

## PAPER

# An Interactive Mobile Application to Enhance Travel Planning Using a User-Centric Approach: A UX Design Case Study

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## ABSTRACT

With the rise of digital platforms, planning and managing travel has become more difficult because many users still have trouble figuring out how to use all the different tools available to them. This study aims to design a mobile-phone-based application that simplifies and enhances the process of international travel and reduces the difficulties faced by the user due to the use of a variety of tools for international trips. A systematic methodology, starting with a literature review followed by in-person interviews with 30 participants to find out their pain points, was used in this study, which used both qualitative and quantitative methods. A competitive analysis of leading travel apps was also conducted to benchmark missing features and opportunities. Fifty participants then took part in usability testing to see how well the prototype worked. The system usability scale (SUS) and a retrospective think-aloud technique were both used to measure how users interacted with the system. The usability testing showed that overall user experience was favorable, with an average SUS score of 87.23, which means the usability was great. A study of the competitors' products revealed that the current ones did not have features such as integrated maps, route planning, and real-time weather-based suggestions for customizing itineraries. In the survey of user satisfaction, 82% of people said they were very satisfied with the app's easy-to-use interface and personalized travel suggestions. However, some people said the method for suggesting trips could be improved. Based on the results, it looks like the proposed app could make planning international trips easier. But better in-app navigation and adding onboarding guidelines for older users could make them even happier. Future work will focus on fixing these problems and getting more people to use it so that it can be used by more people.

## KEYWORDS

travel planning, user-centered design, user experience design, artificial intelligence (AI), travel management

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## 1 INTRODUCTION

In a time when international travel is becoming more widely available, effective trip planning has emerged as a crucial component of the journey. Due to rapidly evolving customer expectations, technological advances, and the growing importance of digital experiences, the travel sector faces particular problems [1]. These days, travelers look for platforms that make trip planning easier and offer assistance with paperwork, customized itinerary creation, and engaging features that improve the whole experience [2]. Nonetheless, many current platforms still have difficulty offering a truly user-centric approach. Despite providing a range of services and valuable resources, major players in this field frequently fall short in delivering the integrated, customized, and interactive features that today's users require [3]. For instance, these platforms do not fully address features such as real-time itinerary updates, seamless packing assistants, personalized local recommendations, and intuitive interfaces that adapt to users' specific travel preferences.

To address these gaps, this study introduces "*Tripmate*," an innovative travel planning app designed with a user-centric focus to elevate the travel experience through personalized and collaborative features. By integrating functionalities such as dynamic itinerary planning, location-based recommendations, and weather-based insights, *Tripmate* seeks to bridge the gap between travelers' evolving needs and the limitations of existing platforms. The study explores how *Tripmate* leverages modern design principles and technology to create a streamlined, efficient, and enjoyable trip-planning experience for travelers, while also addressing the unique challenges international travelers face. This study tries to fill in the gaps in current travel management tools by suggesting a digital solution that makes planning foreign trips easier, more secure, and more accessible. The research question that the study tries to answer is:

1. What are the challenges and the pain points the user faces in planning international trips?
2. What feature needs to be integrated into the mobile application to enhance the international travel planning experience?
3. What is the effectiveness and usability of the proposed travel planning mobile application?

## 2 LITERATURE REVIEW

To reach the study's goals, an extensive review of all the previous research was done, focusing on the problems and possible solutions that come up when planning and managing foreign travel. International travel planning, digital travel options, travel management platforms, travel rules, and user experience in travel apps were some keywords used in the search. Studies from academic databases such as ResearchGate, ScienceDirect, and Springer were looked for that were applicable. Eighteen research articles were found to be relevant to the study's theme. These articles discussed how to make travel platforms easier to use and more accessible, how to use technology to help plan trips, and how different age groups affect travel habits. The literature review also looked at how to plan a trip, paying special attention to the special travel needs of people travelling

from other countries and the difficulties of understanding the rules for travelling between countries. The literature review results set the stage for finding gaps in the current digital solutions and guide the creation of a travel management tool focused on users.

## 2.1 Travel planning: Aspects and purpose of travel

Planning an international trip includes many things, such as choosing a location, keeping track of your budget, booking accommodations and transportation, and making an itinerary. As a result, it makes things easier and less stressful for visitors, so they can make the most of their time and money [4]. Studies have shown that tourists increasingly want smoother trips, and many use digital tools to make planning easier [5]. Artificial intelligence (AI)-powered tools, such as automatic itinerary ideas and travel document management, are changing how people plan trips abroad by providing more personalized and effective options [6].

## 2.2 Role of technology in revolutionizing travel planning

The travel industry has changed a lot because of advances in technology. More and more people are using AI and intelligent technologies [7]. The shift to digital has made it possible for travelers to use mobile apps to book trips and hotels, and handle their schedules, which has led to more online travel bookings. This has made making choices easier, making things more convenient, and making customers happier [8]. In India, AI-powered platforms help people compare travel choices, guess how much they will cost, and deal with problems that come up during trips [9].

## 2.3 Challenges in international travel planning

When planning an international trip, there are a lot of things that can go wrong. For example, getting a visa can be hard, dealing with different countries can be tricky, and you may not be able to handle flight cancellations or local rules. One of the most significant problems is that travelers have to sort through a lot of information to make choices, which can be confusing and wear them down [10]. Travel plans are also less certain now that global disasters like pandemics are happening more often. Some of these problems can be solved by integrating real-time info, which gives you real-time updates and help [11].

## 2.4 Age diversity in digital product usability

Age diversity is crucial for how well digital products, such as travel planning apps [12], work. Younger users are usually more comfortable with AI-powered platforms and mobile apps. Older users, on the other hand, may find it hard to use these technologies because they are new or don't trust digital solutions. So, making user interfaces that work for people of all ages and have features that can be changed to make them easier to use is important for making sure that everyone can use them [13]. Studies show that making app features more flexible

to fit users with different levels of digital literacy is key to making users happier generally [14].

## 2.5 Role of AI in enhancing travel experiences

Artificial intelligence is revolutionizing the travel industry by enhancing user experiences through personalized recommendations, real-time itinerary adjustments, and predictive analytics [15]. AI-driven platforms can anticipate traveler preferences and suggest relevant destinations, accommodations, and activities, thus improving customer satisfaction [16]. Moreover, AI's integration into chatbots and virtual assistants allows for immediate support, streamlining the decision-making process for travelers [18]. AI also enables better budgeting tools and helps users make informed choices by analyzing various travel options in real time [19].

## 3 METHODOLOGY

This study followed the design thinking process, encompassing five phases: 1) empathize, 2) define, 3) ideate, 4) prototype, and 5) test.

### 3.1 User interviews

An interview was conducted, which included 30 participants, to understand user needs and problems when they are planning and managing their foreign travel. The participants aged 18 to 60 years, having a wide range of travel experiences, including solo leisure trips, work trips, family vacations, and educational trips. The interview questions included fifteen open-ended questions regarding their experiences with the existing trip planning platforms, their problems, and the improvements that they wanted. The participants ranged from a wide variety of travel experiences, viz., frequent travelers, occasional travelers, and first-time foreign travelers. Getting qualitative information from these talks helped us clearly understand users' problems, which led to the creation of the design intervention shown in this study.

### 3.2 Contextual inquiry

In-depth interviews and observations of user groups are part of a contextual study to learn about their work habits, behaviors, and mental models. Different environmental design models help record user data from different angles based on the results. A cultural model was made for this study to learn about the values and factors that affect the group of people who plan and handle international travel. The cultural model (see Figure 1) shows how complicated and hard things are for users and helps us understand where they are having the most trouble. This study sheds light on the big problems users face and leads to the idea of a widespread application-based system with smart assistive products that would make managing foreign travel easier and more enjoyable.

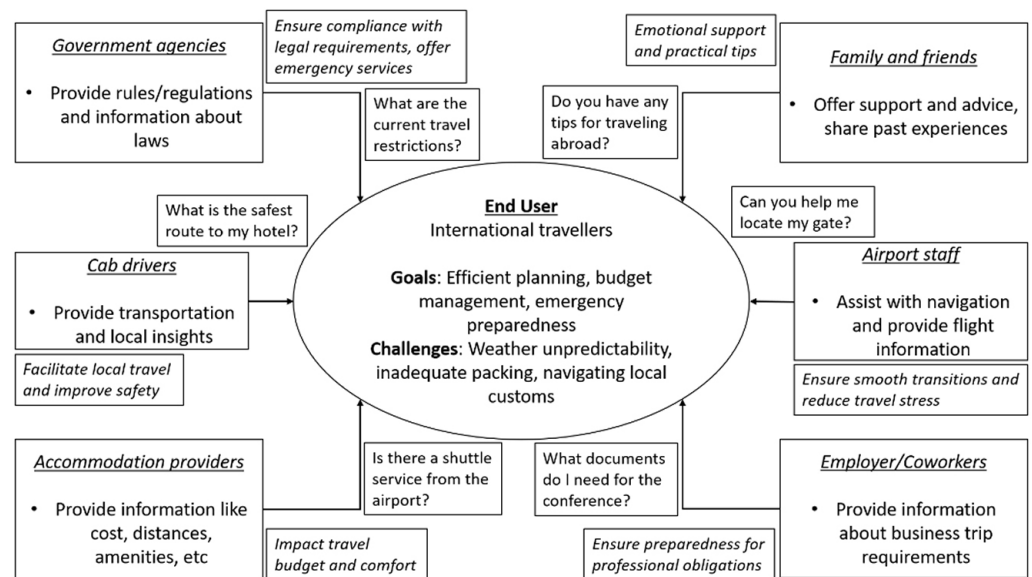


Fig. 1. Cultural model of an international traveler (author-generated)

### 3.3 Defining the problem

When the results of user interviews and surveys were analyzed, they showed that planning an overseas trip can be hard in several important ways. Users often have trouble planning their trips, knowing the visa requirements, and coordinating different parts of their trips, such as flights, hotels, and activities. Also, the differences in how people of various ages use technology became clearer. For example, older users had trouble using digital travel platforms, while younger users valued speed and freedom. Users are also frustrated by language barriers, the lack of personalized trip suggestions, and information that isn't consistent across different sources. To get a better idea of the problem space, the Fishbone diagram (see Figure 2) was used for a thorough analysis. This diagram shows the causes and effects of users' problems with planning and managing their international travel.

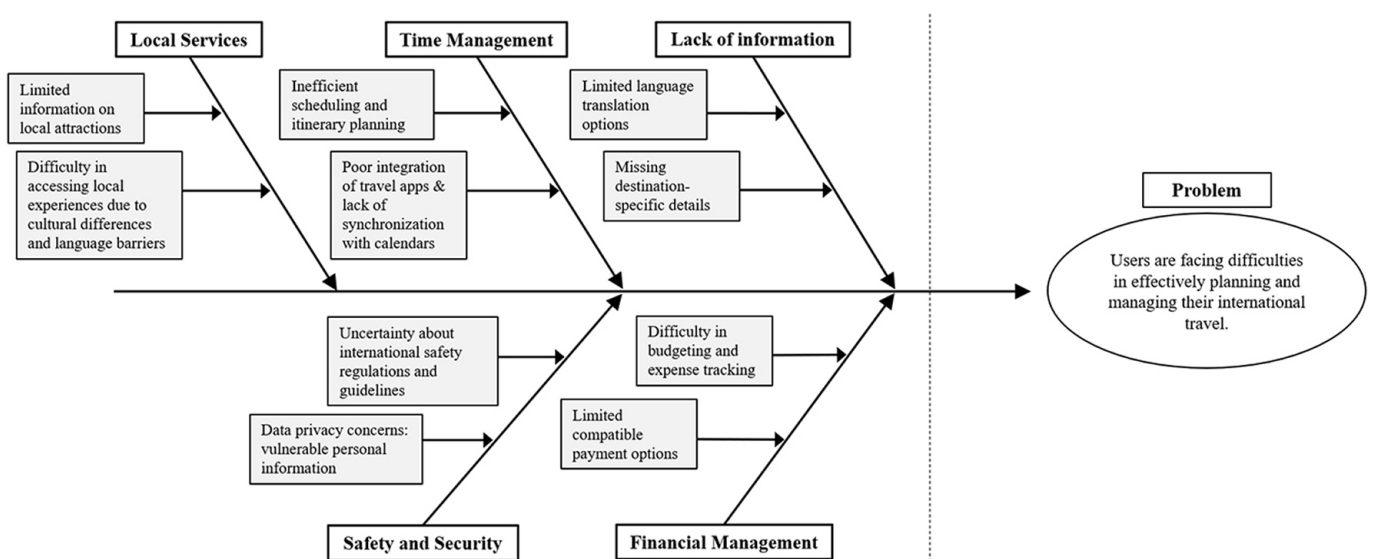


Fig. 2. Fishbone diagram (author-generated)

### 3.4 Competitor analysis

As shown in Table 1, a study of competitors was performed. Existing competitors in the market include TripAdvisor, MakeMyTrip, and Expedia. TripAdvisor connects travelers with global partners through rich content, travel forums, hotel and restaurant reviews, and curated experiences. Through its integrated platform, Expedia offers a wide array of services, including hotel bookings, flights, car rentals, and vacation packages. MakeMyTrip is one of India’s leading online travel companies, offering flight and hotel bookings, holiday packages, train and bus reservations, and local activity planning services. These platforms cater to millions of users and are among the most popular in the travel planning ecosystem.

The comparison focuses on various features essential to enhancing user experience, including itinerary personalization, local recommendations, real-time support tools, and safety alerts. Each platform has its strengths and limitations, which are summarized in Table 1. From the competitor analysis, it was observed that all the existing competitors did not support AI-powered travel assistance, and all of them lacked real-time language translation, which is very important when travelling abroad. It was also observed that TripAdvisor and Expedia lacked integrated map and route planning. A few other notable features that were missing in the existing competitors include smart packing assistance, weather-based outfit suggestions, and multicurrency expense management.

**Table 1.** Features comparison chart of the main competitors

Features	Competitors		
	TripAdvisor	MakeMyTrip	Expedia
Founded	2000	2000	1996
Primary Market	Global	India, SE Asia	Global
Personalized Itinerary Builder	✓	✓	✓
AI-Powered Travel Assistant	✗	✗	✗
Real-Time Language Translation	✗	✗	✗
Integrated Maps and Route Planning	✗	✓	✗
Smart Packing Assistant	✗	✗	✗
Local Experience Suggestions	✓	✓	✓
Multi-Currency Expense Management	✗	✗	✗
Safety Alerts and Health Updates	✗	✗	✓
Translated Food Menu	✗	✗	✗
Weather-Based Outfit Suggestions	✗	✗	✗
Total	2	3	3

### 3.5 Final concept

Finally, the conceptual framework of “*Tripmate*” came together as a one-stop travel planning and management application, which would change the way people plan and handle their foreign trips. The app solves the most prevalent issues travelers face, like not being able to organize their travel plans, compare flight and lodging

options, or keep track of their travel papers. It does this by offering personalized itinerary suggestions, real-time updates, and seamless booking integrations. Key features include ideas from AI for places to visit, things to do, and places to stay based on what the user wants, as well as a budgeting tool and flexible itineraries that can be updated and changed in real time. The app also has social features that let users share their trip plans and work together on group itineraries. The final concept gives travelers a simple, all-in-one way to plan and handle their trips easily. Table 2 shows the SCAMPER model, which was made to improve the trip planning services of the suggested solution. Based on Table 3, the main features of the final idea are shown.

**Table 2.** Description of the SCAMPER model

<b>Substitute</b>	<ul style="list-style-type: none"> <li>• Manual itinerary substituted with an AI-powered itinerary generation</li> <li>• Add support for multiple languages to cater to non-English speaking users.</li> </ul>
<b>Combine</b>	<ul style="list-style-type: none"> <li>• Combine weather updates with travel plans to suggest optimal travel routes.</li> <li>• Integrate local event notifications with user preferences to provide personalized recommendations.</li> <li>• Merge social media sharing features with travel logs for easy sharing of travel experiences.</li> </ul>
<b>Adapt</b>	<ul style="list-style-type: none"> <li>• Use gamification techniques from popular travel apps to enhance user engagement.</li> <li>• Adapt safety alert systems from emergency apps to notify users of potential travel risks.</li> </ul>
<b>Modify</b>	<ul style="list-style-type: none"> <li>• Enhance the app with a more interactive map feature for real-time navigation.</li> <li>• Modify the registration process to be quicker and less intrusive by using social media logins.</li> </ul>
<b>Put to another use</b>	<ul style="list-style-type: none"> <li>• Employ the app's itinerary feature for planning local trips and day-to-day activities.</li> <li>• Use the app to facilitate travel for business trips by integrating meeting schedules and conference details.</li> </ul>
<b>Eliminate</b>	<ul style="list-style-type: none"> <li>• Simplify the user experience by eliminating unnecessary features and focusing on core functionalities.</li> <li>• Remove excessive notifications to reduce user distraction.</li> </ul>
<b>Reverse</b>	<ul style="list-style-type: none"> <li>• Reverse the traditional customer support model by integrating AI-driven customer support for instant assistance.</li> </ul>

**Table 3.** Key features and their description of the proposed solution

Key Features	Description
Smart Itinerary Planner	The app's intelligent itinerary planner allows users to create personalized schedules based on meeting locations, durations, and personal preferences, enabling easy attachment of travel documents and agendas.
Personalized Packing Assistant	The app uses real-time weather data and destination-specific insights to create a personalized packing list, reducing the risk of forgetting essentials during packing.
Budget Optimization Tool	The tool provides a budget estimator that helps travelers determine their expenses based on their accommodation preferences, stay location, and transportation mode, ensuring a cost-effective trip.
Real-time Updates and Emergency Services	The design intervention provides real-time updates on flight statuses, weather, and local events, as well as a directory of emergency services and an integrated SOS feature for immediate assistance

### 3.6 Usability testing

The retrospective think-aloud protocol and a system usability scale (SUS) questionnaire were used to test the *'Tripmate'* app's usability and find out how well it worked and how the users felt about it generally. Fifty participants from a wide range of users were chosen to take part in the usability testing phase. This came after 30 interviews with users were performed during the user research phase. Best practices for usability testing say that 40 to 45 users are enough to find most usability problems in an interface. So, the sample size of 50 people for the testing is thought to be right. Participants were chosen to represent a wide range of possible users, including those with different travel tastes, levels of tech knowledge, and ages. This made sure that the testing results were accurate for all of these groups. During the tests, people were given specific jobs to do, like making plans for a trip, booking accommodations, and making itineraries. They were asked to describe what they were thinking as they used the system. After the tasks, the subjects filled out the SUS questionnaire to give feedback on their experience.

### 3.7 Ethical statement

All the participants who took part in the interview and usability testing signed an informed consent form before the data collection process. The aim, objectives, and process of the study were informed to the participants before starting the data collection. The participants were informed that they could leave the study if they felt uncomfortable, and the confidentiality of their identity would be maintained. The data collection process followed the Helsinki Protocol [17].

## 4 RESULTS

### 4.1 Insights from user interviews

Thirty people between the ages of 18 and 60 years were interviewed as users. The results showed some important things about the problems and preferences people have when planning and managing foreign travel. About 65% of users, mostly those aged 50 and up, said it was hard to find accurate information about visa requirements and trip restrictions. Younger participants (18–35 years old) were annoyed by the huge number of digital tools; 70% said it was hard to put all their trip information in one place. Additionally, 60% of users of all ages said they had trouble communicating with foreign travel companies because of language barriers, which caused them to mess up their plans. People aged 50 and up were more likely to say they were worried about the accessibility features in trip planning apps. In fact, 55% of those people wanted clearer and bigger text options as well as easier-to-use interfaces. Younger participants (18–35 years old), on the other hand, wanted more personalized and dynamic trip suggestions. In fact, 75% of them wanted tools for budget planning and searching for accommodations to be built in. All of the users who commented stressed how important it was for real-time updates to include flight times, safety alarms, and exchange rates. Overall, the interviews showed that there is a strong need for a single platform that can make planning foreign travel easier, meet the needs of a wide range of users, and make sure that people of all ages can

access it. People who used the service were especially excited about a solution that could speed up the process and make managing cross-border travel less stressful.

## 4.2 Conceptualization of UI design

The idea for *Tripmate's* user interface (UI) came from a systematic design thinking process that always focused on the needs and pain points of the users. To begin, rough wireframes were drawn on paper to show the main user experiences. These wireframes helped figure out where to put important UI elements like search bars, navigation menus, and tools for working together. After that, the Figma prototyping tool was used to make high-fidelity interactive prototypes (see Figure 3). Clean layouts, easy-to-understand interactions, and a consistent color scheme were important parts of the UI design so as to make sure the experience was both visually pleasing and useful.

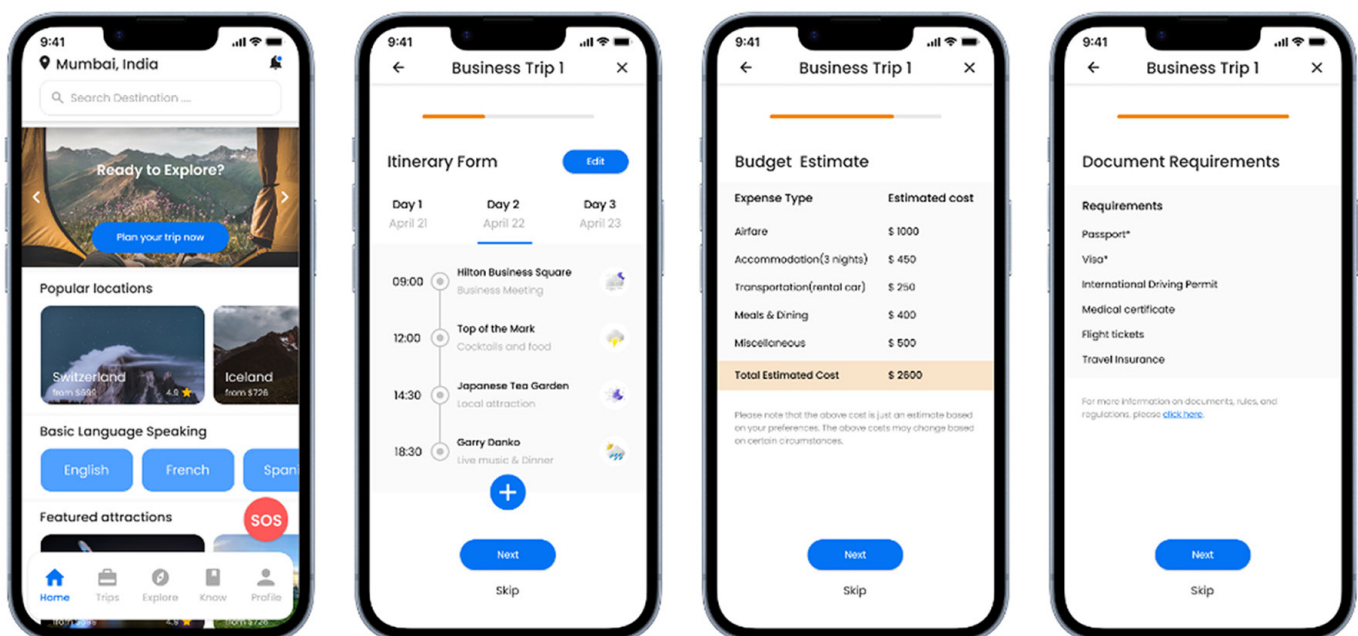


Fig. 3. High-fidelity interactive prototype of the proposed solution (author-generated)

## 4.3 Insights from usability testing

With an average SUS score of 87.23 (refer to Table 4), the results of the usability tests show that the website is very user-friendly and makes people happy. The design was easy for users to understand and use. In fact, 85% of those who participated said they would use the system often. The system's well-organized style and features that worked well together were praised by users, especially those between the ages of 18 and 35, who found it quick and easy to plan trips abroad. But 60% of users aged 50 and up thought the system was a bit hard to understand and asked for more help with complicated features like the multi-city itinerary planner. One problem that many users had was that the system wasn't always consistent. For example, 71% of users got slightly lost when they had to deal with multi-step processes, especially when they had to manage multiple orders or bookings. Some people thought that

visual cues or prompts would help make these things clearer. In spite of these small problems, most users of all ages said they felt confident using the platform and said it was much faster and more useful than other trip planning tools they had tried. Overall, the feedback shows that the platform is great for general usability and satisfaction, but it needs more work to make some complicated features clearer and more consistent, especially for older users. These insights will help guide future improvements that will make the experience smoother and easier for everyone to enjoy.

**Table 4.** System usability scale ratings of the proposed solution

Criteria (SUS Questions)	Ratings, n (%), n = 50				
	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I think that I would like to use this system frequently.	0 (0)	1 (2)	3 (6)	15 (30)	31 (62)
I found the system unnecessarily complex.	18 (36)	12 (24)	9 (18)	8 (16)	3 (6)
I thought the system was easy to use.	0 (0)	0 (0)	5 (10)	16 (32)	29 (58)
I think that I would need the support of a technical person to be able to use this system.	35 (70)	10 (20)	5 (10)	0 (0)	0 (0)
I found the various functions in this system were well integrated.	0 (0)	0 (0)	5 (10)	12 (24)	33 (66)
I thought there was too much inconsistency in this system.	20 (40)	15 (30)	8 (16)	5 (10)	2 (4)
I would imagine that most people would learn to use this system very quickly.	0 (0)	0 (0)	4 (8)	13 (26)	33 (66)
I found the system very cumbersome to use.	10 (20)	15 (30)	13 (26)	6 (12)	6 (12)
I felt very confident using the system.	0 (0)	0 (0)	0 (0)	17 (34)	33 (66)
I needed to learn a lot of things before I could get going with this system.	10 (20)	35 (70)	5 (10)	0 (0)	0 (0)

Average SUS score = **87.23**

## 5 DISCUSSION

The use of mobile technology has played a crucial role in the evolution of the tourism sector, especially travel planning and management for frequent as well as novice travelers. The aim of the study was to design a mobile-phone-based application that simplifies and enhances the process of international travel and reduces the difficulties faced by the user due to the use of a plethora of tools for international trips. This study employed a systematic design thinking framework starting with empathize, define, ideate, prototype, and test. The study started with empathizing by understanding the needs and the pain points of the users who were frequent travelers and required trip planning and management. The interview was used as a tool to gather user needs and pain points. Contextual inquiry, competitor analysis, and fishbone diagrams were used to have a deeper understanding and to define the problem. For ideation of the proposed solution, the SCAMPER method was utilized. A prototype of a mobile-based application was created using the Figma tool, and finally, to test the effectiveness of the prototype, user testing with potential users was performed.

The digital application—‘*Tripmate*,’ proposed in this study, is expected to make planning a trip a lot easier for people, especially when they are going on a foreign trip and need to deal with issues like organizing their plans, getting visas, and keeping track of their budget. There have been other studies in the past that have tried to solve the problem of travel itinerary planning. One study proposes a mobile predictive model for personalized travel itinerary planning, leveraging intelligent algorithms such as spatio-temporal graph convolutional networks (STGCN) [20]. This model tries to address the shortcomings of the traditional planning method, which relies on fixed route planning and neglects the real-time demands of the tourists. This model also tries to integrate an individual’s historical data and preferences to suggest the travel itinerary [20]. However, the researchers did not propose a comprehensive mobile application for travel planning and management. Another study carried out in Thailand and Malaysia tries to promote culture and heritage through a content-specific augmented reality (AR) mobile application [21]. The prototype was developed using the design thinking process, and features like interactive navigation, AR points of interest, and language support to address communication barriers were incorporated [21]. Heuristic evaluation by experts was conducted to evaluate the solutions’ usability [21]. Some studies have also utilized an AI chatbot for tourism recommendations. A similar study was conducted in the city of Jeddah, Saudi Arabia, which utilized a text-based AI chatbot [22]. However, this solution lacked integration with booking capabilities, expanded location data, and support for voice interaction, the English language, and iOS platform support [22]. Similarly, another study conducted on heritage tourism in Indonesia used user-centered design (UCD) method to propose the design of a mobile guide service application [23]. In the current study, a similar UCD approach is being applied. This approach prioritizes users and their needs throughout the design process. Usability evaluation of the proposed mobile-application-based design was performed using SUS. This tool was used because of its effectiveness even with a smaller number of participants [24].

### 5.1 Limitation and scope of future research

Although a systematic design thinking research method was used, there are a few limitations that exist, which could be taken up in future research studies. Although the functions and features, of the proposed mobile application are easy to use, some features such as the ‘smart itinerary planner’ and ‘Budget Optimization Tool,’ may have a steep learning curve and overwhelm old-age people and non- frequent travelers. Another point of concern could be data privacy and security, especially when it comes to the handling of sensitive travel documents. Future studies could include age- and travel experience-based onboarding and guidance. Furthermore, the influence of destination-specific cultural information and integration with other travel management tools on customer engagement could be researched. In addition, cross-device compatibility should also be thought about for future projects to make the user experience better across all devices.

## 6 CONCLUSIONS

In conclusion, the suggested solution ‘*Tripmate*’ aims to simplify and improve the process of planning and managing international travel by addressing common user complaints like complicated processes, not knowing the rules and laws in other

countries, not getting personalized suggestions, and having trouble understanding what paperwork is needed. *Tripmate* creates a smooth user experience by combining real-time data tracking, AI-powered suggestions, and collaborative itinerary planning. It does this by offering personalized options for all travel needs, such as transportation, food, activities, and paperwork. The game-like and advertising features of the app also encourage users to interact with it more. This solution has a lot of potential to change the way people plan their trips by offering a complete, immersive, and UCD solution. It combines traditional travel methods with new digital technologies, eventually making the overall user experience better. This study is one of the first steps towards exploring and developing the technology-driven solution to enhance travel planning and management.

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