENDENT CHILL SOCIABLE

“ I'm down for anything — just tell me when and where. ”

ABOUT

Marc is the kind of friend who's always down for an adventure—as long as he doesn't have to plan it. He thrives in social settings, loves discovering new places, and prefers to live in the moment rather than stress over details. While he rarely initiates trip planning, he's quick to respond when asked and is happy to vote on options or pack a bag last minute.

His laid-back, adaptable nature makes him a favorite in any travel group, especially for those who need a chill companion to balance out the planners. For Marc, the best trips are the ones that feel effortless, spontaneous, and full of good vibes.

GOALS

- Give input to trip planning only when needed.
- See new places, go on hikes, try local food.
- Have a fun, stress-free trip

PAIN-POINTS

- Gets overwhelmed by too many planning messages and options.
- Doesn't like long spreadsheets or itinerary docs.
- When he is not feeling social, he just wants to make his own plans for the day and do things solo.

NEEDS FROM APP

- Ability to quickly vote on dates and decisions
- Clear overview of finalized plans

K Design Principles

Principle 1) Efficiency: Streamline the Planning Workflow

Minimise users' cognitive load and avoid task duplication by providing the most relevant information in one place, streamlining coordination between travellers.

Supporting related literature in the area (Virvou, 2023, Fardous, 2019, Singh et al., 2024), both the qualitative and quantitative findings of this study underscore the importance of developing a solution that assists travellers in managing trip dependencies efficiently.

Principle 2) Collaboration: Empower Shared Decision-Making

Support transparent, inclusive, and non-confrontational group decision-making to ensure everyone feels heard and represented.

This principle aims to address a key insight of the study: group travellers often struggle to align on decisions and expectations. By empowering shared ownership of the planning process, the design can strengthen group cohesion, avoid confrontations, therefore improving the overall travel experience.

Principle 3) Adaptability: Design for the Whole Group

The design should acknowledge and respect that group roles, behaviours, and levels of involvement in planning often vary member to member and group to group.

As the findings highlight, some users take initiative in planning, while others prefer to contribute less actively. A future solution should support this diversity by allowing each participant to contribute in a way that suits their desired level of involvement and preferences.

Principle 4) Transparency: Design for Trust and Clarity

The design must promote transparency in both system behaviour and data practices to build trust, support informed decision-making, and provide fairness throughout the user experience.

Addressing the numerous privacy and ethical concerns of travellers and authors (Virvou et al., 2023, Singh, 2024, Kim et al., 2024, Ricci et al. 2010,) within the area, this principle aims to ensure that users understand how their data is collected and used, why certain information is prioritised, and how system outputs are generated. Upholding this principle is not only essential from a legal and ethical point of view, however it is also critical for fostering user trust towards the system.

Principle 5) User First: Put the User First and in Control

The design should be assistive of the user, however it must always respect the users' agency.

While intelligent suggestions and automation can support decision-making, in line with HCD principles (Nielsen, 1994b), users must remain in control of their actions and choices. The system should support, not override, human judgment.

Principle 6) Responsiveness: Design for Mobility and Flexibility

The design must adapt to a variety of contexts, allowing users to engage with the solution wherever and whenever it best fits their needs.

Recognising the diversity in trip planning habits and behaviours the solution should offer flexible and accessible experience across different situations, devices and environments. Whether planning in collaboration with others at a café or independently on-the-go, the solution should deliver satisfying UX to all travellers. Responsiveness in this sense ensures that the design integrates naturally into users' everyday lives and supports seamless interaction throughout the planning journey.

L User Interview Guide

Table L1 User Interview Questions Overview

Section	Question
Introduction	Thank you for participating in this study and supporting my thesis project. I would like to record this session for analytical purposes. Would you agree to that?
	[Recording begins]
	Your responses will be anonymous and stored in accordance with the European GDPR. You may withdraw consent at any time.
	Let's get started!
Background Questions	1. Could you please tell me a little bit about yourself? (e.g., place of origin, current location)
	2. How old are you?
	3. What do you work with / what is your occupation?
Travel Habits	4. How often do you travel?
	5. Can you tell me about the last trip you planned?
	6. How do you usually decide on destinations and activities?
	7. What factors influence your choices? (e.g., budget, recommendations, interests, time constraints)
Planning Process	8. How do you plan your trips? Could you walk me through your most recent planning process?
	– What were the first steps?
	– What tools/websites/apps did you use? (e.g., Booking.com, Google Maps, TripAdvisor, Airbnb, social media)
	– How did you organise information? (e.g., notes, spreadsheets, saved links)

	– How do you coordinate co-planning? How do you share information with others?
	9. How do you typically research accommodations, transportation, restaurants, and activities?
	– Do you compare multiple sources? If yes, which ones?
	– What information do you find most important when looking for accommodation?
	– What information do you find most important when looking for activities?
	– What information do you find most important when looking for restaurants?
	10. How do you usually book accommodations and flights?
Pain Points	11. How do you feel about the process of planning a trip?
	12. What challenges did you face during planning the trip?
	13. What challenges do you face while co-planning a trip?
	– What part of trip planning do you find most frustrating?
	– Do you ever feel overwhelmed by the number of tools you have to use for trip planning?
Ideal Solution & AI	14. If you could imagine the perfect trip planning app/tool, what features would it have?
	15. What is your opinion about using GenAI tools (e.g., ChatGPT) for trip planning? Have you ever tried it?
	16. What concerns (if any) do you have about using AI for travel planning?
Wrap-up	17. Is there anything you would like to add?
	18. Do you have any comments on how I could make this interviewing process better?

M Test Survey Questions

M1 Overview of Survey Questions

Section	Question	Question
Task 1	Q1	How easy was this task to complete? (SEQ)
	Q2	The information I was asked to provide during this step was clear and relevant.
	Q3	Is there anything you would like to add?
Task 2	Q4	How easy was this task to complete? (SEQ)
	Q5	The information I was asked to provide during this step was clear and relevant.
	Q6	Is there anything you would like to add?
Feature Evaluation: Date Picker	Q7	How easy was this task to complete? (SEQ)
	Q8	This feature would improve how I currently coordinate travel dates with others.
	Q9	This feature would be useful when planning group trips.
	Q10	Is there anything you would like to add?
	Q11	Which city did you plan to?
Itinerary Evaluation (1-2)	Q12	How easy was this task to complete? (SEQ)
	Q13	I feel like this itinerary reflects my group's preferences.
	Q14	I would follow this plan if I was on a real trip.
	Q15	Is there anything you would like to add?
	Q16	Which city did you plan to?
	Q17	I feel like this itinerary reflects my group's preferences.
	Q18	I would follow this plan if I was on a real trip.
	Q19	Is there anything you would like to add?
Plan Comparison & Final Feedback	Q20	Which of the two plans did you prefer?
	Q21	Why did you prefer that plan?
	Q22	Overall, this tool improved my group trip planning experience.
	Q23	I would consider using a tool like this for future group trips.
	Q24	What was the most useful or enjoyable part of the experience?
	Q25	What would you improve?