POLITECNICO DI MILANO

DIGITAL AND INTERACTION DESIGN

Designing an AI-Powered Digital Companion for Solo Travelers: Supporting In-Jouney Decision-Making Through Human Centered Design

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ENGLISH ABSTRACT

Solo travel has rapidly become a widespread practice, particularly among Generation Z and Millennials.This experience offers powerful psychological benefits including independence, personal growth and increased self-confidence. However, solo travelers also face big challenges during their journeys including uncertainty, decision overload and emotional vulnerability. However, existing travel applications mainly focus on pre-trip planning and logistical optimization providing limited support for real-time decision-making and contextual clarification during the journey itself.

This thesis reframes solo travel support as an in-journey decision structuring problem rather than a planning optimization problem. Adopting a human-centered design approach, the study employed diary studies, digital ethnography, and qualitative analysis to investigate real-time decision moments, uncertainty patterns, and associated emotional responses of solo travelers.

The findings informed the development of an AI-powered mobile digital companion concept designed to structure decision moments while preserving user decision ownership. Instead of automating decisions, the proposed system provides contextualized insights, experience-based matching, and emotionally aware support to reduce cognitive and affective load during travel.

By positioning artificial intelligence not as an authoritative decision-maker but as a reactive and user-triggered digital companion, this study contributes a design-oriented framework for AI-supported systems that enhance in-journey experiences while maintaining user control. The research extends the discourse on human-centered AI in tourism by proposing a model that balances personalization, trust, and decision ownership in uncertain travel contexts.

ITALIAN ABSTRACT

I viaggi in solitaria sono diventati rapidamente una pratica molto diffusa, in particolare tra la Generazione Z e i Millennial. Questa esperienza offre notevoli benefici psicologici, tra cui indipendenza, crescita personale e maggiore fiducia in se stessi. Tuttavia, i viaggiatori solitari devono anche affrontare grandi sfide durante i loro viaggi, tra cui incertezza, sovraccarico decisionale e vulnerabilità emotiva. Tuttavia, le applicazioni di viaggio esistenti si concentrano principalmente sulla pianificazione pre-viaggio e sull'ottimizzazione logistica, fornendo un supporto limitato per il processo decisionale in tempo reale e il chiarimento contestuale durante il viaggio stesso.

Questa tesi ridefinisce il supporto al viaggio in solitaria come un problema di strutturazione delle decisioni durante il viaggio piuttosto che un problema di ottimizzazione della pianificazione. Adottando un approccio di progettazione incentrato sull'uomo, lo studio ha utilizzato studi diari, etnografia digitale e analisi qualitativa per indagare i momenti decisionali in tempo reale, i modelli di incertezza e le risposte emotive associate dei viaggiatori solitari.

I risultati hanno portato allo sviluppo di un concetto di compagno digitale mobile basato sull'intelligenza artificiale, progettato per strutturare i momenti decisionali preservando al contempo la titolarità delle decisioni da parte dell'utente. Anziché automatizzare le decisioni, il sistema proposto fornisce approfondimenti contestualizzati, abbinamenti basati sull'esperienza e supporto emotivamente consapevole per ridurre il carico cognitivo e affettivo durante il viaggio.

Posizionando l'intelligenza artificiale non come un decisore autorevole, ma come un compagno digitale reattivo e attivato dall'utente, questo studio contribuisce a creare un quadro orientato alla progettazione per sistemi supportati dall'intelligenza artificiale che migliorano le esperienze di viaggio mantenendo il controllo dell'utente. La ricerca amplia il dibattito sull'intelligenza artificiale incentrata sull'uomo nel turismo, proponendo un modello che bilancia personalizzazione, fiducia e autonomia decisionale in contesti di viaggio incerti.

INTRODUCTION

In recent years, solo travel has become an increasingly popular practice on a global scale. Among Generation Z and Generation Y individuals in particular, it is seen as a meaningful experience associated with freedom, personal development, independence and self-awareness rather than just a way of travelling (Wachyuni et al., 2024; E. C. L. Yang, 2021). As solo travel has grown in popularity, tourism literature has begun to examine the motivations, psychological effects and constraints of this experience. However, despite this growing interest, there has been limited discussion of how the solo travel experience unfolds throughout the travel experience and, in particular, how moments of uncertainty that occur during travel affect the user experience (E. C. L. Yang, 2021).

The solo travel experience offers a structure that requires the individual to make all decisions alone during the trip. While this gives individuals a sense of freedom and control, it also brings increased responsibility and emotional load. Several instant decisions made while travelling, such as evaluating transport options, finding directions, making safety-related decisions and deciding whether to engage in or avoid social interactions, are important moments that directly affect the quality of the experience (Bianchi, 2016). These decisions are often made under time pressure, in an uncertain context, and with limited information, which boosts the cognitive and emotional load for solo travellers (E. C. L. Yang, 2021).

In this context, solo travel experience should be approached as a temporal one that requires constant decision-making and evaluation. As the journey progresses, the situations encountered by the individual and their responses to them change. Therefore, the experience is reshaped independently of prior plans. Unexpected situations, time constraints, or contexts involving uncertainty, primarily, constitute the most fragile moments of the experience for solo travelers. These moments not only change the flow of the experience but also directly affect the individual's perception of the travel process and their emotional state (E. C. L. Yang, 2021).

These decision moments that happen during travel can be considered critical touchpoints in terms of user experience. These touchpoints are also the moments that shape how secure, supported, or alone the user feels. Particularly in the context of solo travel, the sequential and cumulative nature of these decision moments can create an increasing cognitive and emotional load all day. The constant repetition of small, low-threshold decisions can lead to mental fatigue over time and make the individual's decision-making process more challenging. This situation often emerges as a

significant user experience problem that is invisible but directly changes the perceived quality of the experience.

These decision moments are important in design terms for reasons other than ensuring the user accesses the right information. Instead, they are crucial conditions that reveal how users cope with uncertainty, manage their perception of risk and feel in control of the experience. Especially for solo travellers, these moments can be cognitively and emotionally strong; bearing the consequences of a decision alone can make the experience feel more weak. Therefore, decision moments that happen during travel should be treated as experiential touchpoints where the need for emotional support becomes apparent. This perspective necessitates rethinking the design of in-journey experiences through temporal, contextual, and user-centered support systems.

While existing travel technologies and mobile applications have the potential to support the travel experience, they are especially structured around functions such as providing information, creating routes, and comparing options (Sia et al., 2023). Such systems benefit users in terms of advance planning and optimizing options. However, the travel experience is shaped not only during the planning phase, but also by situations that occur momentarily and in specific contexts during the journey. Therefore, existing technological solutions do not sufficiently address the decision-making moments that arise during travel or the emotional needs that accompany these experiences (Chen et al., 2018).

Especially in the context of solo travel, users' interaction with technology should not be evaluated completely in terms of access to information. For them, technological systems also provides more complicated needs such as coping with uncertainty, creating a sense of safety, and balancing feelings of loneliness. However, most existing systems assume that users are rational actors who make logical decisions, largely canceling the emotional and contextual dimensions of decision-making moments (Dirin et al., 2018; Stankov & Gretzel, 2020). This can cause technology to become an additional source of cognitive load in some contexts rather than a supportive component.

Integrating AI-powered systems into the travel experience offers new opportunities in terms of personalisation and contextual awareness. Although voice-based AI systems have been shown to support travel decisions (Ali et al., 2023; Stankov & Gretzel, 2020), they are generally presented as tools that either make decisions for the user or provide accepted suggestions. However, when it comes to solo travel, the importance

of preserving user decision-making autonomy comes to the fore, raising issues of trust, control and emotional safety (Kim et al., 2024). This necessitates rethinking artificial intelligence not as an authoritative decision-maker, but as a context-sensitive and supportive digital companion that accompanies the user's during experience (Chen et al., 2018).

This thesis examines the design of an AI-supported mobile system intended to assist solo travellers in making decisions and navigating uncertain situations while travelling, in line with a human-centred design approach. Qualitative methods such as diary studies and digital ethnography were conducted during the research phase to understand the experiences, emotional responses and decision-making strategies of solo travellers in real-life situations. These findings formed the basis for a design vision that empowers users with decision ownership, aims to reduce cognitive and emotional load, and provides contextual awareness.

This thesis does not aim to evaluate the technical accuracy or algorithmic performance of AI-supported systems. It focuses on how these systems can be designed in the context of user experience, decision ownership, and emotional support. As an outcome of the thesis, an AI-supported mobile application concept has been developed that provides real-time support during travel, matches moments of uncertainty experienced by users with similar travel experiences, and plays a supportive role in the decision-making moments. This approach positions artificial intelligence not as a system that makes decisions on behalf of the user, but as a digital companion that structures the experience and provides cognitive support at moments of decision.

The thesis first reviews the literature on solo travel and the relevant theoretical framework, before revealing how the findings obtained through user research were transferred to the design process. The developed design concept is then detailed, before the final section discusses the study's contributions and opportunities for future research.

1 LITERATURE REVIEW

1.1 Defining Solo Travel: Conceptual Boundaries and Perspectives

1.2 Psychological Motivations and Constraints in Solo Travel

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1.4 Limitations of Travel Technologies for In-Journey Support

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Defining Solo Travel: Conceptual Boundaries and Perspectives

Interest in solo travel is growing in tourism literature day by day. However, when we examine the various definitions of solo travel, we see that the concept is expressed in many different ways. In particular, there is uncertainty regarding the scope of solo travel. Yang (2021, p. 5) highlights that this growing interest requires us to reconsider existing definitions and perceptions of the definition of solo travel. Findings show that solo travel is a dynamic concept shaped by individual experiences, personal circumstances, and social changes, rather than a fixed and singular form of experience (E. C. L. Yang, 2021, p. 22).

Previous studies have tended to view solo travel primarily as the physical act of traveling alone. According to this approach, solo travelers are defined as individuals who travel alone without friends, partners, or any family members. For example, Bianchi (2016, p. 197) defines solo vacationers as people who are married or single and choose

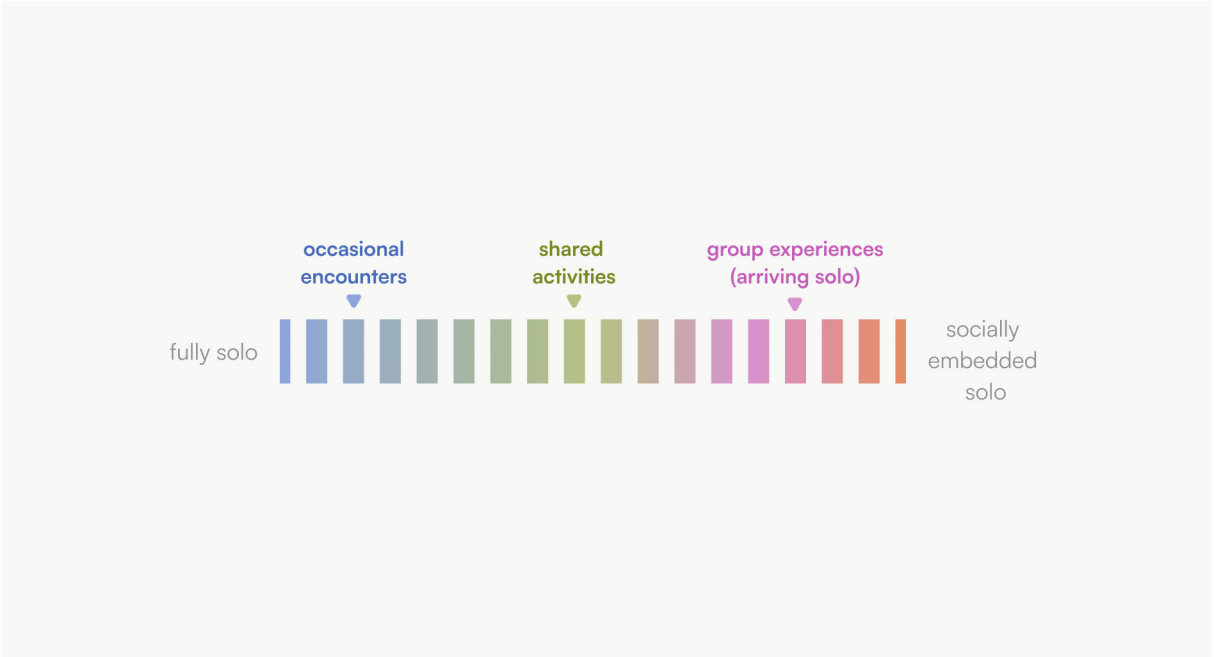

Figure 1. Conceptual spectrum of solo travel experiences, illustrating varying degrees of social embeddedness.

to travel alone for vacation purposes. Similarly, Otegui-Carles et al. (2022, p. 746) define the fundamental criterion of solo travel as the individual arriving at their destination alone; they argue that joining a group during the trip or spending time with people met along the way does not invalidate this definition.

These definitions do not address solo travel in the context of social interaction. Rather, they evaluate it primarily in terms of the initial form of travel. Indeed, empirical findings indicate that social interactions are a component of the solo travel experience. In Yang's (2021, p. 14) study, many solo travelers define solo travel as an experience that includes traveling with people met along the way. This finding emphasizes that solo travel does not mean social isolation and that social interactions can be part of the solo travel experience.

In this context, solo travel is considered within a broad spectrum of experiences ranging from being alone throughout the entire trip to participating in a package tour alone (E. C. L. Yang, 2021, p. 22). Such an approach makes it possible to evaluate solo travel not as a binary category (solo/non-solo), but as a spectrum encompassing different forms of being solo (Figure 1). Otegui-Carles et al. (2022, p. 748) emphasize that the lack of consensus in the literature on the definition of solo travelers stems from the extreme heterogeneity of this tourist group.

This heterogeneous structure makes it difficult to generalize in solo travel studies and demonstrates that treating solo travelers as a homogeneous market or experience group is problematic (E. C. L. Yang, 2021, p. 22). Indeed, variables such as age, gender, life stage, personal experiences, and travel context significantly influence how the solo travel experience is perceived and lived (Otegui-Carles et al., 2022, p. 747).

In this study solo travel is defined as an experience that begins with an individual traveling alone and can encompass various forms of social interaction. Thus, the psychological dimensions and limitations of the solo travel experience will be analyzed within this framework.

Psychological Motivations and Constraints in Solo Travel

The concept of solo travel is a multidimensional experience shaped by strong psychological motivations and constraints. Studies show that both push and pull factors play a significant role in individuals' preference to engage in solo travel, while also indicating that these motivations are often experienced alongside certain limitation (E. C. L. Yang, 2021, pp. 14-16).

Solo travel provides great motivations that nourish the individual psychologically. Existing literature points out self-discovery, a sense of freedom, personal growth and the desire to experience new things as powerful motivations. Yang (2021, pp. 15-16) said that many solo travelers describe this experience as an empowering and liberating form of experience that supports personal growth. Similarly, Bianchi's (2016, p. 201)study found that participants felt more in control when travelling alone and that it allowed them to think and be alone with themselves. These findings show us that this travel experience is related to a conscious and meaningful search for experience rather than a practical choice.

At the same time, individuals' life stages and personal circumstances can also contribute to the formation of motivations. Yang (2021, p. 15) reveals that significant transitions in life, such as changes in relationship status, the grieving process, or "coming of age" experiences, are among the factors that trigger a tendency toward solo travel. In this context, some individuals become independent 'solo travellers by necessity', while for others, solo travel is a conscious choice. However, these two situations are not always clearly distinguishable.

Despite the strong positive effects of this travel experience, there are also factors that limit individuals when deciding to travel alone. Many studies show that barriers such as cost, safety, and social constraints are quite common (Bianchi, 2016, p. 205; E. C. L. Yang, 2021, pp. 16-18). Accommodation and transportation costs, in particular, emerge as a important constraint that individuals will encounter in any kind of travel experience (Wachyuni et al., 2024, pp. 46-47; E. C. L. Yang, 2021, p. 17).

Safety is a key factor limiting the solo travel experience. Yang (2021, p. 17) identifies this factor as one that does not completely deter individuals from solo travel but limits the experience itself and the level of satisfaction derived from it. These concerns manifest differently depending on gender. While women mostly face sexual harassment and physical safety risks, for men, the perception of safety is seen in threats such as petty crime and theft (E. C. L. Yang, 2021, p. 18). Similarly, Hamid and colleagues (2021, p. 9) emphasize that although women traveling alone have strong moti-

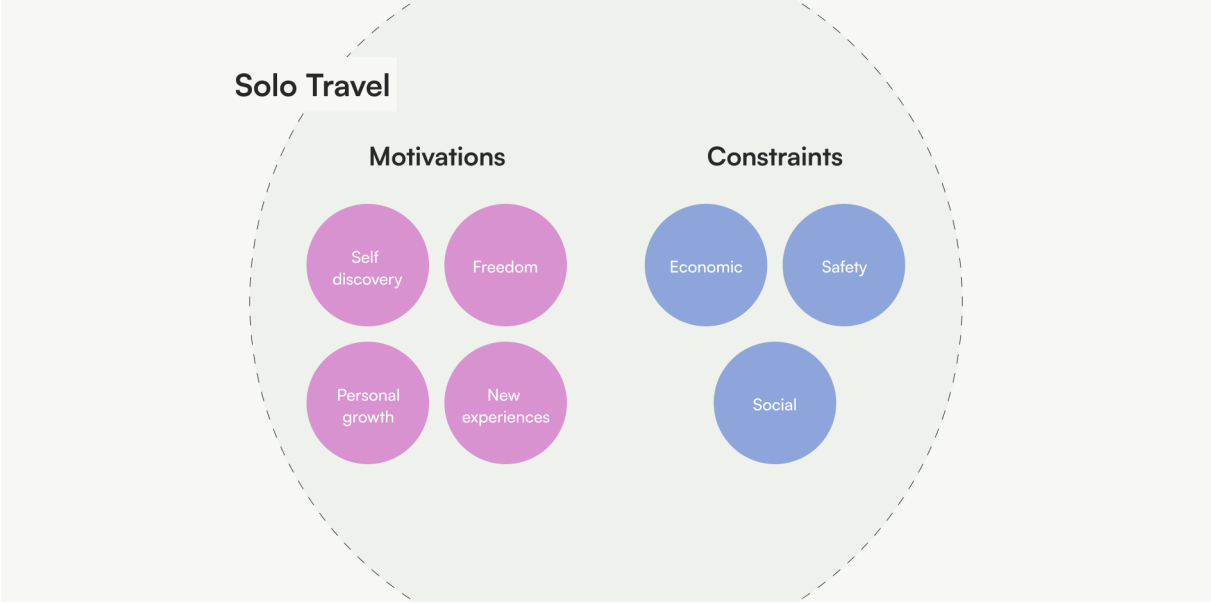

Figure 2. Psychological motivations and constraints shaping the solo travel experience.

vations such as independence and freedom, they also face serious constraints that vary across different geographies.

Another important factor affecting the solo travel experience process is social constraints. Social constraints are considered in two main dimensions: not having someone to share with and trust, and the expectation of always having someone to travel with (E. C. L. Yang, 2021, p. 18). Yang, Lai, and Nimri (2022) state that such social anxieties are associated with the perception of enjoyment and loneliness in the travel experience and undermine individuals' motivation.

When these motivations and constraints are examined, it is observed that solo travelers constitute a heterogeneous group. Yang, Liang, and Lin's (2025, pp. 138-140) segmentation study shows that motivations and constraints vary among individuals, with some participants being sensitive to cost and safety constraints, while others are more sensitive to social constraints. Given this diversity, we see that the solo travel experience cannot be explained through a fixed psychological profile and that this experience is shaped contextually.

The literature on solo travel describes it

as an experience driven by strong psychological motivations, but also constrained by costs, safety concerns, and social factors. This dual structure is evident at every stage of the experience and is a key determining factor (Figure 2).

Decision-Making and Emotional Load During the In-Journey Experience

The literature indicates that individuals travelling alone have to make many decisions independently during the process. Not only do these decisions increase significantly during the pre-travel planning, but they also increase throughout the in-journey experience. It has been observed that these moments increase considerably in uncertain, time and context specific situations that arise during travel. By reason of the fluid nature of solo travel, decision-making moments arise frequently during the journey (E. C. L. Yang, 2021).

Throughout the journey, there are several instances of instant decision-making that directly impact the quality of the experience. The most critical of these are decisions relating to directions, transport options, accommodation choices, security checks and social interactions (Bianchi, 2016).

Current studies emphasize that these decision-making processes create a significant emotional load on individuals. Decision-making carries meaning beyond simply being a problem solving activity. In this context, we can define emotional load as the mental and emotional pressure experienced by individuals during travel due to factors such as uncertainty, risk perception, sense of responsibility, and social isolation. In this process, the fact that the individual is alone and bears the responsibility for all decisions increases the intensity of this load (E. C. L. Yang, 2021, pp. 16-17).

Studies shows that solo travellers experience a sense of freedom and control over their decision-making moments. However, this process can also be stressful and mentally fatiguing for them. Bianchi (2016, p. 201) highlights that solo travel experience provides individuals with more control, but also entails facing the consequences of all decisions alone. Similarly, more recent studies on the solo travel experience show that uncertainty does not completely disappear during the trip; rather than it is reproduced in different contexts (E. C. L. Yang, 2021).

The need to balance security, cost, and social uncertainties is one of the fundamental stresses experienced in decision-making processes. The literature emphasizes that individuals do not cancel their travel plans due to security concerns, but that these concerns make the decisions they make during the travel process more careful and emotionally challenging (Bianchi, 2016, p. 205; E. C. L. Yang, 2021, p. 17). This situation has a strong impact on individuals in contexts where there is a language barrier, when they feel deprived of social interaction, and in unfamiliar environments.

The emotional load also manifests itself in contexts such as uncertainties related to social interactions, eating alone, com-

municating with the local population, or interacting with others. The daily decisions made during this process can also be emotionally challenging for the individual. Previous studies have shown that interacting with people is very important for individuals, but the uncertainty of whether interactions will occur complicates the individual's decision-making process (Bianchi, 2016; E. C. L. Yang, 2021).

Technology supported systems and mobile applications support decision-making processes during travel. However, the literature does not observe that this support reduces emotional and cognitive load in every context. On the contrary, interactive systems require attention during use and can limit users in terms of time and context when making instant decisions. Stankov and Gretzel (2020, pp. 482-483) emphasize that in such situations, system use can be distracting and goal-limiting, negatively affecting the experience. Similarly, inter-

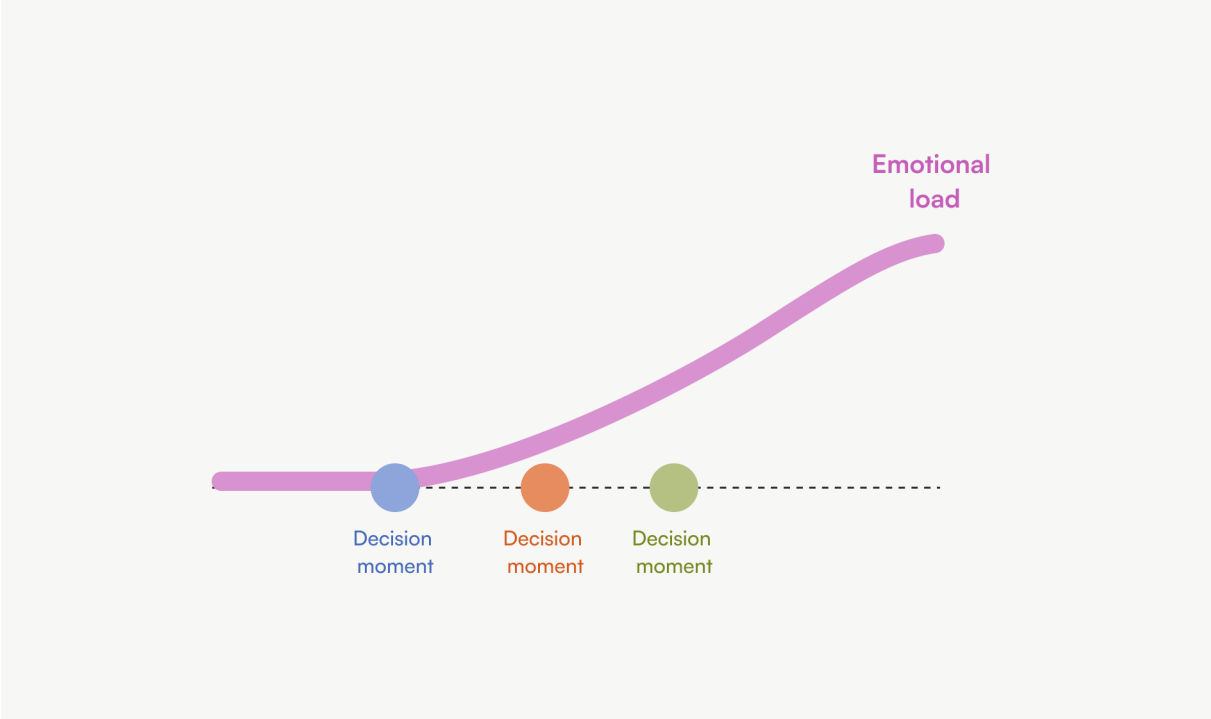

Figure 3. In-journey decision-making moments and emotional load during solo travel experience

active systems that do not offer online usage, do not provide contextually appropriate information, and are not user-friendly have the potential to create an additional mental load on the user (Dirin et al., 2018, pp. 187-189).

In this context, the decision-making process during solo travel is not only shaped by the need for access to information, but also by an increased emotional load, uncertainty and sense of responsibility for the consequences of decisions made. While existing literature acknowledges the potential of travel technologies to support decision-making, it also shows that they do not sufficiently meet individuals' emotional needs, particularly during context and time specific decision-making moments that arise during travel. This suggests that such moments should be considered critical touchpoints for design interventions that take into account the emotional as well as the functional dimensions of the solo travel experience (Figure 3).

Limitations of Travel Technologies for In-Journey Support

In tourism literature, the focus of artificial intelligence and digital travel technologies has largely been on the pre-travel planning process. Current studies show that travellers use digital platforms to access information, select destinations and compare options (Mohamad et al., 2025, pp. 9-13). In this context, AI-supported systems offer users ease of access to information.

Similarly, research on mobile travel applications reveals that technological support is primarily geared towards structuring the pre-travel experience. AI-supported features commonly found in mobile travel apps include geolocation tracking, personalised recommendations and route planning. The primary purpose of these features is to help users create and optimise a suitable travel plan (Sia et al., 2023, pp. 2126-2132). Studies on decision support systems aim to enable travellers to make more informed choices by providing information on traffic, event and weather but they emphasise that this support mostly remains at the level of information provision and recommendations (Badouch & Boutaounte, 2023, p. 39).

While there are various studies focusing on the pre-travel stage, studies addressing problems that arise during travel have been limited in the literature. Uncertain situations encountered during the travel process, decisions made under time pressure, and context sensitive needs fall outside the scope of existing technological solutions that focus on the planning stage. Nevertheless, the travel experience is constantly reshaped by the immediate situations that arise during the experience.

The situation shows that AI-supported travel technologies are powerful for planning, but limited for in-journey support. Especially in the context of solo travel, the question of how to support decision-making during travel has not been sufficiently addressed; most technological solutions have been designed around pre-travel scenarios. This highlights the need for design approaches that treat the experience as a temporal process, focusing on in-journey decision-making dynamics.

AI-Driven Personalization and Digital Companionship

AI-powered systems have emerged with the potential to deliver personalised experiences in the tourism sector. Current studies underlines that virtual assistants, chatbots and recommendation systems can increase service efficiency by providing content that is tailored to users' preferences (Mohamad et al., 2025, pp. 12-13; Nugroho et al., 2024, p. 2). These systems support the travel experience through ease of use, benefit, and accuracy factors.

As mentioned earlier, travel apps mostly offer location services, route planning and recommendation algorithms. A systematic review by Sia et al. (2023, pp. 2126-2132) supports this view, emphasising that most applications feature geolocation, real-time recommendations and route planning yet these features are based on functionality and efficiency. In this context, personalisation is a technical mechanism that optimises user preferences.

In recent years, generative artificial intelligence and conversation-based systems have become widespread. Beside this development, personalisation has evolved from a passive information provider to a more interactive and repeated form. Chat-based systems such as ChatGPT establish a dialogue with the user, providing contextual suggestions and supporting travel decisions (Ali et al., 2023, p. 5; Kim et al., 2024, pp. 1040-1046). However, users' adoption of these systems is directly related to their perceived benefits, previous experiences and appraisals of system reliability.
The literature highlights an important point here. Users rely on artificial intelligence systems because they provide quick, accessible and personalised solutions however, erroneous outputs, linguistic inconsistencies and contextual errors within the system can undermine trust in it (Christensen et al., 2025, pp. 549-556; Kim et al., 2024, pp. 1049-1051). Therefore, it is more realistic to position AI-supported systems as assistants that support decision-making processes in the context of travel than to assign them a delegation role.

In this context, it would be appropriate to consider AI-powered personalization as an experience structure that accompanies the user during the travel. It is particularly important to provide support in situations where the individual make decisions and consequently, experience increased emotional load, especially in the context of solo travel. Although there are numerous studies in the current literature on the technical capacity of personalization technologies, the question of how these systems accompany the travel experience is discussed to a limited extent.

This situation points out the need for design approaches that treat AI-powered

personalisation as an evolving process over time. This thesis aims to address this perceived gap by examining the decision-making processes and emotional needs that appear during the journey.

Trust, Control, and Emotional Safety in Human-AI Interaction

Simply explaining the use of AI-supported systems in the context of travel in terms of their functional and information-providing capabilities is insufficient. The literature emphasises that, when making travel decisions involving intense uncertainty and risk, users evaluate AI systems based on criteria such as trust, control and emotional safety (Shi et al., 2021; R. Yang & Wibowo, 2022).

Trust, when examined in the context of travel, has a multidimensional structure. Studies argue that trust in AI systems consists of cognitive and emotional components. Cognitive trust is related to the consistency, accuracy, and adequacy of the system. Emotional trust, on the other hand, is associated with reduced anxiety, comfort, and a feeling of support during interaction (Shi et al., 2021).

Another critical factor in users' relationships with AI systems is their perception of control. Since travel decisions are experienced directly by the user, they hesitate to delegate full responsibility for these decisions to AI. Studies show that AI systems are highly accepted when positioned as decision-supporting assistants (Kim et al., 2024). This allows users to feel that they are making the decision themselves, thus maintaining their sense of control and the trust relationship they have built with the system.

The trust-control balance is fragile in the context of AI systems' potential for error. With the increasing use of systems such as ChatGPT in travel recommendations and planning phases, discussions on this topic in the literature are growing (Christensen et al., 2025). Surprisingly, despite users being aware of these risks, it has been observed that they carry on benefit from AI and prefer its outputs over verified sources. This situation demonstrate that the trust relationship must be evaluated in conjunction with experiential factors such as ease of use, personalization, and familiarity (Ali et al., 2023; Christensen et al., 2025).

Some studies show that experiencing system errors first-hand can negatively impact users' confidence levels and their intent to use the system in the future. Research highlights that users who have had a negative experience with AI systems demonstrate significantly less trust in and willingness to use the system in future (Kim et al., 2024). These findings suggest that, in the context of travel, AI systems should be designed to support users rather than make decisions on their behalf.

Emotional safety is a extraordinary dimension of human-AI interaction, particularly for individuals traveling alone. Solo travelers need an interaction style that makes them feel safe and supported without judgment. It has been found that systems which provide users with con-

textual awareness, think alongside them and use an empathetic tone are truly effective in reducing feelings of insecurity and ambiguity. (Dirin et al., 2018; Silva & Canedo, 2024).

In conclusion, human-AI interaction in the context of travel is shaped by the delicate balance between trust, control and emotional safety (Figure 4). The literature marks that AI systems are accepted when they play a supportive role by providing users with personalized recommendations, assisting in the decision-making moments, and reducing emotional load (Kim et al., 2024; Shi et al., 2021). In this context, AI systems should be designed as system that accompany the user during the travel experience and make the user feel that they remain in control. This framework shows that human-centered and emotionally safe interactions should play a critical role in the design of AI-supported travel systems, particularly those designed for the in-journey experience.

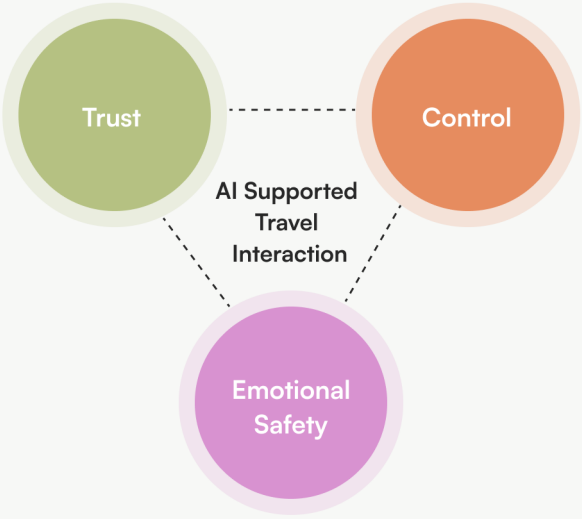

Figure 4. Key dimensions shaping Human-AI interaction in travel contexts

Research Gap and Positioning of the Study

The current literature points out that AI-supported travel systems have primarily focused on pre-travel planning, with these systems mostly limited to functions such as providing information, suggesting routes and comparing options. In contrast, the literature addresses only to a limited extent the contextual uncertainties that occur during travel, the need for instant decision-making and the emotional load, particularly in solo travel experiences.

In the context of solo travel in particular, factors such as the individual making all decisions alone, their perception of safety, loneliness and sense of responsibility shape the experience, affecting both cognition and emotion. However, existing AI-based travel technologies mostly address this experience from a functional, efficiency-oriented perspective. They do not provide ongoing support throughout the travel experience, recognise the emotional load or promote autonomy.

This thesis proposes a new approach to AI-supported systems, positioning them not merely as tools that make suggestions and decisions on behalf of the user but as digital companions that support the decision-making moments during the travel experience while preserving the user's control. This approach provides a framework for designing more human-centered and contextually sensitive AI experiences, particularly during the journey itself, by addressing the interaction between humans and AI in terms of trust, control and emotional safety.

2 METHODOLOGY

2.1 Research Approach

2.2 Data Collection Strategy

2.3 Data Analysis Process

2.4 Research Through Design and Prototyping

2.5 User Testing and Evaluation

2.6 Methodological Reflection and Research Positioning

Research Approach

This study adopts a human-centered, qualitative design research approach to explore the travel experiences of solo travelers. Instead of focusing on pre-travel planning, the research centers on the uncertainty, real-time decision-making and emotions that occur during the trip. Human-centered design indicates designing systems that align with users' cognitive limitations and processes, especially in decision-making contexts (Norman, 2002).

The research is based on an experience-focused perspective. This approach explores how solo travelers behave and navigate decision-making moments during their trip. This perspective points out understanding experience as something that spreads through action, emotion, and interpretation within specific contexts (Wright & McCarthy, 2004). As these decision-making moments are often context-specific, time-sensitive and emotionally charged, quantitative methods may not contribute sufficient insight for their understanding. Therefore, this study focuses on how solo travelers understand situations and make decisions in real time. In this context, qualitative methods focused on meaning-making and interpretation offer a useful framework for examining cognitive and emotional dynamics in depth (Creswell, 2013; Patton, 2015). The research aims to have contextual and transferable insights to shape design decisions.

In this research, design is approached not as a final output, but as a tool for analysis and knowledge generation. Following a Research through Design (RtD) approach, design artefacts and prototypes are used as means to explore, question and reframe users' experiences and decision-making moments (Zimmerman et al., 2007). This approach is particularly applicable for questioning complex and context-dependent experience that cannot be entirely addressed through completely analytical methods.

Data Collection Strategy

This study follow two methods, a diary study and digital ethnography, to gain an in-depth understanding of the problems users encounter during their travel experiences and the decision-making moments (Figure 5).

The diary study method was chosen since it enables participants to record their thoughts, feelings and decision-making moments as they experience them, providing access to in-situ data that may be difficult to capture retrospectively. Diary methods have been shown to reduce recall bias and more effectively capture context-sensitive experiences than post hoc approaches (Bolger et al., 2003). Previous HCI research has demonstrated the value of diary studies in investigating everyday, longitudinal user experiences and uncovering decision-making challenges in real-life contexts (Carter & Mankoff, 2005).

Digital ethnography examines the posts, discourse, and experience narratives of solo travelers on the digital platforms they use. This approach enables an understanding of how users naturally and spontaneously articulate their travel experiences, concerns, and decision-making challenges in online environments. Digital ethnography treats online spaces as part of everyday life. This allows researchers to observe collective patterns, recurring problem areas, and shared processes of creating meaning beyond individual experiences (Hine, 2015).

Method	Context	Platform / Source	Sample Size	Time Period
Diary Study	In-situ / Individual	WhatsApp	8 participants	Aug-Sep 2025
Digital Ethnography	Online / Collective	Reddit + Trip Advisor	860 + 741 comments	Sep-Oct 2025

Figure 5. Overview of data collection methods used in the study

Diary Study

The diary study was conducted to collect data about the decision-making moments experienced by solo travellers during their trips, the emotions accompanying these moments and their attempts to figure out problems when they occurred. An announcement was shared on Instagram, Whatsapp and X platforms to recruit participants for the study, targeting individuals planning to travel alone in the near future. 10 users agreed to participate in the study as a result of this call, eight of whom actively shared their experiences during their travels. The active participants' ages ranged from 22 to 32.

Participants were sent an instructional brief about the purpose and process of this study. This document explained how the diary study process would work, what kind of moments participants were expected to share and how to communicate with the researcher. Participants were asked to share moments during their experience when they found it particularly difficult to make decisions, experienced uncertainty or encountered technology related problems. They were also encouraged to record positive moments when the decision-making process was easier or when the technologies used were helpful.
The diary study process was conducted via WhatsApp. WhatsApp was chosen because it is a platform that participants already actively use while traveling, is easily accessible, and supports instant sharing. Participants were asked to share 1-5 entries per day throughout their travel. Entries could be in the form of text, voice messages or visually supported content. Each entry was expected to consist of a brief description of the condition, the emotions felt at that moment, the ways attempted to solve the problem, and thoughts on what could ideally be helpful. Follow-up questions were asked to participants when assumed necessary to better understand the context of the experience.

Since each participant has different travel schedule, the diary study process took 1 month, from late August to late September. Participants joined the diary study process when they reported that their trip had begun, they indicated that the process had ended when they completed their trip. After the trip was completed, participants were asked a short post-trip set of questions; demographic information, solo travel history, and motivation data were collected.

Digital Ethnography

Digital ethnography method was conducted to complement the individual and momentary experience data obtained through the diary study. This approach aims to understand how solo

travelers express their experiences on digital platforms, what topics they discuss, and what situations they define as problems, without researcher guidance.

Reddit and TripAdvisor were selected to examine the platforms actively used by solo travelers. Reddit was chosen because it provides an environment where users share their thoughts, experiences, and problems related to solo travel in a community based and daily language. TripAdvisor was included in the research to examine how solo travelers convey their travel experiences in a more structured context, particularly through destination reviews and user comments.

During the data collection process conducted via Reddit, searches were performed using keywords such as solo travel, traveling alone, solo trip, solo travelers, and solo journey. In this process, user comments related to solo travel topics were treated as data units. The Apify tool was used for data scraping. It's dataset only involves publicly available content. 1,000 comments was the limit to make the dataset manageable. After filtering, 860 comments related to solo travel experiences were included in the dataset. The content included in the dataset was selected from current posts accessible on the platforms.

TripAdvisor focuses on destinations where solo travelers share and evaluate their experiences. Based on this Italy, Spain, Greece, Portugal and Iceland were selected as destinations where solo traveler reviews are outstanding. The first 50 user reviews for each destination listed under Destinations > Travelers' Choice > Top 3 on the TripAdvisor platform were received in the data set. The solo traveler filter was used to select reviews, and filtering options offered by the platform were utilized like language, travel type, and time range. As a result of this process, a total of 741 user reviews were obtained from TripAdvisor.

All content collected from Reddit and TripAdvisor was collected in Microsoft Excel before proceeding to the analysis phase. The digital ethnography data obtained was used to understand what topics solo travelers discussed during their travel experience, what experiences they preferred to share, what situations they defined as problematic, and how they expressed their decision-making processes in the digital environment. When digital ethnography and diary study were considered together, the research enabled access to a multi layered data set covering both individual decision-making experiences during travel and solo travel narratives collectively produced in digital environments. This holistic approach supported a more comprehensive understanding of the decision-making moments during solo travel experiences.

Data Analysis Process

The analysis of the data obtained varied depending on the type of data (Figure 6). The data collected through the diary study consisted of participant-generated accounts of in-journey experiences. To systematically interpret the qualitative content and identify recurring patterns, the data was grouped and analyzed using an affinity mapping approach. This approach enabled the synthesis of fragmented observations into meaningful clusters (Beyer & Holtzblatt, 1998) This analysis helped reveal common problems and difficulties experienced by solo travelers during their travel experiences.

Within the scope of digital ethnography, user comments obtained from Reddit and TripAdvisor were analyzed using thematic analysis to identify recurring themes and patterns across the dataset (Braun & Clarke, 2006). To support the interpretation of these themes and their relationships, a sunburst visualization was employed to represent the hierarchical structure of themes and the distribution of topics discussed on digital platforms.

The themes that emerged from these analysis processes were evaluated to explore the problem areas that arise during travel in greater depth. The relationships between these themes were examined to identify insights that would inform the research design process.

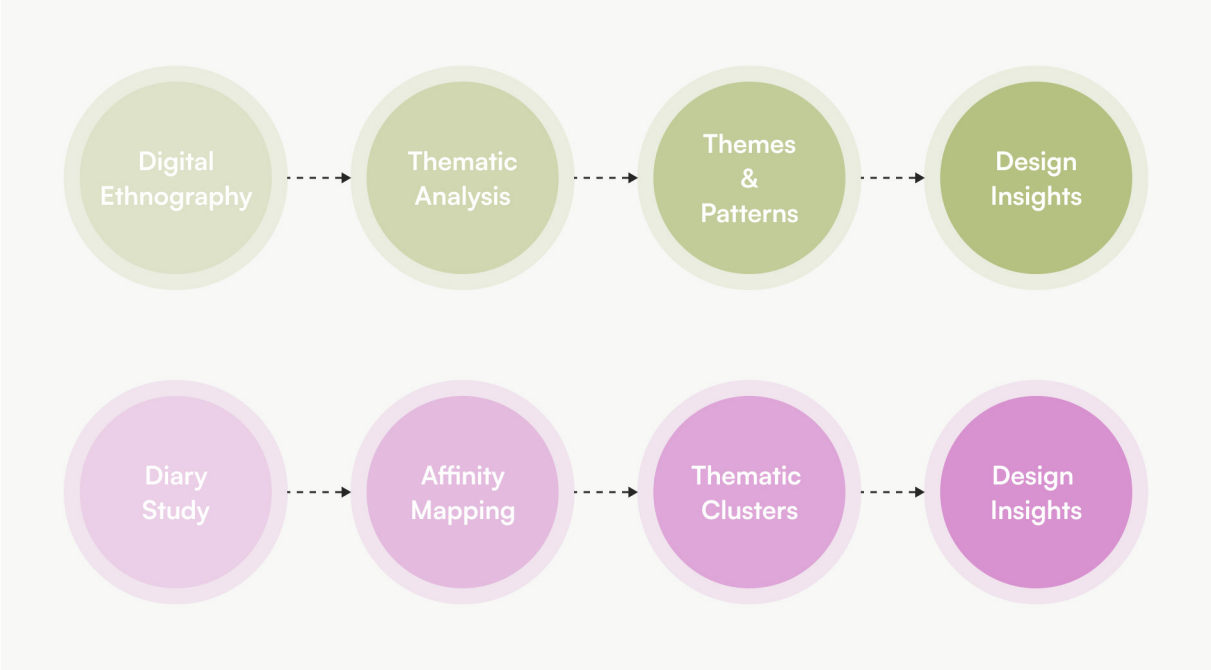

Figure 6. Overview of the qualitative analysis process from data collection to design insights.

Affinity Mapping

At this stage, a large amount of qualitative data obtained through the diary study was examined. Before beginning the analysis process, each participant's entries were examined separately. Meaningful notes were extracted from the messages shared by the participants for use in the analysis process. These notes covered the moments when users experienced problems, the emotions accompanying these moments, and the expressed needs. The same approach was followed for participants who sent voice recordings. These were transcribed and converted into meaningful notes.

After bringing together all the obtained notes, they were grouped according to similar meanings and recurring expressions. The notes were grouped together to form meaningful wholes, and the first group structures emerged. However, the amount of data concentrated under some groups necessitated a more detailed breakdown. Therefore, subgroups (sub-categories) were created under the main groups where deemed necessary. These subcategories, particularly in groups with a large number of notes, made the data clearer and more readable.

The grouping process was not linear. Instead, the study progressed iteratively through the examination of notes and the merging, separating, and reorganizing of groups. This iterative process resulted in the gathering of all content under four main headings, creating a consistent conceptual framework for the next stage of analysis.

Thematic Analysis

In the context of digital ethnography, user comments obtained from Reddit and TripAdvisor were treated as separate datasets for thematic analysis. The comments were initially compiled in Microsoft Excel and underwent a pre-analysis preparation process. At this stage, information not directly related to the content was removed from the datasets, and the textual content was prepared for analysis.

A keyword-based preliminary analysis was then conducted to reveal prominent discourses and recurring problem areas in the comments. Frequently recurring words for both datasets were obtained using the WordArt tool. The resulting word lists were cleaned to remove out of context expressions, stop words and semantic repetitions. This created clean, representative word sets for analysis. Word frequency analysis was used as a preliminary step to quantitatively validate the themes.

The word lists obtained were grouped

and organized by theme to reveal thematic patterns. ChatGPT was used to assist with theme creation and word matching during this process. In the theme creation stage, ChatGPT served as a supporting tool for the preliminary classification of word groups. As a result, Reddit data was structured under seven themes, while TripAdvisor data was structured under fifteen. The difference in the number of themes reflects the varying scope, structure, and narrative depth of the two platforms. These themes provided a framework for understanding the problem areas about which users discussed their solo travel experiences in digital environments.

The RAWGraphs platform was then used to visualize these thematic structures and clarify the relationships between themes. Themes and word clusters were visualized using a thematic sunburst diagram. Sunburst diagrams display hierarchically structured data and quantitative distributions within this structure through concentric circles. Main themes are located at the center of the diagram and outer rings represent sub-themes and corresponding word densities. This visualization aims to analyze the themes that users discuss most intensely on digital platforms.

To support the sunburst diagram, bar chart and Sankey diagram visualizations were also created. The bar chart allows for the comparison of quantitative distributions between themes. The Sankey diagram visualizes relationships and flows between themes and word groups, providing a more comprehensive assessment of thematic structures.

This thematic analysis process ensured the systematic interpretation of user discourse obtained from digital ethnography data, creating an analytical basis for understanding problem areas encountered by solo travelers in the digital travel process.

Research Through Design and Prototyping

In this study, the design process was approached as a research practice that transforms the findings into a solution proposal for the problem area. Diary study and digital ethnography analyses revealed that decision moments during solo travel are time and context-sensitive experiences that often involve emotional intensity. These findings revealed that the decision-making moments is influenced by factors such as the need for trust, the search for social support, and cognitive load.

Based on these analyses, the research findings were converted into design requirements. In order to support decision moments, the system must allow the user to express their situation with low cognitive load. The system is expected to provide contextual and experience-based content and adopt an interaction style that builds trust. It was determined that the user should then support the post-decision moments. In line with these requirements, an In-Journey Decision Support System aimed at supporting moments of uncertainty that arise during solo travel was conceptualized and concretized through a mobile application prototype.

Within the Research Through Design approach, the prototyping process was carried out iteratively. In the first phase, the information architecture and basic interaction flow were designed using low-fidelity wireframes. Later, mid-fidelity prototypes were developed to detail the system's interaction logic. In the final stage, high-fidelity prototypes were created to refine the visual hierarchy, micro-interactions, and trust-building language elements. This iterative process enabled the evaluation of both the functional and experiential dimensions of the system.

In this context, the prototype was positioned not only as a final product output but also as a method that translates research findings into design decisions and as a concrete representation of the proposed In-Journey Decision Support System. Each iteration was treated as a research step that tested how the analysis findings could be reflected in system behavior. Thus, the design process functioned as a holistic research practice that made the transition between analysis and application visible and operationalized the decision support approach.

User Testing and Evaluation

User tests were conducted to evaluate the proposed In-Journey Decision Support System. These tests were designed to examine the system's usability. They also aimed to measure whether it actually provided support at decision moments and whether it instilled a sense of trust in users.

Five participants with different ages, genders, solo travel experience, and cultural backgrounds were included in the testing process. Participant diversity was preferred in order to observe how the system was perceived by different user profiles and how the decision support mechanism worked at various experience levels.

The tests were conducted face-to-face and with a moderator. Participants were presented with an uncertain solo travel scenario and asked to complete some specific tasks step by step within the system. During this process, participants were asked to express their thoughts aloud to understand their thoughts while using. This approach made it possible to understand not only what users did, but also how they positioned the system in the decision-making moments and at which points they felt supported or hesitant.

The testing process was conducted to cover different prototype stages. Firstly, the interaction flow, decision moment entry process, and trust-building elements were evaluated using low and mid-fidelity prototypes. Then, the visual hierarchy and micro-interactions were examined using a high-fidelity prototype. This multi-stage approach ensured a all-inclusive evaluation of both the structural and experiential aspects of the system.

This evaluation process focused on generating qualitative insights into the user experience. The aim was to understand how the system was integrated into the decision-making moments, whether it truly helped the user during in moments of uncertainty, and how it affected the trust relationship. In this context, user tests were approached as a design research practice that examined the functionality and perceptual impact of the proposed decision support approach.

Methodological Reflection and Research Positioning

Decision moments that arise during solo travel are contextual and situation-specific experiences. Therefore, the study aims to examine decision-making moments through how users interpret, understand, and manage their experiences. This approach does not solely associate decision moments with information gaps but considers them as experiences shaped by emotional and social dynamics.

The methodological structure of the research is based on a multi-layered qualitative design research strategy. Diary study made decision moments visible in real time and at an individual level, while digital ethnography revealed the collective narratives of solo travel experiences. Affinity mapping and thematic analysis processes systematically structured this data and transformed it into design requirements. The Research Through Design approach then enabled these requirements to evolve into a concrete solution proposal. This holistic structure offers a research framework that makes the transition between analysis and design methodologically visible.

The main contribution of this study is a proposed In-Journey Decision Support System designed to support uncertainty and decision-making moments that occur in the context of solo travel. The developed mobile application prototype is a design representation of this system.

The study provides a conceptual and practical framework for how decision support mechanisms can be designed using a human-centered approach. In this respect, the research aims to provide a design contribution to system design that focuses on decision moments in the solo travel experience.

However, the research has some methodological limitations. User tests were conducted in a controlled environment and scenario-based, and the system was not tested in a real travel context (in-situ). This resulted in real-time environmental factors and spontaneous stress elements arising during travel not being included in the evaluation process. Furthermore, the evaluation process does not cover long-term usage behaviors. AI-supported content generation was designed at the prototype level and does not include full technical implementation. Therefore, the behavioral effects and performance of the system on a real-world scale were not examined in this study.

This methodological positioning provides a comprehensive contribution at both the analytical and design levels to how decision support systems can be structured in the solo travel experience.

3 FINDINGS AND INSIGHTS

3.1 Overview of Participants and Collected Data

3.2 Identified Themes

3.3 Key Insights

3.4 Synthesis: Behavioral Patterns and Persona Construction

Overview of Participants and Collected Data

This study relies on multiple qualitative data sources to examine the decision-making moments and problem areas encountered by solo travelers during their journeys across different contexts. The collected dataset combines individual and momentary experience narratives obtained through the diary study method with user content gathered from online platforms within the scope of digital ethnography. This multi-layered data structure allows for an understanding of the solo travel experience at both the individual and collective levels.

A total of ten participants reached through social media platforms were included in the diary study, eight of them actively shared data during their travel experience. The participant's ages ranged from 22 to 32. The diary study data consists of written messages, audio recordings and visual content shared by the participants during their travels. These entries documented decision-making moments, the emotions accompanying these moments, the difficulties encountered and the perceived need for support in real time. Diary study participants traveled especially in different countries and cities in Europe, the shared experiences were diverse, reflecting decision-making moments that arose in different spatial and cultural contexts.

Within the scope of digital ethnography, data was collected from two online platforms actively used by solo travelers: Reddit and TripAdvisor. A total of 860 user comments related to solo travel experiences were included in the dataset from Reddit. These contents were selected from current and publicly available posts to reflect the topics of discussion and problem areas among users. From TripAdvisor, a total of 741 user reviews related to destinations frequently chosen by solo travelers were collected. The reviews were selected to fit the research focus using the platform's filtering options, such as travel type and language.

When evaluated together, this dataset encompasses in-depth and temporally traceable data on individual travel experiences, as well as large scale user narratives shared in digital environments. This comprehensive structure has made it possible to examine the decision-making moments and problem areas experienced by solo travelers during their experience from different perspectives and has provided a solid empirical basis for the themes and insights presented in the following sections.

Identified Themes

This section presents themes emerging from the analysis of data collected through diary studies and digital ethnography. The identified themes describe recurring problem areas encountered by solo travelers during decision-making moments while traveling and how these problems take shape in different contexts. These themes aim to systematically classify common patterns observed in the data rather than interpreting user experiences.

The themes are addressed under two main groups based on the differences in the data collection methods and analysis processes used. First, the themes derived from diary study data reflect individual and context-specific decision-making experiences. Then, themes derived from user comments collected from the Reddit and TripAdvisor platforms within the scope of digital ethnography reveal broader, collective problem areas related to the solo travel experience. This structure enables findings from various data sources to be presented within a comparable, holistic framework.

Diary Study Themes

Qualitative data collected as part of the diary study was analyzed using affinity mapping and grouped under four main themes reflecting the problem areas encountered by solo travelers during their trips (Figure 7). These themes describe the difficulties users experience when making decisions, their emotional states and their need for support.

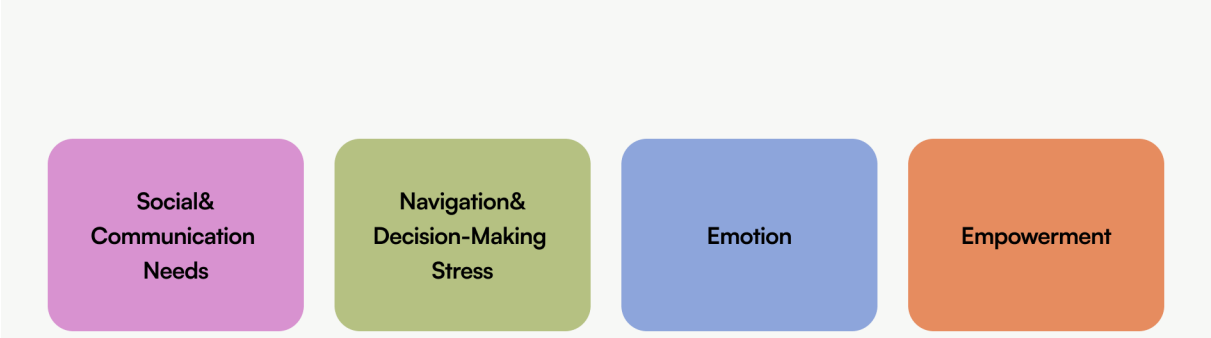

Figure 7. Main themes identified through the affinity mapping of diary study data.

Social & Communication Needs
This theme covers users' experiences shaped around their need for social interaction, connecting with people and communication during their travels. In particular, situations involving meeting new people, communicating with locals and accessing social environments are grouped under this theme. The theme also includes shared experiences about how language barriers and difficulties in self expression affect the social experience.

Navigation & Decision-Making Stress
This theme represents the mental load users experience due to the challenges of finding their way and the intense decision-making moments they face while traveling. Daily planning, route selection, time management and making instant decisions are the prominent problem areas under this theme. User shares reveal that uncertainty and excessive options complicate the decision-making moments.

Emotion
This theme covers emotional responses and moods that arise during the travel. Users' entries about moments when they experience different emotions such as stress, anxiety, relaxation, loneliness or peace are grouped under this theme. It has been observed that emotional states are directly related to decision-making moments and affect the overall perception of the travel experience.

Empowerment
This theme covers moments when users feel more efficient, confident and independent as the experience progresses. This theme associated with overcoming challenges, adapting to new environments, and personal development. User entries indicate that some decision-making moments can transform into empowering experiences over time.

Digital Ethnography Themes

Within the scope of digital ethnography, user comments collected from Reddit and TripAdvisor platforms were examined using thematic analysis methods, and recurring topics related to the solo travel experience were identified. The emerging themes describe the topics users focused on during their travel process, the situations they defined as problematic, and how they framed their experiences.

The analysis of Reddit data identified seven main themes. These themes revolve around logistics, emotional&mental, identity&empowerment, social interaction, safety &risk, environment&destination, digital tools&support (Figure 8). The thematic sunburst diagram and supporting bar chart visualizations reveal that logistics is particularly prominent in user discourse, followed by emotional&mental and identity&empowerment themes.

The themes derived from TripAdvisor data, on the other hand, exhibit a more destination-focused and experience-descriptive structure. In this dataset, the prominent themes are place, logistics, aesthetics, activities, service, time, social, safety and overall emotional evaluations (Figure 9). The prominence of place and logistics themes in particular shows that solo travelers largely express their experiences in terms of the physical environment, accessibility, and operational conditions.

When the themes obtained from both platforms are evaluated together, it is seen that user narratives on Reddit are shaped more around decision-making processes, uncertainties, and personal experiences, while on TripAdvisor, experiences are conveyed in a more structured, space and service based language. However, logistics, safety and emotional experiences emerge as recurring common themes on both platforms. This thematic structure describes the problem areas around which solo travel narratives shared in digital environments are concentrated and provides an analytical basis for developing the key insights discussed in the following section.

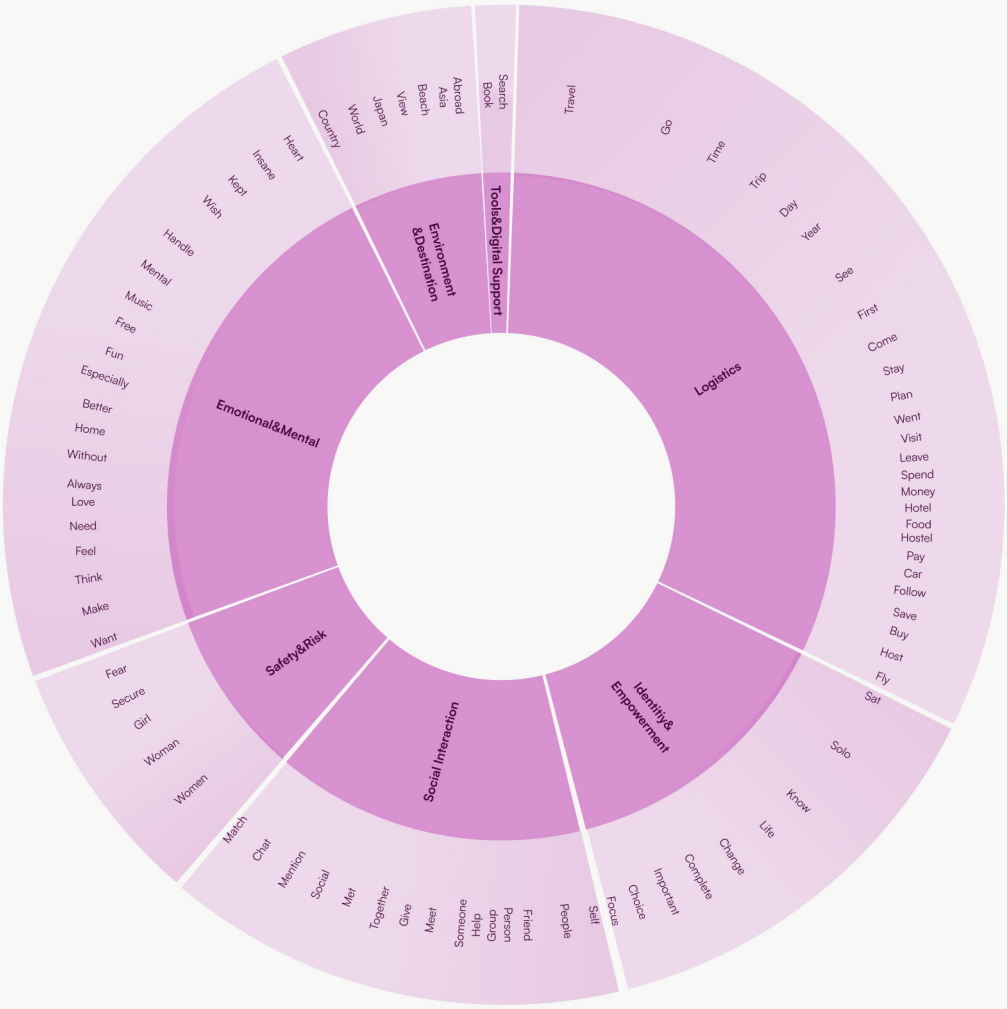

Figure 8. Main thematic structure derived from Reddit data, visualized through a sunburst representation.

Figure 9. Main thematic structure derived from TripAdvisor data, visualized through a sunburst representation.

Key Insights

Insight 1: The decision-making moments creates a constant mental load for solo travelers.

Diary study findings show that the daily, low-stakes decisions made by solo travelers during their trips accumulate over time, creating significant mental fatigue. The problem for participants is not only making the right decision, but also bearing sole responsibility for all of these decisions. The decision-making moments becomes even more challenging in situations where the context is unfamiliar, the technical infrastructure is weak or time pressure is felt. One participant described this burden early in the day as follows:

"I had a hard time deciding where to have breakfast this morning and planning where to go today. The internet is bad and using my phone is difficult. Being spontaneous is challenging for me here."
(Diary study participant, User 4)

This load created by the decision-making moments is not experienced only at certain moments, it is a situation that permeates the participants' overall experience. Another participant expressed this situation more directly and in a more generalizing manner:

"Making decisions exhausts my mind."
(Diary study participant, User 5)

These sharings explain that decision-making in the context of solo travel is experienced as a constant process that consumes mental energy and creates emotional load. Especially in situations where there is no supportive reference point or reliable guiding voice, this load of decision-making triggers anxiety and a sense of loss of control.

Insight 2: Uncertainty is more related to a lack of context than a lack of direction.

Diary study findings show that the uncertainty experienced by solo travelers during their experience is not limited to physical orientation problems. Participants want to know not only "how to get there" in an unfamiliar city, but also which options are meaningful and convenient. This situation highlights the need for context specific information rather than directions.

User entries tell that unfamiliarity with a city or destination triggers a feeling of emotional insecurity. Contextual information, such as which areas are lively, what times are best to visit or what events are happening in the city at that moment becomes an significant part of the decision-making moments. One participant expressed this need for context as follows:

"I'd like to know wherever I could find

the most lively locals/pubs to meet new people. Also if I were told where to find any kind of public events."
(Diary study participant, User 3)

This sharing shows that solo travelers need contextual guidance to make sense of their experiences during decision-making moments. Uncertainty often stems insufficient context for evaluating the available options. Therefore, the desired outcome at decision points is for the decision to feel meaningful and reliable.

Insight 3: Local and experience-based recommendations reduce the load of decision-making by serving as reliable reference points.

Diary study and digital ethnography findings show that solo travelers need not only information but also a reliable reference point in their decision-making moments. Recommendations from locals or individuals who have had similar experiences are perceived by users as more trustworthy and reassuring than general and anonymous information.

Local and experience-based recommendations reduce users' need to constantly research, compare different sources and verify their decisions. This not only speeds up the decision-making moments but also lightens the mental load. One participant described how information obtained from local sources created this effect:

"Since I got information about the island from locals, I didn't need to research anything online. It made everything so much easier for me."
(Diary study participant, User 4)

This entry affirms that the main comforting factor for solo travelers is trusting the source of that information. Small, context-specific recommendations, such as "go early," "use this route," and "buy tickets here," are frequently encountered in Reddit and TripAdvisor data. These recommendations provide practical reference points that help users cope with uncertainty.

In this context, experience-based advice plays not only a guiding role for solo travelers but also a validating and confidence building role in the decision-making moments. Such references promote a smoother travel experience by giving users an internal sense of reassurance that their decisions are correct.

Insight 4: Technology is not just a tool for solo travelers, but an invisible safety net.

Diary study findings show that solo travelers approach technology during their travels not only as a practical tool but also as a source of psychological sup-

port and reassurance. Beyond functions such as phone calls, navigation, access to information and communication, it becomes an invisible safety net that makes users feel that they are not alone.

Moments when the technological infrastructure break down, particularly when the phone cannot be used or the connection is lost, have been associated with intensive stress and feelings of helplessness among participants. One participant directly expressed this situation as follows:

"I got really stressed when my phone ran out of battery."
(Diary study participant, User 2)

This entry reveals that the absence of technology does not merely create a functional problem, but also triggers a sense of loss of control and insecurity. The problem for users is not just being unable to find their way or access information, but feeling completely unsupported in these situations.

Concerns frequently encountered in Reddit data, such as "going offline," "running out of phone battery," or "what to do in an emergency," support the idea that technology is positioned as a critical element of trust in the solo travel experience. In this context, technology becomes a fundamental pillar that maintains a sense of control in the decision-making moments for solo travelers.

Insight 5: The solo travel experience is interpreted through both emotional and operational dimensions, and this interpretation varies depending on the platform.

When digital ethnography and diary study findings are evaluated together, it is seen that the solo travel experience cannot be defined through a single dimension. In Reddit data, solo travel is mostly described in terms of personal transformation, empowerment, courage and identity building; while on TripAdvisor, experiences are primarily evaluated in terms of physical space, aesthetic qualities and operational flow (accessibility, timing, queues, ticketing). The diary study data shows that users experience their travel journey on both emotional and practical levels.

These different narrative forms determine that solo travelers' decision-making moments are influenced by the need for emotional safety, contextual meaning and a sense of control. The dimension that comes to the fore varies depending on the user's context, the level of uncertainty they encounter, and their need for support.

This finding acknowledge that digital solutions designed for solo travelers should not offer a one-size-fits-all sup-

port model; rather, hybrid support systems that can provide both operational guidance and emotional reassurance depending on the context are needed.

Synthesis: Behavioral Patterns and Persona Construction

This section explains how the findings obtained in the previous stages are transformed into usable behavioral structures in the design process. The aim is to take a holistic view of the experience of solo travelers during their travels and to structure the needs, uncertainties, and recurring behavioral patterns that shape this experience within a persona-based framework. This synthesis process is based on revealing the patterns indicated by the research data and shaping the design focus in line with these patterns.

The persona creation process was carried out based on the goal-directed persona approach (Goal-Directed Design) developed by Cooper, Reimann, and Cronin (2007), as illustrated in Figure 10.

In this approach, personas are treated not as representative profiles of real individuals, but as composite user archetypes synthesized from recurring behaviors, attitudes, motivations, and goals observed during the qualitative research process. In this study, personas were

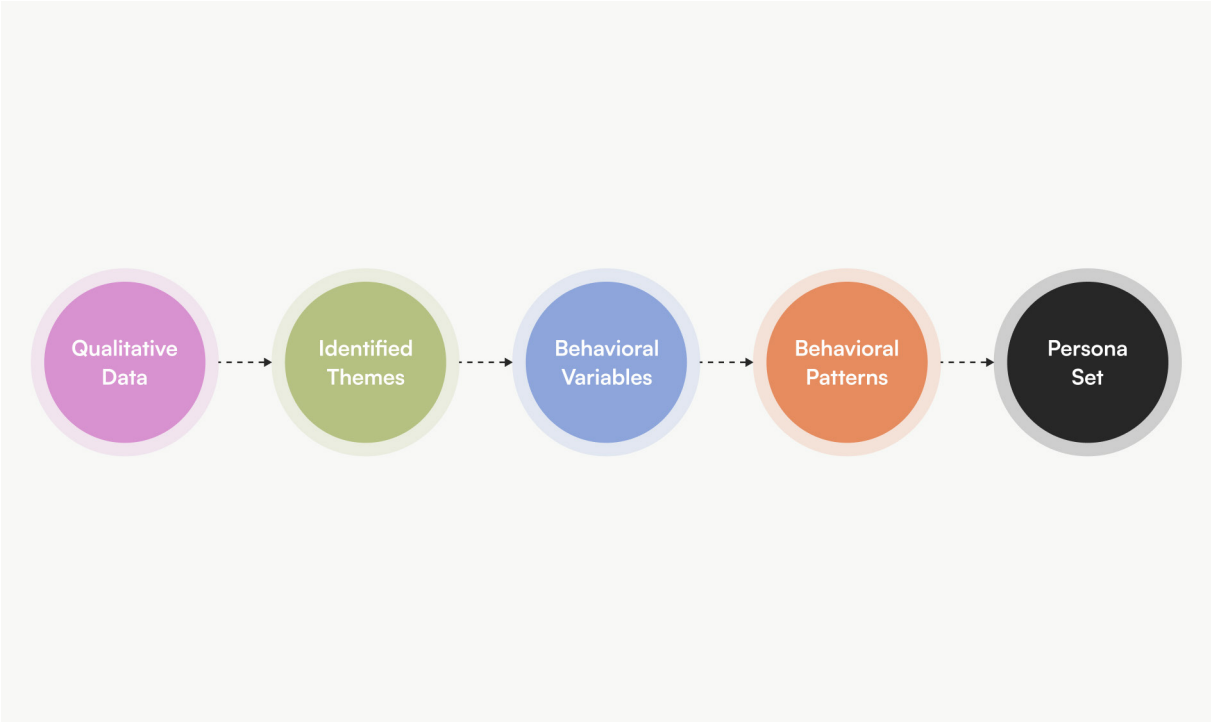

Figure 10. Behavioral synthesis process from qualitative findings to persona definition.

defined based on how users experience their journey, how they interpret this experience, and how they respond to the uncertainties they encounter.

The primary data source for persona synthesis was qualitative data collected through diary studies. Participants' momentary experiences, emotional responses, expressed needs and encountered difficulties during their travels were used as the fundamental reference point for identifying behavioral patterns. Data obtained from Reddit and TripAdvisor platforms within the scope of digital ethnography was evaluated as a complementary layer to observe and support the patterns emerging in individual experiences within a broader context.

The structure proposed by Cooper was followed in the persona creation process. In the first stage, diary study participants were grouped into preliminary groups based on the dominant behaviors they exhibited during their travels. This preliminary grouping aimed to reveal general behavioral tendencies regarding how participants experienced their travels and how they positioned themselves within that experience.

In the following stage, behavioral variables such as coping styles with uncertainty, need for contextual information, search for social and emotional support, role attributed to technology and strategies for making sense of the experience were identified. Participants were mapped onto these identified variables, and recurring and distinctive behavioral patterns were determined by analyzing the resulting distributions.

As a result of this analysis, three behavioral patterns were identified in the context of the solo travel experience. These patterns reflect how participants perceived the situations they encountered during their travels, how they responded to these situations and the axes through which they made sense of the experience. For each behavioral pattern, the hidden motivations, needs, attitudes and challenges encountered were synthesized, followed by a redundancy and completeness check. This process approve that the identified patterns did not overlap and appropriately represented meaningful behavioral differences in the solo travel experience.

The joint evaluation of behavioral patterns has revealed that solo travel experiences involve varying levels of need intensity and vulnerability. Among these patterns, the one exhibiting lower tolerance for uncertainty and requiring intensive support and validation during the travel process represents the extreme point with the highest support requirement within the experience flow. A design approach targeting this pattern offers a solution framework that can en-

compass other behavioral patterns that progress with lower support needs without excluding them. Therefore, this behavioral pattern has been positioned as the primary persona in the persona set, representing the design goal.

The second behavior pattern, characterized by the need to make sense of the experience and provide contextual explanation, is considered a secondary persona because it offers a complementary perspective that strengthens the content and context dimensions of the support required by the primary persona. The third behavior pattern, focused on control and monitoring, has been evaluated not as a separate target persona but as a complementary behavior profile that helps test the boundaries of the design, as it significantly overlaps with the primary and secondary personas in terms of basic needs and can be addressed within the developed solution area.

In this regard, the primary-secondary distinction, need intensity, vulnerability level and inclusive design targeting logic were implemented. This approach is based on the Goal-Directed Design methodology principle of targeting users with the highest needs to encompass broader user groups.

The resulting persona set is positioned not as direct representations of real users but as analytical tools that help understand the travel experience in its various dimensions, guide design decisions and evaluate which experiential needs the digital solution to be developed should address. The personas have created a common reference framework for defining design requirements, scenario development and prototyping processes in subsequent stages. The personas, obtained by synthesizing behavioral patterns, are visualized below as analytical representations that guide the design process of the study.
The synthesized behavioral patterns are embodied in two personas that guide the design process.
Figure 11 shows the primary persona, while Figure 12 shows the secondary persona.

Primary Persona

Chiara, 24

Decision Reassurance–Driven Solo Traveler

A solo traveler who enjoys traveling independently but struggles with the emotional load of making in-the-moment decisions alone during the journey.

“Being alone in moments of decision and carrying the emotional load by myself is exhausting.”

Key Characteristics

-Low tolerance for situational uncertainty
-Seeks contextual validation in real time
-Prefers experience-based signals over generic recommendations
- Uses technology for reassurance rather than planning

Pain Points

-Decision fatigue during the day
-Hesitation under time pressure
-Context-disconnected suggestions
-Information overload
-Emotional isolation in decision moments

Goals

-Confidence in real-time decisions
-Contextually appropriate choices
-Preserving travel flow
-Emotional reassurance without overplanning

Figure 11. . Primary Persona: Chiara (Decision Reassurance-Driven Solo Traveler)

Secondary Persona

Marco, 27

Context-Fit Oriented Solo Traveler

For Marco, solo travel means adapting to the rhythm, habits, and immediate dynamics of the place he is in.

"I want to do things that make me feel like I belong where I am."

Key Characteristics

-Discomfort when context is unclear
-Seeks decisions that feel locally meaningful
-Values local knowledge over generic recommendations
-Uses technology to interpret situational logic

Pain Points

-Tourist-oriented, generalized platform
-Recommendations disconnected from current context
-Lack of reasoning behind suggestions
-Decisions feeling random or superficial

Goals

-Making timely, location-specific decisions
-Acting in alignment with local logic
-Ensuring decisions feel authentic to the place
-Gaining mental clarity in situational moments
-Understanding why a choice makes sense in context

Figure 12. Secondary Persona: Marco (Context-Fit Oriented Solo Traveler)

4 PROBLEM FRAMING AND DESIGN VISION

4.1 Framing In-Journey Decision-Making as a Design Problem

4.2 User Expectations and Contextual Decision Dynamics

4.3 Design Vision: AI as a Supportive Companion

4.4 Design Requirements as Conditions for Support

This chapter focuses on translating research findings into design problems and establishing a conceptual direction for the proposed system. Insights generated during the research phase are used to construct a design framework focusing on user goals and contextual dynamics. This approach aims to address the recurring challenge of the research-design gap in design practice by providing a structured transition from qualitative insights to design reasoning.
The structure of this chapter aligns with the Goal-Directed Design approach outlined in About Face. Cooper emphasizes the importance of clarifying what a product should do before addressing how it should be designed, through persona-based scenarios and the derivation of design requirements. In this context, design is framed as the process of identifying which user needs must be addressed in relation to user goals.

Accordingly, in-journey decision-making moments are framed as a design problem in this chapter.User expectations and contextual decision dynamics that happen in uncertainty moments are addressed, the role of artificial intelligence as a supportive digital companion is defined and design requirements that embody this vision are derived. This framework forms the basis for the conceptual design and prototyping work discussed in the next section.

Design Principle

Define what the product will do before you design how the product will do it.

(Cooper et al., 2007, p. 107)

Framing In-Journey Decision-Making as a Design Problem

Although solo travel is often associated with individual freedom, autonomy, and personal development in the literature, this experience also involves numerous uncertain decision-making conditions. These conditions are not usually limited to high-risk or critical safety contexts. Instead, they arise from decisions repeated throughout the day that are individually perceived as low in importance. Even if decisions such as whether to continue on the planned route, move to a different neighborhood, enter a venue, or reorganize the route of the day are perceived as insignificant individually, they can accumulate over time and create cognitive and emotional loads.

This study addresses the uncertainty and hesitation solo travelers experience when making decisions in unfamiliar contexts under time pressure with limited reference points. Existing travel technologies mainly focus on pre-travel step, recommendations, and optimizations. They only address the need for instant decision-making during travel experience at a secondary level. This leads to users lacking contextual support at decision moments and having to cope with uncertainty individually.

In this context, the problem is defined in terms of the decision-making process being unmanageable and unsustainable for the user. Repeated decision moments throughout the day, when sufficient contextual support is not provided, can lead to mental fatigue, decision postponement, and disruption of flow. This situation becomes a factor that negatively affects the overall quality of the solo travel experience.

Therefore, this study frames a successful travel experience not in terms of decision outcomes, but in terms of decision-making moments that feel emotionally safe, cognitively balanced, and continuous over time (Figure 13). This framework shifts the design problem to focus on the experiential dimension of the decision-making moments rather than the outcomes of decisions.

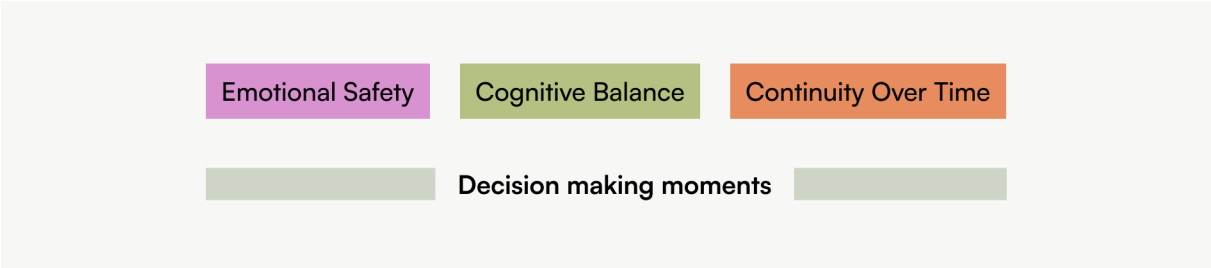

Figure 13. Reframing travel success through the experiential quality of decision-making moments.

User Expectations and Contextual Decision Dynamics

User expectations in solo travel experiences are shaped by moments of uncertainty that arise in specific contexts. These moments typically occur when users encounter unfamiliar spatial, social, or cultural conditions, transforming the decision-making process into an experience with emotional and cognitive dimensions.

The user experiences examined in this study show that decision-making difficulties generally accumulate through low-threshold decisions repeated throughout the day, rather than through singular and critical moments. Uncertainty is more manageable in the early hours of the day but becomes more challenging over time due to increasing mental fatigue and a lack of contextual reference. Decisions such as deviating from the planned route, heading to an alternative location, or leaving or staying in an environment require brief assessments each time. However, the repetition of these assessment cycles slows down decision-making and amplifies hesitation. For the primary user, this situation manifests itself as an increased concern about "making the wrong decision" at decision moments. In this context, users do not expect in-depth analysis or extensive lists of suggestions. They need support that helps them quickly understand their situation, is nonjudgmental, and does not take away their responsibility for decision making. The expected support is geared toward making the decision-making moments feel safer and more manageable.

At this point, user expectations are defined through contextual clarity, emotional balance, and a sense of control. Information is valuable to the user only when it serves as a meaningful contextual signal at the moment of decision. Otherwise, presenting excessive information can increase the existing cognitive load and make the decision-making process even more difficult. While emotional intensity is more limited in secondary user profiles, a similar need for contextual awareness is observed. The expectation for these users is that technological support stands in the background, only intervening when necessary and not interrupting the current flow of experience. Rather than becoming an authority that governs decision-making moments, technological support is expected to adopt a facilitating role that enables users to act independently and continue progressing.

The user expectations and contextual decision dynamics discussed in this chapter highlight the need to evaluate when, to what extent, and in what tone the design should intervene. This approach lays the groundwork for the design vision discussed in the next section, positioning artificial intelligence not as a decision-making system but as a supportive digital companion.

Design Vision: AI as a Supportive Companion

The design vision developed within the scope of this thesis reframes the role of artificial intelligence in the solo travel experience. The problem definition and user expectations outlined in previous sections show that the difficulties encountered in the decision-making process stem not only from a lack of information, but also from uncertainty, emotional load, and a lack of contextual references. Accordingly, the proposed system is positioned as a digital companion that supports the user's decision-making process (Figure 14).

Within this vision, the fundamental function of artificial intelligence is not to make decisions on behalf of the user or to optimize decisions. Instead, the system is conceived as a support layer that helps the user understand their situation more quickly and safely at decision points. Artificial intelligence does not function as a guiding or evaluating entity; it is designed as a non-judgmental presence that can step in when needed

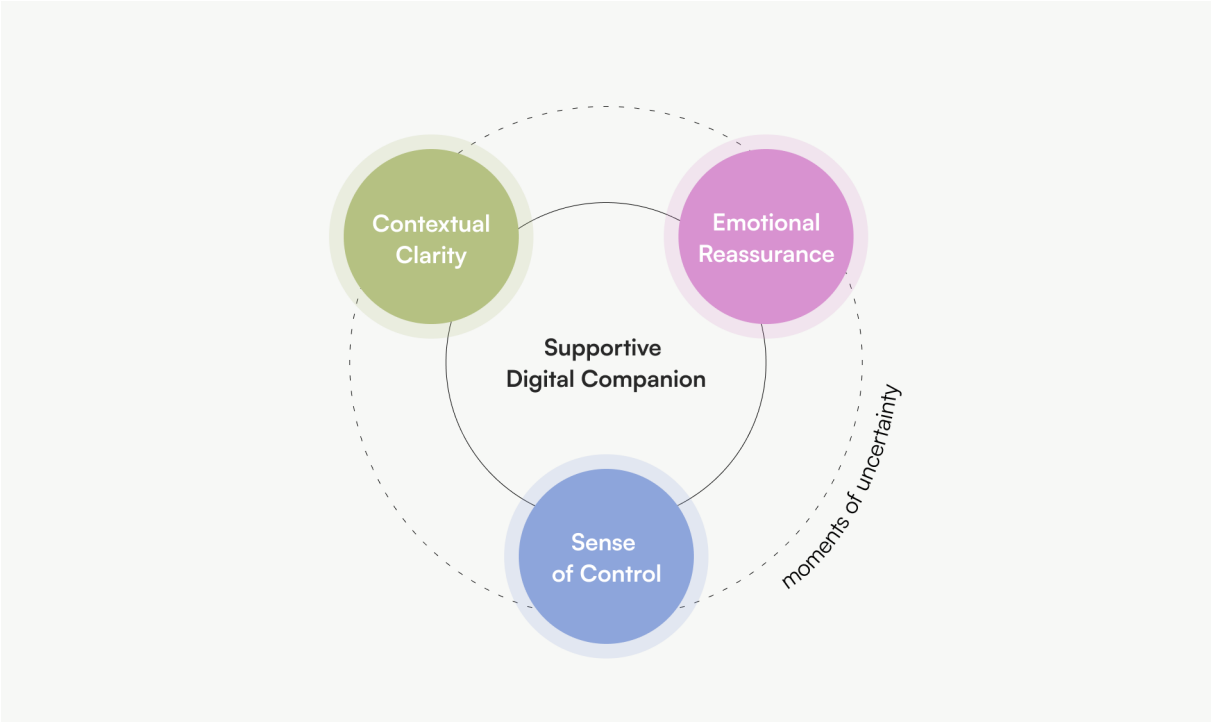

Figure 14. The experiential dimensions of the supportive digital companion in moments of uncertainty.

and remain in the background.

The recommended form of support is not based on a continuous and intrusive interaction approach. The system is designed to activate only during moments of uncertainty and at the user's initiative. This approach both protects the continuity of the user experience and provides that responsibility for decision-making remains with the individual rather than the system.Therefore, the user can continue without losing their sense of control, even while getting support.

The design vision also focuses on the emotional tone of the interaction established with artificial intelligence. The support provided is structured through a calm, reassuring and context-sensitive language, consciously avoiding assertions of certainty and normative judgments. This approach aims to support users in trusting their own decisions.

In this context, the proposed digital companion is defined as a system that works alongside the user during the experience, providing space for reflection when needed and supporting the emotional continuity of the decision-making moments. This design vision suggests evaluating the decision-making moments based on how sustainable, balanced and safe it feels from the user's perspective.

The approach defined in line with this vision forms the basis for the design requirements discussed in the next section, providing a more particular framework for the conditions the system must meet.

Design Requirements as Conditions for Support

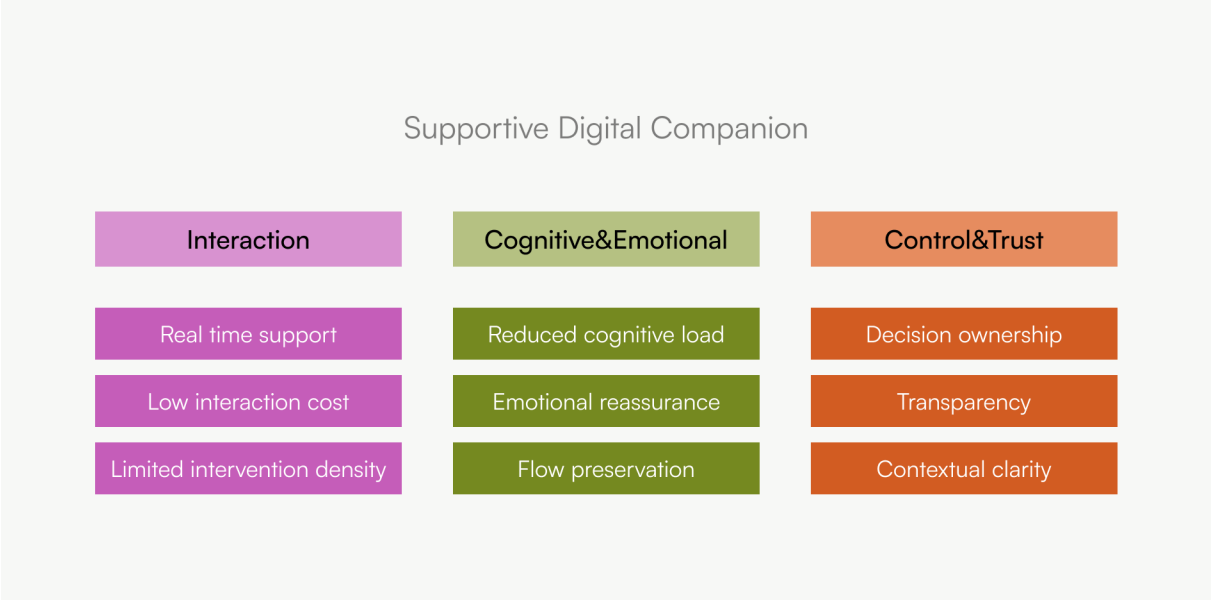

Figure 15. Design requirements of the supportive digital companion

The design requirements presented in this section define the conditions under which the system should support the user experience. These requirements are derived from the problem framing, user expectations arising in moments of uncertainty and the defined design vision. Within this framework, the requirements are treated as criteria that guide design decisions and provide consistency during the prototyping phase (Figure 15).

Real-Time, In-Journey Support

The system should be able to provide real-time support during uncertainty that emerge during the travel experience. The support provided should be designed as an instant form of support that adapts to the context of the decision moment.

Reducing Cumulative Cognitive and Emotional Load

The system should aim to reduce the cognitive and emotional load perceived by the user, taking into account the cumulative effect of low-threshold decisions repeated during the day. The interaction should not subject the user to additional evaluation loops, it should make the decision-making moments more manageable.

Decision Ownership and User Control

The system should not make decisions on behalf of the user or assume an authoritative role in the decision-making moments. The user should have control over whether to accept or reject the suggested support, the system should be designed to keep decision ownership with the user.

Contextual Clarity and Meaningful Signals

The system should contribute contextual clues to set up the user to quickly understand their environment. The content provided should be designed based on its capacity to generate meaningful signals at the decision moment, rather than on information density, and should avoid distracting the user with unnecessary details.

Low Interaction Cost and Fast Usage

The system should operate with a low interaction cost, suitable for mobile and on-the-go usage conditions. The user should not be expected to enter long text, navigate complex selection flows or perform steps that demand high attention, support should be provided through short, targeted interactions.

Experience Continuity and Flow Preservation

While supporting individual decision points, the system should consider that recurring decisions during the day form a whole. The support provided should not interrupt the user's travel flow, it should strengthen the sense of continuity between decision points.

Limiting Information and Intervention Density

The system should not overwhelm the user with excessive information, options, or notifications. Support should be provided only when needed and in a measured manner, it should not push the user to make new decisions.

Supporting Transparency and Trust

The system should be transparent enough for the user to figure out the rationale behind the support it offers. The user should be able to sense what the system bases its recommendations on, recommendations should not claim certainty and control should remain with the user to maintain trust.

5 CONCEPT DEVELOPMENT

Concept Framing and Value Proposition

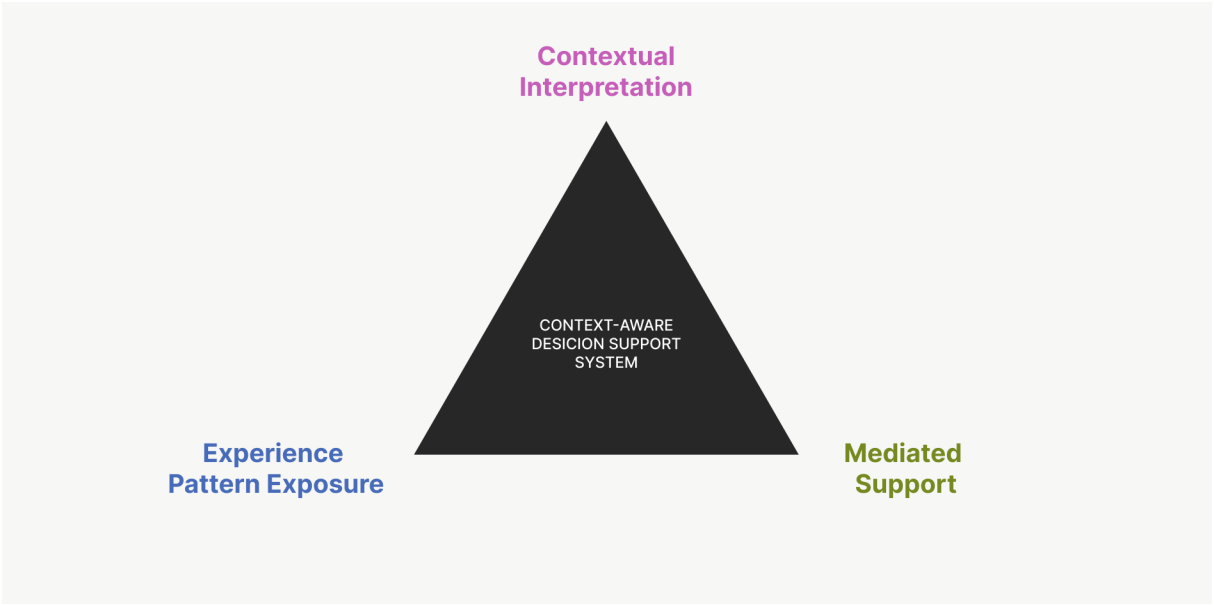

Figure 16. Three Core Principles of the Proposed System.

The system developed within the scope of this thesis is positioned as a context-aware in-journey decision support system that aims to support solo travelers facing uncertainty and micro-decision moments during their journey. We observe that existing travel technologies in the literature are predominantly focused on pre-travel such as planning, route optimization, and reservations. Systems that address contextual and momentary decision moments that arise during travel are not addressed (Chen et al., 2018).

However, the solo travel experience is not merely about spatial mobility. It is also a process of sequential decisions made within constantly changing contexts. Findings from diary studies and digital ethnography show that decision moments often arise in situations such as being stuck between two options, experiencing hesitation about safety, prioritizing under time pressure, or changing plans due to emotional fatigue. Such micro-decision moments should not be treated as problems where the objectively best option can be calculated. These decision moments are complex situations involving contextual, subjective, and often emotional assessments.
As discussed in Section 1.3, as uncer-

tainty and contextual complexity increase, cognitive load rises and the decision-making moments can become more challenging. Particularly in the context of solo travel, the limited availability of social support mechanisms makes this loas more apparent. This situation makes the decision moments that arise during travel a critical area for intervention in terms of design.

The system developed in this direction consciously differs from traditional recommendation systems. Recommendation systems mostly focus on predicting the most optimal option or generating personalized lists based on user preferences. In contrast, the system proposed in this thesis adopts a structuring logic instead of a predictive logic. Rather than making decisions for the user or suggesting the "most correct" option, the system contextually analyzes the decision moment and structures the decision process by revealing similar experience patterns.

This approach is built on three fundamental principles (Figure 16):

1. Contextual Interpretation
The decision moment is addressed not only as a textual question but also in conjunction with multidimensional data such as location, time, intent, and the emotional state expressed by the user. This analysis prevents the decision from being reduced to an abstract suggestion, preserving the uniqueness of the current situation.

2. Experience Pattern Exposure
The system matches and presents, in a structured manner, the experiences of other solo travelers who have made decisions under similar contextual conditions. This allows for the comparison of context-sharing experience patterns rather than abstract suggestion lists. The decision-making process thus moves beyond being a solitary individual burden and is supported by the reference framework provided by collective experience.

3. Mediated Support
Artificial intelligence is positioned as an agent that analyzes and summarizes experiences. Rather than providing direct guidance, AI makes patterns visible and offers a structure that reduces cognitive complexity. This approach is also seen in studies emphasizing the importance of maintaining trust and control with the user in human-AI interaction (Parasuraman & Miller, 2004; Winfield & Jirotka, 2018).

The value proposition of this system is to make the decision-making moments more transparent, comparable, and manageable by providing context-sensitive and experience-based support during moments of uncertainty that

arise while traveling. The system structures and supports the decision-making process without taking responsibility for the decision away from the user.

In this context, the developed concept repositions travel technologies from a planning-centric and future-oriented paradigm to a decision-moment-centric and context-aware paradigm. While current applications operate on the axis of efficiency and optimization, this system is positioned on the axis of contextual interpretation and experience-based structuring. Thus, technology moves away from being a tool that manages the travel experience and becomes a system that is embedded within the experience and supports the decision-making moments.

System Architecture and AI-Supported Decision Logic

This section explains the data structure of the system developed, the matching strategy, and the operational logic of the artificial intelligence-supported decision support mechanism. The proposed architecture treats the decision moment as a multidimensional and temporally expanding data model (Figure 17). The system creates a dynamic and continuously enriched experience network by evaluating pre-decision and post-decision data together. This approach parallels other travel-focused studies that position AI not as a decision maker but as a structured decision support mechanism (Kim et al., 2024).

The AI-supported architecture operates through a hybrid structure that combines rule-based logic, natural language processing (NLP) techniques, clustering mechanisms and generative AI components. Contextual constraints are handled through deterministic filtering rules, while semantic similarity between textual inputs is assessed through embed-

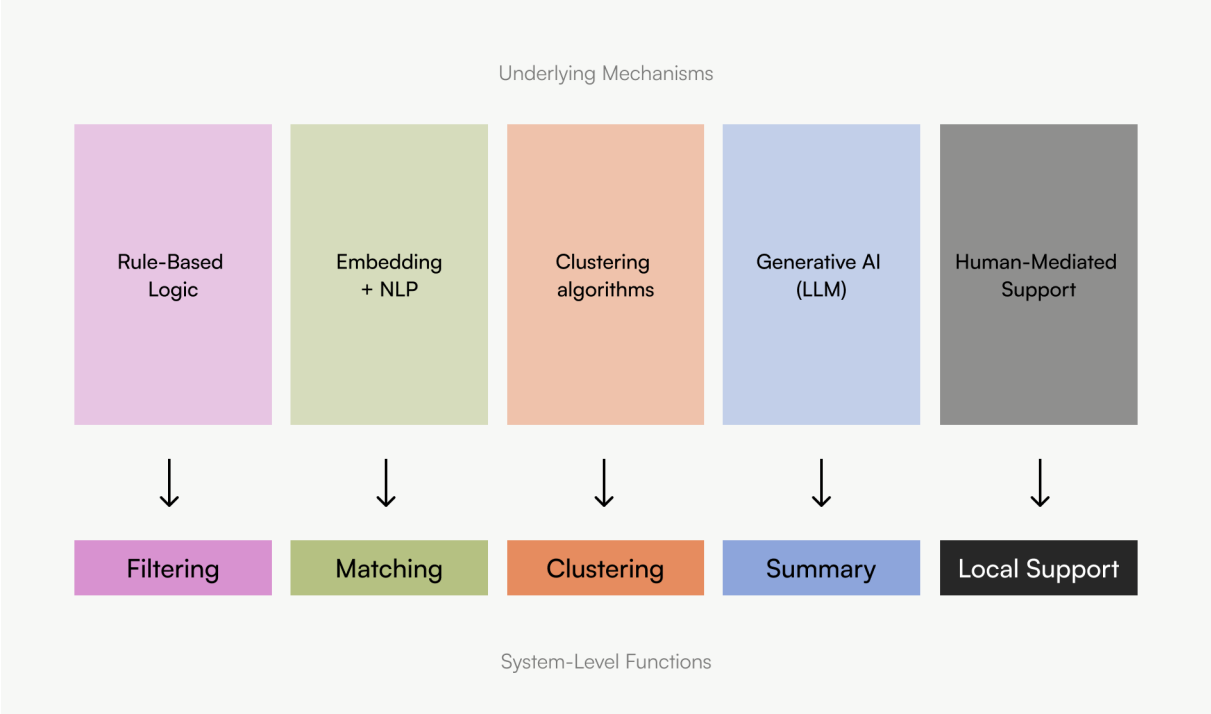

Figure 17. Hybrid AI Architecture Mapping Underlying Mechanisms to System-Level Functions.

ding-based representations. Decision moments are further organized through clustering processes that identify recurring behavioral and emotional patterns. On top of these analytical layers, a generative AI agent synthesizes structured summaries. This layered design enables computational pattern recognition while preserving interpretability and user autonomy.

Decision Moment Data Model

The system's basic operational unit is the "decision moment." This structure represents a moment of uncertainty experienced by the user and is based on a two-stage data model: the pre-decision state and the post-decision state.

In the pre-decision phase, subjective and contextual information related to the user's uncertainty is collected. This information includes the pre-decision emotional state, the main concern category, and a short textual note describing the situation. In addition, the system automatically records contextual data such as city information, geographic location, local time and day information, and time zone.

This structure ensures that the moment of decision is represented not only in terms of content but also in terms of its spatial, temporal, and emotional dimensions. In the context of travel, the accuracy and contextual appropriateness of information have been shown to be decisive for the user experience (Mohamad et al., 2025). Therefore, preserving contextual authenticity is one of the system architecture's fundamental design principles.

Once a decision has been made, feedback about the experience is collected from the user. At this stage, the decision made, the emotional state after the decision, the subjective confidence level, and a brief evaluation note about the experience are recorded. Derived indicators such as emotional change, increase or decrease in confidence level, and the outcome of the decision are calculated from this data. The system also records whether only algorithmic support or local user support was used in the decision-making process.

This bidirectional data model transforms the decision-making process into a structure that tracks and evaluates it over time.

Matching and Ranking Strategy

The matching process begins with contextual filtering. In this initial stage, the dataset is narrowed down based on fundamental contextual features such as city, time period, and concern category. This design choice aims to reduce the risk of contextually irrelevant suggestions arising from content similarity-based matching. Considering that

users have high expectations for information accuracy and contextual relevance in the travel context (Mohamad et al., 2025), starting the matching process with contextual filtering is considered a critical trust mechanism.

After contextual filtering, the remaining decision moments are evaluated through a multi-layered similarity assessment. Psychological and emotional fit constitute the strongest component of matching. The emotional context of the decision moment and the concern category are evaluated first. Spatial proximity and temporal similarity form the second layer.

At the content level, semantic similarity analysis is performed using embedding-based natural language processing techniques. User-generated textual descriptions are transformed into vector representations that enable the system to detect emotionally and contextually similar experiences beyond exact keyword overlap. This approach allows the identification of nuanced similarity patterns across different narratives.

In addition, stored decision moments are grouped through clustering mechanisms that identify recurring emotional trajectories and behavioral outcomes. Clustering enables the system to recognize structural similarities within the experience pool, supporting more coherent ranking and summary generation.

Instead of directly listing the experiences with the highest similarity scores, the system applies a controlled diversity strategy. By default, three experience cards are displayed: two experiences with high similarity levels and one experience that is contextually similar but has a different outcome. This approach aims to reduce confirmation bias and algorithmic one-sidedness risks. It has been noted that trust in AI systems in the travel context is shaped by both cognitive and emotional processes (Shi et al., 2021).

Furthermore, the risks of misinformation generation and overconfidence in generative AI systems are discussed in the literature (Christensen et al., 2025). The diversity strategy is a balancing mechanism designed to mitigate these risks.

In addition to the selected experience cards, an AI agent analyzes the clustered experience pool to generate a dynamic summary. This generative layer synthesizes recurring decision patterns, the most frequently observed emotional outcomes, and notable exceptions in a structured and human-readable format. Rather than making a prescriptive recommendation, the agent operates as a reflective synthesis layer that structures collective experience into interpretable insights. AI is therefore positioned as a support tool that organizes the de-

cision-making landscape, rather than making the final decision (Kim et al., 2023).

Hybrid Support Mechanism

After algorithmic matching and summary presentation, if the user is still undecided, the system offers the option to contact a local user upon request. The literature emphasizes that AI-supported systems in the context of travel require human intervention, particularly in complex or emotional situations (Nugroho et al., 2024; Pillai & Sivathanu, 2020). Designed in line with this, the local support layer adds human-based contextual nuances to algorithmic pattern analysis.

The local matching process considers geographic proximity, concern category compatibility, availability and profile verification criteria. When a request is accepted, real-time messaging is initiated. If a request is rejected, the system offers an alternative match. If no local user is available, the system maintains support continuity through the AI layer. Thus, rather than a fully automated recommendation mechanism, the system offers a hybrid decision support model that provides social support when needed while preserving algorithmic consistency.

Feedback Loop and System Evolution

Feedback received after the decision is integrated into the database and stored for use in future matching processes. This approach is consistent with studies indicating that trust in AI systems is a dynamic process that evolves over time (R. Yang & Wibowo, 2022).

As new decision moments are added, the system incrementally updates its clustering structures and similarity references. Through this ongoing structural update process, contextual and emotional pattern detection becomes progressively more consistent. Thus, the application evolves from a static recommendation mechanism into a continuously expanding collective network of experiences.

Interaction Model: Decision Lifecycle and User Journey

This section explains how the system architecture materializes at the user experience level. The aim is to reveal how decision moments are structured through the experiential flow.

The application focuses on moments of uncertainty that arise during travel. Users typically open the application when they can not decide. During this process, the user is asked to share a short note explaining how they feel at that moment, what the decision relates to, and the context they are in. The input process is consciously designed to be minimal. The goal is to capture contextual information without increasing the cognitive load at the decision moment.

After the user's input, the system matches experiences from similar contexts and presents three experience cards. These cards represent the experiences of other solo travelers who have made decisions under similar conditions before. The card structure makes visible not only the decision taken, but also the emotional outcome after the decision and the change in confidence level. Thus, the user encounters not just a list of suggestions, but a pattern-based comparison field. If they wish, users can save the experience they are reviewing to the map and make the moment of decision a part of their personal travel narrative.

In addition to experience cards, the summary generated by the system presents recurring decision patterns and emotional outcomes in a structured format. This summary is specifically designed to help users under time pressure quickly form an opinion. Users who lack sufficient time to review lengthy explanations can evaluate the decision context in a short time thanks to this layer synthesized by AI. Here, AI is positioned not as a directive authority but as a reflective layer that makes the decision space quickly readable. Thus, the decision process proceeds based on user autonomy.

If the user is still undecided after reviewing the experience cards and the summary, there is the option to contact a local user. This stage is the transition point from algorithmic support to human-based support. A notification containing a summary of the decision context is sent to the local user, and messaging begins if they accept. If the user feels the current conversation is insufficient, they can request a match with another local user. The system then suggests a new match from among suitable candidates.

If no local users are available, the system may redirect the user to the AI-supported chat layer. This layer continues to provide contextual support through the experience database. Thus, the support mechanism does not depend on a single source. The system is designed to be

flexible and provide continuity.

The messaging process is limited to a specific decision context and ends automatically when the user's journey ends. This design choice aims to preserve contextual principle and ensure that users' personal boundaries are respected.

This hybrid structure aims to reduce the perceived social risk and feelings of loneliness experienced by solo travelers during uncertainty. However, users are never directed at any stage, the system offers options. The final decision rests with the user.

After making a decision, the user can exit the application. After a certain period of time, the system will send a notification inviting the user to share how their experience turned out. This feedback process enables users to reflect on their decisions and enriches the collective experience pool. Consequently, the application evolves from a static recommendation tool into a dynamic network of experiences.

The map interface on the main screen allows the user to spatially track their decision moments. Decisions become visible not only chronologically but also within a geographical context. This structure reframes the journey as a holistic experience narrative rather than a process composed of fragmented decision moments.

This interaction structure shows the user's flow from the moment of uncertainty to the feedback process within a holistic framework. Figure 18 visually presents the user flow, from capturing the decision moment to experience matching, transitioning to human support, and the feedback loop.

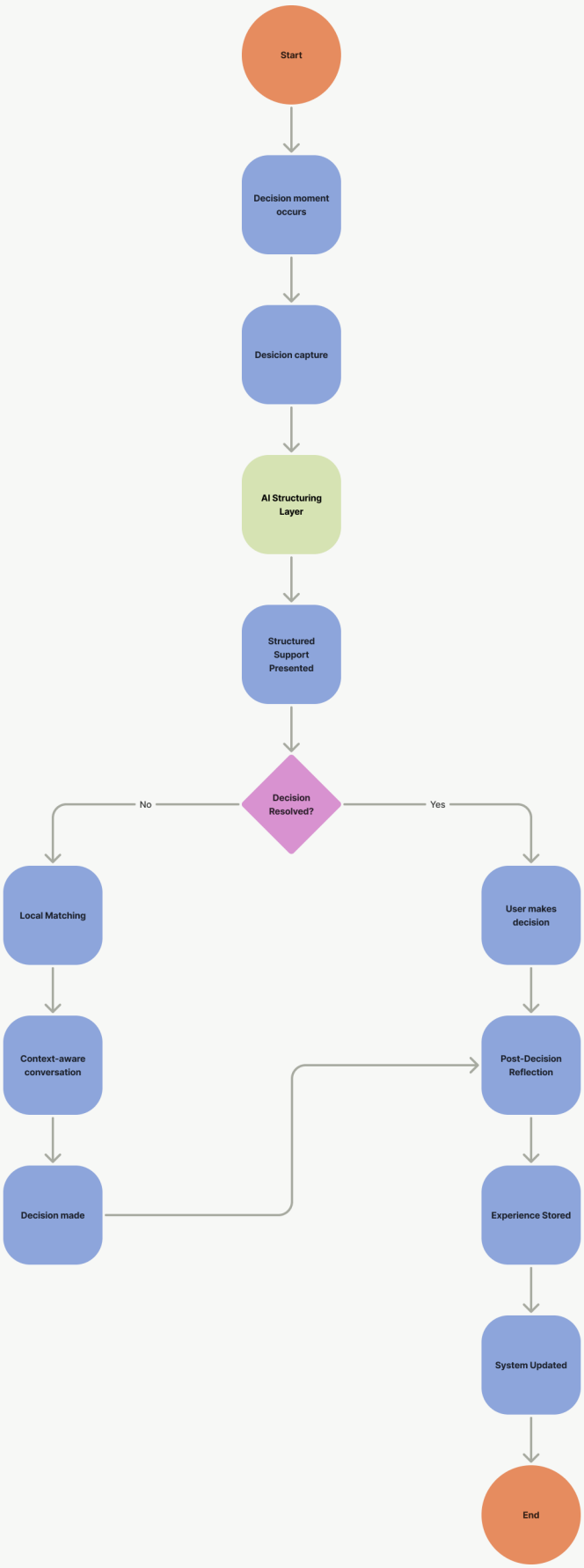

Figure 18. Decision Lifecycle - System Level User Flow.

Human Support Layer and Platform Ecosystem

While algorithmic matching and summaries generated by generative artificial intelligence provide structured decision support, the system consciously integrates a human support layer to address the need for emotional reassurance, contextual nuance, and social validation during moments of uncertainty. In this layer, local users are positioned not as service providers but as volunteer members of the platform ecosystem who contribute contextually.

Local support participation operates through an optional activation model. Each user can activate the "Help locally" option on their profile screen. After activation, the user can specify the topics they can assist with (e.g., security, transportation, social environment), their availability time slots, and notification preferences. Profile verification is mandatory to strengthen platform security and trust between users. This structure prevents mandatory participation and supports subjectification from both the traveler and local user perspectives.

If the traveler is still undecided after reviewing similar experiences and AI-generated summary content, the "Talk to a local" option is always visible as an actionable choice. When a request is submitted, the system performs local matching based on geographic proximity, concern category compatibility, availability, and verified profile criteria. When a suitable local user accepts the request, real-time messaging channel opens.

To reduce cognitive load and prevent the traveler from having to re-explain their situation, the system automatically sends an AI-generated summary message. It contains contextual information about the decision point at the beginning of the conversation. This message brings the traveler's uncertainty in a structured manner and speeds up the communication process.

Communication is currently limited to text and voice formats. The sharing of personal contact information or sensitive data is restricted by design. The messaging process is both decision-moment focused and travel-duration limited; the conversation channel automatically closes when the traveler's journey ends. This limitation prevents dependency formation and the platform's transformation into a social network structure; it preserves the system's focus on contextual decision support.

The platform includes notification and reporting mechanisms to reduce the risk of misuse. These mechanisms enable the monitoring of and intervention in security breaches and inappropriate behavior. Thus, the human support layer is positioned as a controlled and contextual support environment rather than an open-ended social space.

If a suitable local user cannot be found, the system maintains support continuity through the artificial intelligence layer. This hybrid structure ensures that the system remains reliable even in the absence of human support and is consistent with the trust dynamics based on human-artificial intelligence interoperability highlighted in the literature (Pillai & Sivathanu, 2020).

The platform ecosystem is designed as a cyclical network of experiences:

- Travelers contribute their decision moments and post-decision experiences to the system.
- These contributions enrich the collective experience database.
- Artificial intelligence structures this collective memory into patterns.
- Local users provide contextual support at the micro-level when needed.

A “travel credit” mechanism has been designed into the platform to encourage local participation without transforming the system into a gig-economy-based marketplace. Local users earn travel credits as they support solo travelers. These credits can be used as discounts on partner travel platforms for things like accommodation or flight reservations. This reciprocity-based model encourages a community-supported value exchange system rather than an economic structure based on paid service exchanges. This human support layer functions as a trust enhancer within the AI-structured decision environment. Verified profiles, a limited and contextual messaging structure, visible contribution history, and reporting mechanisms aim to reduce the level of uncertainty users perceive at decision points. Thus, over time, the platform evolves from merely being a recommendation tool to becoming a distributed and layered decision trust infrastructure for solo travelers.

Incentive Structure, Trust, and Competitive Positioning

The sustainability of the platform depends on its technical infrastructure as well as its participation dynamics and trust architecture. Therefore, the system is built on a holistic structure that both encourages user contribution and aims to generate trust at decision points.

Incentive Structure: Reciprocity-Based Participation

A "travel credit" accumulation mechanism has been designed on the platform to support the contribution of local users. Local users earn travel credits as they provide contextual support to solo travelers. These credits are designed to be used as discounts on travel services such as accommodation and transportation through potential platform partnerships. This model consciously diverges from a gig-economy-based paid service structure. Local users do not become service providers. Their contributions gain meaning through reciprocity and community-based value creation. Thus, the system approaches a platform economy built on experience sharing and trust building (Figure 19). This approach supports the organic growth of the experience database in the long term while also strengthening the platform's social context.

The Multi-Layered Structure of Trust Architecture

Decision moments in the context of solo travel often involve uncertainty, social risk, and security concerns. The literature emphasizes that trust in artificial intelligence systems is shaped through both cognitive and emotional processes (Shi et al., 2021).

Accordingly, platform trust is based on a multi-layered structure:

- Contextual filtering and controlled diversity strategy
- Summaries structured by generative artificial intelligence
- Profile verification mechanism
- Decision-moment and travel-duration messaging limits
- Notification and reporting mechanisms
- Human support layer (local contribution)

These mechanisms work together to aim to generate both cognitive trust (algorithmic consistency and transparency) and emotional trust (human contact and social validation). The system positions artificial intelligence not as the ultimate decision-maker, but as a support layer that structures collective experience. This positioning is a conscious design choice against the risks of overconfidence and misinformation production discussed in generative artificial intelligence systems (Christensen et al., 2025).

Competitive Positioning

Current travel technologies mostly focus on planning and booking. Platforms such as Booking.com, Airbnb, or Sky-

scanner are adapted toward comparing, filtering, and optimizing the purchasing processes for accommodation and transportation options. While these systems support pre-travel, they do not offer solutions to problems that may occur during the trip.

Experience-sharing platforms, such as community-based environments like TripAdvisor or Reddit, provide user reviews and individual experiences. However, this content is not contextually filtered, structured at the decision-making level, or based on emotional matching. Users are forced to manually sift through all reviews.

Generative artificial intelligence tools such as ChatGPT, can generate personalized recommendations. However, these systems don't use a data model based on verified collective decision moments and don't implement a controlled diversity strategy. Furthermore, they don't systematically integrate a hu-

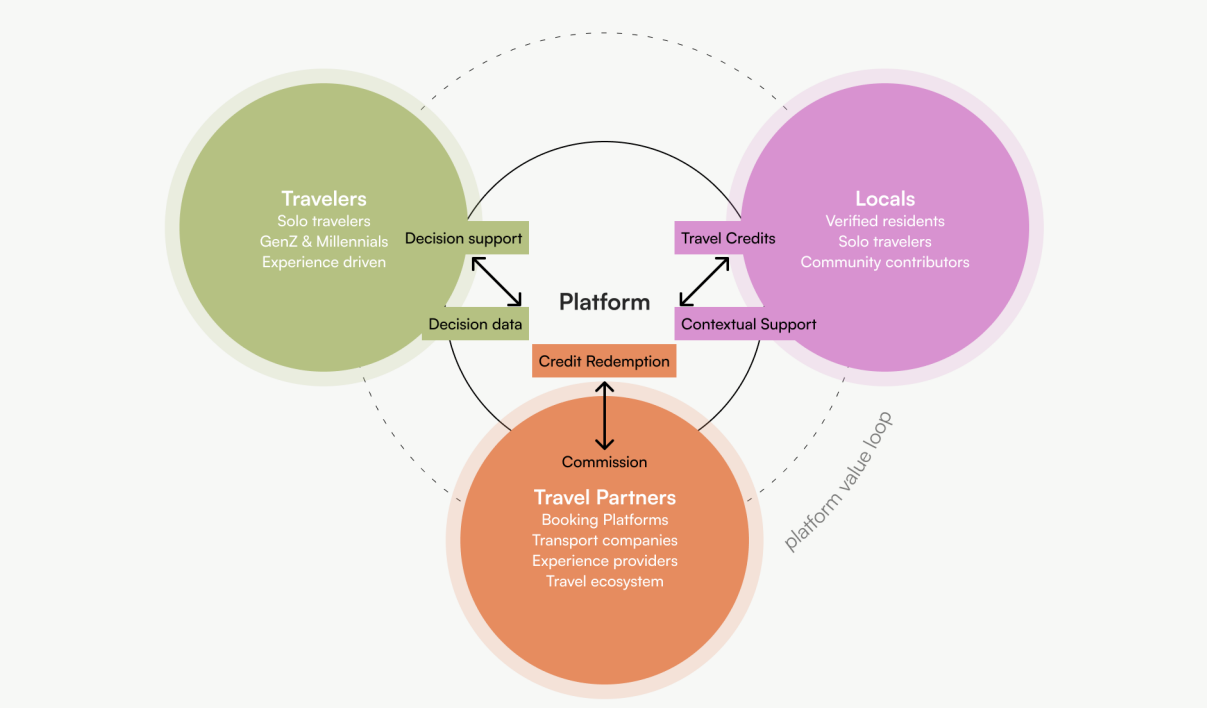

Figure 19. Platform Incentive and Value Exchange Model.

man based micro-support layer.

This system focuses on the experience during travel, an area lacking in the literature, and aims to complete the support layer that is missing in in-travel decision moments. Unlike planning tools, it focuses on moments of uncertainty during travel. Unlike classic review platforms, it structures experiences through contextual and emotional filtering. Unlike generative AI tools, it positions the human support layer as an integral component of the design. Therefore, the platform positions itself as a contextual, experience-based, and hybrid in-travel decision support infrastructure for solo travelers.

6 PROTOTYPE AND DESIGN SOLUTION

6.1 Low-Fidelity Prototype and Initial Testing

6.2 Mid-Fidelity Iteration and Structural Refinement

6.3 High-Fidelity Prototype and Interaction Design

6.4 Final Refinement

Low-Fidelity Prototype and Initial Testing

The low-fidelity prototype developed at this stage was designed to test the conceptual structure's comprehensibility and the interaction model's logical. The goal is to evaluate whether the system's core value proposition (in-journey decision support) is intuitively perceived by the user. The prototype was designed around three main interaction areas:

1. Setting Today's Intention
2. Adding Decision Moment
3. Checking Others' Experience Maps

The testing process was conducted with 5 participants. Participants were presented with a solo travel scenario and asked to complete these three tasks. The objectives of this phase were:

- To evaluate the concept's comprehensibility
- To analyze whether users found the system supportive at the decision moment
- To identify conceptual friction and mental model mismatches

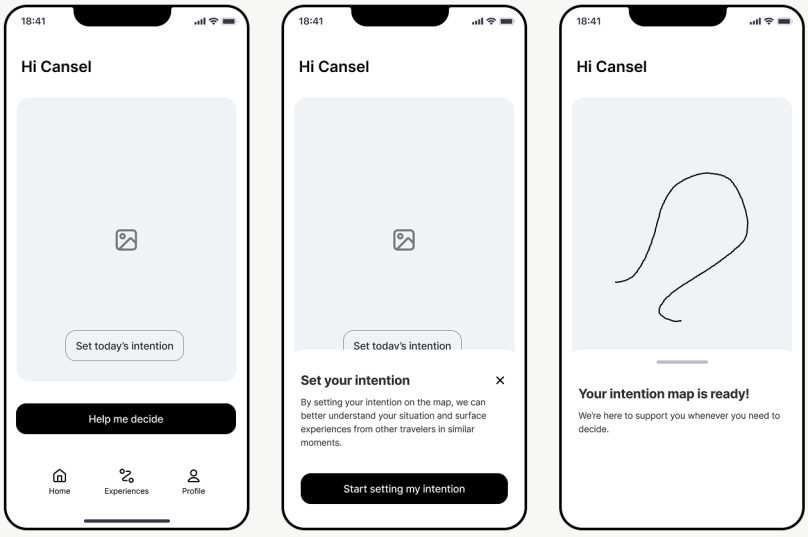

Figure 20. Task 1 - Setting Today's Intention Flow - Low Fidelity

Task 1: Setting Today's Intention

The "Set today's intention" button on the home page was not clicked directly by most participants. Users did not immediately grasp how this feature related to the decision-making process.

This finding shows that the concept of "intention" did not align with users' existing mental model of travel apps. Participants generally perceive travel apps in the context of navigation, discovery, or booking; an abstract concept of "intention mapping" does not directly fit into this familiar usage framework. This situation indicates a mismatch between the conceptual framework offered by the design and the user's pre-existing cognitive model (mental model mismatch) (Figure 20).

Insights

•The benefit of the "Intention" feature should be stated more clearly.
•The role of the feature within the decision support system should be clarified with visuals or explanatory text.
•The functional value of abstract concepts should be clearly framed.

This finding demonstrates that conceptual entry points are particularly critical in decision support systems.

Task 2: Adding Decision Moment

On the results screen, some users did not perceive the structured experience cards as "other user comments." One participant evaluated the comment at the bottom as an option and used the phrase "I would prefer this."

This situation shows that the epistemic status of the content (is it a suggestion, data, or comment?) is not clearly differentiated. Additionally, users stated that:
• They found the options difficult to understand.
• It was unclear who produced the content.
• They wanted to see at least a nickname or date.

This feedback shows that users seek not only information but also clues about the source when making decisions. The perception of trust is fed not only by the algorithmic structure but also by social signals (Figure 21).

Insights

• It should be made clearer that experience cards represent "other users' experiences."
• Minimal identity indicators (nickname, date) can increase the perception of trust.
• The difference between structured experiences and free comments should be

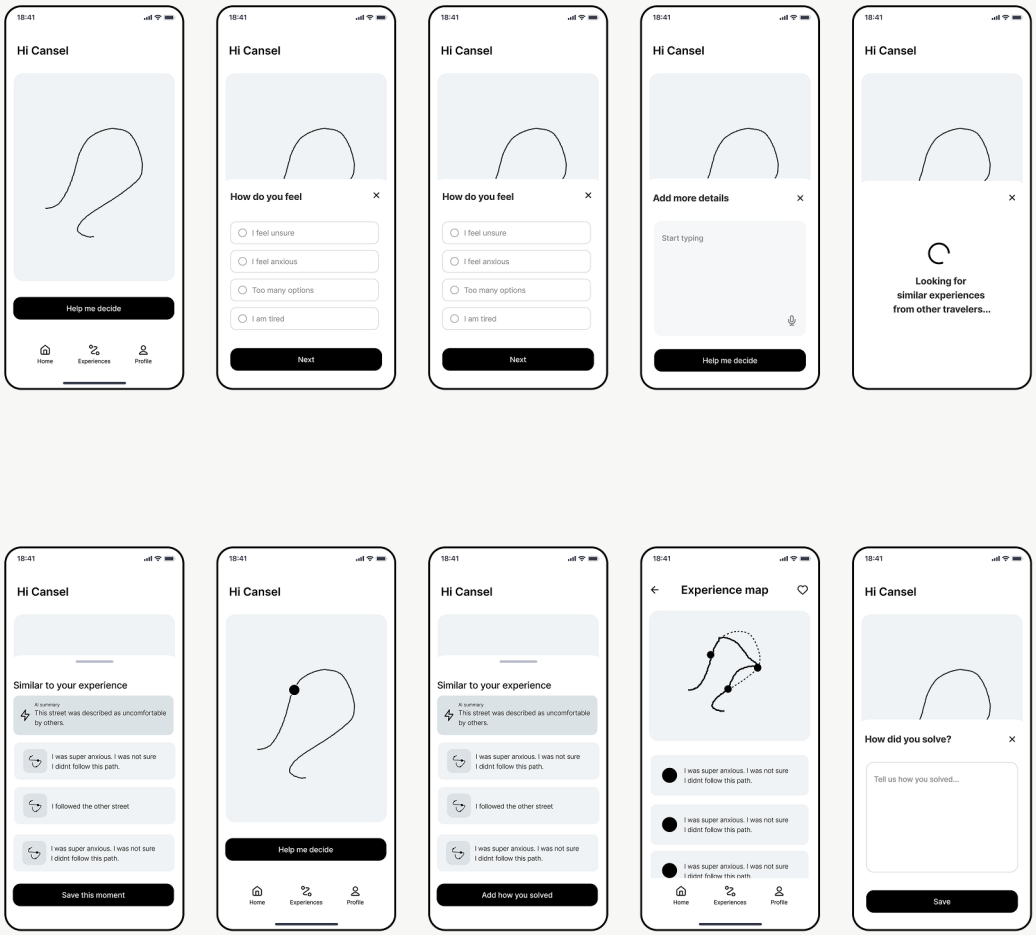

Figure 21. Task 2 - Adding a Decision Moment Flow - Low Fidelity

clarified.
• Discovery options such as “view all comments” can be added; however, excessive information overload should be avoided.

This finding shows that the system should not only provide information but also have a structure that makes the social context transparent.

Task 3: Checking Others’ Experience Maps

The decision pins on the main page have been perceived by some users as system suggestions, navigation points, or current location indicators.

This finding shows that the spatial metaphor used in the design (map + pin) conflicts with the user’s familiar map experience. Users generally interpret markers on a map as directions, routes, or suggestions. However, in this system, pins represent past decision moments (Figure 22).

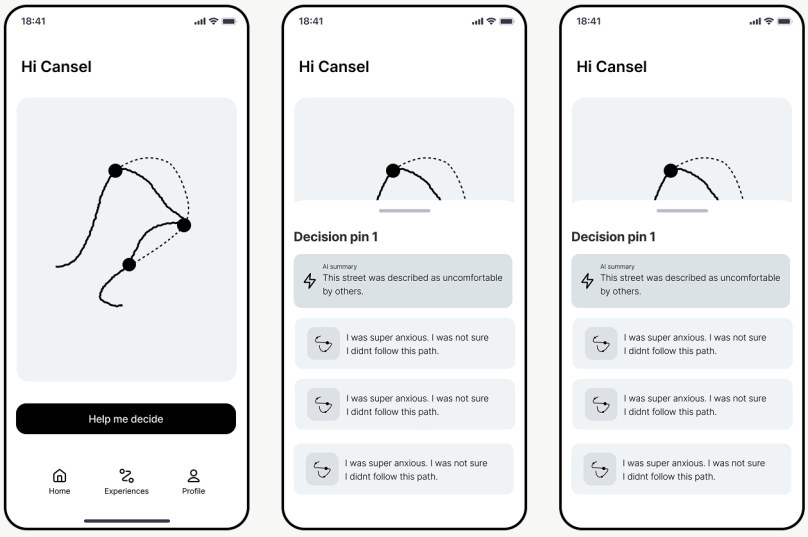

Figure 22. Task 3 - Exploring Other Travelers’ Experience Map - Low Fidelity

This situation shows that the conceptual boundary between the "experience map" and the "navigation map" is not clearly defined.

Additionally:
• Decision moments should be more visually distinct.
• Other users' maps should be clearly labeled.
• It should be made clearer that comments are clickable and discoverable.

Insights
• The decision layer and location layer should be visually separated.
• The pin metaphor should be reconsidered.
• Interaction affordances on the map should be strengthened.
• Explanatory micro-textual guidance should be added.

These findings necessitate a re-examination of the system's spatial representation language.

Overall Assessment

Although conceptual friction points were identified, participants evaluated the system's core value proposition positively. User statements:

•"I would use it."
•"I've been in the same situation before."
•"It helps."
•"I would share my experience map at the end of the day."
A particularly noteworthy finding is that users found the "decision moment creation" initiative to be quick and understandable. Participants stated that they could express their situation in a short time and that the system did not complicate this process. This indicates that the decision capture flow is conceptually well-positioned and does not create cognitive load. Therefore, the test results show that the system's core value proposition-providing a fast, structured, and supportive sharing environment at the moment of decision-is intuitively understood by the user.

However, the test revealed that while the concept is understandable, it needs improvement in terms of conceptual clarity, visual labeling, and trust architecture. The low-fidelity testing process necessitated revisiting three design areas in particular:

1. Framing the Intention feature
2. Making the social context of experience content visible
3. Redesigning the decision layer on the map

Based on these insights, the mid-fidelity prototype phase was initiated, and the design was iteratively restructured.

Mid-Fidelity Iteration and Structural Refinement

The design was restructured during the mid-fidelity phase in line with the conceptual uncertainties that emerged during the low-fidelity testing process. The aim at this stage was to clarify the conceptual framework of the system, systematize the data structure, and make the decision support logic more consistent. The mid-fidelity development process was shaped around four key design interventions:

1. Clarifying the decision flow (Figure 23)
2. Reorganizing the results screen
3. Integrating the hybrid support layer (AI + Local) (Figure 24)
4. Designing the post-decision feedback flow (Figure 25)

Clarifying the Decision Flow

In the low-fidelity test, it was observed that the “Set today’s intention” layer distracted the user’s focus and weakened the main decision support flow. Instead of moving directly to the decision moment, users encountered an additional conceptual step, which blurred the system’s core value proposition.

Therefore, in the mid-fidelity phase, the intention layer was removed and the user flow was restructured around the decision moment. This intervention aims to make the system’s decision-moment-centric structure clearer and more direct.

Result Screen Restructuring

During the mid-fidelity phase, the result screen was redesigned both structurally and content-wise.

The AI summary and experience cards have been reorganized according to a specific data structure. The following elements have been added to the experience cards:
• User nickname
• Emotional state before the decision
• Emotional change after the decision
• Short contextual explanation

This structure aims to enable users to quickly grasp the general nature of the experience without reading long comments.

Test results:
• The emotional state structure on the cards was evaluated positively.
• The AI summary was found useful.
• It was observed that the buttons were unclear and misunderstood.

Some users stated that they wanted to see all comments. Others stated that the structured short information was sufficient. This finding shows that there is a design tension between speed and depth of information at the moment of decision.

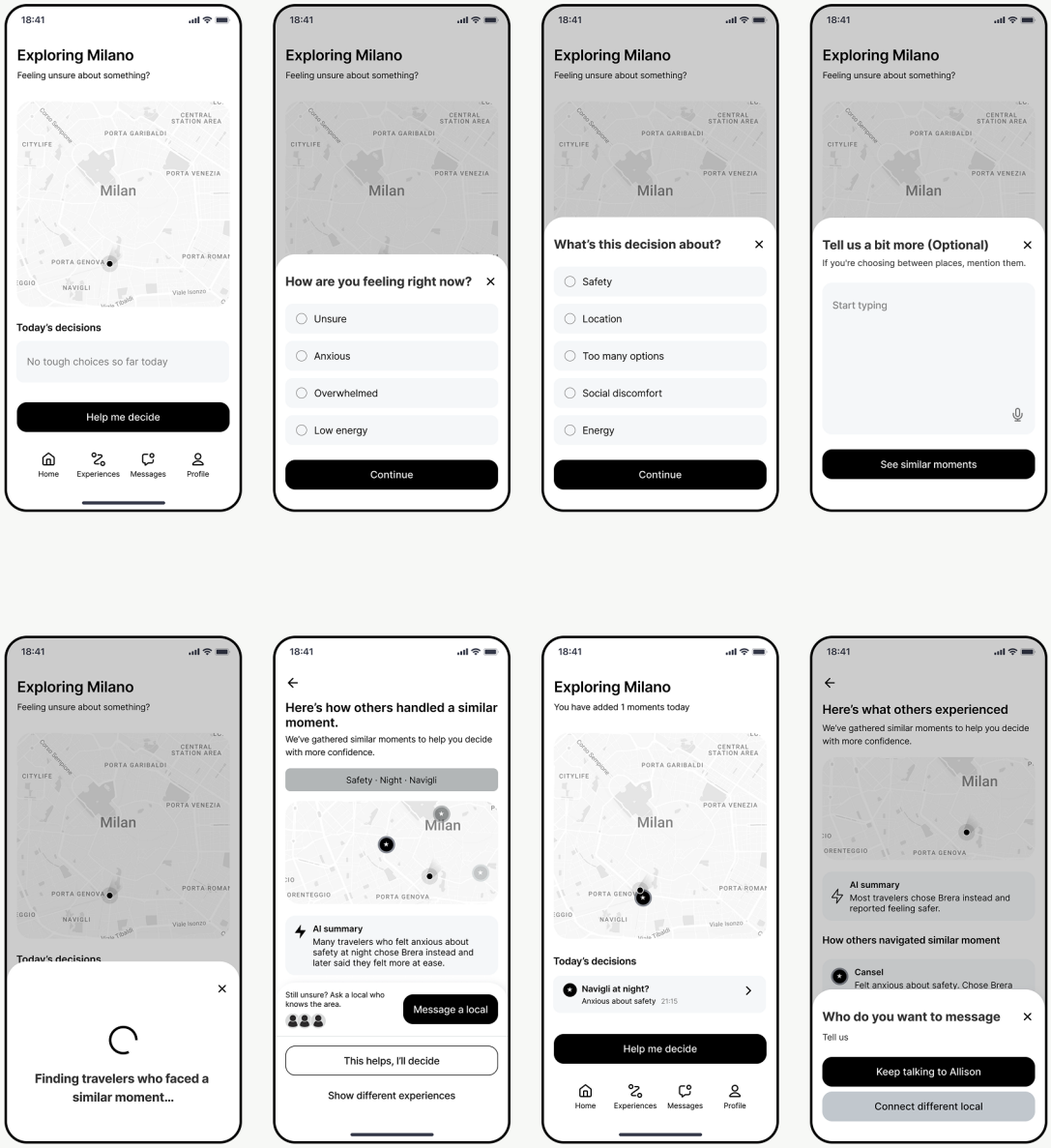

Figure 23. Decision Moment Flow - Mid Fidelity

The Role of the Spatial Layer on the Results Screen

A map layer has been integrated into the results screen at the mid-fidelity stage. This arrangement aims to ensure that the user does not lose sight of the spatial context of the decision they are evaluating. During testing, some users indicated that they might want to see a visual warning on the map, especially in situations involving intense comments related to security. This feedback shows that the decision is evaluated not only through textual content but also through spatial risk perception. Users also requested that the map layer be preserved. This reveals that spatial representation does not only serve a navigation function in the system; it is also an element that strengthens the contextual framework of the decision. This finding demonstrates that the spatial layer plays a meaningful role in the decision support architecture.

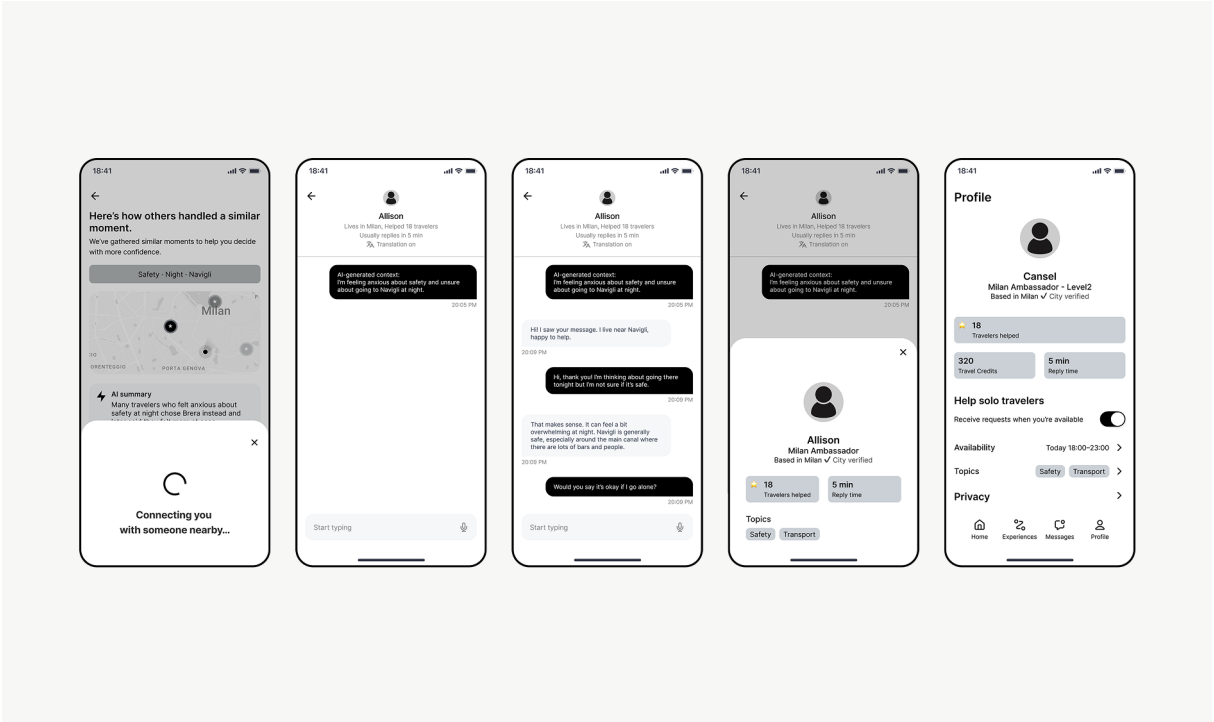

Figure 24. Message a Local Flow - Mid Fidelity

Integration of the Hybrid Support Layer

The function of communicating with local users has been integrated at the mid-fidelity stage. This layer is designed for situations where experience cards are insufficient or the user still feels uncertain.

In testing, users stated that they:
• appreciated being able to talk to a local if the comments were insufficient,
• felt reassured by communicating with a real person,
• found the ability to communicate with the same local again to be positive.

However, some users mentioned that the AI summary was fast and sufficient, and that communication with the local took longer. This finding shows that the hybrid model produces different values depending on the context:

• AI layer: fast, structured, and scalable support

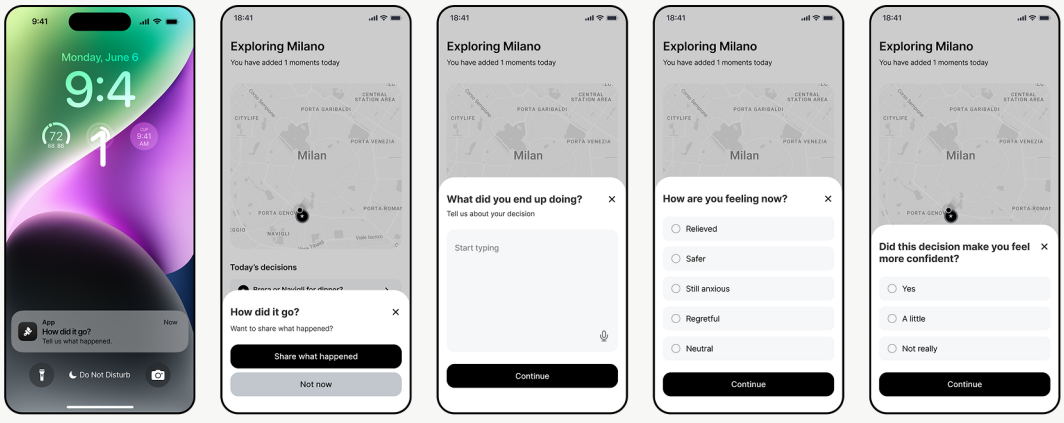

Figure 25. Post-Decision Feedback Flow - Mid Fidelity

• Local layer: social trust and emotional reassurance

These two layers work together to create a multi-layered support structure at the moment of decision.

Post-Decision Feedback Flow

The post-decision feedback flow was also designed and tested during the mid-fidelity phase.

In this flow, a notification is sent to the user after a certain period of time, asking them to share their post-decision experience. The user shares:
• What they did,
• How they felt,
• Whether the decision changed their perception of trust.
In testing, this flow was found to be short and clear. However, it was noted that some statements could be made more explanatory. This layer ensures that the system produces not only pre-decision but also post-decision validation data.

Overall Assessment of the Mid-Fidelity Testing Process

The mid-fidelity prototype was retested with 5 participants. Scenario:

“You are alone in Milan. You are unsure about going to Navigli at night.”

Tasks:
1. Open the application and try to make a decision
2. Provide feedback after making a decision

Test results show that the system’s focus on the moment of decision is more clearly perceived. The AI summary was found useful; local support generated social trust. The emotional structure on the Experience cards helped quickly grasp the nature of the experience. Some users indicated that they would switch to different tools for navigation after making a decision. This supports the idea that limiting the system’s usage time to the decision moment is a conscious design choice. The platform is not a navigation tool, but a contextual decision support tool.

Overall, the mid-fidelity testing process shows that the conceptual ambiguities identified in the low-fidelity phase have been largely resolved and that the system’s hybrid support structure is considered meaningful by users.

High-Fidelity Prototype and Interaction Design

Based on the findings from the mid-fidelity test, the interface has been structured at both the visual and interactive levels. The adjustments made at this stage were not limited to aesthetic improvements; conceptual ambiguities and issues related to trust architecture identified during the second testing phase were also addressed in line with user needs. The goal is to make the system, which provides support at the moment of decision, more readable, reliable, and consistent both perceptually and structurally (Figure 26).

Visual Language and Interface Identity

The system's visual language has been redefined in the high-fidelity phase within the framework of conscious design decisions.

Green has been chosen as the primary color. Since decision moments often involve uncertainty and anxiety, the interface aims to create a calm and secure interaction space for the user. Green tones were used to create a supportive and confidence-building interface atmosphere. Orange tones were chosen as the secondary color to provide a balanced contrast with green.

A rounded form language was adopted for the visual language. This approach aims to position the system as a more accessible and friendly interaction space.

Decision moments are represented by different colors on the main page. Thus:

- A visual connection can be established between the pin on the map and the decision card on the main page.
- Each decision moment is distinguished by a separate color code, ensuring cognitive clarity.

This arrangement makes the relationship between spatial representation and the decision layer more consistent.

Results Screen Improvements

The areas mentioned in the decision have been highlighted on the map to enhance contextual readability. This allows users to establish a more direct relationship between the content and its spatial representation.

Experience cards have been restructured. User visuals have been added to the cards. This arrangement aims to make it clear that the content is not just algorithmic output, but collective data based on real experiences. Thus, the perception of trust is supported not only structurally, but also through social signals.

The "This helps" and "Show different experiences" buttons from the previous version have been removed. Since the function of these buttons was not suf-

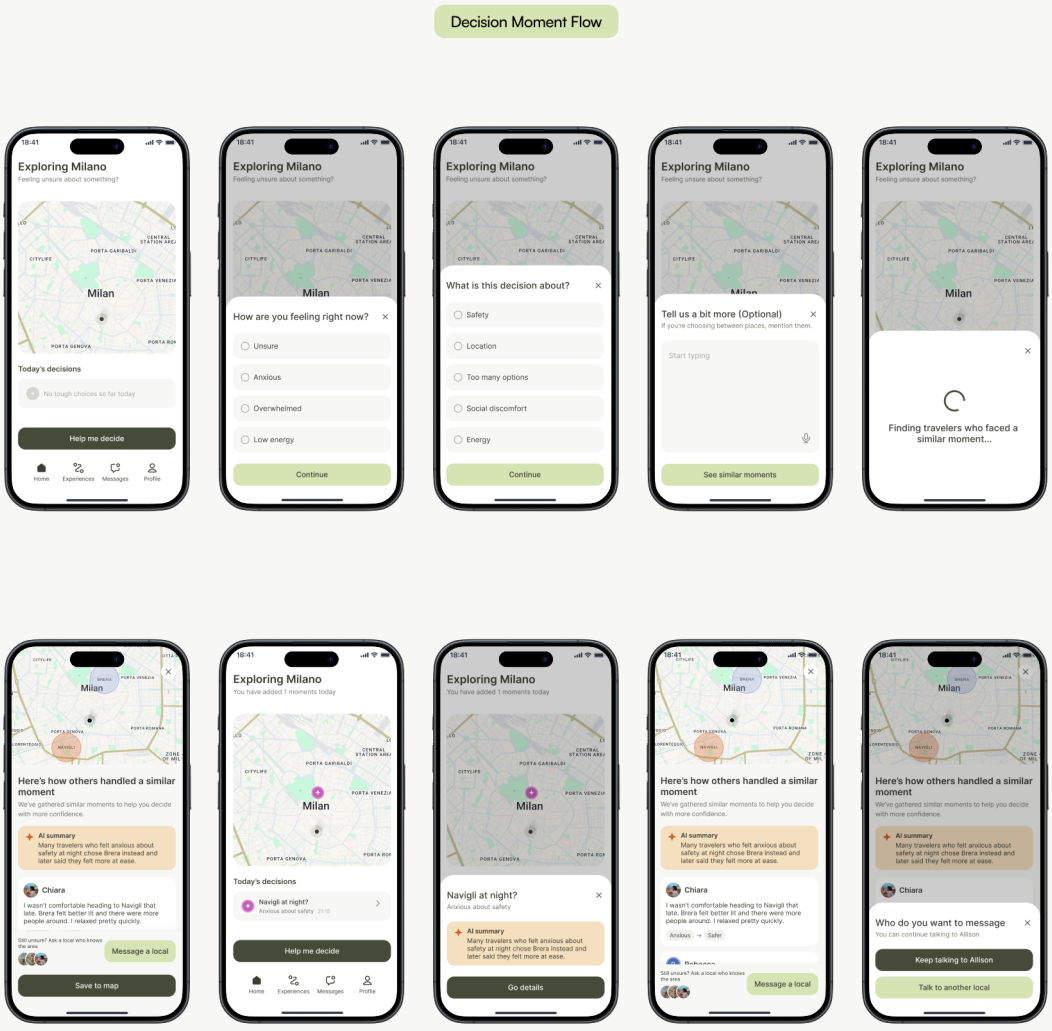

Figure 26. Decision Moment Flow - High Fidelity

ficiently understood by users, the “Save to map” option has been added instead. This means that adding the decision moment to the main page is now left to the user’s preference rather than being done automatically by the system. This change aims to empower the user agency.

Visualization of the Human Support Layer

In the high-fidelity phase, the hybrid support model is more clearly structured on the interface. The system offers a three-layer support architecture:

1. Algorithmic configuration (AI summary)
2. Collective experience (experience cards)
3. Human micro-support (local messaging) (Figure 27)

For users with a local role:
- Verified status
- Number of travelers assisted

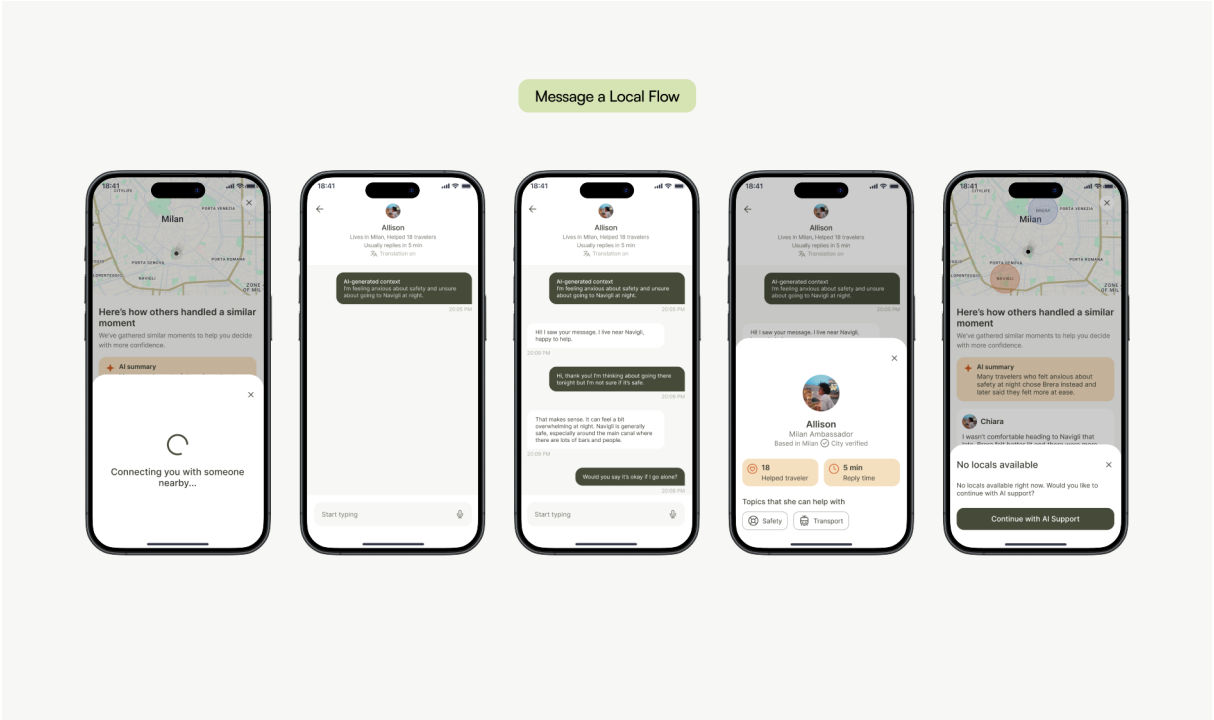

Figure 27. Message a Local Flow - High Fidelity

• Average response time

This has been made visible for solo travelers. This structure demonstrates that the human support layer is positioned not merely as a feature, but as an active component of the trust-building mechanism. (Figure 28)

Additionally, some edge-case scenarios have been clarified:
• When no available local is found
• Interaction after clicking the decision pin
• Transition between the main page decision card and the results screen

These adjustments aim to enhance the system's interactive consistency.

Feedback Flow Improvements

In the previous design, feedback submission was performed via a single button at the end of the feedback entry. This structure was found to be unclear by users.

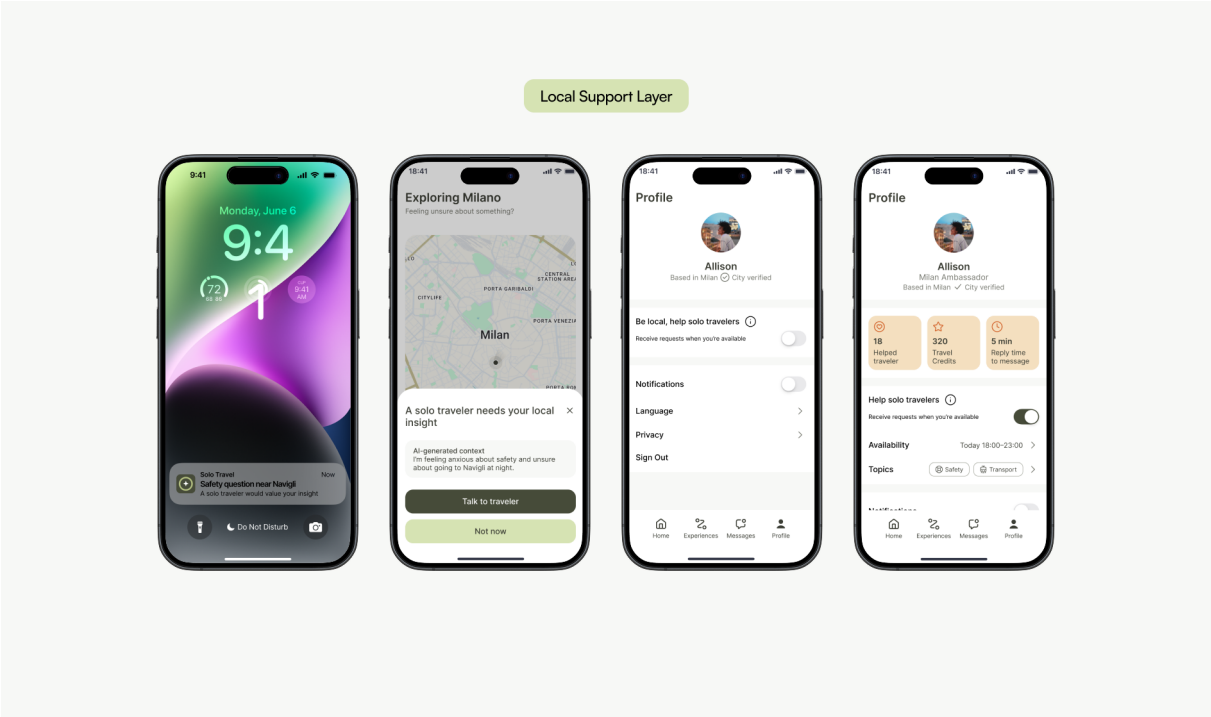

Figure 28. Local Support Layer - High Fidelity

In the new flow, the user is offered the option to share their experience publicly or save it privately. This preference is clearly selected at the end of the decision moment, and the process is completed without creating additional navigation load.

This arrangement aims to position experience sharing within the framework of the principles of voluntariness and control (Figure 29).

High-Fidelity Test Findings

The high-fidelity prototype was retested with 5 participants.

Scenario:
You are in Milan and are undecided about going to Navigli at night.
Task 1: Try to make a decision by opening the app.
Task 2: Give feedback after making your decision.

Additionally, the profile screen was

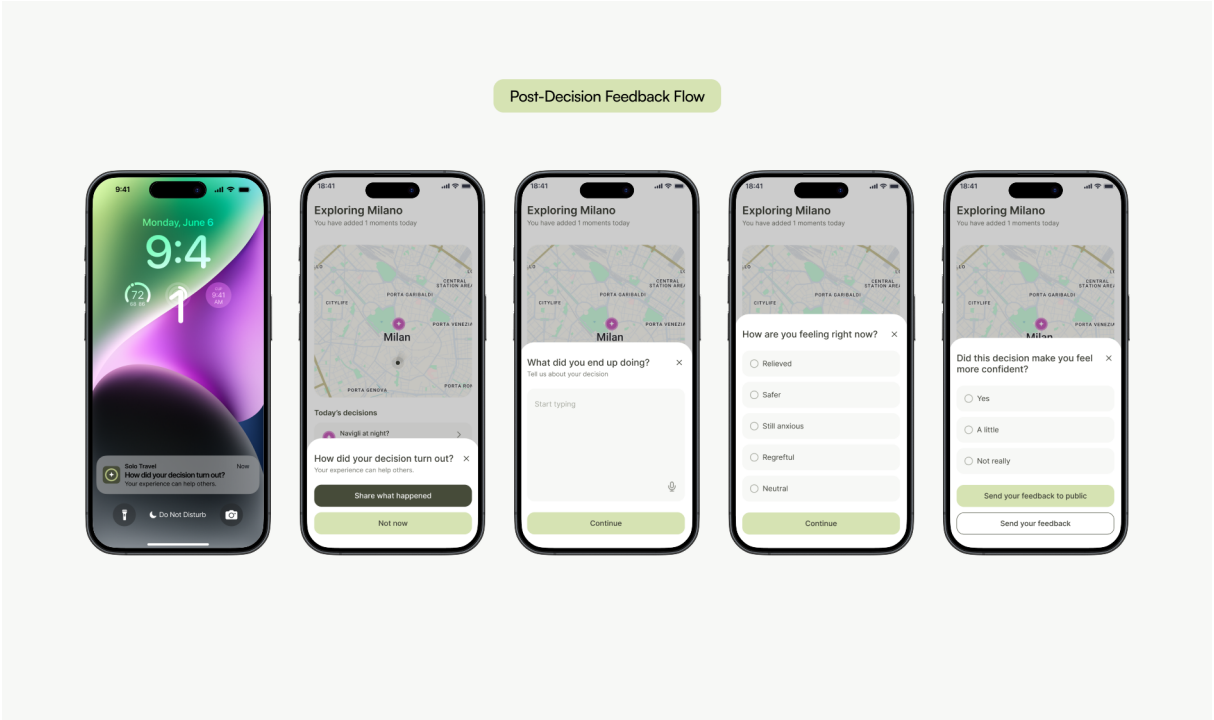

Figure 29. Post-Decision Feedback Flow - High Fidelity

shown, and users' views on the local role and travel credits mechanism were analyzed.

Home Page
The navigation was found to be more understandable compared to previous stages. The color selection was considered reassuring. The contrast was found to be sufficient.
However, some users expected the decision pin to be automatically added to the destination. This indicates that the expectation relationship between decision recording and spatial representation needs to be clarified.

Results Screen
The highlighted areas were found to be contextually helpful. The addition of user names and images reinforced the perception that the content was based on real user experiences, not just algorithmic outputs. One participant described this as "the presence of names and photos gave the impression that it was real people commenting, not just AI." This finding shows that social signals play a critical role in building trust in the decision-making process.

However, the fact that the color used in the AI summary was the same as the color used to highlight areas on the map was perceived by some users as a deliberate steering strategy. Participants thought that the AI summary specifically pointed to the relevant area on the map and that the system was directing the user to that point.

However, this color matching was not deliberately designed to create an association during the design process. This overlap in color semantics led users to establish a direct causality between the AI summary and the spatial highlight. This situation demonstrates that small semantic overlaps in visual language can be interpreted by users as carrying strong meanings.

This finding indicates that the visual codes used between algorithmic output and spatial representation need to be more carefully distinguished.

Local Messaging

Local's verification has been found to be confidence-building. The profile details of the local contacted were seen to be influential in the decision-making process.

While one user found the human support layer more persuasive than comments, another user noted that communication with the local could take a long time and that user comments were sufficient. These findings show that the hybrid support model is considered meaningful and valuable by users.

Feedback

The feedback flow was found to be understandable. However, it was noted that the button texts were not sufficiently distinct. There was a need for clarification at the microtext level.

Profile

The ability to select availability and topics on the profile screen was well received. The travel credits system was found to be motivational, and the local role was seen as potentially adoptable.

Overall Assessment

The high-fidelity phase has been a process in which the system has matured not only visually but also in terms of user experience. The visual language has been restructured to support the trust architecture, the social context has been made visible, user agency has been strengthened, and the hybrid support model has been concretized on the interface.

Test findings indicate that the system is perceived as supportive at decision points and that the human support layer plays a critical role in trust generation. However, some clarifications are needed regarding color semantics, spatial orientation perception, and microtext.

Final Refinement

Following the testing of the high-fidelity prototype, final adjustments were made based on user feedback. At this stage, the system's visual language, microcopy structure, and interaction clarity were enhanced based on the findings. The goal is to stabilize the final configuration of the design. This final refinement process was addressed under three main headings:

1. Visual semantic disambiguation
2. Textual clarity in the feedback flow
3. Completion of flow integrity
Visual Semantic Disambiguation

During the high-fidelity testing process, some users interpreted the overlap between the highlight colors used on the results screen and the color language in the AI summary area as guidance. Participants thought that the information in the AI summary was deliberately matched with the emphasis on the map and perceived that the system was directing them to a specific location (Figure 30).

Although this color overlap was not consciously designed as a guidance strategy during the design process, it led users to establish a strong causal relationship. This finding highlights the impact of visual codes on meaning production in the user's mind.

In the final stage, the color language between the algorithmic output and the spatial representation was separated, and the visual semantics were clarified. This aimed to prevent the perception of misdirection and strengthen the system's position as a neutral support.

Clarity in the Post-Decision Feedback Flow

The button labels for public sharing and private saving options on the post-decision feedback screen were not sufficiently distinguishable by users. This created uncertainty about the sharing preference.

Accordingly, the button texts have been revised and the options presented to the user have been more clearly differentiated. This intervention aims to remove experience sharing as a default behavior of the system and position it as a conscious choice of the user (Figure 31).

Flow Consistency and Interaction Clarity

In the final stage, edge-case scenarios were reviewed and micro-interactions were clarified. Interaction details such as the relationship between the decision pin and the result screen, the system's response when the location cannot be found, and the behavior of adding the decision to the map were restructured.
These adjustments are fine-tuning aimed at strengthening the alignment between

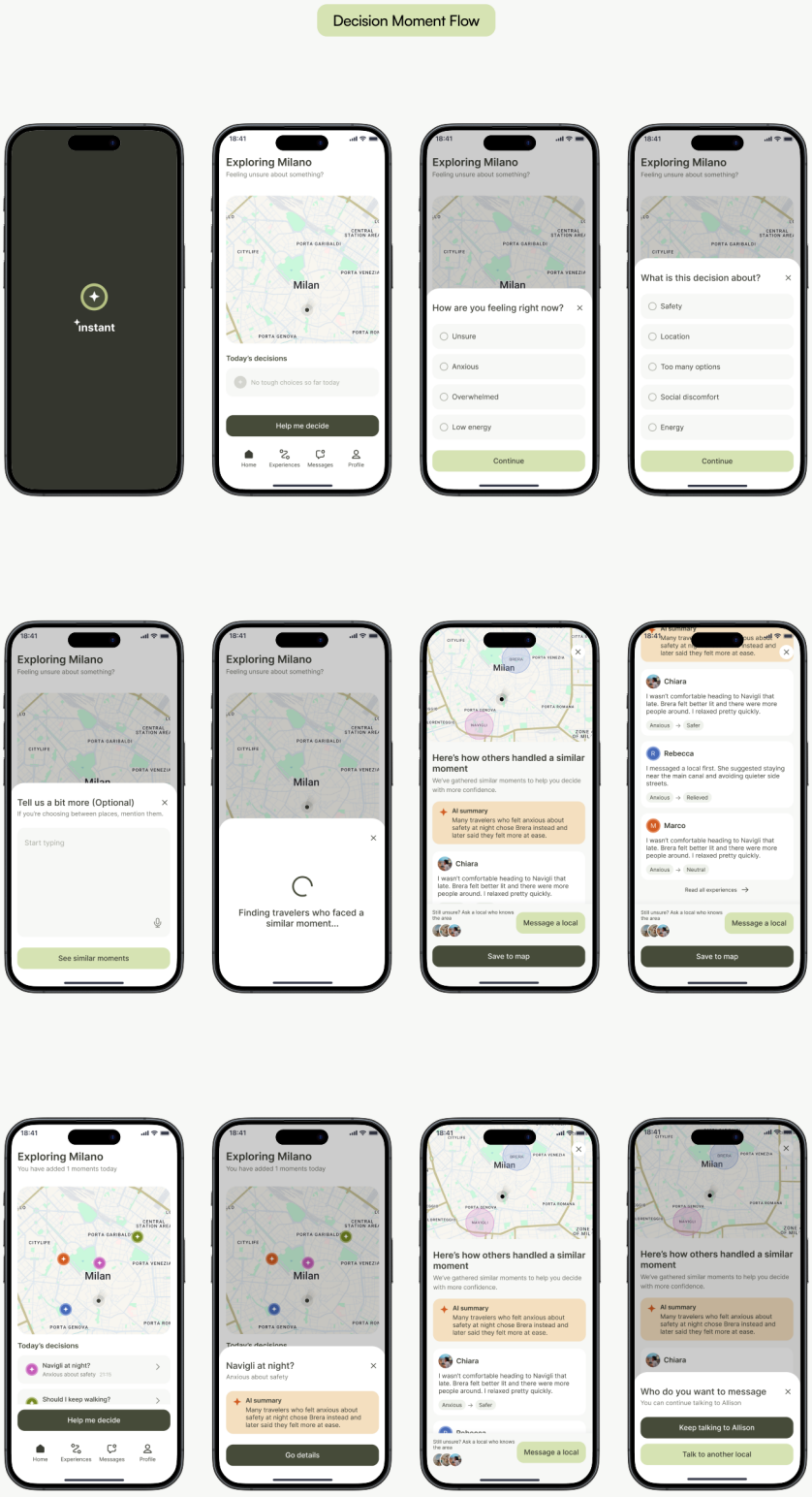

Figure 30. Decision Moment Flow - Final

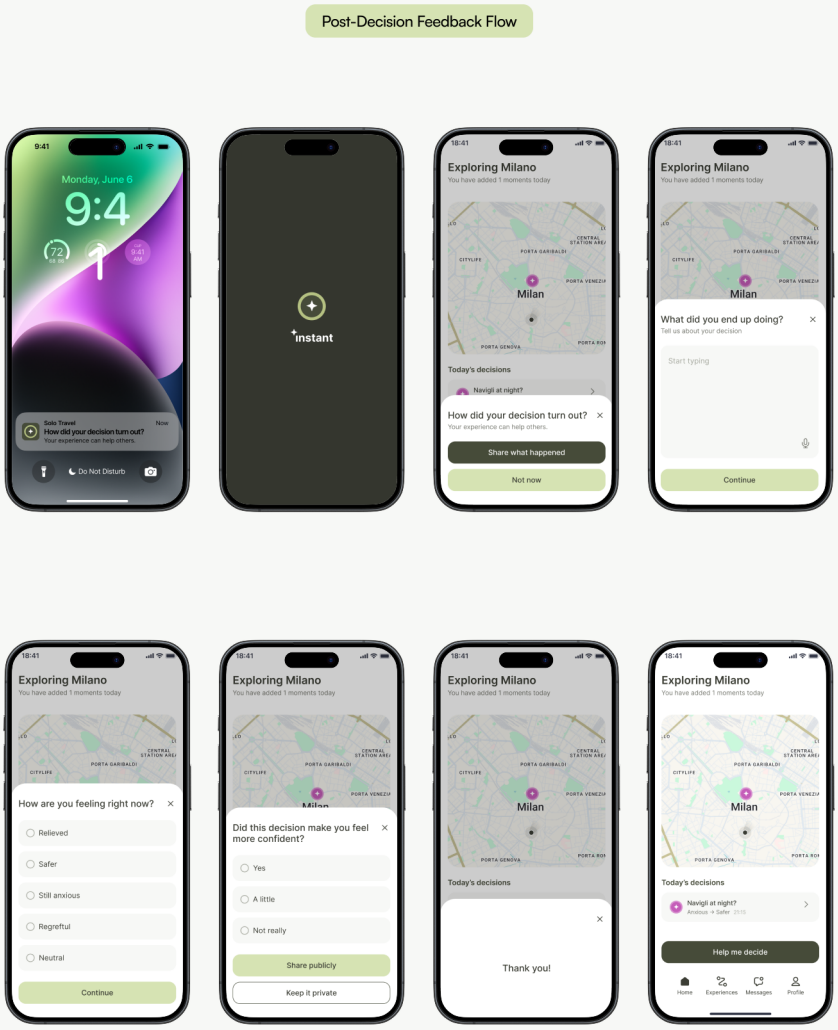

Figure 31. Post-Decision Feedback Flow - Final

system behavior and user expectations.

Overall Assessment

When the high-fidelity testing process and subsequent final adjustments are evaluated together, it is evident that the system functions consistently as a decision-moment-focused support model. Users positioned the application as a meaningful tool to turn to in moments of uncertainty, completed the flow seamlessly, and perceived the hybrid support structure as a consistent system.

While the AI summary provided a fast and structured framework, the experience cards made the emotional context visible; the local support layer played a critical role in generating social trust. This multi-layered structure has been evaluated as a support architecture that reduces cognitive load at the moment of decision and maintains user control (Figure 32).

The fact that the final adjustments were made at the semantic and interactive

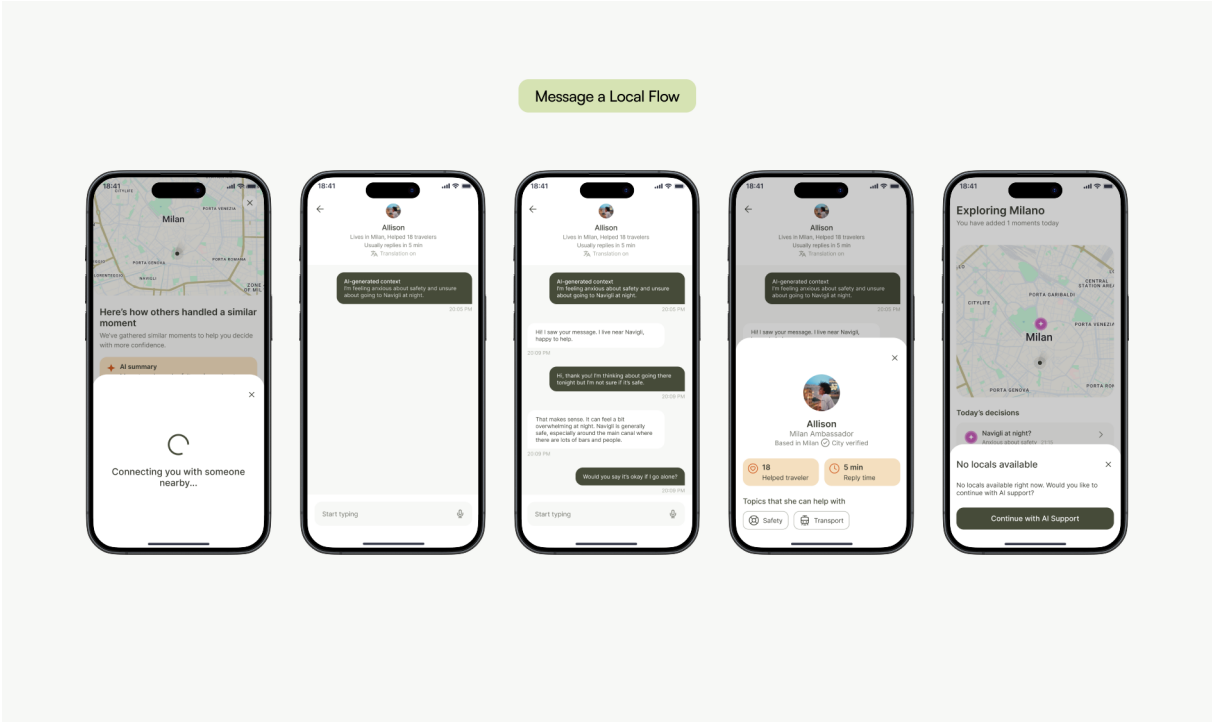

Figure 32. Message a Local Flow - Final

levels indicates that the design has now moved beyond the discovery phase and reached the maturation and stabilization phase (Figure 33).

At this point, the system has achieved a holistic structure as a contextual, experience-based, and hybrid decision support model. Thus, the design has taken its final form as an applicable and defensible solution proposal that responds to the problem framework defined in the thesis.

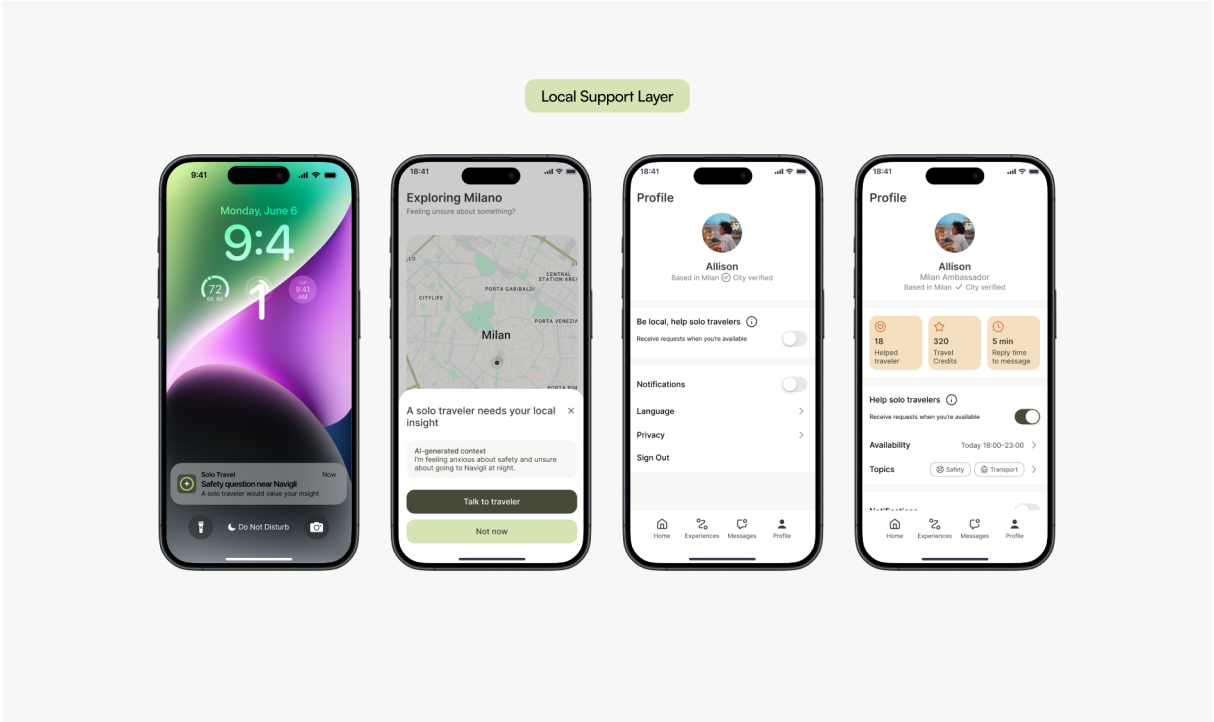

Figure 33. Local Support Layer - Final

7 DISCUSSION

This study goes beyond existing digital approaches that treat the solo travel experience as a planning-focused problem, reframing the experience through decision moments that arise during the trip. The literature defines solo travel in terms of motivations such as freedom, flexibility, and self-discovery, alongside obstacles such as safety, cost, and social constraints (Bianchi, 2016; E. C. L. Yang, 2021). However, this thesis reveals that this tension between motivation and obstacles is felt most intensely in the micro-decision cycles that arise during the trip.
Therefore, this study reframes the support problem in the context of solo travel as a lack of in-journey contextual decision support.

Reframing Solo Travel: From Planning to Decision-Making

Most current mobile travel applications focus on functional needs such as route planning, reservations, and navigation. However, diary study findings show that the decision load mostly includes small, sequential, and context-sensitive decisions. While these decisions may not seem critical on their own, they expand during the day, increasing cognitive fatigue and uncertainty.

This finding establishes that the solo travel experience is a static event but a process that unfolds over time. Decision-making is not only a logical selection mechanism but also an emotional regulation process. Users often investigate answers to the question, “Which is the right and safest choice for me right now?” rather than “Which is the best option?”

Therefore, the design focus should be on structuring and simplifying the moment of decision. This approach is rational with the human-centered design perspective, which argues that technology should play a role that strengthen the tourist experience rather than limiting it (Stankov & Gretzel, 2020).

Uncertainty Design: Cognitive Load and Emotional Safety

Research findings show that the uncertainty experienced by solo travelers often comes out a lack of contextual references to make sense of their options. In particular, the perception of safety, time pressure, and loneliness in unfamiliar environments boost this uncertainty.

This aligns with the literature on the context awareness and personalization potential of mobile tourism applications (Dirin et al., 2018; Sia et al., 2023). However, this thesis approaches uncertainty not as a functional problem but as an emotional experience. Situations such as the phone running out of battery or lack of internet access, although tech-

nical glitches, produce a feeling of loss of control and insecurity. The system developed in this direction has adopted four basic strategies:

1. Reducing cognitive load through contextual filtering
2. Generating social proof through experience-based matching
3. Facilitating comparison with an AI summary layer
4. Communicating with local entities appropriate to the immediate context

This structure presents the user with the framework for the decision. Thus, uncertainty is not eliminated, it is made manageable. A good decision-support system does not force the user to think less, it enables them to think more clearly.

AI, Trust, and Decision Ownership

Trust in AI-powered systems has both cognitive and emotional components (Shi et al., 2021; R. Yang & Wibowo, 2022). For example, in contexts involving uncertainty, users seek support that is both accurate and reassuring.

However, considering the risk of generative AI systems producing errors and misinformation (Christensen et al., 2025), a full delegation model is risky. Users' ambivalent attitudes toward AI (Ali et al., 2023) and the fact that error experiences can rapidly undermine trust make the positioning of the system critical.

In this thesis, AI does not take on a decision-making role. It is positioned as a supportive tool that organizes the decision-making process. Accordingly:

• Controlled diversity is offered instead of a single "correct" suggestion,
• The AI language is kept neutral rather than directive,
• The content source is made transparent,
• Decision ownership remains with the user at every stage.

These choices aim to ensure that AI is perceived as a companion rather than an authority. Trust here is not built solely on algorithmic accuracy. It is constructed through interface semantics, visual consistency, and user control.

Hybrid Support Model: AI + Human Layer

One of the study's significant contributions is the hybrid model that combines AI-powered configuration with human micro-support.
Test findings have shown that:

• AI provides fast and low-interaction-cost support,
• Experience cards generate emotional

trust and relatability,
• Local user messaging creates a social validation signal.

However, the human layer is not always the fastest or most necessary solution. Therefore, the system leaves the choice of support layers to the user. This approach offers a balanced structure between speed and trust, scalability and human connection.

Design Implications for AI-Powered Digital Companions

This thesis proposes the following design principles for how AI-powered systems should be designed in the context of solo travel:

• A decision structuring approach should be adopted instead of recommendation.
• User agency should be preserved while reducing cognitive load.
• Trust architecture should be built at the interface semantics level.
• Hybrid support models should provide contextual flexibility.
• Technology should not fragment the experience but rather enhance it.

These contributions provide a conceptual and practical framework for designing AI-powered digital companions for solo travel.

8 CONCLUSION AND FUTURE WORK

Conslusion

This thesis argues that digital support in solo travel experiences should focus not only on planning processes but also on micro-decision moments that arise during the trip. In a context where existing travel applications are primarily geared toward route and reservation optimization, this study redefines the solo travel support problem as an in-journey contextual decision-making problem.

Qualitative research and an iterative design process revealed that solo travelers seek contextual clarity, experience-based references, and emotional reassurance in addition to information. The hybrid model developed accordingly proposes a system that preserves decision ownership by combining AI-supported structuring with experience sharing and optional human support.

The main contribution of this study is positioning artificial intelligence as a digital companion that supports the decision-making process while keeping decision ownership with the user.

Limitations

This research is based on prototype and scenario-based testing. Long-term usage and trust dynamics under real travel conditions have not been measured. The AI layer is conceptually structured, and real-time model performance has not been experimentally tested. While the number of participants is sufficient for qualitative depth, it does not aim for generalization.

Future Work

This thesis has proposed a human-centered AI support framework focused on in-journey decision moments during solo travel. However, the scope and impact of the proposed approach can be deepened through broader and longer-term research.

First, longitudinal field studies should examine the system's usage dynamics under real travel conditions. Specifically, how user trust evolves over time, the effects on decision-making confidence, and reuse behaviors can be investigated. Such studies will reveal whether the decision structuring approach produces short-term relief or long-term decision ownership reinforcement.

Second, system performance can be experimentally tested with real-time generative AI integration. In this context, misinformation generation, user responses in case of errors, and trust loss dynamics should be examined. In particular, studies can be conducted on trust calibration mechanisms. For example, design strategies such as the system providing confidence level indicators for recommendations, providing explanatory feedback

in case of errors, or suggesting alternative verification methods to the user can be experimentally evaluated.

Thirdly, research can be conducted on the evolution of personalization capabilities as the system's usage period increases. By learning users' preferences at decision points, risk tolerance, social interaction tendencies, and contextual priorities over time, the mechanism offered to users can become more context-sensitive and accurate. However, it is a critical design principle that this personalization approach does not turn into proactive intervention. In the proposed model, the system does not intervene in the decision-making process without user trigger; it only provides structured support when requested. Future studies should examine this delicate balance between adaptive personalization and user control.

Fourth, comparative studies can analyze how different solo traveler segments respond to the hybrid support model. The approach of users with a high tendency toward autonomy and users who are more open to social validation toward AI-supported decision structuring systems can be examined. In this regard, adaptive designs that can dynamically adjust the system's intervention intensity according to the user profile can be developed.

Fifth, research can be conducted on how the system can evolve with contextual data integration. The integration of real-time data layers such as instant security alerts, traffic density data, or environmental conditions into the decision configuration process can be tested. However, it is a critical design issue that this integration should not weaken decision ownership while increasing automation.

Finally, the decision structuring approach proposed in this thesis is not limited to the tourism context. It can be adapted to AI-supported digital companion designs in other areas where uncertainty and individual decision load are high—for example, moving to a new city, decision-making experiences in healthcare, or solo living practices. In this respect, the study contributes to a broader research agenda on context-aware AI design that keeps decision ownership with the user.

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APPENDIX

Pre-Diary Study

Researcher: Cansel Gürsoy - Polimi, Digital and Interaction Design Master

What is a Diary Study?

I'm designing an AI-powered travel app for solo travelers. Your real experiences will help determine what features this app should have and how it should work.

Your Task

You should share the challenges, decision-making moments, and technology experiences you encounter during your solo trip via WhatsApp.

How it Works?

Platform: WhatsApp, we'll communicate naturally
Duration: Throughout your entire solo trip
Frequency: 1-5 messages per day

What Should You Share?

Challenging Moments
Decision-making struggles: Indecision between restaurant/hotel/transport options
Technology problems: Maps/booking apps not working, language barriers
Information gaps: Can't find opening hours, prices, directions
Safety concerns: Feeling unsafe, area security uncertainty
Your emotions: Confusion, stress, frustration, loneliness, fear

Positive Moments
Technology worked perfectly
Easy decision-making
Quick solutions

Include in Each Message

What happened? (Brief situation description)
How did you feel? (Your emotion in that moment)
What did you try? (How you attempted to solve the problem)
What would be ideal? (What would have helped?)

Post-Diary Study

Questions

What is your name and surname? (Optional)
How old are you?
When and where did your solo trip take place? (Please specify the dates and route)
What is your current occupation?
What is your nationality?
In which country do you currently live?
How many times have you traveled solo? (First time, 2—3 times, more than 4 times)
What is your main motivation for traveling solo?

Diary Study Pariticipant Overview

ID	Age	Experience level (solo travel)	Destination	Duration (days)
Participant 1	27	High (4+ solo trips)	Sweden	2 days
Participant 2	27	Medium (2 solo trips)	Italy - Rome	7 days
Participant 3	22	High (4+ solo trips)	Finland - Helsinki	7 days
Participant 4	32	High (4+ solo trips)	Greece - Athens, Milos, Serifos	10 days
Participant 5	25	Medium (2 solo trips)	Austria - Hallsttat, Salzburg, Vienna	5 days
Participant 6	29	High (4+ solo trips)	Spain - Madrid, Seville, Malaga, Valencia, Barcelona	11 days
Participant 7	27	Medium (2 solo trips)	Greece - Athens	3 days
Participant 8	28	Medium (2 solo trips)	China - Shanghai	4 days

Sample Diary Study Entries

This appendix presents selected and anonymized excerpts from the diary study. The excerpts illustrate key decision-making moments and emotional challenges experienced by solo travelers. All entries have been translated and edited for clarity without altering their original meaning.

Participant 1, Sweden
"It is always meaningful to connect with local people while traveling, listening to stories about the neighborhood, and learning about everyday life. I enjoyed this experience very much."

Participant 2, Italy
"The biggest problem I experience while traveling is that my internet connection often does not work, which makes navigation difficult. When my battery runs out, I feel stressed. In those moments, I usually ask people for directions or randomly choose a restaurant. Interestingly, these interactions increased my confidence in communicating with others."

Participant 3, Finland
"I have been struggling to decide what to do during my free time here. During the day I stay busy, but in the evenings I feel unsure about where to go. I am not familiar with the city and do not know which areas are active at night or when nightlife usually starts. As a result, I often end up walking alone and returning to my hostel feeling like I wasted my time. I wish there was a way to see what events or social activities are currently happening in the city."

Participant 4, Greece
"The third day of my trip has started, and I struggled to decide where to have breakfast and where to go today. Internet access on the island is poor, and using my phone is difficult. Before coming here, I usually planned my itinerary in detail, but being spontaneous in this context feels challenging."

Participant 5, Austria
"I feel tired because I am doing everything alone. If I were traveling with friends, it might be more enjoyable, but when I am alone, decision-making becomes a heavy responsibility."

Participant 6, Spain
"The main challenge I faced was navigating transportation in an unfamiliar train station. The station layout felt complex at first, but I managed to figure it out on my own. I had visited the city before, and since I often travel alone, I tend to approach such situations more practically."

Digital Ethnography Data Sample

This appendix presents a sample view of the raw datasets collected during the digital ethnography phase. The screenshots illustrate how Reddit posts and TripAdvisor reviews were collected, structured, and prepared for thematic analysis. All data shown here is publicly available and has been anonymized where necessary.

Reddit

	A	B	C	D	E	F
1	**body**	**category**	**communityName**	**createdAt**	**numberOfreplies**	**upVotes**
2	People should have the right to travel free	CringeTikToks	r/CringeTikToks	2025-11-26T22:22:41.000Z	3	
3	We don't hate tourists as long as they kee	Kashmiri	r/Kashmiri	2025-11-19T04:42:44.000Z	0	
4	I've been on 4 international trips this year	CreditCards	r/CreditCards	2025-11-17T16:52:47.000Z	1	
5	It's been a while since I've written a longe	amsterdam_rave	r/amsterdam_rave	2025-11-17T14:17:37.000Z	3	
6	As far as the 'declining health' goes, you \	JUSTNOMIL	r/JUSTNOMIL	2025-11-26T08:19:50.000Z	0	
7	I started over in my early 60s, and wish I h	TwoXChromosomes	r/TwoXChromosomes	2025-11-24T00:13:20.000Z	0	
8	I have attached a cable to my phone so th	solotravel	r/solotravel	2025-11-20T17:46:19.000Z	2	
9	Taiwan would've been another huge cons	solotravel	r/solotravel	2025-11-17T10:03:50.000Z	2	
10	Also sometimes no one is necessarily in th	parentsnark	r/parentsnark	2025-11-14T17:24:48.000Z	1	
11	I love solo travel. It grows me in ways I cc	solofemaletravellers	r/solofemaletravellers	2025-11-10T10:28:45.000Z	1	
12	Thanks everyone! Think I might stay on Tc	ffxiv	r/ffxiv	2025-11-26T01:56:35.000Z	0	
13	been traveling from 28-40 years old as a r	travel	r/travel	2025-11-15T19:49:38.000Z	5	
14	Anything you want! Things I've done by m	SingleAndHappy	r/travel	2025-10-31T13:50:05.000Z	1	
15	What was the solo supplement/penalty fc	solotravel	r/solotravel	2025-11-22T23:54:56.000Z	1	
16	Forget the anniversary. The minute he 'fo	WouldIBeTheAhole	r/WouldIBeTheAhole	2025-11-25T01:34:33.000Z	2	
17	I travel solo and Morocco couldn't have w	travel	r/travel	2025-10-26T18:06:52.000Z	2	
18	> I was curious if anyone has ever trie	solotravel	r/solotravel	2025-11-26T20:56:24.000Z	0	
19	1. The serac is dangerous all year round (t	alpinism	r/alpinism	2025-11-20T11:00:38.000Z	2	
20	I absolutely, unequivocally and sincerely l	EscapefromTarkov	r/EscapefromTarkov	2025-11-23T01:48:45.000Z	1	
21	My brother! Never had a job. Utusan ni m	CasualPH	r/CasualPH	2025-10-31T02:23:17.000Z	3	
22	Totally agree!! Amazing photo deck also.	VisitingIceland	r/VisitingIceland	2025-10-10T17:22:39.000Z	1	
23	I've been a divorced dad with 50/50 custc	biglaw	r/biglaw	2025-11-20T15:19:13.000Z	0	
24	It's definitely boring, especially if you trav	travel	r/travel	2025-11-03T09:51:37.000Z	4	
25	But he's not calling out hikers, is he. He's :	CringeTikToks	r/CringeTikToks	2025-11-25T02:36:42.000Z	0	
26	Honestly though, solo women traveling ur	iamatotalpieceofshit	r/iamatotalpieceofshit	2025-11-19T10:00:28.000Z	8	
27	LMAO this is why I love solo travel NOLA	travel	r/travel	2025-10-24T01:35:11.000Z	3	
28	You're awesome for asking this! I didn't re	BigBrother	r/BigBrother	2025-11-11T01:18:18.000Z	1	
29	I feel the exact same way. I am single anc	offmychest	r/offmychest	2025-11-23T14:48:18.000Z	2	
30	I'm not from a "developed country", altho	femaletravels	r/femaletravels	2025-10-08T23:27:06.000Z	2	
31	I just traveled to Ireland in October. Cave	irishtourism	r/irishtourism	2025-11-22T02:20:25.000Z	0	

Data +

TripAdvisor

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Body**	**Country**										
2	I joined a tour group, which I highly rec	Italy										
3	Inside, it is not worth seeing, because	Italy										
4	The Cathedral dedicated to the Nativi	Italy										
5	I chose the combination of Duomo an	Italy										
6	No trip to Milano should exclude a tou	Italy										
7	Beautiful majestic church. I download	Italy										
8	The 4th largest church in Christendon	Italy										
9	The floor is nicely decorated. Stained	Italy										
10	Definitely worth going in and up to the	Italy										
11	I signed up for a group tour and it was	Italy										
12	A magnificent Duomo and spiritual pla	Italy										
13	Beautiful Gothic style cathedral. One	Italy										
14	Don't think it's a disappointment in the	Italy										
15	The Duomo is majestic inside and out	Italy										
16	I live near Mialno, but every time I go th	Italy										
17	Absolutely admirable. The cathedral is	Italy										
18	Absolutely stunning building. They are	Italy										
19	I live in Milan, It may be nice but if you	Italy										
20	The Duomo is worth seeing, but do not	Italy										
21	A great experience please see detail1	Italy										
22	To be honest the outside is a lot more	Italy										
23	I took a tour of this amazing Cathedral	Italy										
24	My review is not based on beauty or pl	Italy										
25	Yesterday, I stood in the Milano Duom	Italy										
26	This tour had presences of tourists fro	Italy										

Sheet1 +

Affinity Map

Social & Communication Needs

Social Interaction & Meeting People

I feel happy when I meet new people.

I'd like to know wherever I could find the most lively locals/ pubs to meet new people. Also if I were told where to find any kind of public events.

I stayed in a hostel and met many people. We had a great time together.

I feel weird. I couldn't meet anyone. When it's not a hostel, meeting people becomes almost impossible.

I wish I could speak the language better and communicate more comfortably.

The hostel had a WhatsApp group QR, but I wish there was a space where I could see people's profiles and meet them. I wish there was a place where I could join a plan or activity. An app that makes it easier to meet people would be really helpful, because I'm a bit shy.

I met someone and we talked a lot. It was really enjoyable. Meeting someone new has a big impact on my mood

Connecting with Locals & Local Social Knowledge

Since I got information about the island from locals, I didn't need to research anything online. It made everything so much easier for me.

It's not a touristy place. I made my reservations through local (Greek) websites. This could be made easier

Its always great when travelling to connect with local people, listen to stories about local neighborhood.I enjoyed it very much.

The girl at the car rental place gave me recommendations about the island and the tavernas. I'm following those suggestions for my route today.

Communication Barriers (Language & Expression)

Using my phone for translation can be difficult in sunny conditions or when I'm short on time.

Unfortunatelly the menu was finnish with no translation and I was too embarassed to ask clarification in english.

A voice translation feature would have made things easier for me.

Navigation & Decision-Making Stress

Planning & Decision Overload

I had a hard time deciding where to have breakfast this morning and planning where to go today. The internet is bad and using my phone is difficult. Being spontaneous is challenging for me here.

I've had problems figuring out what to do in my free time.

Making decisions exhausts my mind.

I felt mentally exhausted before the trip even started.

I go and make decisions on the spot. Some places were too crowded, and in others the weather was bad.

It would be nice to have an app that offers personalized recommendations (routes, food).

Not having a plan made me panic.

While walking around the supermarket, I saw foods I had never seen before. When I thought about buying something, I couldn't decide. I end up losing time and feeling drained.

I feel like I need to see everything.

Orientation & Local Knowledge Gaps

There were walking routes in the places I visited. I wish I had known about them earlier.

I'm not familiar enough with the city to know which area are good for the nightlife, nor I know what time the nigtlife here starts. So I just walked around alone. Its such a pity and I feel like wasting my time.

TripAdvisor feels too touristy. I try to avoid that

I just got to Barcelona and it's raining — and I don't have any clothes for this weather.

I ended up in a tourist trap, and I wish there had been somewhere I could check for this kind of information.

While visiting the museums, I read a lot of information about the history, but I got confused as I was walking around

I wish there was some way to know what events are currently being held in the city.

For advice, routes, and generally the things I would normally ask someone if they were with me, I asked ChatGPT instead.

Technology Dependence & Operational Stress

I got really stressed when my phone ran out of battery.

I got really stressed. I couldn't figure out where to buy the train ticket, and I couldn't understand the ticket itself. Everything was in German and I couldn't make sense of it, and I didn't have time to use a translator.

I couldn't use navigation in areas with no internet connection.

Emotion

I wish there had been something to help calm me when I started to panic.

This island is much better for solo travelers. I don't feel panicky here I actually feel relaxed.

I feel very relaxed.

Speaking a foreign language makes me nervous sometimes. I feel a bit shy when I'm abroad.

Google Maps isnt updated. I was speecless but honestly I didn't even know to who to be mad at

My flight was delayed, so now I'm not sure if I'll make it to my bus to Naples on time. It's making me anxious.

Both situations gave me an overall sense of frustrations

There's no one at the reception, so I'm trying to figure things out with ChatGPT.

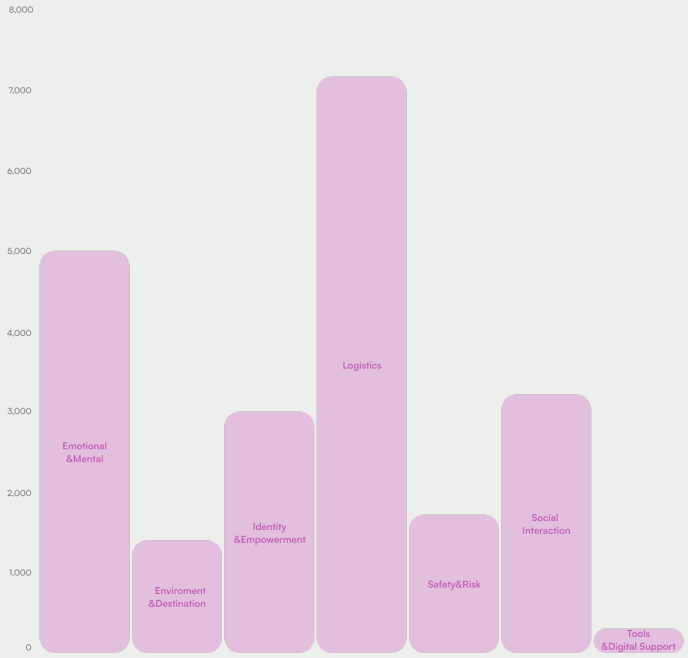
Empowerment

At one point, I even considered emailing my therapist. Then I tried to calm myself down. Having an AI I could chat with in that moment would have been perfect.

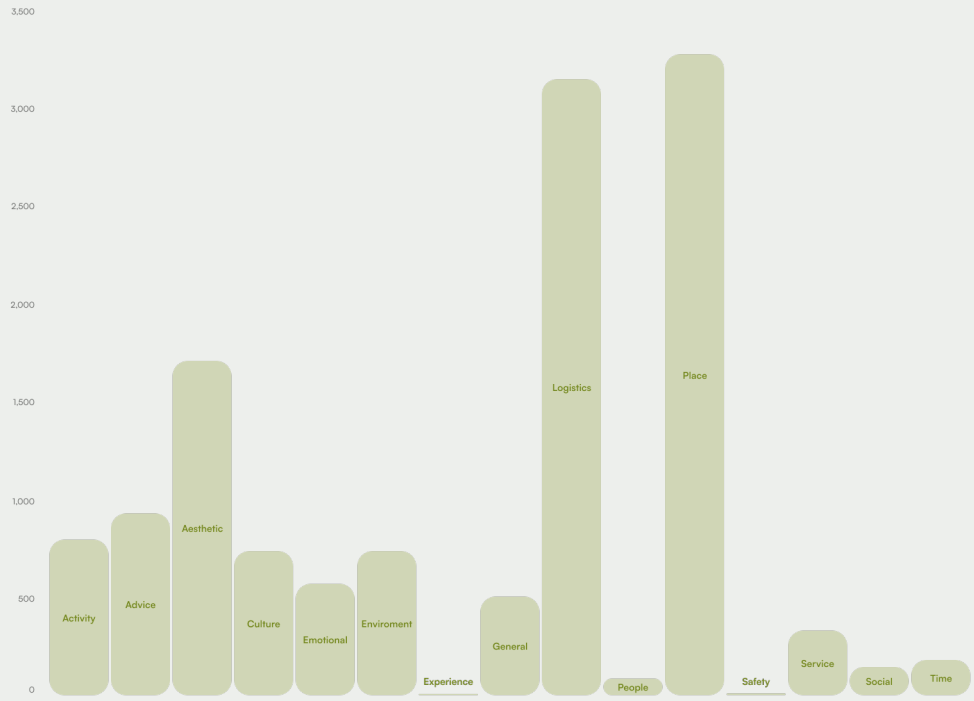
The more I talked, the more confident I became with the language.

Today was much more enjoyable because I now know the island better the distances, the timings, everything.

Reddit: Theme Frequency Barchart



TripAdvisor: Theme Frequency Barchart



User Test Participant Overview

ID	Age	Experience level (solo travel)	Nationality
Participant 1	28	Medium (3 solo trips)	Colombia
Participant 2	24	Medium (3 solo trips)	Turkey
Participant 3	29	High (6+ solo trips)	Turkey
Participant 4	21	High (6+ solo trips)	Colombia
Participant 5	32	Medium (3 solo trips)	Italy