Designing for empowerment: Can the UX of a mobile app empower and enrich the solo female traveller experience?

Measuring the effects of empowering User Experience Design on users' psychological empowerment

SARA D. GRANADOS

MSc Student, Dún Laoghaire Institute of Art, Design and Technology (IADT), Dublin, Ireland

MARIAN McDONNELL

Supervisor, Dún Laoghaire Institute of Art, Design and Technology (IADT), Dublin, Ireland

Solo travel is a transformative experience for women, leading to self-discovery and feeling empowered, enriched, brave, free, and in control. Even still, the female solo travel experience has barriers and constraints. Loneliness, safety and security, lack of confidence, and fear of social stigma have been identified as barriers that keep women from fully enjoying, or even being completely deterred from, travelling alone [45]. This study further explored the factors that enhance and hinder the female solo travel experience, as well as investigated if the user experience (UX) design of a mobile application can influence a user's feeling of empowerment and, more specifically, help women have a more enriching and transformative solo travel experience. A group of 62 participants completed usability testing to determine if implementing empowering UX principles into the design of a mobile application and giving users choice and control in the form of customisable onboarding affected their feeling of empowerment and their overall user experience. Results found an overall increase in user empowerment and a positive user experience among participants.

CCS CONCEPTS • Solo female travel • Female empowerment • Designing for empowerment

Additional Keywords and Phrases: Travel, Tourism, Smartphone application, Psychological Empowerment

1 INTRODUCTION

The travel and tourism industry is one of the biggest industries in the world. Women's participation in the industry has been on the rise in the past decade [74] due to the changing views on traditional gender roles and changes in women's socioeconomic status [68]. Women are getting married later, having children later, and becoming increasingly more educated and therefore more financially independent.

As such, women are taking more control of their lives and embracing their increased autonomy by demanding space in the travel and tourism sector which has historically been dominated by men [28]. Because of this, women now make up half of the travel and tourism market in both leisure and business tourism [30].

This financial freedom, freedom from gender norms, and the gradual trend towards individualism and decreasing social stigma towards participating in social activities alone [22], have manifested the rise of female solo travel, which has become significantly popular [45]. This rise in popularity is evidenced by the increase in

bookings made by female solo travellers, online communities of female solo travellers, and research in the areas of female solo travel.

Also among this research is the link between female solo travel and female empowerment. As will be discussed, it is widely recognised by research that even though solo travel comes with its challenges and risks, it can be a transformative experience and vehicle of empowerment for women.

This study investigates the concept of empowerment within the context of solo female travel and within the context of UX design as well. It aims to determine if the UX of a mobile application, when designed using various UX design empowerment principles and a methodology focusing on user empowering design and participatory design, can increase women's feeling of empowerment.

To do this, a literature review was conducted on topics surrounding solo female travel and designing for empowerment to better understand these topics and identify gaps in research. Next, a design methodology focusing on user centred design (UCD), user empowering design (UED), and participatory design, was deployed. User research was conducted, analysed, and incorporated into the design of a mobile application for solo female travellers. Two versions of the prototype were tested with 62 participants and the effects of the intervention on participants' psychological empowerment, as well as the prototypes' user experience score, were measured.

2 LITERATURE REVIEW

The literature review analyses existing literature and addresses research gaps on topics of interest to this study, including research on female solo travel, designing for empowerment, and the intersection of tourism and technology.

2.1 The Rise of Female Solo Travel

The growing popularity of female solo travel is immediately evident when searching the term on Google. The search yields over 167,000,000 results, ~46,000,000 of which are just from 2019 to present. There has also been a 230% increase in the number of women-only travel organisations since 2013 [45].

This explosive growth of the female solo travel market is recognised by booking websites, travel companies, and tour operators who continue to acknowledge the significance of women, specifically women solo travellers, in their customer base. According to the booking website Hostelworld, there was a 88% increase in bookings made by solo female travellers from 2015-2018 [7].

As the female solo travel market continues to grow, so has the amount of research on the topic. It has been acknowledged that more needs to be understood about the needs and motivations of female solo travellers – why solo travel is so appealing to women specifically, and what motivations, barriers, and perceived risks exist.

2.1.1 Female Solo Travel and Empowerment

According to Cambridge dictionary, empowerment is defined as "the process of gaining freedom and power to do what you want or to control what happens to you" [8].

Many women are increasingly choosing to travel alone; they do not travel solo because they have no other choice [4, 24, 42]. It has been widely recognized by several studies that solo travel is used as a vehicle of empowerment for women [1, 19, 21, 28, 33, 36, 76]. Solo travel provides women with a sense of freedom, independence, adventure, personal fulfilment, and escape, which ultimately leads to empowering and transformative travel experiences [4, 30, 45, 60, 63].

2.1.2 Solo Travel Motivations

Travel motivations are the driving forces that lead individuals to perform travel behaviours [63]. Motivation is complex; the reason for choosing to travel varies from person to person and can depend on many different factors such as personality, experience, and demographics [74]. There are also external factors that motivate travel decisions, such as budget or destination offerings.

When it comes to internal factors that motivate people to travel solo, common motivators include: an opportunity to be spontaneous, take risks, escape, travel at one's own pace, expand one's social circles, and experience freedom and personal growth [31]. The main motivation for women is the desire to challenge themselves [24] and the sense of power, autonomy, personal fulfilment, and self-understanding that comes from successfully travelling alone [42].

2.1.3 Solo Travel Constraints and Risks

As transformative and empowering as solo travel can be for women, it is not without barriers and perceived risks. It is widely accepted by existing literature that constraints on female solo travellers can be divided into four categories: sociocultural, personal, practical, and spatial [1, 21, 34, 45, 51, 68, 74] A description of how these internal and external constraints are defined in existing literature can be found in Figure 1.

Figure 1: Types of travel constraints

However, travel constraints do not always deter women from participating in solo travel. In fact, it is argued that learning how to participate in constraint negotiation, conscious risk-taking, and overcoming challenges while travelling alone can add to the feeling of empowerment, accomplishment, confidence, and strength that women feel when and after travelling solo [30]. Although solo travel presents challenges the act of pushing themselves out of their comfort zone and facing and overcoming those challenges head on is part of what makes solo travel appealing for women.

2.2 Mobile Tourism

Mobile devices are increasingly becoming an intrinsic part of everyday life and extensions of our bodies [27]. They are also changing and impacting the way people travel more than any other technology [52, 77]. Travellers are now “perpetually connected” via their mobile phones, and nearly all aspects of travel before, during, and after a trip are shaped to some degree by the integration of technology [2, 38]. Travellers now have the power to directly and instantaneously access travel information, reviews, and advice. They can also book accommodations, transportation and activities and connect with others via virtual communities.

Mobile phones are especially becoming an integral part of solo travel. According to online travel agent Agoda, solo leisure travellers spend approximately 15% more time on their phones than any other traveller type [6]. Mobile technology can offer solo travellers a sense of safety, security, and connectedness, and may even help mitigate the stigma of being alone [48].

Because of the growing popularity of mobile tourism, there are countless apps available to help travellers with a variety of needs. There are a few apps specifically for female solo travellers, most with the goal of connecting them to a network of like-minded female travellers. However, there is no evident market leader.

2.2.1 Competitor Analysis

When searching “app for female solo travellers” on Google, most results are not for one specific app, but instead a myriad of travel apps that provide a specific function and would help anyone who was travelling, such as Google Maps for directions, TripAdvisor for reviews, and Uber for rideshares, to name a few. Having to switch between multiple apps does not lead to an empowering and seamless experience for solo travellers.

Further investigation revealed that there are very few apps that are geared to female solo travellers specifically. Searching for “female solo travel” apps on the Apple App Store only yields 4 relevant and functioning apps. The most popular one is NomadHer (Figure 2), which boasts over 10,000 members from 170+ nationalities [14]. It is a free app for all women who want to travel alone, allowing users to discuss travel experiences, get tips from locals, find travel companions, access guidebooks and blog articles with advice, attend pre-planned events, or create their own event.

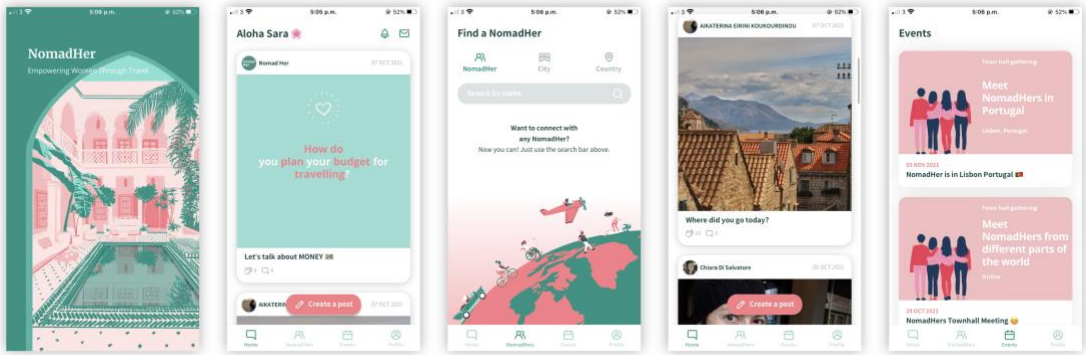


Figure 2: NomadHer mobile application

Other apps from the search results provide different functions, as described below:

1. TravSolo (Figure 3) is a free travel app that allows users to chat with people nearby, and create “Hangs” to meet new people in the area [11]. However, this app is for anyone travelling solo; it is not geared to women specifically. It also has certain features that are only accessible with a paid account.

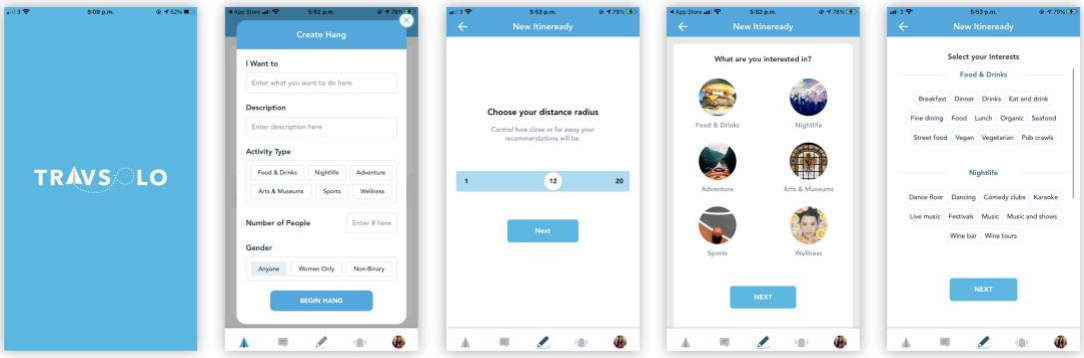


Figure 3: TravSolo mobile application

2. Travel Ladies (Figure 4) is a free female-only app that allows members to couch surf with verified female hosts, find a travel buddy for a trip, hangout with nearby female travellers and locals, share travel stories, and ask and give travel advice [9].

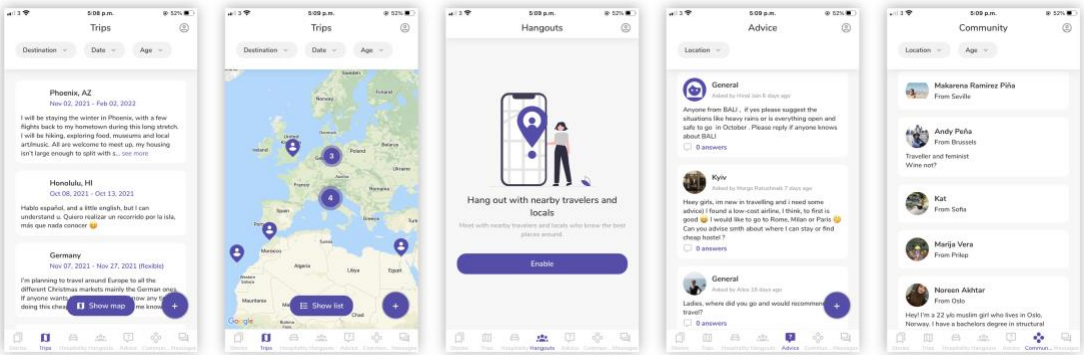


Figure 4: Travel Ladies mobile application

3. Tourlina (Figure 5) focuses on connecting girls who will be in the same destination at the same time with a dating app-style interface to match them with compatible travel companions [10].

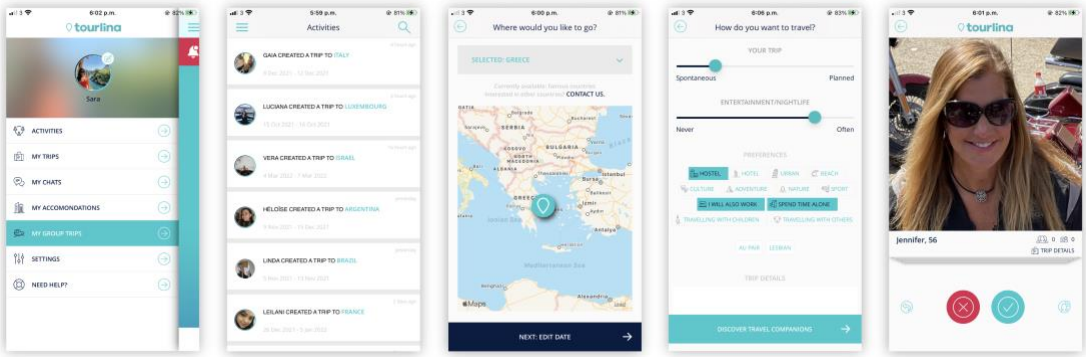


Figure 5: Tourlina mobile application

Although the apps mentioned above offer some similar and some unique features, none address safety concerns regularly referenced by female solo travellers, and also do not provide users with a meaningful onboarding experience that provides a sense of control or empowerment. A full outline of what features the apps have can be found in Table 1.

Table 1: Competitor Features

Features	NomadHer	TravSolo	Travel Ladies	Tourlina
Free	Y	Y – but certain features only accessible with paid “Plus” account	Y	Y – but certain features only accessible with paid “Premium” account
Female Only	Y	N	Y	Y
Onboarding	N	3 screens stating app features	4 screens stating app features	4 screens stating app features
User identity verification	Y – Selfie and ID verification	N	Y – Selfie verification	Y – Selfie verification
Find travel companions for a trip	Y	Paid only	Y – but map feature broken	Y
Connect with locals	Y	Y	Y	N
Connect with nearby travellers	N	Y	Y	N
Find places to stay with female hosts	N	N	Y	N
Ask for advice/recommendations	Y	Paid only	Y	N

Features	NomadHer	TravSolo	Travel Ladies	Tourlina
Share experiences	Y	N	Y	N
Safety feature(s)	N	N	N	N

2.3 Designing for Empowerment

"Empowerment" is often used in the context of mental and/or physical health [43, 64], accessibility [69], the workplace [40, 61], and social impact for disenfranchised groups [3, 20]. However, user empowerment should not be limited to vulnerable groups. In the context of UX, the aim of digital products should always be to empower users as a way to engage them, encourage them, and give them an "I've got this!" feeling that will increase their enjoyment of using a product and ensure they continue to [64].

For example, when discussing empowerment for disenfranchised groups, Wang & Burris [20] concluded that people are empowered when they have access to knowledge, decisions, networks, and resources. Can this same idea of access not be applied in a UX context to empower all users of a digital product?

2.3.1 Empowering Design Principles

There is currently no one standardised set of principles for designing for user empowerment. Rather, different researchers have defined their own parameters and principles for achieving empowerment both in and out of a design context (Figures, 6, 7, 8, and 9). This study aims to amalgamate these parameters and principles and apply them in a UX context to shape the design methodology and influence the proposed design artefact.

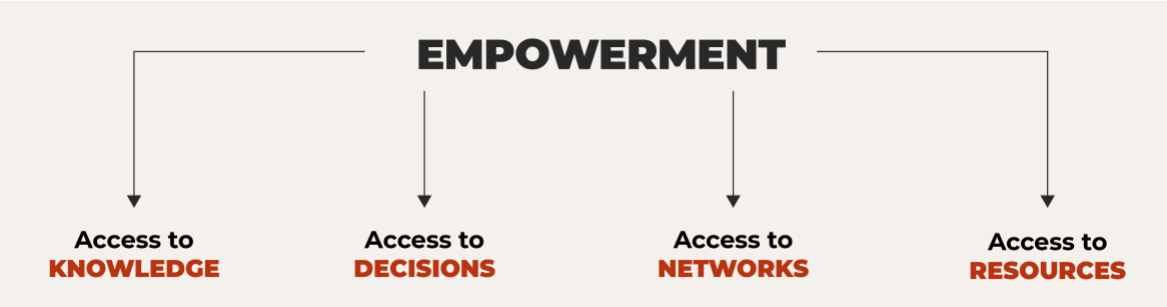


Figure 6: Wang & Burris [20] determine the type of access that leads to empowerment

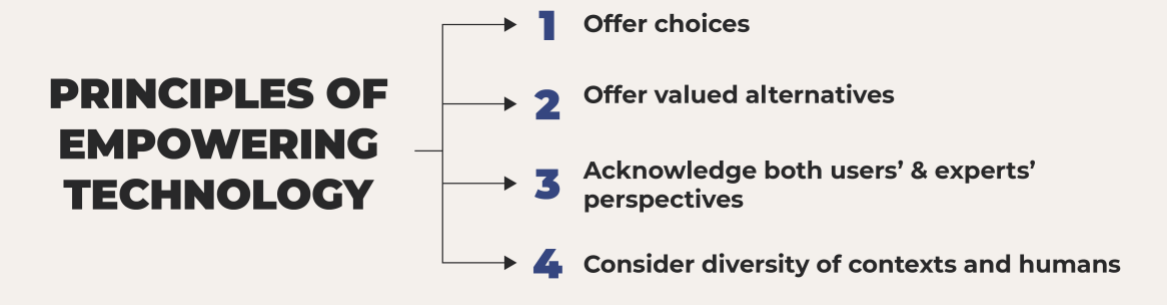


Figure 7: Schneider's four principles of empowering technology [43]

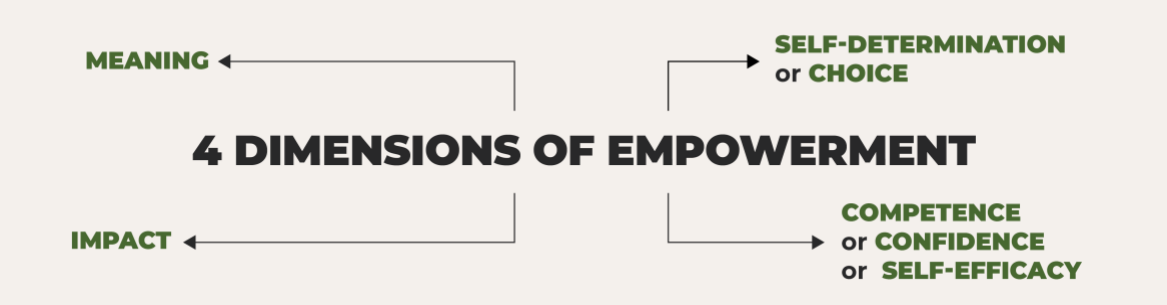


Figure 8: The widely accepted 4 dimensions of psychological empowerment [40]

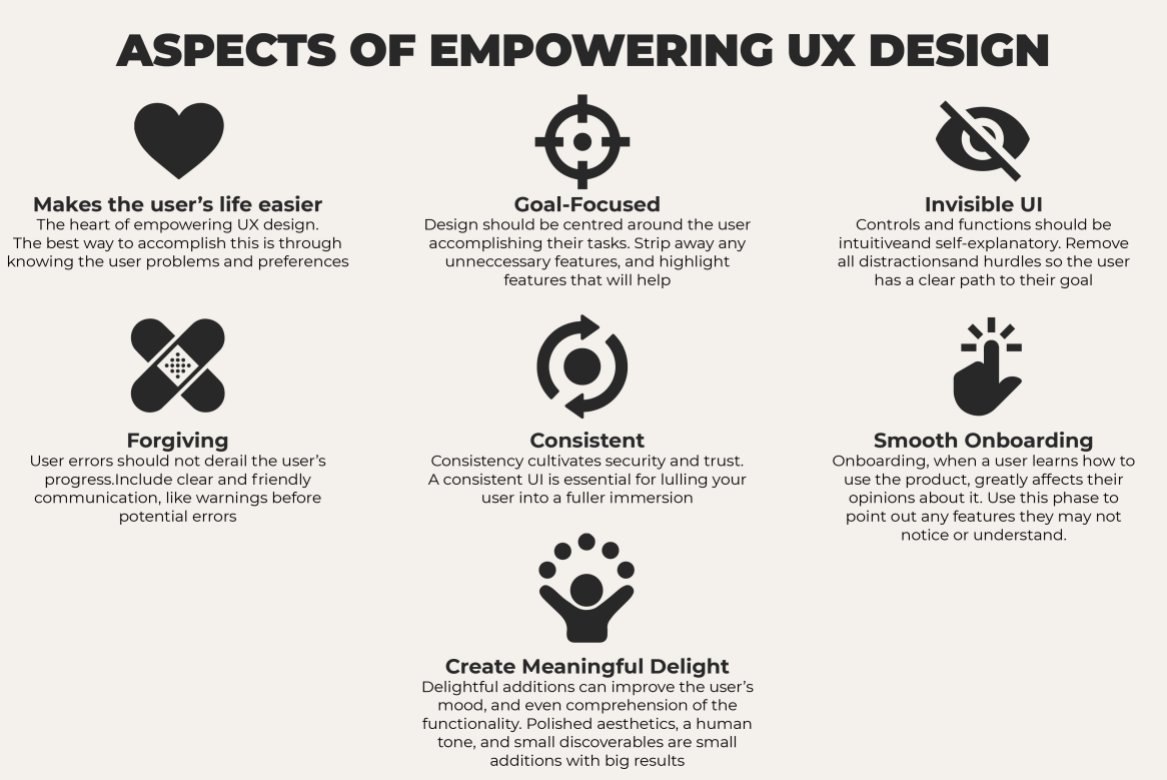


Figure 9: Aspects of Empowering UX Design [73].

2.3.2 Empowerment and Choice

Choice and control are an important part of empowerment and are prevalent and recurring themes across research when it comes to both empowering design and empowering solo travel. For women, empowerment while traveling solo can come from the ability to make their own choices and control their own actions [33]. When it comes to empowering technology, this idea of user autonomy through choice and control as a vehicle for empowerment is prevalent among researchers.

For example, in an attempt to create a framework for empowering technology, Schneider [43] identified choice as one of the four principles of empowerment (Figure 7). She argues that a sense of user agency is crucial for empowerment, and that intelligent personalised systems that make recommendations and decisions for users can cause users to over rely on the system instead of fostering choice and upholding agency [43]. As previously mentioned, research from Wang & Burris [20] concluded that one of the types of access that users need to feel empowered is access to decisions.

Ståhl et al. also say that empowering design empowers users to "make their own choices, rather than being told by a system what they are experiencing" [5].

Gallula & Frank [26] conclude that while UX design places emphasis on the experience a user feels interacting with a product, empowering design should place emphasis on the four widely-accepted dimensions

of empowerment: Meaning, Competence/Confidence/Self-Efficacy, Impact, and Self-Determination/Choice [40, 61] (Figure 8), to generate empowerment for users.

2.3.3 Empowerment and Participation

One way that users can be given a chance to decide how a product can work best for them is through participatory design. Research has found that participation is a key element of empowerment [4, 20, 32], and in a design context, designers and researchers can use participatory design to empower users by involving them in the design process of a product or application [23]. This will be discussed further in Section 4.0.

If designed with user empowerment in mind, the UX and user interface (UI) of a product can be a critical vehicle of empowerment for users, ensuring that a user's interaction with a product adds value to their life and makes them a better version of themselves [73].

2.4 Research Gaps

Although more research into female travellers and their motivations and constraints is becoming increasingly available as solo travel continues to gain popularity, there are still gaps in existing literature.

2.4.1 Lack of research on non-solo travellers

The majority of existing studies on female solo travel only studied women who had already travelled alone at least once. Only one recent study of note surveyed both solo and non-solo travellers, but had some limitations: it only had 28 participants, and it included both men and women [31].

This study aims to add to this limited existing research by doing more investigation into non-solo travellers, focusing only on females, to get insight into barriers and constraints that negatively affect their solo travel intention so that they can be removed [31].

When it came to those who had never travelled solo before, Yang's study found that 10 out of the 14 non-solo travellers surveyed showed an interest in solo travel, with self-discovery and freedom being two of the main motivations to consider travelling solo, while price and safety concerns were two of the main constraints.

2.4.2 Geographical constraints

Another limitation from Yang's study, and most other studies, is a geographical limitation. In Yang's study, all participants were Australian. Many other notable studies in existing literature only focus on specific geographical areas such as Australia and New Zealand [24, 34, 35, 56], various Asian countries [25, 30, 4, 63], and the US and UK [37], to name a few.

This does not allow for full insight into the many different segments of the travel and tourism market. Therefore, this study aims to expand on the existing research by gathering data from both solo and non-solo female travellers from a variety of nationalities and cultures.

2.4.3 Onboarding

As mentioned in Section 2.3.1, smooth onboarding is an aspect of empowering UX design that can play a key role in empowering and educating users. Therefore, it is an important part of UX, especially for mobile applications.

Onboarding is the term used to describe the first time a user interacts with a product or app [39]. Onboarding is a product's "first impression" on a user and the first chance to give the user a positive UX. It's also an opportunity to educate users on key app functionality and what benefit(s) the app provides [18]. Successful onboarding makes users feel engaged to and emotionally connected with the product to encourage and foster retention and continuous engagement [58].

There are several contrasting opinions of what exactly constitutes onboarding, and when exactly the onboarding process ends, if at all. Renz et al. [47], when discussing onboarding for online courses, suggest that onboarding refers to helping the user become an effective user of a system with elements like login and registration, demos, tutorials, public sections, and welcome mails. When it comes to mobile games, onboarding sometimes refers to the first few minutes of play [67]. Zichermann and Cunningham, when referring to onboarding in a gamification context, suggest that onboarding ultimately ends at user registration [39]. In contrast, Ruairí Galavan, Manager of Product Education at Intercom, suggests that onboarding is a continuous and cyclical process that never stops [72].

"Smooth" and "frictionless" are commonly used to describe the ideal onboarding UX [47]. Even so, there is very little research into what makes successful, smooth onboarding, and especially on how to best utilize onboarding as a vehicle for empowerment within a UX context. In fact, most of the current research on onboarding is in relation to employee onboarding in business organisations.

However, some principles of employee onboarding within a business context could also be applied to onboarding users of mobile applications and other digital products. Just as research has showed that successful employee onboarding programmes lead to an increase in retention, employee satisfaction, and employee engagement [44], it can be that onboarding in a UX context can lead to increased retention, satisfaction, and engagement of users of a digital product.

More research is needed into what makes good onboarding UX and how onboarding can be used to give users a feeling of empowerment, choice, and control, especially in travel and tourism applications.

3 RESEARCH PROBLEM

Although more research into female travellers and their motivations and constraints are becoming increasingly available, there is still a disconnect on how technology, specifically mobile applications, can be used as a tool to empower women to travel alone.

Just as mobile technology is always changing and evolving, so are women's preferences for tourism products and technology [23]. There is an opportunity to introduce mobile applications as a vehicle for female empowerment and, more specifically, as a tool to feel empowered to participate in solo travel.

While applying elements of empowering design described in Section 2.3, this study aims to evaluate the effectiveness of different types of onboarding, using A/B testing, to a mobile app for female solo travellers to empower them and enrich their solo travel experience. One group of users will be tested on an app with traditional onboarding and another group will be tested on an app with customisable onboarding to determine if giving users choice and control in this capacity positively affects their feeling of empowerment. There will be a focus on collecting data from both solo and non-solo female travellers from different geographical regions, nationalities, and cultural backgrounds.

3.1 Research Questions

This study will aim to answer the following research questions:

Q1. Can the UX of a mobile application empower and encourage women to participate in solo travel?
Q2. Will designing an onboarding experience that customises the app's features based on customer choices and preferences improve the user compared to traditional onboarding?
Q3. Will designing an onboarding experience that customises the app's features based on customer choices and preferences improve users' feeling of empowerment compared to traditional onboarding?
Q4. What are the opinions of experienced and potential solo travellers of the app and how it could be improved?

3.2 Hypotheses

Based on those research questions, the following hypotheses are proposed:

H1. Empowering UX improves and increases women's willingness to participate in solo travel.
H2. Incorporating customisable app features at the onboarding stage into the design of a mobile app provides a better user experience in comparison to traditional onboarding.
H3. Incorporating customisable app features at the onboarding stage into the design of a mobile app increases users' feeling of empowerment.

4 RESEARCH METHODOLOGY

This section will discuss the methodology of this study, including the design process, methods, tools, and technologies used.

This study used a mixed-method approach when it came to user research methods – surveys, interviews, and desk research; the type of user data collected – qualitative and quantitative; and the design approaches used – UCD, UED, and participatory design.

4.1 Design Methodologies

4.1.1 User Centred Design and User Empowering Design

As the goal of this study is to empower users, a user-centric approach to and process for investigating the research problem and answering the research questions is required. As Gallula and Frank [26] point out, when it comes to designing digital interfaces and human-computer interaction (HCI) products, using UCD ensures the focus is on users of a product and not the product itself. However, they argue that because UCD only focuses on usability and UX design, and not on user empowerment, user empowerment needs are not necessarily met when using just UCD.

Although they do provide a proposed UED framework with functionality, experience, and empowerment at the core of the design approach (Figure 10), they recognize that there is currently no full or dedicated design method that meets the need of empowerment [26].

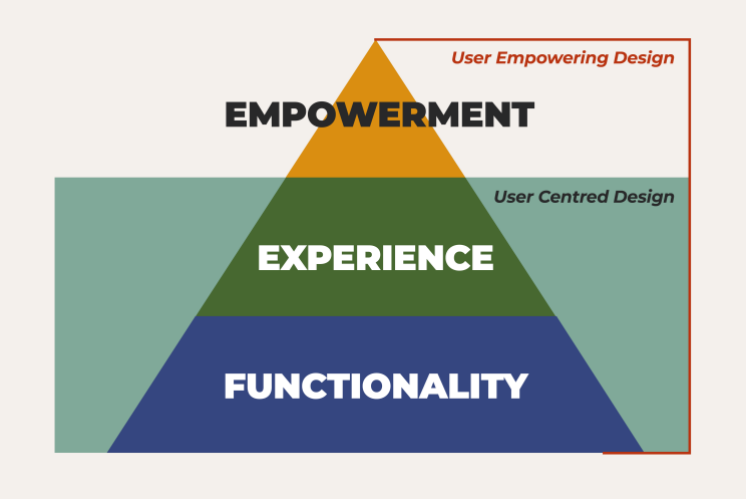


Figure 10: User Empowering Design [26]

So how can user empowering design be implemented into the methodology of this study? As mentioned in section 2.3, this project aims to amalgamate findings from current research available on designing for empowerment to shape a design methodology.

Therefore, in conjunction with using a UCD ideology to keep all design decisions user-focused, the empowerment principles from Wang & Burris [20], Schneider [43], and Riddle [73], as well as the focus on user choice and control as a vehicle for empowerment will be used to foster a UED ideology [26]. This aims to achieve the four dimensions of psychological empowerment: Meaning, Impact, Self-Determination/Choice, and Competence/Confidence/Self-Efficacy [40].

4.1.2 Participatory Design

As mentioned in Section 2.3.2, various research shows that giving users choice and control can lead to a feeling of empowerment. One way to do this in the context of HCI is through participatory design, where users are directly and actively involved in the research, design, and development process of a product [23]. Participatory design helps users feel more empowered by putting the power in their hands, allowing them to have a direct say in what they want a product to be and decide how a product can work best for them.

For this project, participatory design was implemented during the *Empathise* phase (Section 4.3), through questions in the online survey that prompted participants to brainstorm potential features they would like to see in an app designed for female solo travellers, and during the *Ideate* phase (Section 4.4) with a remote co-design workshop.

4.2 The Design Thinking Process

In order to implement the design methodologies mentioned above, the design thinking process was used to guide the research. Design thinking is “a human-centred approach to innovation that integrates the needs of people, the possibilities of technology, and the requirements for business success” [12]. Because design thinking is human-centred, it is a natural fit as a framework to achieve successful UCD and UED.

Sarah Gibbons of the Nielson Norman Group divides the design thinking framework is into six phases: empathize, define, ideate, prototype, test, and implement [75]. These six iterative, cyclical phases fall under IDEO's 3 core activities of design thinking: ideation, inspiration, and implementation [12]. In the context of this project, these core activities manifest as user research, design, and user testing.

Using this framework, as described in Figure 11, to guide the course of this study, while also staying human-centred and focusing on empowering the end user, will ultimately lead to satisfaction and enrichment for female solo travellers.

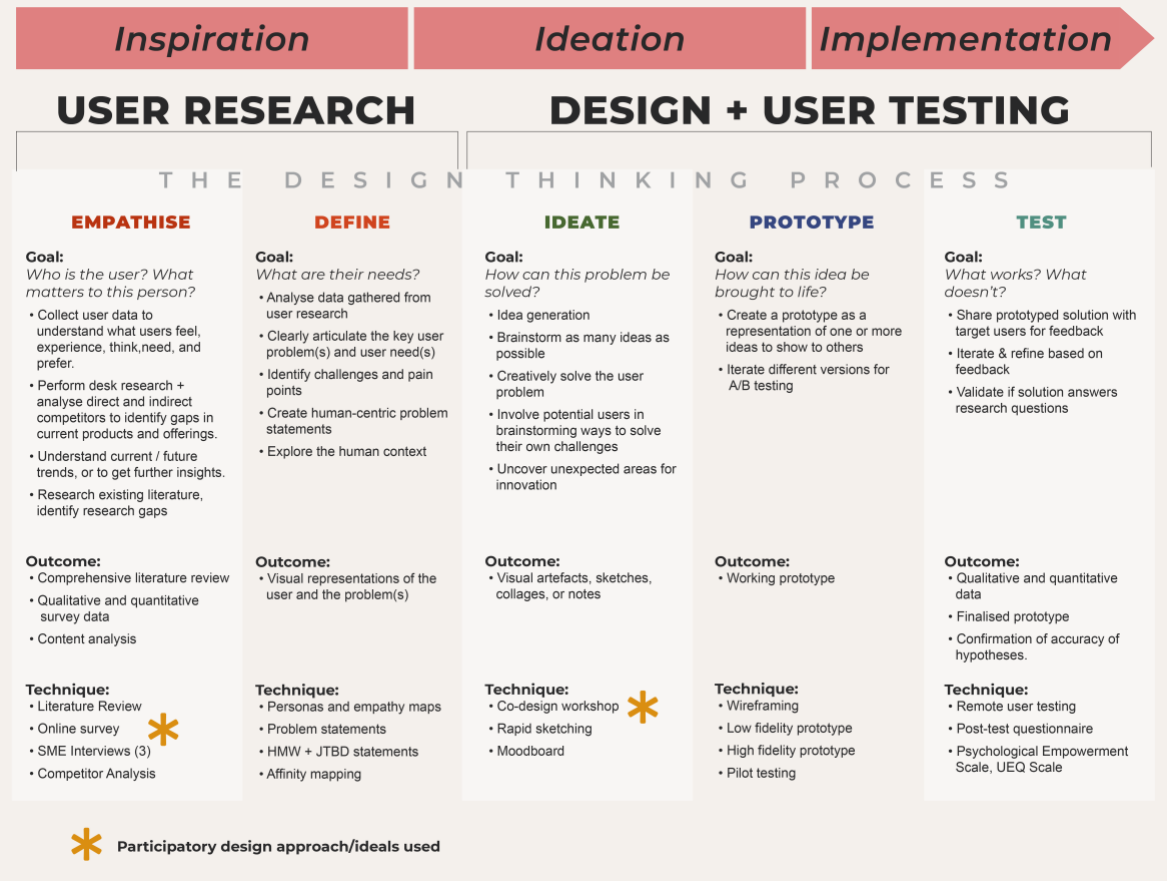


Figure 11: Project methodology framework

4.3 Empathise

For the first stage of this process, data was collected from users to understand what they feel, experience, think, need, and prefer. To do this, a mix of exploratory research methods was used. The following is an overview of the different research methods used, the details and results of which will be discussed in Section 5.

4.3.1 Online Survey

Online surveys are an easy and quick way to gather data from users [71]. One goal of this study was to add to the existing data and research on solo female travel. As mentioned in section 2.4.1, there is a lack of research on non-solo female travellers, as well as geographical constraints in current research. An online survey was circulated to gather information from a large and diverse group of current and aspiring female solo travellers of various demographics, backgrounds, and locations. The survey consisted of both open- and closed-ended questions to gather both qualitative and quantitative data.

It investigated solo travel barriers, motivations, likes, dislikes, and even gave participants a chance to brainstorm how technology or mobile apps could enhance their solo travel experience. These added prompts were intended to bring in a participatory design element into the survey, giving participants a chance to brainstorm ideas of what they would like to see in an app for female solo travellers.

4.3.2 Subject Matter Expert Interviews

Interviews are a great way to get an even deeper understanding of user preferences, motivations, and pain points [59]. Semi-structured interviews were conducted with three subject matter experts (SME) with expertise in UED or solo female travel. A semi-structured approach allowed other topics to be explored during the interview based on the participant's responses, as well as having a predetermined set of topics and questions defined before the interview [29].

4.3.3 Desk Research

It is widely accepted in research that social media is a vital source of information for potential travellers and that it has changed and impacted the travel planning experience in a positive way [16, 28, 50, 66]. Online communities of travellers play an important role in influencing people's travel decisions by providing a forum where members can share experiences and travel advice, ask and answer questions, and provide and receive support [28].

Posts from 2 popular and worldwide female traveller Facebook groups, The Solo Female Traveler Network [15] and Girls LOVE Travel® [13], with 472.4K and 1.2M members respectively, were examined and analysed to find common themes surrounding solo female travel motivations and barriers.

4.4 Define and Ideate

Next, user data and research was analysed and collated to create user personas and empathy maps. Personas serve as a visual representation and personification of the key audience, expressing needs, expectations, goals, and values of those users [70].

At this stage of the design process, a remote co-design workshop was held with 4 participants to serve as a participatory design element that consisted of collaborative conversations, brainstorms, and activities that gave them an opportunity to directly contribute to building the proposed app.

Additionally, affinity diagrams were created to organize and group the qualitative data from the survey into natural categories. A second competitor analysis was conducted with various travel resource, safety, social, and trip planning apps in the competitor landscape (Figure 12), some of which were mentioned during the online survey and co-design workshop. In this analysis, found in Appendix A.4, a sample of competitor apps were measured against Riddle's Aspects of Empowering UX Design [73].

Figure 12: Competitive landscape

These user and data insight visualisations served as the foundation of all future design decisions to ensure the design process continually remained user-centric.

4.5 Prototype, Test, and Implement

As discussed in Section 2.2, the importance of smartphones in the tourism sector cannot be overstated. They are an integral part of the travel experience both before, during, and after a trip. Therefore, the best design deliverable to ideate research and insights from the Empathise and Define stages of the study was a mobile application.

Following the ideation process, an initial prototype was created using Figma then pilot tested to ensure there were no issues with the prototype. Then, unmoderated usability tests were administered remotely using the testing platform Maze to identify problems, uncover opportunities for improvement, and learn how users interact and behave with the app [57].

4.5.1 Scales Used

There is currently no scale to specifically measure user empowerment within an HCI context. Therefore, in an attempt to best measure user empowerment within the context of this study, 2 scales were used. First, Riddle's [73] aspects of empowering UX design (Section 2.3.2) were matched with an existing validated scale, the user experience questionnaire (UEQ) [17, 62], as it's subscales were found to correspond with aspects of empowering UX design, as illustrated in Table 2.

Table 2: Aspects of Empowering UX Design vs proposed UEQ scale measurables

7 Aspects of Empowering UX Design [73]	Description	UEQ Subscale	Description
Makes Users Life Easier	The heart of empowering UX design. The best way to accomplish this is by knowing the user problems and preferences	Perspicuity	**Is it easy to get familiar** with the product and how to use it?
		Efficiency	Can users solve their tasks **without unnecessary effort**? Does it react fast?
Goal-Focused	**Design should be centred around the user accomplishing their tasks**. Strip away any unnecessary features, and highlight features that will help	Efficiency	**Can users solve their tasks without unnecessary effort**? Does it react fast?
Invisible UI	**Controls and functions should be intuitive and self-explanatory**. Remove all distractions and hurdles so that the **user has a clear path to their goal**	Efficiency	**Can users solve their tasks without unnecessary effort**? Does it react fast?
Forgiving	User errors should not derail the user's progress. Include clear and friendly communication, **like warnings before potential errors**	Efficiency	**Can users solve their tasks without unnecessary effort**? Does it react fast?
Consistent	**Consistency cultivates security and trust**. A consistent UI is essential for lulling your user into a fuller immersion	Dependability	Does the user feel in control of the interaction? **Is it secure and predictable**?

7 Aspects of Empowering UX Design [73]	Description	UEQ Subscale	Description
Smooth Onboarding	Onboarding, when a **user learns how to use a product**, greatly affects their opinions about it. Use this phase to point out any features they may not notice or understand	Perspicuity	**Is it easy to get familiar with the product and learn how to use it**?
Create Meaningful Delight	**Delightful additions can improve the user's mood**, and even comprehension of the functionality. **Polished aesthetics**, a human tone, and small discoverables are small additions with big results	Stimulation	Is it exciting and motivating to use the product? Is it fun to use?
		Attractiveness	Overall impression of the product. Do users like or dislike it?
		Novelty	Is the design of the product creative? Does it catch the interest of users?

Additionally, a scale to measure psychological empowerment in the workplace [40] was reformatted for the purposes of this study, with "solo travel" replacing "work"/"job" in the original scale where applicable (Table 3). Spreitzer's original scale has been widely used, translated, and well-validated in a variety of different work contexts [41]. The result is a 12-question questionnaire using a 7-point Likert scale that specifically measures empowerment within the context of the four widely recognised dimensions of empowerment – Meaning, Competence, Self-Determination, and Impact [40].

Table 3: Spreitzer's original Psychological Empowerment Instrument [40] and the updated Instrument used for this study

Spreitzer's original Psychological Empowerment Instrument	Updated Psychological Empowerment Instrument for this study	Subscale
I am confident about my ability to do my job	I am confident about my ability to travel solo.	Competence
The work I do is important to me	The solo travel I do is important to me	Meaning
I have significant autonomy in determining how I do my job.	I have significant autonomy in determining how I solo travel.	Self-Determination
My impact on what happens in my department is large.	My impact on what happens during my solo travel is large.	Impact
My job activities are personally meaningful to me	My solo travel activities are personally meaningful to me.	Meaning
I have a great deal of control over what happens in my department.	I have a great deal of control over what happens during my solo travel.	Impact

Spreitzer's original Psychological Empowerment Instrument	Updated Psychological Empowerment Instrument for this study	Subscale
I can decide on my own how to go about doing my own work.	I can decide on my own how to go about travelling solo.	Self-Determination
I have considerable opportunity for independence and freedom in how I do my job.	I have considerable opportunity for independence and freedom in how I solo travel.	Self-Determination
I have mastered the skills necessary for my job.	I have mastered the skills necessary for solo travel.	Competence
The work I do is meaningful to me.	The solo travel I do is meaningful to me.	Meaning
I have significant influence over what happens in my department.	I have significant influence over what happens in my solo travel.	Impact
I am self-assured about my capabilities to perform my work activities.	I am self-assured about my capabilities to solo travel.	Competence

The Cronbach alpha coefficients for both the UEQ [17] and psychological empowerment instrument [40, 61] were both > 0.8, signifying good reliability. This will be further explained in Section 6.1.2.

4.6 Recruitment

Recruiting participants for data collection and usability testing was done via social media and word-of-mouth. Because the study focuses on female solo travel, only those who identify as female were recruited. To increase participation and response rate, as well as geographical location of participants, there was a focus on recruiting participants via female-only and/or travel-focused online communities. Because people are more likely to respond to surveys with research topics that are important to them [65], targeting online communities of female travellers helped maximise the survey response rate.

4.7 Ethical Considerations

Ethical approval was granted by the IADT Ethics Committee. This study did not raise any ethical concerns, as it did not involve any vulnerable or minority group. The survey, interviews, and prototypes did not cause any harm or distress to participants. Participants were asked to provide informed consent before taking part in any part of this study.

5 DESIGN

This section outlines the design process used in this study, including the results of the exploratory research used to identify user needs and preferences when it came to female solo travel, and the development of a prototype designed to address them.

5.1 Primary Exploratory Research Results

5.1.1 Online Survey

A survey was circulated online via social media networks and online travel groups. Online surveys are convenient, flexible, quick, and allow for a global reach [53]. This proved to be the best primary research method. The survey received a total of 768 responses, of which 761 were usable (responses were usable for this study if the participant was over 18 years old and identified as female). The full survey and results can be seen in Appendix A.3.1.

Demographic questions revealed that respondents came from 44 countries, with most residing in the USA (53%) and Ireland (28%). Although the majority of participants were aged 25-34 (42%) or 35-44 (18%), there were still participants in all age cohorts from 18-65+ years old. When it came to marital status, the majority of participants were either married (45%) or single (30%). Even though an effort was made to recruit both solo and non-solo travellers, only 16% of respondents had never travelled alone before, with the majority (84%) having travelled solo before at least once, most (28%) citing that they had participated in 5-10 solo trips.

The survey consisted of both qualitative and quantitative questions, which were different depending on whether a respondent had travelled solo before or not.

5.1.1a Data Collected from Solo Travellers

The key quantitative results from respondents who had travelled solo before can be seen in Figure 13.

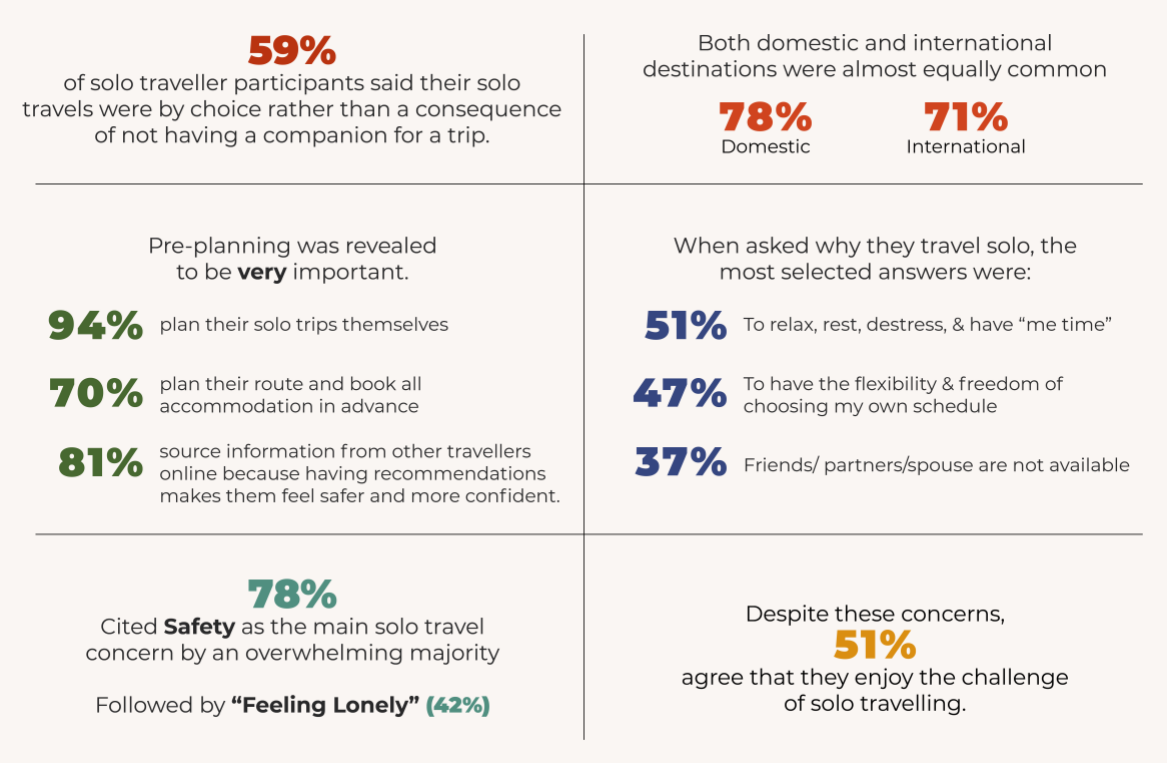


Figure 13: Key insights from quantitative data from solo female travellers.

Open-ended questions focusing on solo travel likes and dislikes were included in the survey to give respondents a chance to answer in their own words to gather rich qualitative data. Responses were long, detailed, and often spirited, revealing how passionate respondents are about the topic of female solo travel and how eager they are to have their voices heard. The text analysis tool Caplena was used to find trends in the responses.

Qualitative data from solo travellers revealed:

- The freedom and independence to do what they want when they want, being responsible only for themselves, and not having to compromise their schedule is what they like most about travelling solo (Figure 14).
- Like with the quantitative data, safety and loneliness are the main dislikes of solo travel (Figure 15).
- There were also common trends when it came to what would make them feel safer while travelling solo (Figure 16).

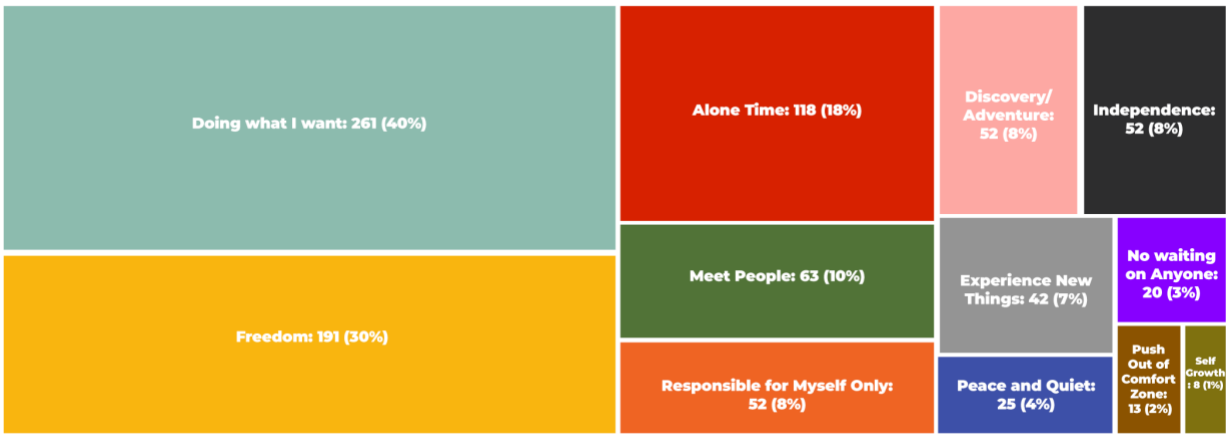


Figure 14: What do you like about travelling solo?

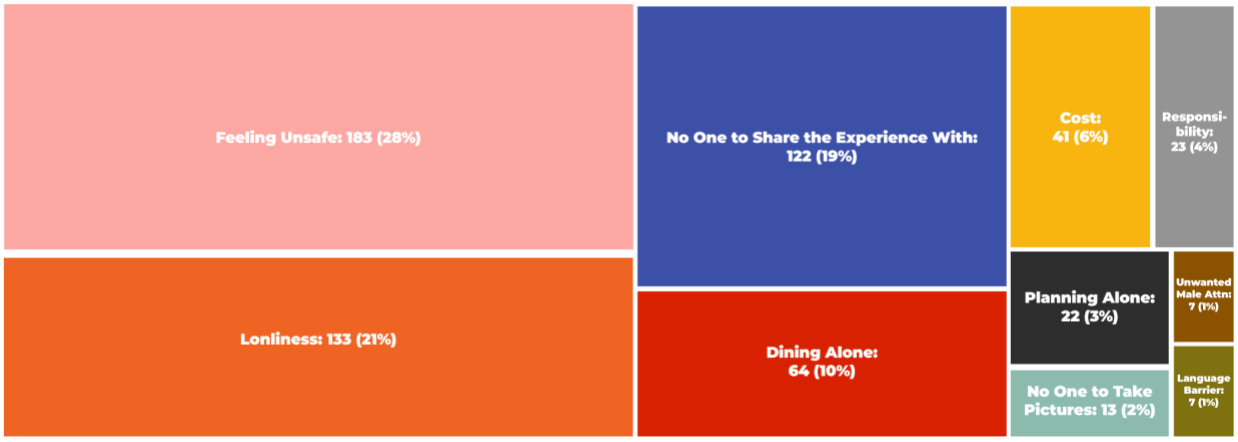


Figure 15: What do you not like about travelling solo?

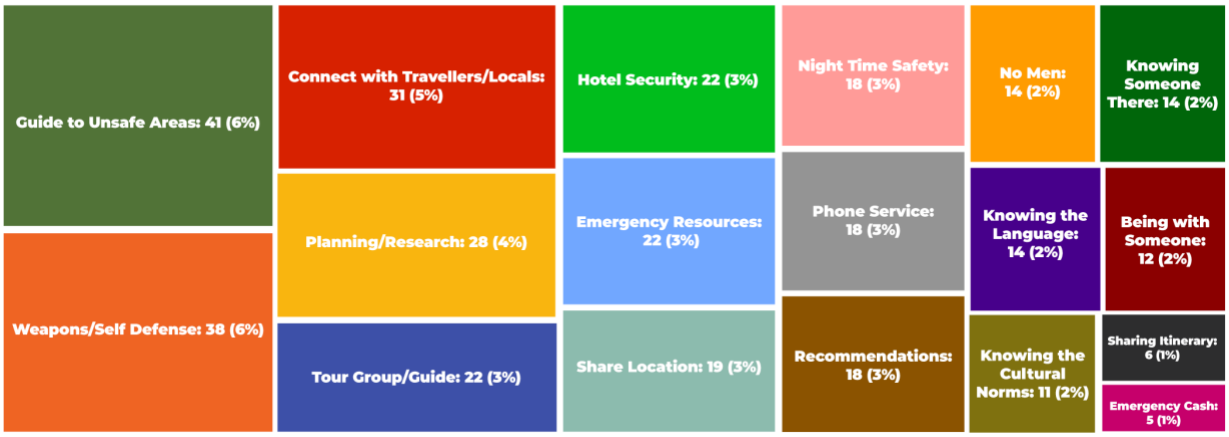


Figure 16: What do you think would make you feel safer while travelling solo?

5.1.1b Data Collected from Non-Solo Travellers

The key qualitative insights from respondents who had not travelled solo before were:

- Like those who had travelled solo, safety is a big concern for non-solo travellers, with 52% citing "Safety Concerns" as what has kept them from travelling solo.
- Despite this, 52% said they would consider travelling solo, with the majority saying joining a small group tour would make them more likely to travel on their own.

The results of the qualitative questions for non-solo travellers can be found in Appendix A.3.1.

5.1.1c Proposed Features

Additionally, users were given a chance to brainstorm and suggest potential features they would like to see in an app designed for female solo travellers as another way to incorporate participatory design into this study. This gave them an opportunity to actively participate and have a direct say in the design and development of this product. Similar features were proposed by both solo and non-solo travellers (Figures 17 and 18), which would later form the key features of the app.

Figure 17: Features proposed by solo travellers

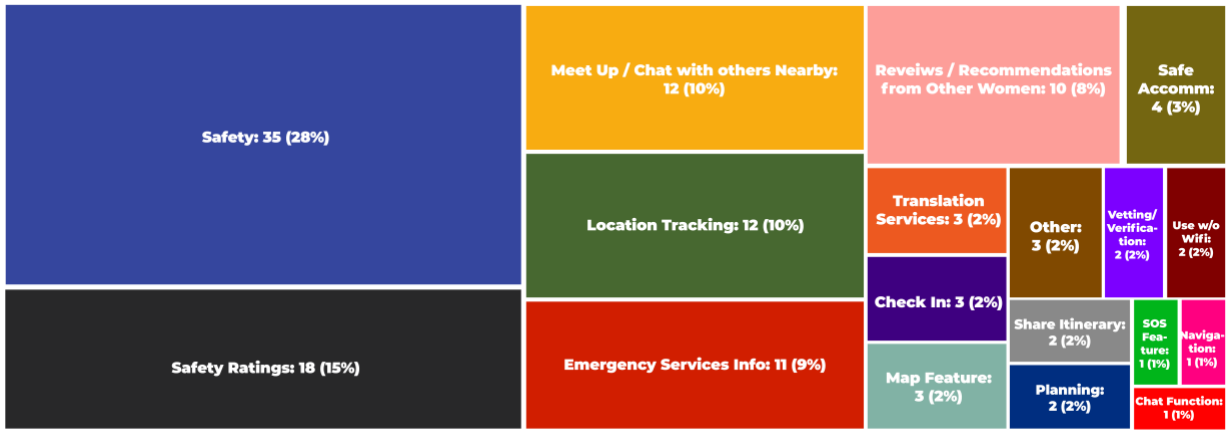


Figure 18: Features proposed b non-solo travellers

5.2 Secondary Exploratory Research Results

5.2.1 Subject Matter Expert Interviews

Semi-structured interviews were conducted remotely with three SMEs in the fields of empowering UX design, solo female travel, and female empowerment. SME interviews can be a valuable resource that yields knowledge and insights and are most beneficial when there is a focus on utilising the SME's particular area of expertise [55].

The three SME interviews were conducted with:

1. David Gallula Ph.D: Head of UED Research Institute and CEO & Founder of ProUX. He is one of the researchers responsible for developing the proposed UED framework (Section 3.1.1) and is currently

conducting further research to develop a clear design method that focuses on user empowerment. He is based in Israel.

2. Megan Arzbaecher: The Solo Female Traveler Network's Meetup Tours Coordinator and an avid solo traveller with 7 years of experience working in the tourism industry. She is based in Germany.
3. Georgia Collard: A former MSc in UX Design student who's thesis research focused on female empowerment and empowering UX design. She is based in Ireland.

Two interviews were recorded and transcribed with the SME's permission (Appendix A.3.2). These interviews provided key insights and learnings (Figure 19) that complemented other findings from primary research.

5.2.2 Desk Research

Social media, specifically online communities for female travellers, play an essential role in travellers' decision making by offering support and interactions [28]. Posts from two of the biggest Facebook communities for female travellers, The Solo Female Traveler Network (481k+ members) and Girls LOVE Travel® (1.2m+ members), were analysed to find common topics and trends. Although most posts are either women sharing an experience or asking for advice/recommendations, there are also many compelling discussions about travelling as a woman, with safety being the main theme. Many women also share personal stories about why they are travelling – with life events ranging from positive ones like milestone birthdays to negative ones like a divorce or bereavement – and why travel is so important to them. These communities include women from all around the world, from all walks of life, and with a range of travel experience, providing great first-hand insight into their travel decisions, motivations, and concerns. A sample of posts can be seen in Figure 20 and Appendix A.3.3.

DAVID GALLULA, Ph.D

Head at UED Research Institute and CEO & Founder of Pro UX

Co-author of *User Empowering Design* (2014)

"We should know and realize that most of the companies don't want to empower users, they want to monetize users."

"Empowerment is looking behind the product and the relationship between the user and the product and to think about the effectiveness of the product."

"In our research we found that in the central path of your life, it's important to you to be able to control and have choices. But, when things are not important for you, you prefer not to be in control."

"Choice and control is not always a good thing for the user. It's only really important for the important things in their life."

MEGAN ARZBAECHER

Meetup Tours Coordinator for the Solo Female Traveler Network

[When discussing meetup tour locations] **"We really focus on destinations where women don't necessarily feel safe or comfortable or empowered to travel as a solo traveler. Creating a group environment allows them to have some of that security and those concerns addressed."**

"We see a lot of success in women coming together as a group to feel more comfortable travelling."

"We really like to create itineraries and custom tour agendas that focus on women not just as the traveller but also as the experience in the country. So trying to visit small businesses opened by women, hiring female tour guides, visiting hotels that are owned by women...really focusing on empowering women on every level of our business operations."

"When you are truly solo and not meeting up with another group, you have to do so much more work, you have to do so much more preparation, you have to do so much more research."

GEORGIA COLLARD

Previous MSc in UX Design student focusing on female empowerment and empowering UX design

[When discussing current work focusing on user empowerment] **"The focus is on the participation of the user."**

"Empowerment is about understanding the person and getting them to help themselves."

"I wanted the user to design what I was going to create in the end"

LEARNINGS / TAKEAWAYS

Choice and control is an important part of user empowering design, but users are only interested in having chioce and control when it comes to the importnat things in their life.

There should be a focus on supporting/ highlighting female-owned businesses within the app.

Meeting up and creating connections with other solo female travellers can be an important vehicle for empowerment.

Participation is a key element of empowerment, and one way to achieve that is to involve the user in the design of the product.

Figure 19: Key quotes and learnings from the 3 SME Interviews

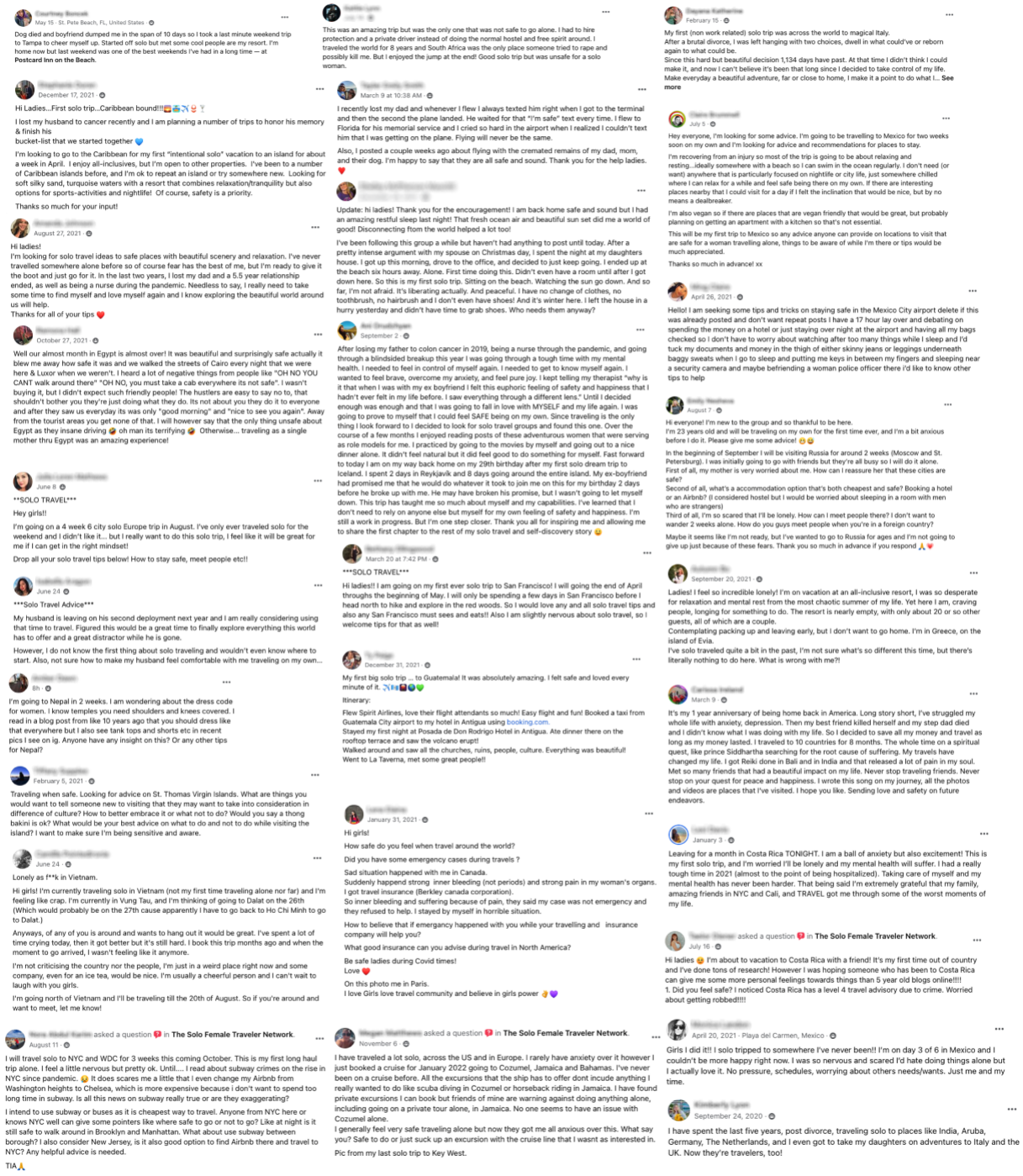


Figure 20: A sample of posts about solo travel from The Solo Female Traveler Network and *Girls Love Travel*®

1.2 Defining User and Design Requirements

Two personas were created to help visualise users and help understand their needs, goals, experiences, and behaviours [70]. The primary persona and empathy map (Figures 21 and 22) were based on an amalgamation of the trends found from the survey responses for those who had travelled solo before. A secondary persona was also created based on the responses of those who had not travelled solo (Appendix A.4).

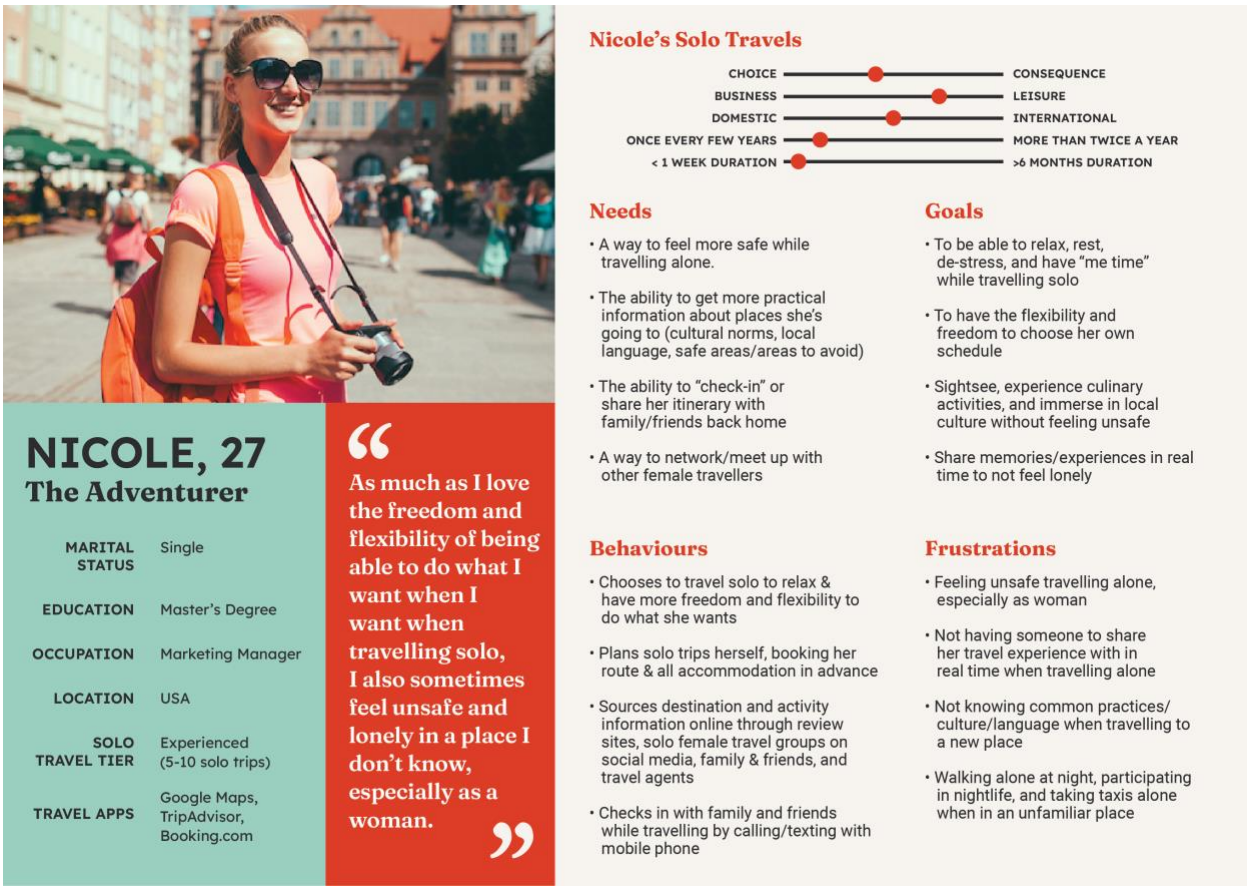


Figure 21: Primary Persona

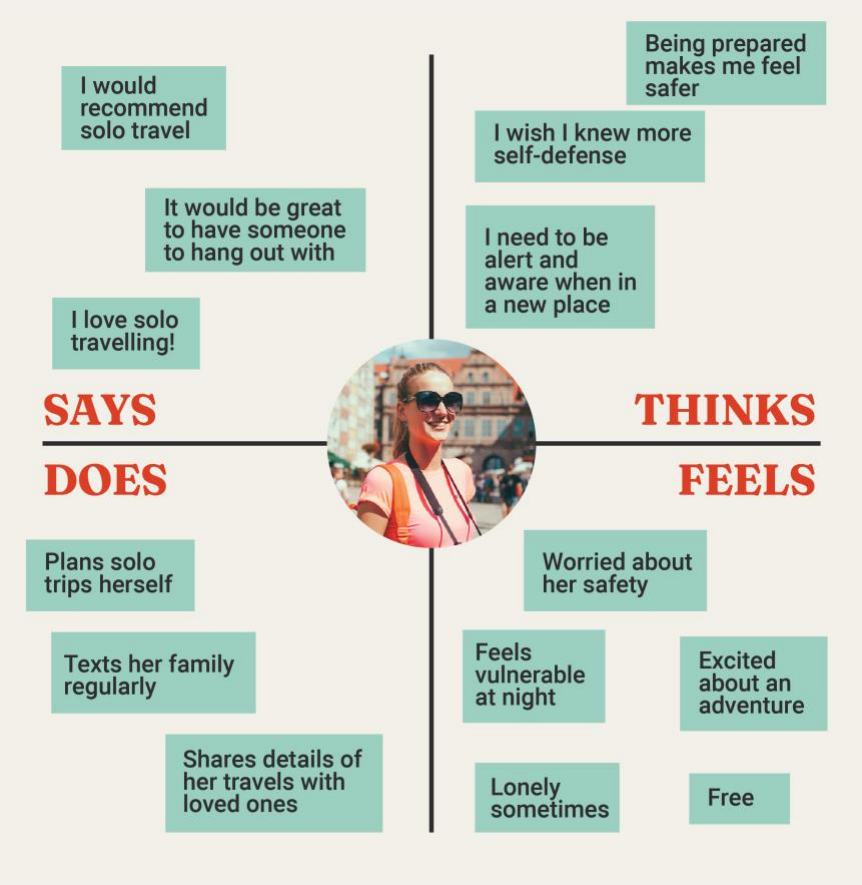


Figure 22: Empathy map created for the primary persona

Next, affinity diagrams (Appendix A.4) were created in Invision to bundle and group the large amount of answers and ideas from survey responses into their natural relationships [70]. The qualitative survey responses were organised by question and clustered into themes. Of those themes, those that were actionable within the context of this project were consolidated. For example, many respondents said being able to carry a self defense weapon would make them feel safer while travelling solo, which is beyond the scope of a digital product. They were then matched to empowerment principles from Schneider [43] and Wang and Burris [20] (Figure 23). These would be become the basis for the app's functionality and features.

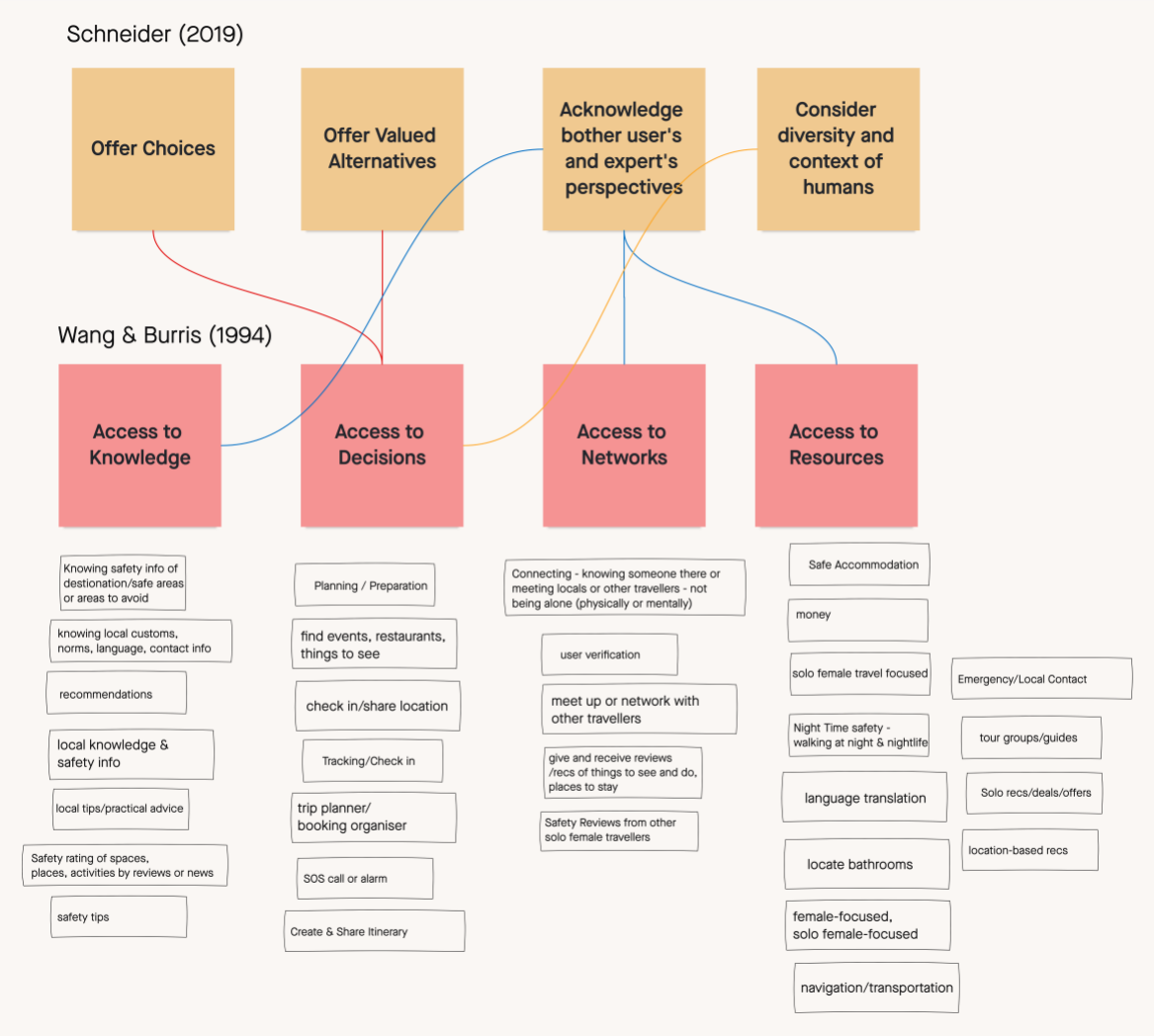


Figure 23: Results of Affinity Diagrams

1.3 Co-Design Workshop

A co-design workshop was conducted to give users the chance to be directly involved in the design process of the product, instead of just being passive recipients [49]. This fostered user empowerment and incorporated participatory design into the design methodology of this project.

The 2-hour remote workshop consisted of 12 activities designed to involve the 4 participants in the Define, Ideate, and Prototype phases of the design thinking process (Figure 11).

Participants created problem definition and How Might We statements, brainstormed app features, organised those features with an open card sort (Figure 24), and even sketched ideas during a Crazy 8's exercise (Figure 25). Participants also got the chance to brainstorm the app's colour scheme and name, and their input would end up being directly implemented into the final design.

The 2-hour remote workshop consisted of 12 activities designed to involve the 4 participants in the Define, Ideate, and Prototype phases of the design thinking process (Figure 11).

Participants created problem definition and How Might We statements, brainstormed app features, organised those features with an open card sort (Figure 24), and even sketched ideas during a Crazy 8's exercise (Figure 25). Participants also got the chance to brainstorm the app's colour scheme and name, and their input would end up being directly implemented into the final design.

Figure 24: Open Card Sort

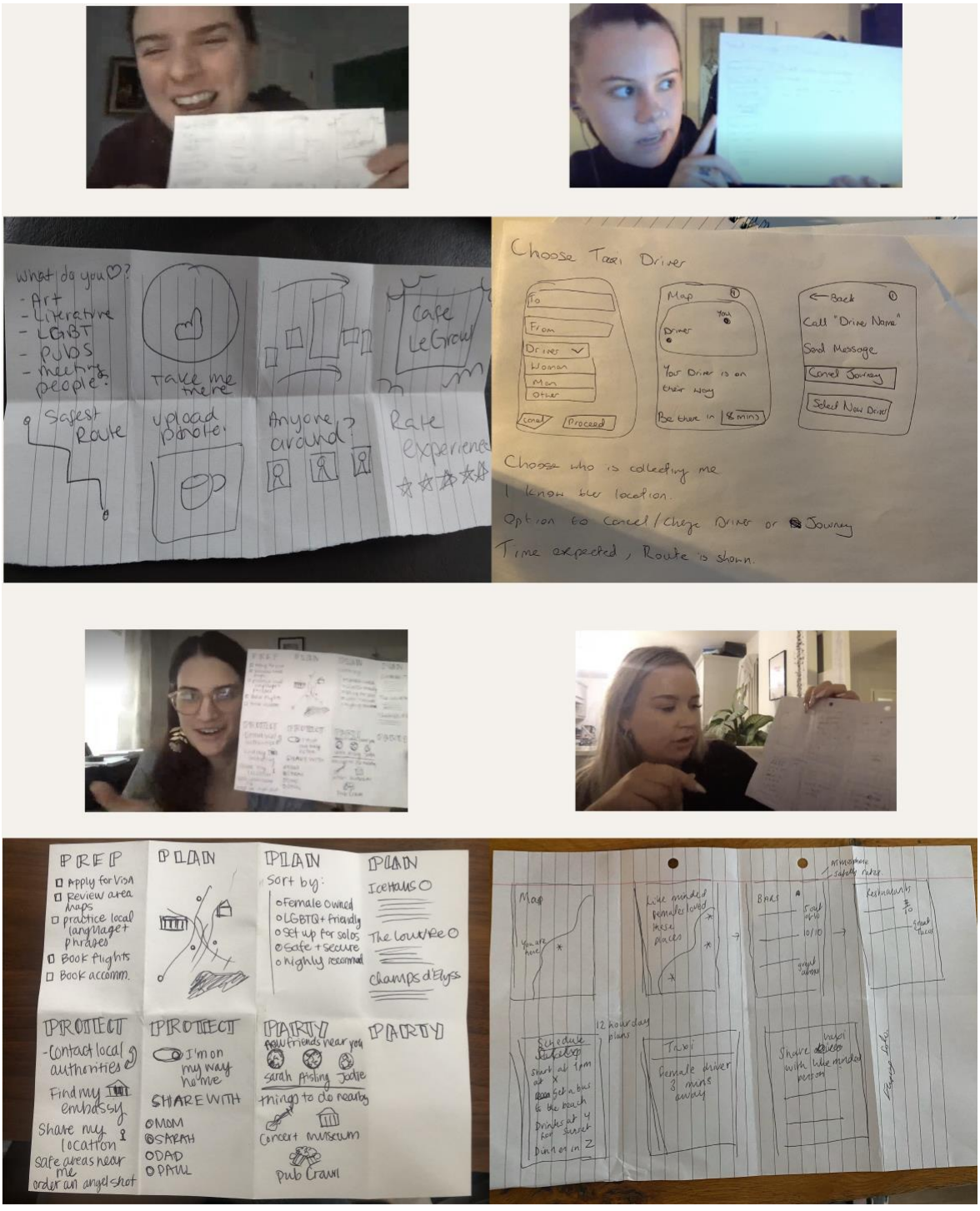


Figure 25: Crazy 8's

In a post-workshop survey, participants noted that they enjoyed doing the activities, hearing others' opinions, and felt comfortable and encouraged to share their ideas. Participants strongly agreed that they learned a lot from the workshop, were proud of their contributions, and that the workshop made them feel empowered. A full synopsis of the workshop can be found in Appendix A.5.

1.1 The Design Process

After all exploratory research methods and the co-design workshop was conducted, and user and design requirements were defined, the following design decisions were made:

- The core app functions would be: Safety, Trip Planning, Exploration and Discovery of Destinations, and a Community of female solo travellers.
- Two versions of the app would be created and tested – one with traditional onboarding and one with customisable onboarding – to learn whether giving users choice and control at the onboarding stage would affect their feeling of empowerment.
- There would also be a focus on including thorough user verification at the onboarding stage.

1.1.1 Wireframing

Once core app functionality was decided, proposed task flows and screens (Appendix A.6) were quickly sketched to begin building the information hierarchy and visualising the path users will go through to complete a particular task. Then, low-fidelity digital wireframes were created in Figma to begin bringing the app functionality to life. Figure 26 shows some key screens from the wireframes. Guerrilla tests of these initial designs were conducted with 4 participants to get early feedback and iron out any issues with the prototype or task flows.

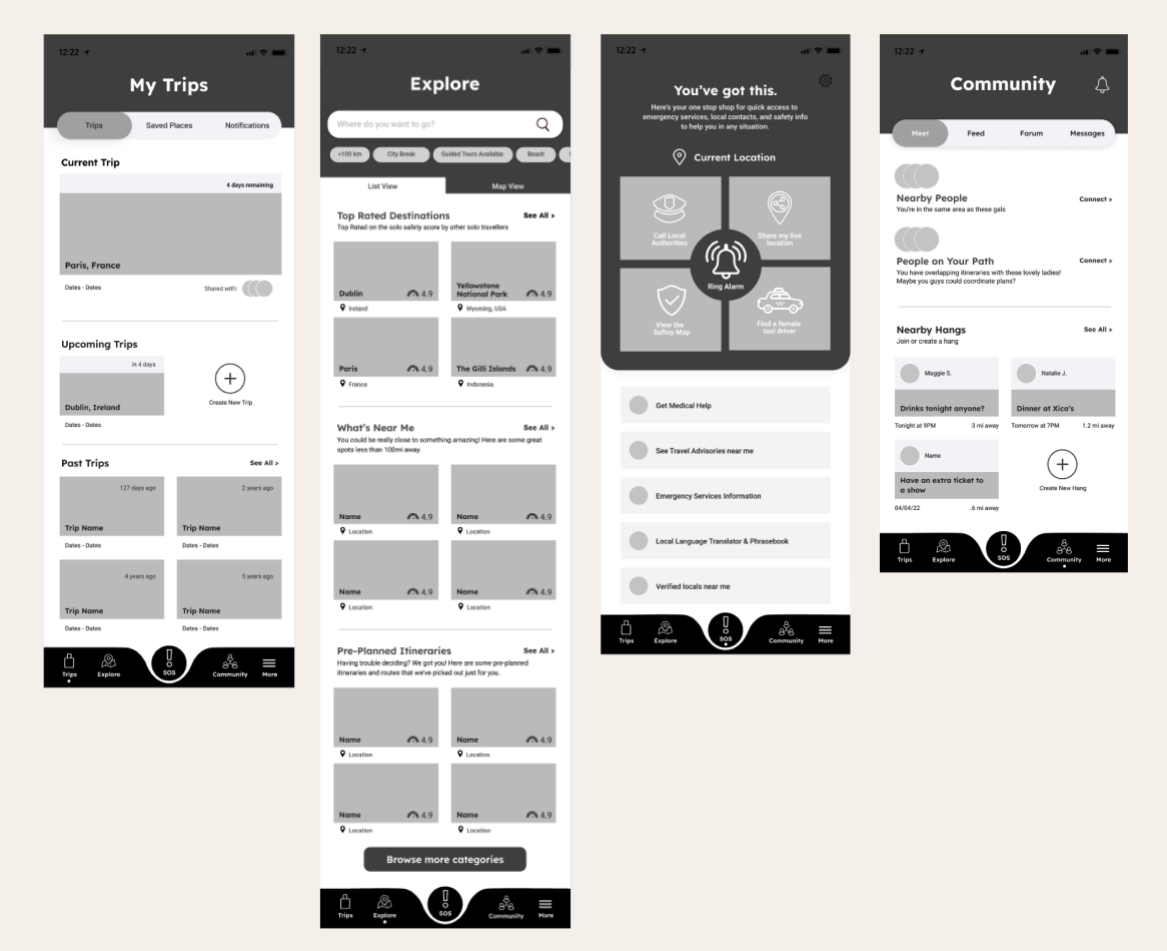


Figure 26: Key screens of the initial app wireframe – the landing pages for the Trips, Explore, SOS, and Community.

Guerrilla testing mainly revealed issues with the Figma prototype, specifically screen linking and clicking issues. Participants also commented that the tasks could be simplified. The wireframes and full guerrilla testing session can be found in Appendix A.7.

1.1.2 Design Inspiration

A moodboard (Figure 27) with common UI patterns found in similar apps, and inspiration for the icons, illustrations, and fonts helped to visualise the desired look and feel. The app colours were taken directly from the results of the co-design workshop and edited slightly to ensure readability. The name was also taken directly from the co-design workshop. These elements became the app's visual identity (Figure 28). A high-fidelity prototype was then produced, implementing feedback from the guerrilla tests.

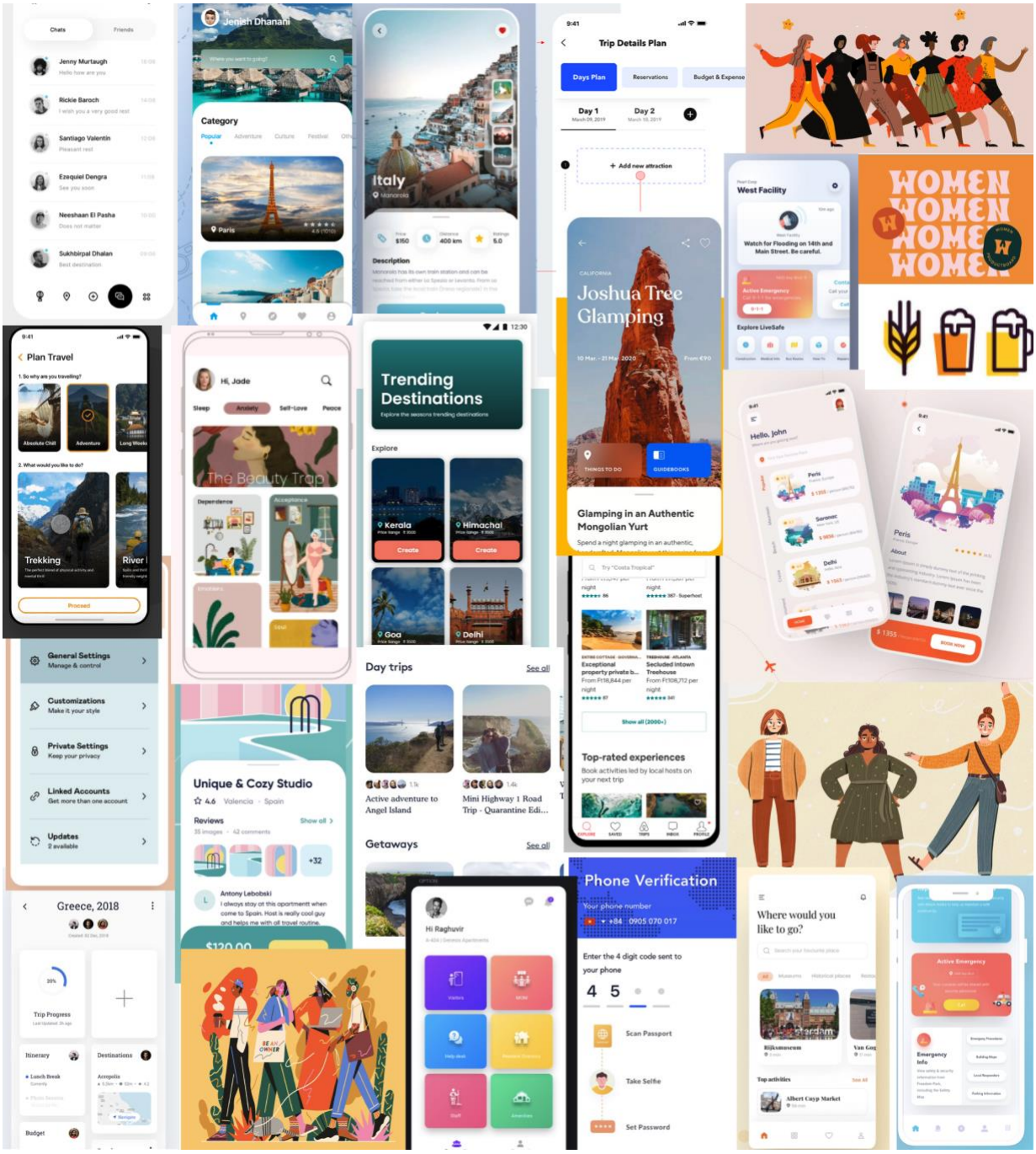


Figure 27: Moodboard for the WING WOMAN app

Figure 28: WING WOMAN final visual identity

1.1.1 First Iteration

A sample of the iteration process carried out between the low-fidelity wireframe and high-fidelity prototype stages can be seen in Figure 29. The full prototype can be found in Appendix A.8.

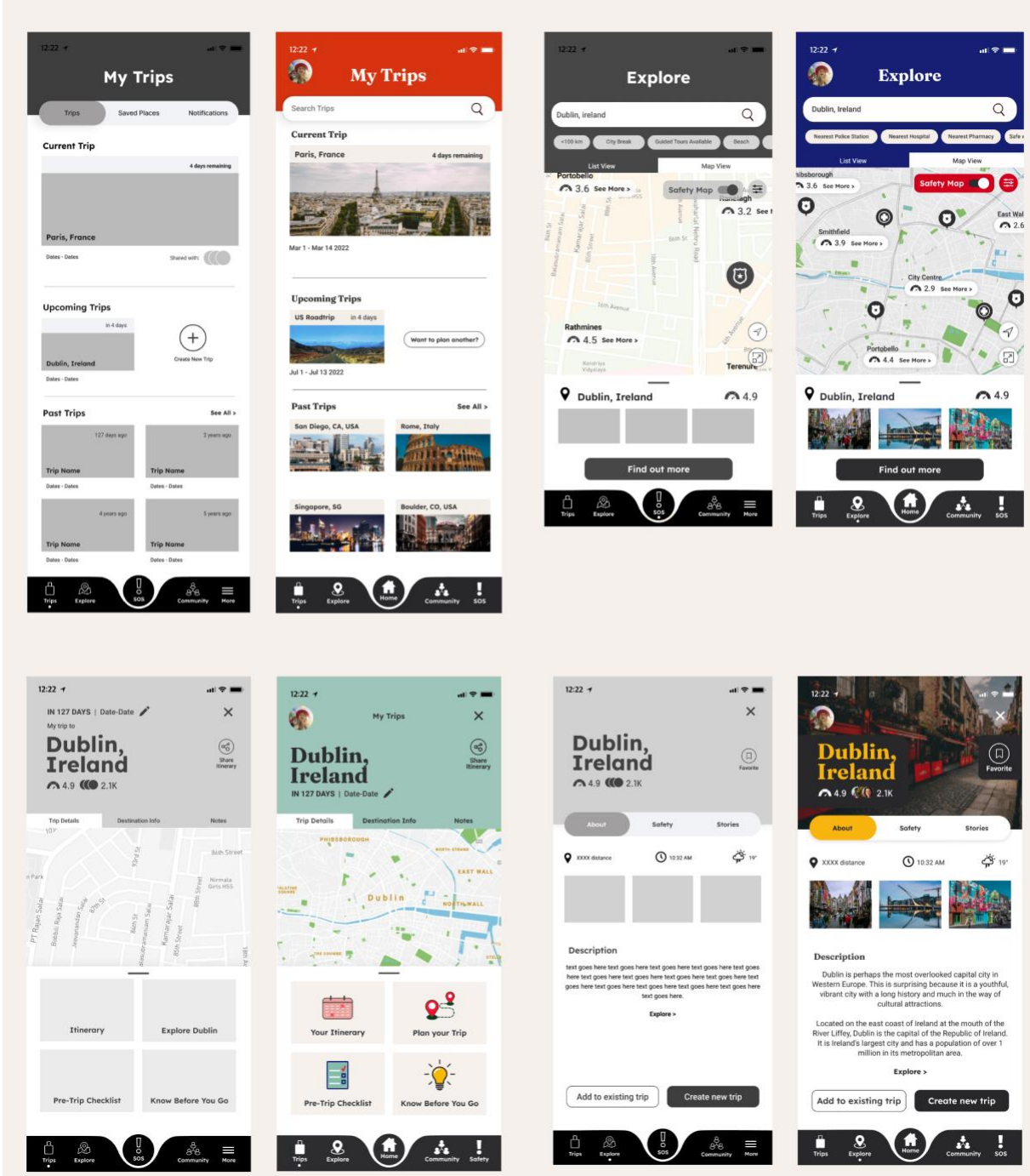


Figure 29: Initial wireframe key screens and their high-fidelity counterparts

1.1.1 Simplified Tasks

The original tasks used during guerrilla testing were simplified to ensure testing participants were still taken through the main functionalities of the app but not overwhelmed (Figure 30).

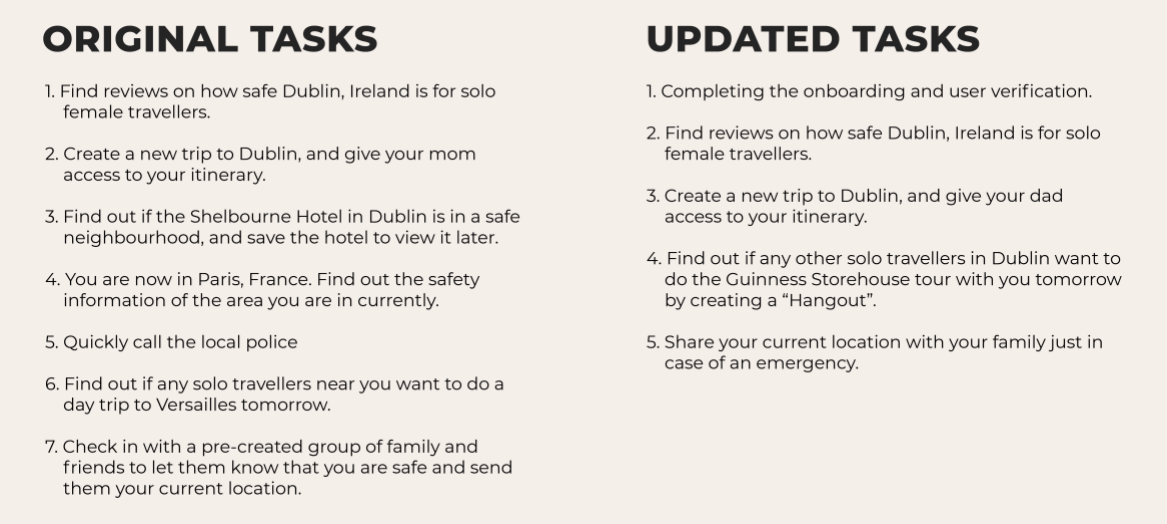


Figure 30: Original tasks for guerrilla testing (left) and the updated tasks for final testing (right)

1.1.2 Pilot Testing

Two rounds of pilot tests were conducted with 17 participants to catch any issues with the new high-fidelity prototype, the updated tasks, the usability testing flow in the user testing software Maze, and the pre- and post-test questionnaires built in Microsoft Forms.

The pilot testing feedback was gathered (Appendix A.8), then problems were addressed (Table 4), resulting in the final design iteration that was ready for testing. Edits made after pilot testing can be seen in Figure 31.

Table 4: Problems found from pilot testing

Problem	Solution
Cluttered	Layouts and icons simplified
Navigation issues	Prototype linking issues resolved
SOS page cluttered	Page simplified
“SOS” wording misleading	Changed from “SOS” to “Safety”
Users had trouble sharing itinerary	“Share Itinerary” button made larger, “Your Itinerary” page built

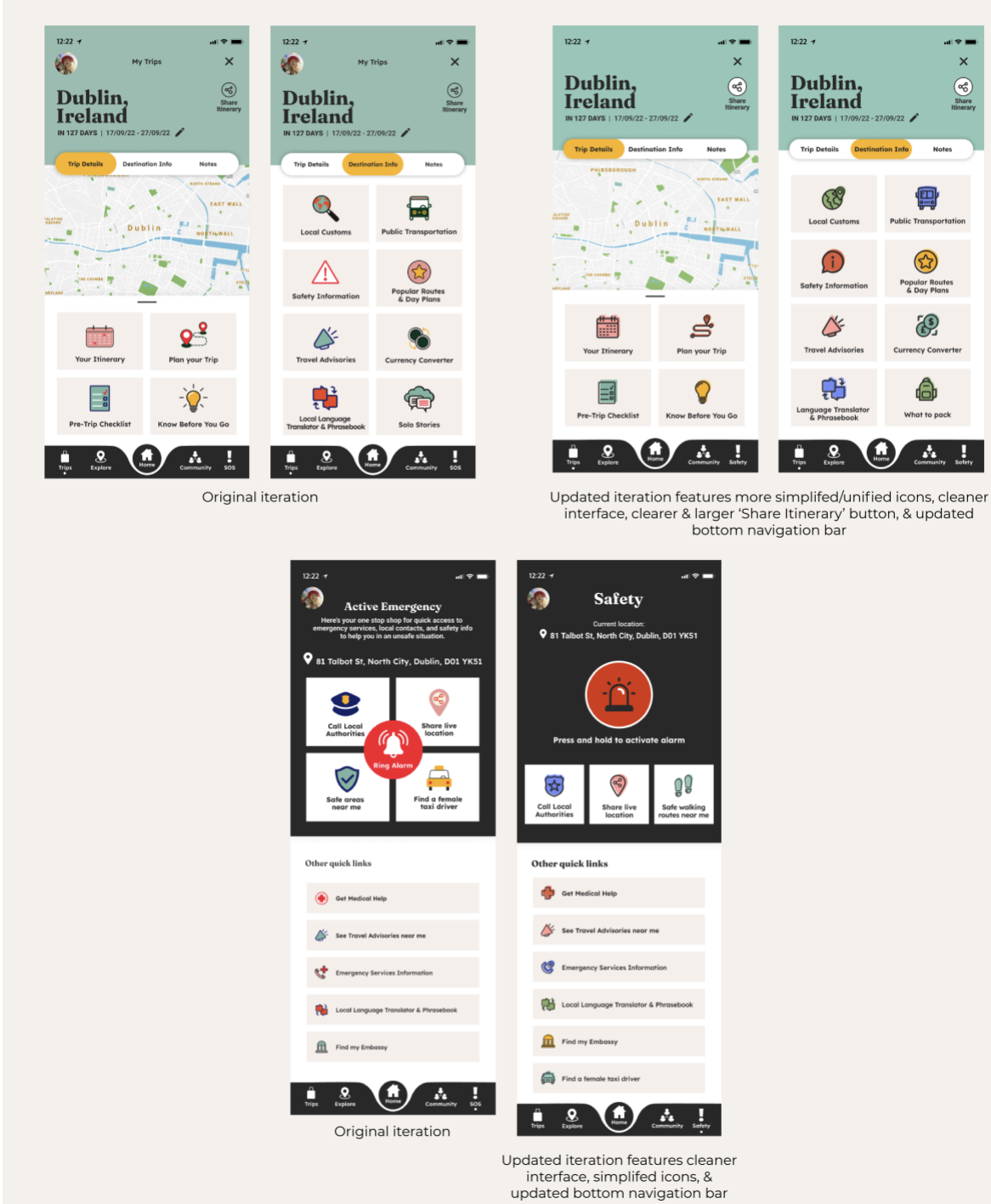


Figure 31: Changes made after Pilot Testing

1.1.3 Traditional vs Customisable Onboarding

As mentioned in Section 5.5, two variations of the app – one with traditional onboarding and one with customisable onboarding – were built to test if the customisable element impacted user empowerment. The traditional onboarding included a feature promotion, account creation, and user verification (Figures 32 and 33). The customisable onboarding featured an additional component where users could select widgets and build their home screen (Figure 34). Onboarding also featured empowering and encouraging text throughout.

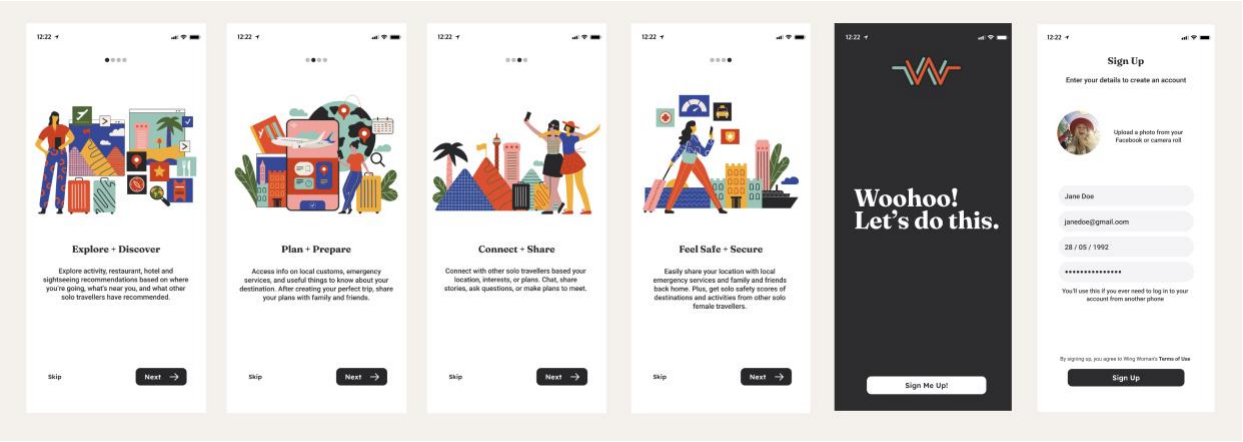


Figure 32: Key screens of app information and sign up during onboarding

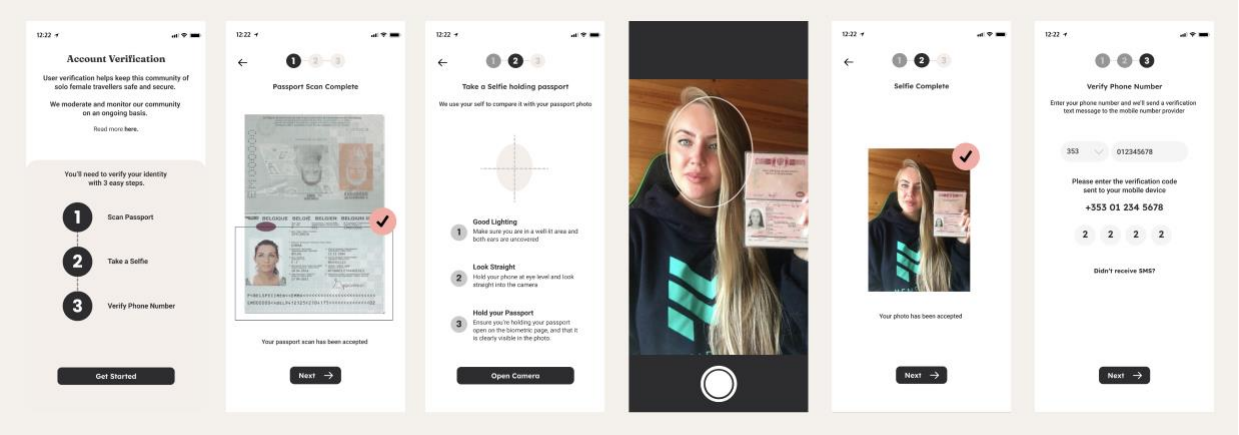


Figure 33: Key screens of user verification steps during onboarding

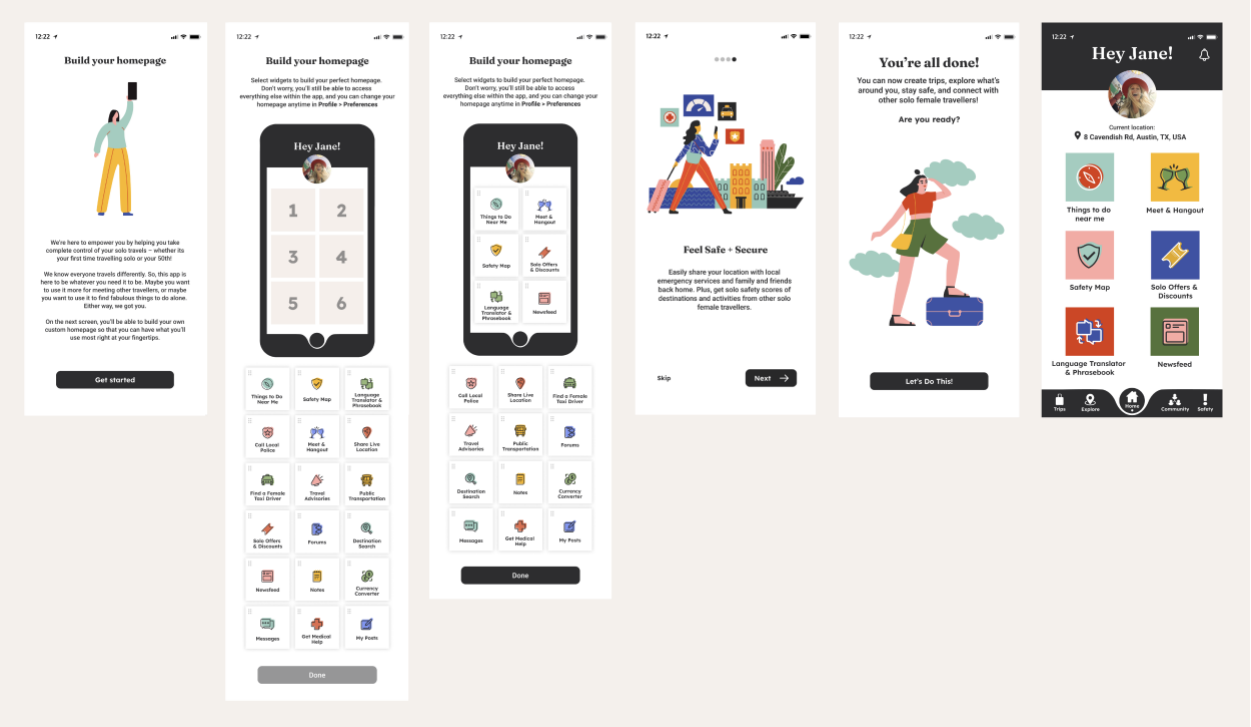


Figure 34: Key screens of customisable onboarding addition, allowing users to build their homepage.

1.2 Second Iteration

The full second prototype can be viewed at Appendix A.9. The prototype aligned with Wang and Burris's [40] and Schneider's [35] empowerment principles, and included Riddle's aspects of empowering UX design [73] (Figure 35). Below is an annotated walk-through of the second prototype used for testing.

Makes the user's life easier The heart of empowering UX design. The best way to accomplish this is through knowing the user problems and preferences	**Goal-Focused** Design should be centred around the user accomplishing their tasks. Strip away any unneccessary features, and highlight features that will help	**Invisible UI** Controls and functions should be intuitive and self-explanatory. Remove all distractions and hurdles so the user has a clear path to their goal	**Forgiving** User errors should not derail the user's progress. Include clear and friendly communication, like warnings before potential errors	**Consistent** Consistency cultivates security and trust. A consistent UI is essential for lulling your user into a fuller immersion	**Smooth Onboarding** Onboarding, when a user learns how to use the product, greatly affects their opinions about it. Use this phase to point out any features they may not notice or understand.	**Create Meaningful Delight** Delightful additions can improve the user's mood, and even comprehension of the functionality. Polished aesthetics, a human tone, and small discoverables are small additions with big results
- Extensive user research - Features on app are directly from user comments and suggestions in survey and aim to help them solve their problems	- Task-oriented - Completion of task clearly indicated (ex: when sharing itinerary or location or creating Hangout) - All features and functionality come directly from users and aim to help them solve their problems	- All buttons & controls clearly labelled - Navigation bar clearly labelled - Usability testing performed to determine if task flows are intuitive.	- X buttons to exit and back arrow buttons to return to previous screen - Buttons greyed out and user has to input appropriate information before they can continue	- Typography, colours, tone of voice and iconography, and illustration style consistent throughout - Familiar design patterns (Chat function, Map Function, etc)	- 2 onboarding options including feature promotion, account creation, user verification, and home page customisation	- Friendly, encouraging human tone throughout - "Nice to have" additions like featuring female-owned businesses and offering downloads for offline use

Figure 35: Riddle's aspects of empowering UX design found in the prototype

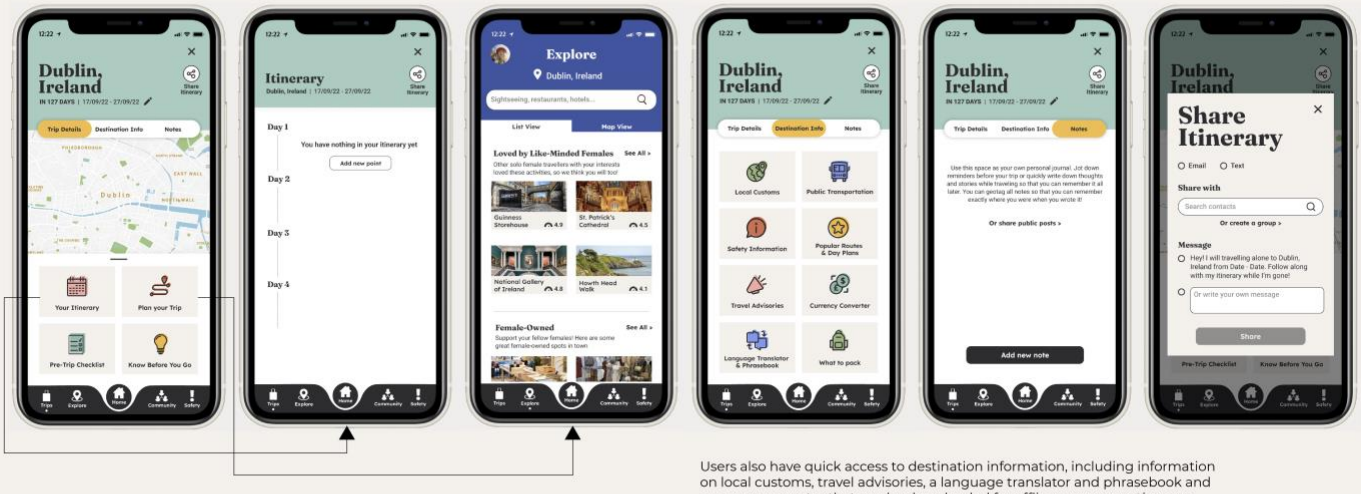
BROWSING DESTINATIONS & CREATING A TRIP

When users are browsing destinations, they can get general information about the destination, as well as view the 'Solo Safety Score' to see what other solo female travellers have rated this destination in terms of safety. They can also browse a feed of stories and posts from other solo female travellers that are tagged in that destination.

The user can either 'Favourite' the destination to view later, add this destination to an existing trip, or create a new trip to this destination.

Users can see all current, past, and upcoming trips from their 'Trips' landing page to keep all of their plans organised.

PLANNING A TRIP



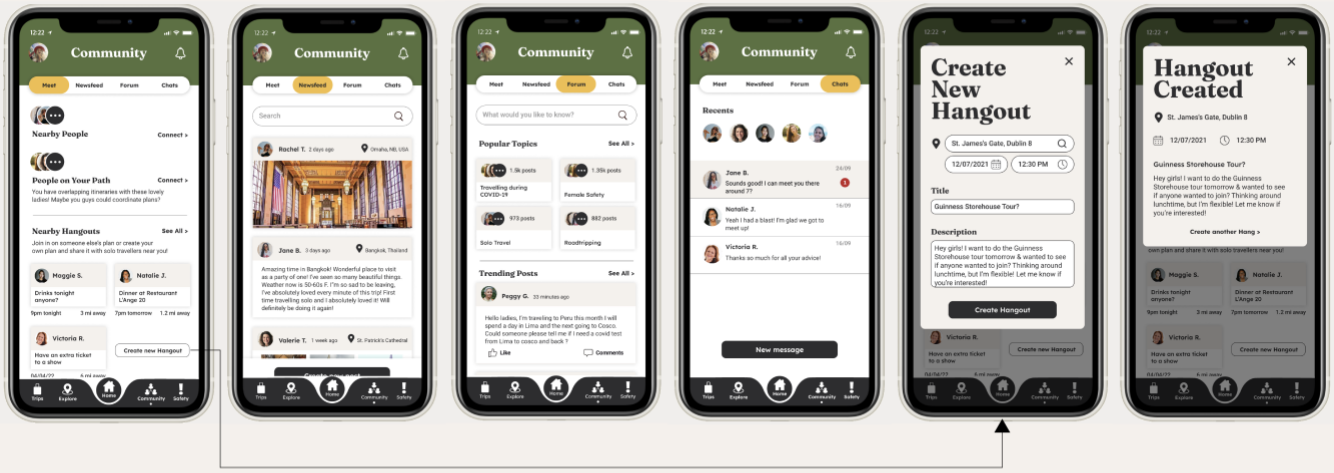
Once a trip has been created, users can plan their trip and build their itinerary from within the app – exploring activities, hotels, sightseeing, etc.

Users also have quick access to destination information, including information on local customs, travel advisories, a language translator and phrasebook and currency converter that can be downloaded for offline use, suggestions on popular day trips and routes from other solo female travellers.

There is also a place for users to write notes – whether that be reminders before the trip, or geo-tagged notes during the trip.

Users can also share their itinerary via text or email family or friends so that they can feel more safe and secure knowing someone trusted knows of their plans.

MEETING & CONNECTING WITH OTHER SOLO TRAVELLERS

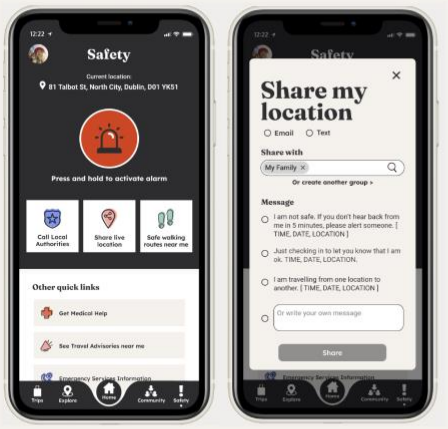


The 'Community' allows users to connect, network, talk, and meet up with other solo female travellers.

'Hangouts' allow users to join in on someone else's plan or create a plan and share it with solo travellers near you to see if they want to join in. Users can browse Hangouts happening near them. Users can also find travellers nearby or who will be nearby, based on their itineraries, to connect and make plans with.

Users can also browse a newsfeed of posts from others, or ask and answer questions in the Forum.

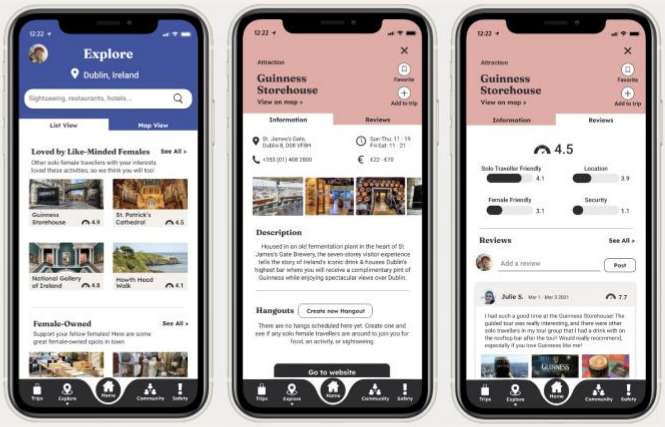
SAFETY FEATURES



Users can access a range of safety features, including setting off a loud alarm if in an unsafe situation, calling the local authorities automatically without having the look up the number, finding safe walking routes, and having quick access to emergency medical services.

Users can also share their live location with family and friends in case of an emergency.

FINDING THINGS TO DO



Users can browse and get information ans safety reviews on a range of activities and businesses including sightseeing, restaurants.

1.3 Testing

Remote and unmoderated usability testing was conducted using a mixed-tool approach. Participants who had volunteered to participate in testing during the primary research survey were contacted via email. Users were asked to complete a pre-test questionnaire in Microsoft Teams, a usability test in Maze, and a post-test questionnaire in Microsoft Teams. A split link tool was used to ensure equal participants for both the traditional onboarding and the customisable onboarding tests.

2 RESULTS

A total of 68 participants completed the usability testing, with 62 of the responses being deemed valid for the purposes of this study. To be deemed a valid response, participants had be over 18 years old, identify as female, and had to have completed the pre- and post-test psychological empowerment scale, the usability test in Maze, and the post-test UEQ.

The final sample of 62 participants consisted of two groups, with 31 participants per group. Group A interacted with the prototype containing traditional onboarding, and Group B interacted with the prototype containing customisable onboarding. The demographic breakdown of participants can be seen in Figure 36.

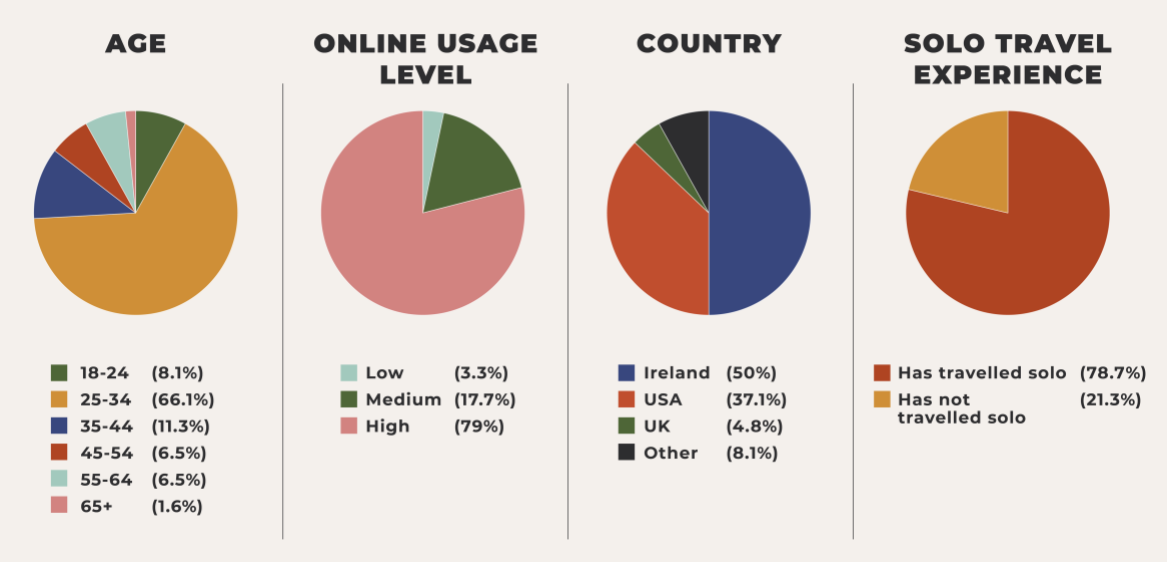


Figure 36: Demographics of usability testing participants

The quantitative data gathered from the questionnaires administered before and after the usability test were analysed with IBM's statistics software SPSS to extract data insights. The UEQ was further analysed using it's own data analysis tool, detailed in Section 6.1.2. Qualitative responses from the free text questions in the post-test questionnaire were coded and analysed using Caplena to find the most common answers. All guidance on analysing and reporting on SPSS results came from Pallant's SPSS Survival Guide [54].

2.1 Quantitative Results

The quantitative data from the usability tests came from 3 sources:

1. The pre-test psychological empowerment scores
2. The post-test psychological empowerment scores
3. The post-test UEQ scores

Quantitative data was used to answer Q1, Q2, and Q3 and evaluate H1, H2, and H3 (Figure 37).

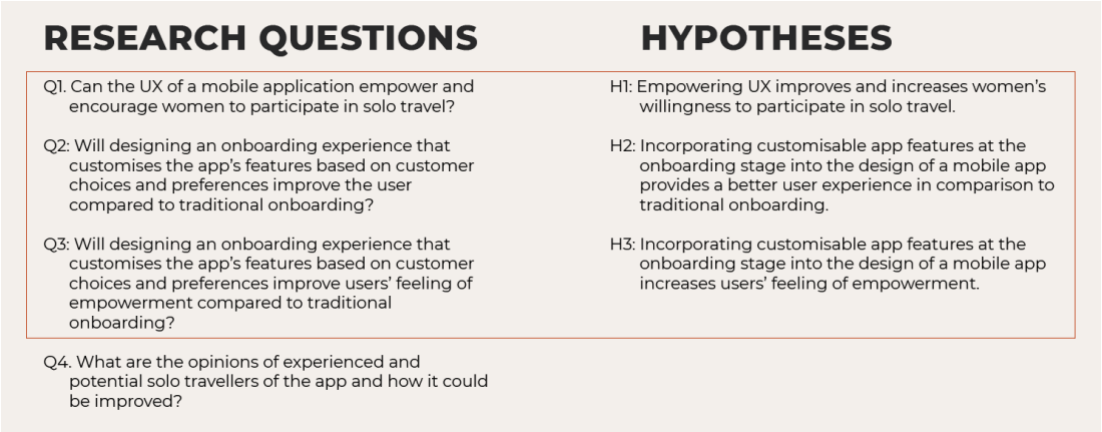


Figure 37: Research questions and hypotheses explored with quantitative data

2.1.1 Scales

The UEQ is a widely used evaluation tool for interactive products consisting of 26 items that are rated on a 7-point Likert scale [62]. There is no total score for the UEQ; the overall result is based on 6 subscales: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty.

The Psychological Empowerment scale is a theory-based four-dimensional measure consisting of 12 questions ranked from “Very Strongly Disagree” to “Very Strongly Agree” on a 7-point Likert scale [40]. Each of the 4 dimensions of empowerment – Meaning, Competence, Self-Determination, and Impact – contributes to an overall construct of empowerment, with 3 questions per dimension.

The rationale for using these scales for this study is described in Section 4.5.1, and the full scales can be found in Appendix A.2.

2.1.2 Assessing Normality and Reliability of Scales

Normality tests were performed to determine what tests could be conducted. The Shapiro-Wilk *Sig.* value was > .05 for the pre- and post-test psychological empowerment scores, indicating normal distribution, and < .05 for the UEQ scores, indicating abnormal distributed. Therefore, Independent and Dependent Sample T-Tests could be performed on the psychological empowerment data to determine if there was a significant difference between Groups A and B (Independent Sample T-Test) and between overall pre- and post-test scores (Dependent T-Test). Because the UEQ scores were not normally distributed, the non-parametric alternative to the Independent Sample T-Test, the Mann-Whitney Test, would be used to analyse the UEQ scores between Groups A and B.

Table 5: Tests of Normality

	Kolmogorov-Smirnov			**Shapiro-Wilk**		
	Statistic	*df*	*Sig.*	*Statistic*	*df*	***Sig.***
PsyEmp_PreTest	.077	62	.200	.979	62	.368
PsyEmp_PostTest	.077	62	.200	.964	62	.064
UEQ_Attractiveness	.128	62	.013	.918	62	<.001
UEQ_Perspicuity	.156	62	<.001	.905	62	<.001
UEQ_Efficiency	.144	62	.003	.918	62	<.001
UEQ_Dependability	.090	62	.2	.961	62	.048
UEQ_Stimulation	.136	62	.006	.904	62	<.001
UEQ_Novelty	.129	62	.012	.930	62	<.002

The psychological empowerment scale has good internal consistency, with a Cronbach's alpha coefficient reported of 0.72 for one sample and 0.62 for another during Spreitzer's initial assessment in 1995 [40] and > 0.7 by Siegall and Gardner in 2000 [61]. For the Cronbach's Alpha reliability analysis, values > 0.7 are acceptable, but values > 0.8 are preferred. In this current study, the Cronbach alpha coefficients for both the pre- and post-test measures were both > 0.8, signifying good reliability.

Laugwitz et al. [17] suggest the UEQ also has sufficient internal consistency, with a Cronbach alpha coefficient reported of > 0.7 for 5 out of the 6 subscales. In this current study, the Cronbach alpha coefficients for 1 UEQ subscale was < 0.7, 2 were > 0.7, and 3 were > 0.8. These statistics for both scales can be seen in Table 6.

Table 6: Reliability Statistics

Problem	**Cronbach's Alpha**	N of Items
PsyEmp_PreTest	.837	12
PsyEmp_PostTest	.843	12
UEQ_Attractiveness	.876	6
UEQ_Perspicuity	.929	4
UEQ_Efficiency	.809	4
UEQ_Dependability	.658	4
UEQ_Stimulation	.797	4
UEQ_Novelty	.754	4

2.1.3 Comparing Overall Pre- and Post-Test Psychological Empowerment Scores (H1)

H1 stated that empowering UX improves and increases women's willingness to participate in solo travel.

A Dependent Sample T-Test was conducted to determine if there was a significant difference between the pre- and post-test psychological empowerment scores of the entire testing group to evaluate the impact of the proposed app on participants' feeling of empowerment. A Dependent Sample T-Test is used to measure changes in scores at two different times, often after some intervention [54]. Tables 7 and 8 shows there was a

statistically significant increase on psychological empowerment scores from pre-test (*M* = 63.53, *SD* = 12.17) to post-test (*M* = 70.08, *SD* = 9.39), t(61) = 6.16, p < .001 (two-tailed). The mean increase in scores was 6.55 with a 95% confidence interval ranging from -8.67 to -4.42. The eta squared statistic (.38) indicated a large effect size. Therefore, H1 is accepted.

Table 8: Paired Sample Statistics

	Mean (M)	*N*	***Std. Deviation (SD)***	*Std. Error Mean*
PsyEmp_PreTest	63.5315	62	12.17564	1.54631
PsyEmp_PostTest	70.0785	62	9.38640	1.19207

Table 7: Paired Samples Test

	Mean	*Std Deviation*	*Std. Error Mean*	*Lower*	*Upper*	*t*	*df*	***Sig. (2-tailed) (p)***
PsyEmp_PreTest PsyEmp_PostTest	-6.54707	8.36960	1.06294	-8.67254	-4.42159	-6.159	61	<.001

Additionally, the UEQ was analysed using the UEQ Data Analysis Tool, which measures each of the 6 subscales against a benchmark data set of > 21,000 persons from 468 studies [62]. All subscales scored Good, Above Average, or Excellent against the benchmark (Figure 38), and all answers were positively distributed (Figure 39). Figure 40 also shows the means of Attractiveness, Pragmatic Quality (Perspicuity, Efficiency, and Dependability), and Hedonic Quality (Stimulation, Originality).

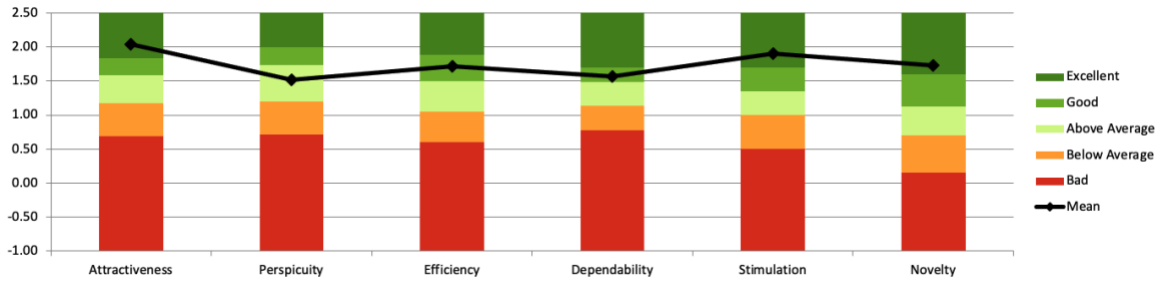


Figure 38: UEQ scale means in relation to existing values from a benchmark data set

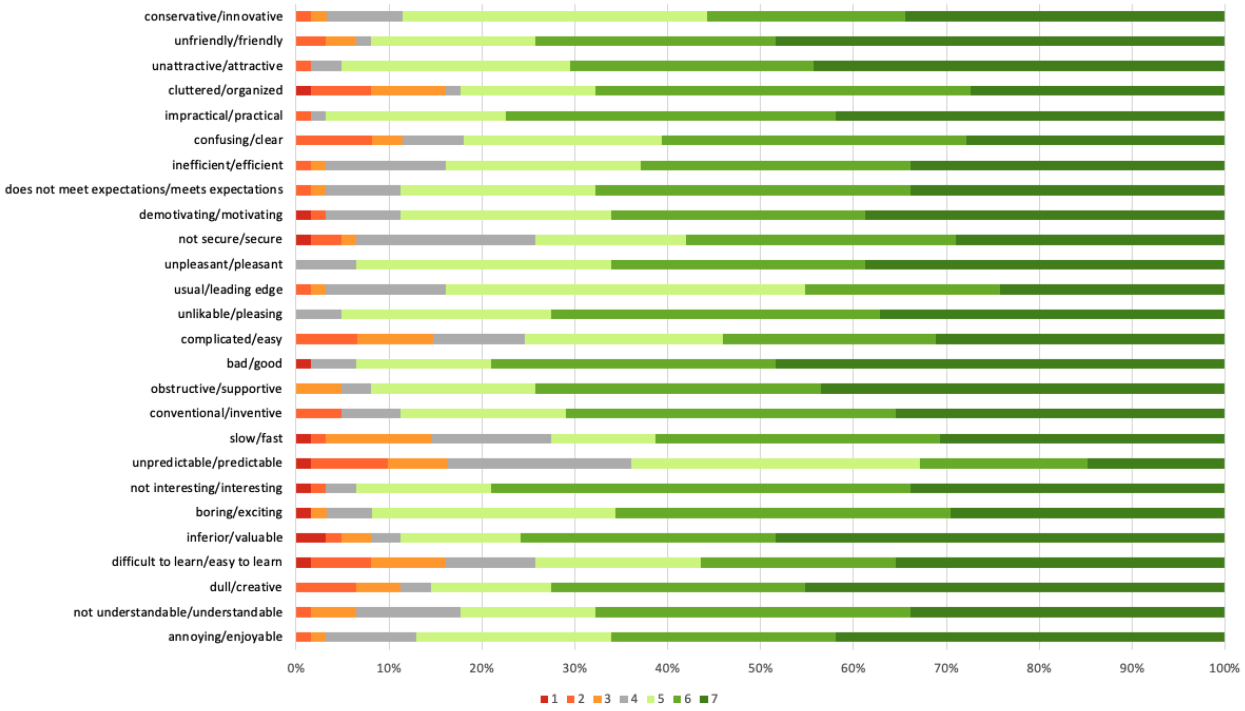


Figure 39: Distribution of answers per item

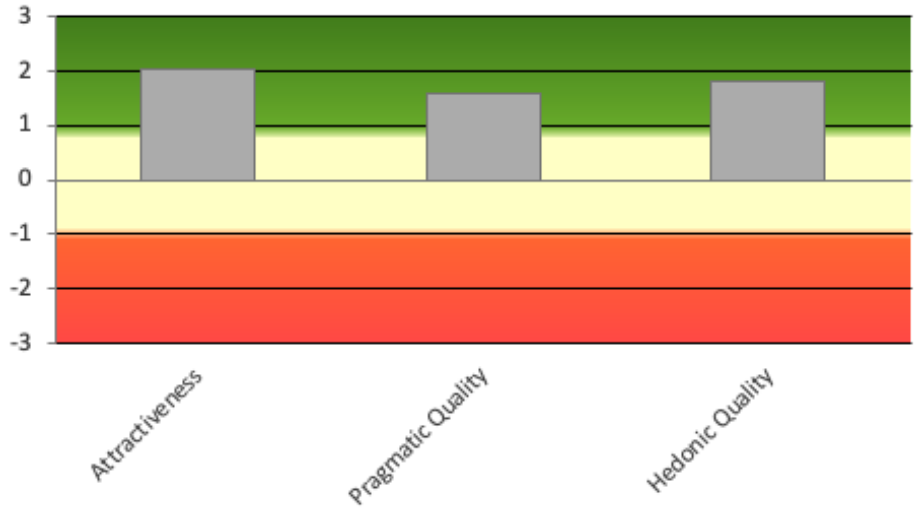


Figure 40: Mean of the 3 pragmatic and hedonic quality aspects

2.1.4 Comparing user experience scores between Groups A and B (H2)

H2 stated that incorporating customisable app features at the onboarding stage into the design of a mobile app provides a better user experience in comparison to traditional onboarding.

A Mann-Whitney Test revealed no significant difference in UEQ scores between Groups A (traditional onboarding) and B (customisable onboarding). None of the subscales have a probability value (p) < .05 (Table 9), indicating the results are not significant. Additionally, calculating the median scores per group (Table 10) revealed marginal difference between the medians of Group A vs Group B. Therefore, it can be concluded that there is no significant difference in the user experience between Groups A and B, and H2 is rejected.

Table 9: Mann-Whitney Test Statistics

	UEQ_Attractiveness	UEQ_Perspicuity	UEQ_Efficiency	UEQ_Dependability	UEQ_Stimulation	UEQ_Novelty
Mann-Whitney U	410.000	413.500	410.000	394.500	409.000	410.500
Wilcoxon W	906.000	909.500	906.000	890.500	905.000	906.500
Z	-.999	-.948	-.997	-1.216	-1.016	-.993
Asymp. Sig. (2-tailed) (p)	.318	.343	.319	.224	.310	.321

Table 10: Median Scores Per Group

		UEQ_Attractiveness	UEQ_Perspicuity	UEQ_Efficiency	UEQ_Dependability	UEQ_Stimulation	UEQ_Novelty
A – Traditional Onboarding	N	31	31	31	31	31	31
	Median	37.0000	24.0000	24.0000	23.8361	25.0000	24.0000
B – Customisable Onboarding	N	31	31	31	31	31	31
	Median	37.0000	23.0000	23.0000	22.0000	24.0000	22.0000
Total	N	62	62	62	62	62	62
	Median	37.0000	24.0000	24.0000	22.0000	24.0000	23.0000

2.1.5 Comparing empowerment scores between Groups A and B (H3)

H3 stated that incorporating customisable app features at the onboarding stage into the design of a mobile app increases a users' feeling of empowerment.

An Independent Sample T-Test, which compares the scores of two different groups [54], was performed on the post-test psychological empowerment scores of Groups A and B to compare the difference in scores between the 2 groups.

As seen in Tables 10 and 11, there was no significant difference in scores for Group A (M = 70.35, SD = 9.49) and Group B (M = 69.81, SD = 9.43), t(60) = .266, p = .822 (2-tailed). The magnitude of the differences in the means (mean difference = .54, 95% CI: -4.26 to 5.35) was very small (eta squared = .001). Therefore, H3 is rejected.

Table 10: Independent T-Test Results

	Group	*N*	***Mean (M)***	***Std. Deviation (SD)***	*Std. Error Mean*
PsyEmp_PostTest	A – Traditional Onboarding	31	70.3506	9.48849	1.70418
	B – Customisable Onboarding	31	69.8065	9.43193	1.69402

Table 11: Independent T-Test Results

		Levene's Test of Equality of Variances		t-test for Equality of Means						
		F	***Sig.***	***t***	***df***	***Sig. (2-tailed)***	***Mean Difference***	***Std. Error Difference***	***Lower***	***Upper***
PsyEmp_PostTest	Equal variance assumed	.003	.958	.266	60	.822	.54416	2.40291	-4.26237	5.35069

2.2 Qualitative Results

The qualitative data from the usability tests came from 3 open-ended questions asked after the usability test:

1. Please list the most negative aspect(s) of your experience with the app
2. Please list the most positive aspect(s) of your experience with the app
3. What are your opinions on how the app could be improved?

Qualitative data was used to answer research question Q4 (Figure 41). Users were given open-ended questions to write free answers to what they thought the positive and negative aspects of the app were, and how they thought the app could be improved (Figures 42, 43, and 44).

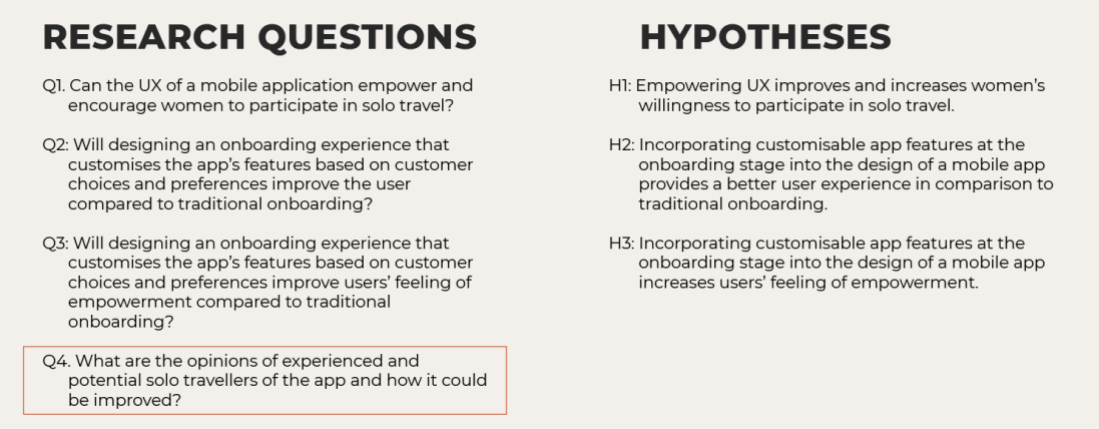


Figure 41: Research question explored with qualitative data

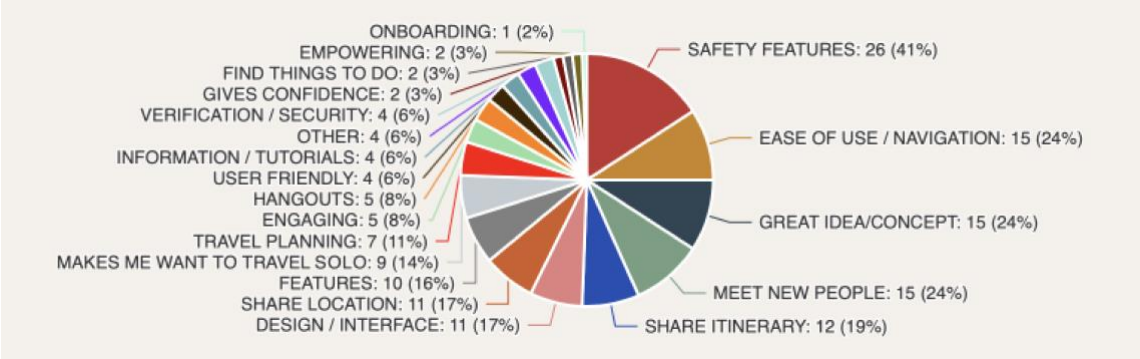


Figure 42: Positive aspects of the app

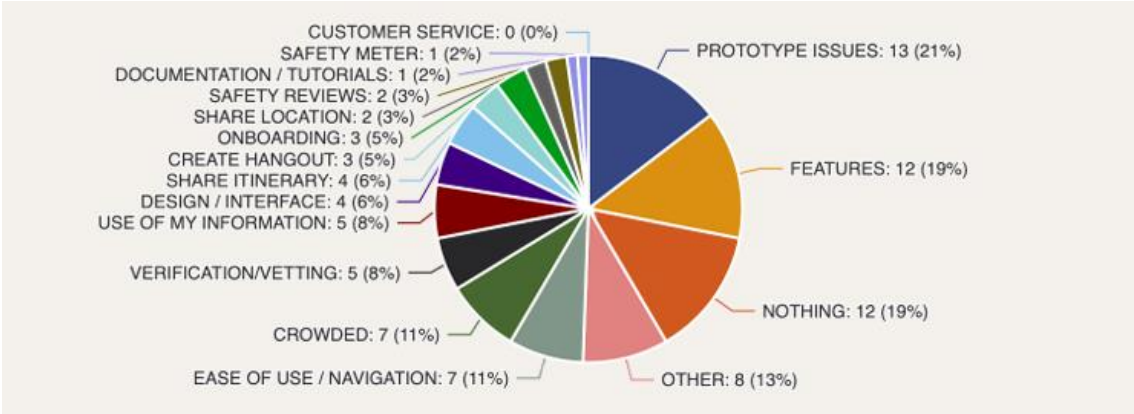


Figure 43: Negative aspects of the app

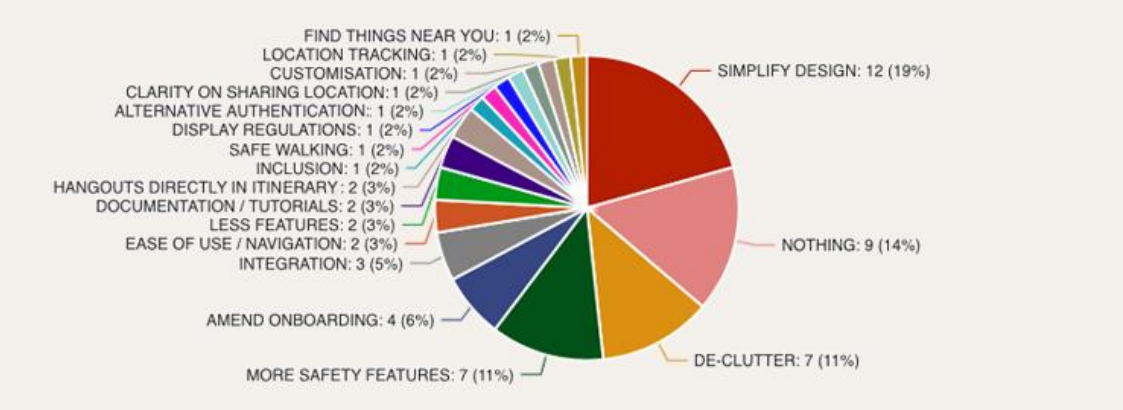


Figure 44: Proposed app improvements

3 DISCUSSION

This section will discuss the results of the quantitative and qualitative data analyses presented in Section 6, and how the relevant findings could influence and inform the design of future user empowering technology.

3.1 Demographics

The demographic information from participants revealed that the two largest age cohorts of participants was 25-34 (66.1%) and 35-44 (11.3%), with 34 being the age with the single most number of participants overall (8 participants). Most participants (79%) consider themselves to have a high online usage level, so it can be assumed that they are comfortable using technological products and are familiar with how digital products work and behave. 50% of participants were from Ireland, with a further 37.1% from the United States. Another 4 countries were represented: Canada, The UK, Italy, and Germany. As with those recruited to complete the primary research survey, most participants had travelled solo before (78.7%), while only 21.3% had never travelled solo before.

3.2 Quantitative Analysis

The goals of the quantitative data analysis were:

1. To determine if there was a significant difference between the pre- and post-test psychological empowerment scores overall. A higher total score post-test would signify that the app did succeed in making women feel empowered and therefore improving and increasing their willingness to participate in solo travel (H1).
2. To measure how the UEQ measured compared to the benchmark data set, and if answers were distributed positively, as positive scores for all subscales would indicate an overall positive user experience and signify that the app did succeed in improving and increasing women's willingness to participate in solo travel (H1).

3. To determine if there was a significant difference between the post-test UEQ scores of Group A and Group B. Group B having a higher overall score would confirm that incorporating customisable app features at the onboarding stage did have a positive effect on user experience (H2).
4. To determine if there was a significant difference between the post-test psychological empowerment scores of Group A and Group B. Group B having a higher overall score would confirm that incorporating customisable app features at the onboarding stage did have a positive effect on user empowerment (H3).

3.2.1 Validating H1

The Dependent Sample T-Test comparing the overall pre- and post-test scores of the whole group concluded that there was a statistically significant increase between the pre- and post-test scores, with an overall mean difference of 6.55. An effect size statistic of .38 was calculated which means the magnitude of the intervention's effect was large [46], with a substantial difference in the psychological empowerment scores obtained before and after the intervention.

The overall post-test UEQ scores were all positively distributed and scored Above Average, Good, or Excellent against the benchmark for all 6 subscales, with 50% of the subscales falling under Excellent. The benchmark comparison breakdown is as follows:

- Above Average (25% of results are better, 50% of results worse): Perspicuity
- Good (10% of results better, 75% of results worse): Efficiency and Dependability
- Excellent (In the range of the 10% beset results): Attractiveness, Stimulation, and Novelty.

Additionally, the means of the attractiveness, pragmatic, and hedonic quality aspects were positively evaluated and scored > 1.5. Attractiveness achieved the highest score with 2.03. Hedonic, or the non-task related "joy of use" quality (Stimulation and Originality), achieved a score of 1.83. Pragmatic, or task-related utility and usability aspects (Perspicuity, Efficiency and Dependability), achieved a score of 1.60. This signifies that of the 3 qualities, the pragmatic quality is most in need of improvement, which correlates with the qualitative results (explained in Section 6.2).

The results of the Dependent Sample T-Tests, showing a statistically significant increase between pre- and post-test psychological empowerment scores, signify an increase in participants' feelings of empowerment after the intervention. The positive distribution of answers, the positive evaluation of the means, and the above average results of the UEQ against the benchmark signify an overall positive user experience. Therefore, it can be concluded that the hypothesis H1 set forth is supported.

3.2.2 Validating H2

The Mann-Whitney Test revealed no significant difference in the UEQ scores of those with traditional onboarding (Group A) and those with customisable onboarding (Group B). None of the UEQ subscales had a probability value (p) < .05 or a significant median difference. Additionally, the effect size, or indication of the magnitude of difference between the groups [54], for all subscales were between .12-.15, indicating a small effect size using Cohen's criteria [46]. Therefore, it can be concluded that hypothesis H2 is rejected.

3.2.3 Validating H3

The Independent Sample T-Test comparing the post-test psychological empowerment scores of Group A and Group B concluded that there was no significant difference between the scores of the two groups. The overall mean difference was a marginal .54, and an effect size statistic of .001 was calculated which means only .1% of the variance in empowerment is explained by the customisable onboarding experience. Therefore, hypothesis H3 is also rejected.

3.3 Quantitative Analysis

The research data also gave insights into what users found positive and negative about the app, and what their opinions were on how it could be improved, to answer research question Q4 and get feedback for future design iterations. The most commonly mentioned positive aspects were the safety features (41%), the ease of use/navigation (24%), the overall idea/concept of the app (24%), and the ability to meet new people (24%). The most commonly mentioned negative aspects were issues and limitations with the prototype (21%), features not being in the expected place (19%), ease of use/navigation difficulties (11%), and a cluttered/crowded interface due to a lot of information and elements (11%). When it came to proposed app improvements, the most commonly mentioned suggestions were to simplify design (19%), de-clutter (11%), refining and adding more safety features (11%), amending the onboarding experience by rearranging screens and simplifying text (6%), and integrating the app with other apps and services (5%).

These results correlate with the findings from the UEQ means scores, which found that pragmatic qualities had the lowest overall scores. Therefore, it can be concluded that implementing these proposed improvements could improve the overall pragmatic quality score of the app in future tests.

4 CONCLUSION AND FUTURE WORK

4.1 Summary

This study aimed to explore whether UX design can empower and enrich the solo female traveller experience. This was accomplished by performing a literature review, posing research questions and hypotheses, incorporating an empowerment-focused design methodology, conducing various methods of user research to collect data. This was followed by implementing empowering UX principles into the design and development of a mobile app for female solo travellers, and conducting usability tests and follow-up statistical tests to determine whether the results support the hypotheses put forth. This paper also aimed to contribute to exploratory research into female solo and non-solo travellers' likes, dislikes, hesitations, and opinions on the female solo travel experience.

In conclusion and as discussed in Section 7, of the three hypotheses put forward during the course of this research, H1 was supported by the research data, and H2 and H3 were rejected. Therefore the results of the study support the following statements:

1. Empowering UX did improve and increase women's willingness to participate in solo travel.
2. Incorporating customisable app features at the onboarding stage into the design of a mobile app did not prove to provide a better user compared to traditional onboarding.
3. Incorporating customisable app features at the onboarding stage into the design of a mobile app did not prove to increase users' feeling of empowerment compared to traditional onboarding.

Within the context of this study, giving users choice and control in the form of homepage customisation during onboarding did not provide a better user experience or increase users' feelings of empowerment compared to traditional onboarding with a fixed homepage. Although this seemingly conflicts with research citing user choice and autonomy as an important element of empowerment [5, 20, 26, 33, 43], there are certain limitations to this study that are discussed in Section 8.3. Additionally, the methodology of this study focused on user empowerment through choice and control in the form of participatory design, primarily evidenced in a co-design workshop. Other opportunities for users to be given choices and to have control over their decisions as one of the dimensions of empowerment were present within the functionalities of the app itself, as shown in the Affinity Diagrams in Appendix A.4. This helped lead to the overall increase in empowerment scores after the app intervention.

4.2 Key Contributions

This study contributes to existing research on female solo travel – not only to the growing amount of research on solo female travellers and their motivations, constraints, concerns, likes, and dislikes, but also to research on non-solo travellers and their hesitations, fears, and desires when it comes to participating in solo travel in the future. The research data collected in this study was from a wide geographical range of 44 countries, which helps to minimise the geographical limitations present of much of the currently available research, as discussed in Section 2.4.2.

This study also aimed to create a bespoke design methodology focused on user empowerment, as there is currently no methodology fully dedicated to empowerment. To do this, user centred design, user empowering design, and participatory design were combined and implemented into the design thinking process. To explore the relationship between participatory design and user empowerment, a co-design workshop was conducted with a group of participants. This workshop proved an effective way to involve users in the design and development of the product, with their feedback and ideas being directly implemented into the final app design. Overall, the design methodology and focus on the incorporation of empowering principles and design ideologies proved effective, as one of the hypotheses of this study has been supported by this research. Therefore, the design methodology and rationale used during this study can potentially contribute to future projects focusing on user-empowering design and technology.

4.3 Limitations

As with most studies, there were limitations to this study that should be noted. Although the research did not present the expected results for hypothesis H2 or H3, it is important to acknowledge prototype limitations. The intervention that testing participants interacted with was only an app prototype and not a fully functioning app, and therefore it could not be truly customisable as that would have involved creating screens for hundreds of different widget combination possibilities. Instead of truly getting to customise their homepage during the onboarding stage, users were instructed which features to add to their homepage, and in what order. Although this was supposed to mirror a "real" interaction with the app and be an example of how the custom homepage could be built, it must be acknowledged that the experience was not truly customisable. Therefore, it could be argued that perhaps, had the user interacted with a wholly customisable product and truly had the choice to customise their homepage as they wished, the difference in their feeling of empowerment versus traditional onboarding could have been statistically significant and supported hypothesis H2.

Additionally, there are limitations when it comes to usability testing situations compared to real life. Completing delegated tasks in a controlled setting does not necessarily mirror a real life situation. Some testing participants remarked that they would have liked to be able to explore the prototype more and become familiar with the layout before being asked to complete the tasks. This could be addressed in future studies by building out more of the app's functionality.

Another limitation that must be noted is that although an effort was made to recruit a diverse group of participants for the primary research survey, co-design workshop, and usability testing, in the end there was a lack of diversity of age ranges and geographical locations. The majority of participants were from Ireland or the United States and within the 25-34 and 35-44 age ranges due to the nature of the researcher's personal network. Additionally, although an attempt was made to gather data and insights from both solo and non-solo travellers, the majority of survey, testing, and co-design workshop participants had travelled solo before at least once.

Lastly, the lack of a full or standardised design framework focusing on user empowerment, and of a scale to specifically measure user empowerment in the context of HCI, must be recognised. This study aimed to create a bespoke user empowering design methodology and reformatted existing scales to fit the need of this study, but it can be argued that had a standardised methodology and scales been used, the results of this research would be stronger.

4.4 Future Work

As the design thinking process is iterative and cyclical [75], the prototype can continue to be amended as per user feedback and functionality can continue to be expanded and refined. Immediate future work can consist of conducting more rounds of usability tests with new and improved iterations of the prototype, with a focus on recruiting more non-solo traveller participants and participants of different age cohorts.

The research and findings from this study have potential to be expanded on further in the long-term. Future work into developing a design framework for user empowerment is important for the expansion of user empowering design as an important focus within the realm of UX design.

REFERENCES

[1] Adele Doran. 2016. Empowerment and women in adventure tourism: A negotiated journey. *Journal of Sport & Tourism* 20, 1 (2016), 57–80. DOI:http://dx.doi.org/10.1080/14775085.2016.1176594

[2] Adrian Tanti and Dimitrios Buhalis. 2017. The influences and consequences of being digitally connected and/or disconnected to travellers. *Information Technology & Tourism* 17, 1 (2017), 121–141. DOI:http://dx.doi.org/10.1007/s40558-017-0081-8

[3] Akshay Sharma. 2012. Designing empowerment – design thinking for social impact. *Advances in International Marketing* (August 2012), 195–205. DOI:http://dx.doi.org/10.1108/s1474-7979(2012)0000023013

[4] Andreia Pereira and Carla Silva. 2018. Women solo travellers: Motivations and experiences. *Millenium - Journal of Education, Technologies, and Health* , 6 (2018), 99–106. DOI:http://dx.doi.org/10.29352/mill0206.09.00165

[5] Anna Ståhl, Jonas Löwgren, and Kristina Höök. 2014. Evocative Balance: Designing for Interactional Empowerment. *International Journal of Design* 8, 1 (2014), 43–47.

[6] Anon. 2018. Whether for business, leisure or 'bleisure', travelers are going solo. *Agoda* (October 2018).

[7] Anon. 2019. Hostelworld unveils its 'Evolution of the Hostel Traveller' Report . Hostelworldgroup.com (June 2019).

[8] Anon. 2020. empowerment. Cambridge Advanced Learner's Dictionary & Thesaurus (2020).

[9] Anon. 2021. Travel Ladies: Solo Travel App. (2021). Retrieved 2021 from https://traveltogether.app/

[10] Anon. 2021. Tourlina – Female Travel Buddy. (February 2021). Retrieved 2021 from https://tourlina.com/

[11] Anon. 2021. TravSolo – Solo Travel Easier. (July 2021). Retrieved 2021 from https://www.travsolo.com/

[12] Anon. Design Thinking Defined. Retrieved 2022 from https://designthinking.ideo.com/

[13] Anon. Girls Love Travel®. Retrieved 2021 from https://www.facebook.com/groups/GirlsLOVETravel/

[14] Anon. NomadHer: Solo Female Travel. Retrieved April 2021 from https://nomadher.com/

[15] Anon. The Solo Female Traveler Network. Retrieved 2021 from https://www.facebook.com/groups/thesolofemaletravelernetwork/

[16] Benxiang Zeng and Rolf Gerritsen. 2014. What do we know about social media in tourism? A Review. *Tourism Management Perspectives* 10 (April 2014), 27–36. DOI:http://dx.doi.org/10.1016/j.tmp.2014.01.001

[17] Bettina Laugwitz, Theo Held, and Martin Schrepp. 2008. Construction and evaluation of A user experience questionnaire. *Lecture Notes in Computer Science* 5298 (November 2008), 63–76. DOI:http://dx.doi.org/10.1007/978-3-540-89350-9_6

[18] Brendan Strahm, Colin M. Gray, and Mihaela Vorvoreanu. 2018. Generating mobile application onboarding insights through minimalist instruction. *Proceedings of the 2018 Designing Interactive Systems Conference* (June 2018), 361–372. DOI:http://dx.doi.org/10.1145/3196709.3196727

[19] Candice Harris and Erica Wilson. 2007. Travelling beyond the boundaries of constraint: Women, travel and empowerment. *Tourism and gender: embodiment, sensuality and experience* (2007), 235–250. DOI:http://dx.doi.org/10.1079/9781845932718.0235

[20] Caroline Wang and Mary Ann Burris. 1994. Empowerment through photo novella: Portraits of participation. *Health Education Quarterly* 21, 2 (June 1994), 171–186. DOI:http://dx.doi.org/10.1177/109019819402100204

[21] Chiu-Ping Su and Tsung-Chiung Wu. 2020. The dark side of solo female travel: Negative encounters with male strangers. *Leisure Sciences* 42, 3-4 (2020), 375–392. DOI:http://dx.doi.org/10.1080/01490400.2020.1712277

[22] Christian Laesser, Pietro Beritelli, and Thomas Bieger. 2009. Solo Travel: Explorative Insights from a mature market (Switzerland). *Journal of Vacation Marketing* 15, 3 (2009), 217–227. DOI:http://dx.doi.org/10.1177/1356766709104268

[23] Clay Spinuzzi. 2005. The Methodology of Participatory Design. *Technical Communication* 52, 2 (May 2005), 163–174.

[24] Constanza Bianchi. 2015. Solo holiday travellers: Motivators and drivers of satisfaction and dissatisfaction. *International Journal of Tourism Research* 18, 2 (2015), 197–208. DOI:http://dx.doi.org/10.1002/jtr.2049

[25] Dana Seow and Lorraine Brown. 2018. The solo female Asian tourist. *Current Issues in Tourism* 21, 10 (2018), 1187–1206. DOI:http://dx.doi.org/10.1080/13683500.2017.1423283

[26] David Gallula and Ariel Frank. 2014. User Empowering Design. In *Proceedings of the 2014 European Conference on Cognitive Ergonomics*. New York, NY: Association for Computing Machinery (ACM), 1–3.

[27] Deborah Lupton. 2015. *Digital Sociology*, London u.a.: Routledge.

[28] Deniz Karagöz, Cem Işık, Tarik Dogru, and Lu Zhang. 2020. Solo female travel risks, anxiety and travel intentions: Examining the moderating role of online psychological-social support. Current Issues in Tourism 24, 11 (September 2020), 1595–1612. DOI:http://dx.doi.org/10.1080/13683500.2020.1816929

[29] Ditte Hvas Mortensen. 2021. Pros and cons of conducting user interviews. (2021). Retrieved 2022 from https://www.interaction-design.org/literature/article/pros-and-cons-of-conducting-user-interviews

[30] Elaine Chiao Yang, Catheryn Khoo-Lattimore, and Charles Arcodia. 2018. Power and empowerment: How asian solo female travellers perceive and negotiate risks. *Tourism Management* 68 (2018), 32–45. DOI:http://dx.doi.org/10.1016/j.tourman.2018.02.017

[31] Elaine Chiao Yang. 2020. What motivates and hinders people from travelling alone? A study of solo and non-solo travellers. *Current Issues in Tourism* 24, 17 (2020), 2458–2471. DOI:http://dx.doi.org/10.1080/13683500.2020.1839025

[32] Elizabeth Sucupira Furtado, Lara Furtado, and Vasco Furtado. 2016. A Framework to Evaluate User Empowerment in Decision-Making Experiences with Participatory GIS. In *Design, User Experience, and Usability: Technological Contexts*. 148–158.

[33] Erica Wilson and Candice Harris. 2006. Meaningful travel: Women, independent travel and the search for self and meaning. *Tourism: An International Interdisciplinary Journal* 54, 2 (June 2006), 161–172.

[34] Erica Wilson and Donna E. Little. 2005. A "relative escape"? the impact of constraints on women who travel solo. *Tourism Review International* 9, 2 (2005), 155–175. DOI:http://dx.doi.org/10.3727/154427205774791672

[35] Erica Wilson and Donna E. Little. 2008. The solo female travel experience: Exploring the 'geography of women's fear.' *Current Issues in Tourism* 11, 2 (2008), 167–186. DOI:http://dx.doi.org/10.2167/cit342.0

[36] Essi Valaja. 2018. Solo Female Travellers' Risk Perceptions and Risk Reduction Strategies - As Expressed in Online Travel Blog Narratives. thesis. Lund, Sweden: Lund University.

[37] Fiona Jordan and Heather Gibson. 2005. "We're not stupid . . . but we'll not stay home either": Experiences of Solo Women Travelers. *Tourism Review International* 9, 2 (2005), 195–211. DOI:http://dx.doi.org/10.3727/154427205774791663

[38] Fiona Jordan. 2016. 2nd International Conferences on Information Technology and Business (ICITB). In *Proceeding International Conferences on Information Technology and Business*. Lampung, Indonesia: Darmajaya Informatics and Business Institute.

[39] Gabe Zichermann and Christopher Cunningham. 2011. *Gamification by design: Implementing game mechanics in web and mobile apps* 1st ed., Sebastopol, CA: O'Reilly.

[40] Gretchen M. Spreitzer. 1995. Psychological, empowerment in the workplace: Dimensions, Measurement and Validation. *Academy of Management Journal* 38, 5 (October 1995), 1442–1465. DOI:http://dx.doi.org/10.2307/256865

[41] Gretchen Spreitzer. 2007. Taking stock: A review of more than twenty years of research on empowerment at work Cary Cooper & Julian Barling, eds. *The SAGE Handbook of Organizational Behavior* 1 (January 2007), 54–72. DOI:http://dx.doi.org/10.4135/9781849200448.n4

[42] Hanaa Osman, Lorraine Brown, and Thi Minh Phung. 2019. The travel motivations and experiences of female Vietnamese solo travellers. *Tourist Studies* 20, 2 (2019), 248–267. DOI:http://dx.doi.org/10.1177/1468797619878307

[43] Hanna Schneider. 2019. Designing for empowerment – an investigation and critical reflection. *it - Information Technology* 61, 1 (January 2019), 59–65. DOI:http://dx.doi.org/10.1515/itit-2018-0036

[44] Hannah McKelvey and Jacqueline Frank. 2018. Improving onboarding with employee experience journey mapping: A fresh take on a traditional UX technique. *Weave: Journal of Library User Experience* 1, 9 (September 2018). DOI:http://dx.doi.org/10.3998/weave.12535642.0001.903

[45] Hong Ngoc Nguyen. 2018. An Investigation into Female Solo Travelers: Solo Travel Exposure and Perceived Constraints, Personal Development, Authentic Personality and Self-Esteem. thesis. Stillwater, Oklahoma: Oklahoma State University.

[46] Jacob Cohen. 1988. In *Statistical Power Analysis for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum Associates, 184–187.

[47] Jan Renz, Thomas Staubitz, Jaqueline Pollack, and Christoph Meinel. 2014. 6th International Conference on Education and New Learning Technologies . In *EDULEARN14 Proceedings*. Barcelona, Spain: IATED, 3931–3941.

[48] Janet K. McKeown and Maggie C. Miller. 2019. #tableforone: Exploring representations of dining out alone on Instagram. *Annals of Leisure Research* 23, 5 (April 2019), 645–664. DOI:http://dx.doi.org/10.1080/11745398.2019.1613245

[49] Jennifer Davidson, Meridel Walkington, Emanuela Damiani, and Philip Walmsley. 2019. Reflections on a co-design workshop. (January 2019). Retrieved 2022 from https://blog.mozilla.org/ux/2019/01/reflections-on-a-co-design-workshop/

[50] Jeongmi (Jamie) Kim and Iis P. Tussyadiah. 2013. Social Networking and social support in tourism experience: The moderating role of online self-presentation strategies. *Journal of Travel & Tourism Marketing* 30, 1-2 (2013), 78–92. DOI:http://dx.doi.org/10.1080/10548408.2013.751220

[51] Jin Young Chung, Hye-Jin Baik, and Choong-Ki Lee. 2016. The role of perceived behavioural control in the constraint-negotiation process: The case of solo travel. *Leisure Studies* 36, 4 (2016), 481–492. DOI:http://dx.doi.org/10.1080/02614367.2016.1190780

[52] Joe P. Pavelka. 2016. TTRA Canada 2016 Conference. In *Lighting Talks Research Forum*. Calgary, Canada: TTRA Canada.

[53] Joel R. Evans and Anil Mathur. 2005. The value of online surveys. *Internet Research* 15, 2 (April 2005), 195–219. DOI:http://dx.doi.org/10.1108/10662240510590360

[54] Julie Pallant. 2010. *SPSS Survival Manual* 4th ed., Open University Press .

[55] Kai Wong. 2021. How to get the most out of an interview with a subject matter expert. (July 2021). Retrieved 2022 from https://uxdesign.cc/how-to-get-the-most-out-of-an-interview-with-a-subject-matter-expert-c3f01cec5f69

[56] Karen Elizabeth McNamara and Bruce Prideaux. 2009. A typology of Solo Independent Women Travellers. *International Journal of Tourism Research* 12, 3 (October 2009), 253–264. DOI:http://dx.doi.org/10.1002/jtr.751

[57] Kate Moran. 2019. Usability testing 101. (December 2019). Retrieved 2022 from https://www.nngroup.com/articles/usability-testing-101/

[58] Leonieke G. Zomerdijk and Christopher A. Voss. 2009. Service design for experience-centric services. *Journal of Service Research* 13, 1 (December 2009), 67–82. DOI:http://dx.doi.org/10.1177/1094670509351960

[59] Louis Cohen, Lawrence Manion, and Keith Morrison. 2007. *Research Methods in Education* 6th ed., London: Routledge.

[60] Madeleine Frohnholzer. 2021. Tinder Tourism - Exploring the Role of Tinder in Solo Female Travel: An Affordance- and Motivation-based Approach. thesis. Kuopio, Finland: University of Eastern Finland.

[61] Marc Siegall and Susan Gardner. 2000. Contextual factors of psychological empowerment. *Personnel Review* 29, 6 (December 2000), 703–722. DOI:http://dx.doi.org/10.1108/00483480010296474

[62] Martin Schrepp, Andreas Hinderks, and Thomaschewski Jörg. 2017. Construction of a benchmark for the User Experience Questionnaire (UEQ). *International Journal of Interactive Multimedia and Artificial Intelligence* 4, 4 (June 2017), 40. DOI:http://dx.doi.org/10.9781/ijimai.2017.445

[63] Mohammad Jamal Khan, Shankar Chelliah, Firoz Khan, and Saba Amin. 2019. Perceived risks, travel constraints and visit intention of young women travelers: The moderating role of travel motivation. *Tourism Review* 74, 3 (June 2019), 721–738. DOI:http://dx.doi.org/10.1108/tr-08-2018-0116

[64] Morgan Brennan. 2020. User empowerment in product design. (December 2020). https://uxdesign.cc/user-empowerment-in-product-design-1685269928b7

[65] Patrick S. Poon, Gerald Albaum, and Felicitas U. Evangelista. 2008. Why people respond to surveys. *Journal of International Consumer Marketing* 16, 2 (September 2008), 75–90. DOI:http://dx.doi.org/10.1300/j046v16n02_05

[66] Pei-Jung Lin, Eleri Jones, and Sheena Westwood. 2009. Perceived risk and risk-relievers in online travel purchase intentions. *Journal of Hospitality Marketing & Management* 18, 8 (October 2009), 782–810. DOI:http://dx.doi.org/10.1080/19368620903235803

[67] Falko Weigert Petersen, Line Ebdrup Thomsen, Pejman Mirza-Babaei, and Anders Drachen. 2017. Evaluating the onboarding phase of free-toplay mobile games. *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* (October 2017), 377–388. DOI:http://dx.doi.org/10.1145/3116595.3125499

[68] Rachel Douglas and Anne E. Barrett. 2020. Bounded explorers: Online constructions of solo women travelers. *Sociological Forum* 35, 3 (2020), 765–784. DOI:http://dx.doi.org/10.1111/socf.12627

[69] Richard E. Ladner. 2015. Design for user empowerment. *Interactions* 22, 2 (2015), 24–29. DOI:http://dx.doi.org/10.1145/2723869

[70] Rikke Friis Dam and Teo Yu Siang. 2022. Personas – A Simple Introduction. (2022). Retrieved 2022 from https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them

[71] Rohan Mishra. 2018. This is all you need to know to conduct a UX survey. (June 2018). Retrieved 2022 from https://uxplanet.org/this-is-all-you-need-to-know-to-conduct-a-ux-survey-50400af45920

[72] Ruairí Galavan. 2016. Onboarding never stops. (September 2016). Retrieved 2021 from https://medium.com/intercom-inside/onboarding-never-stops-a9ccfd782ffd#.ifnm3rjh8

[73] Ryan Riddle. 2015. Deconstructing 6 UX design examples that empower users. (October 2015). Retrieved 2021 from https://www.uxpin.com/studio/blog/deconstructing-6-examples-of-empowering-ux-design/

[74] Salla Ahokas. 2017. *Safety of female travellers*. thesis. Helsinki, Finland: Haaga-Helia University of Applied Sciences.

[75] Sarah Gibbons. 2016. Design thinking 101. (July 2016). Retrieved 2022 from https://www.nngroup.com/articles/design-thinking/

[76] Sarah McRae. 2018. Retreats Into Nomadism: Negotiating “The Good Life” in the Intimate Publics of Postfeminist Online Culture. thesis. Edmonton, Canada: University of Alberta.

[77] Shuchih Ernest Chang and Wei Cheng Shen. 2018. Exploring smartphone social networking services for Mobile tourism. *International Journal of Mobile Communications* 16, 1 (2018), 63. DOI:http://dx.doi.org/10.1504/ijmc.2018.10007781