TRAVEL SMART – TRAVELLING SYSTEM

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ABSTRACT

The primary focus of this research study is the development and implementation of *Travel Smart*, a comprehensive travel platform designed to provide users with detailed travel-related information. The platform serves as a Single Page Application (SPA) with a responsive design, ensuring accessibility across various devices. *Travel Smart* aims to streamline the travel experience by offering information on destinations, accommodations, transport options, and cultural insights. The study addresses the key research question: *How can user experience be optimized in a travel platform through improved design and usability?*

To answer this, usability tests were conducted in a controlled environment, where participants interacted with the platform on different devices, including smartphones. The tests were designed to evaluate the platform's user interface and user experience, focusing on task efficiency, ease of navigation, and overall satisfaction. The findings highlight the challenges and usability issues encountered by users, providing insights for future improvements in design and functionality.

React can change how you think about the designs you look at and the apps you build. When you build a user interface with React, you will first break it apart into pieces called *components*. Then, you will describe the different visual states for each of your components. Finally, you will connect your components together so that the data flows through them. In this tutorial, we'll guide you through the thought process of building a searchable product data table with React.

KEYWORDS
Travel platform; Usability; Responsive design; Single Page Application; User Interface

1. INTRODUCTION

The rapid growth of the internet and mobile technology has transformed the way people access and interact with information, especially in the travel industry. As travelers increasingly rely on mobile devices for real-time information, bookings, and navigation, there is a growing need for platforms that offer seamless, comprehensive travel experiences. *Travel Smart* is designed to address this need by providing users with a streamlined travel platform that delivers essential information about destinations, accommodations, transportation, and local attractions. Built as a Single Page Application (SPA) with responsive design, *Travel Smart* ensures a smooth user experience across various devices, enhancing accessibility for travelers on the go.

In today's fast-paced world, users expect immediate access to travel resources, regardless of their location or device. *Travel Smart* aims to meet these expectations by offering a user-friendly interface, intuitive navigation, and an efficient way for users to explore and plan their trips. The platform not only simplifies travel planning but also integrates essential features that allow users to make informed decisions and optimize their travel experience. This introduction sets the stage for exploring the usability and functionality of *Travel Smart*, highlighting its potential to become an essential tool for modern travelers.

2. TRAVEL-SMART

2.1 Overview

Travel Smart is a travel platform designed to streamline and enhance the user experience by leveraging the latest web and mobile technologies. The platform addresses the growing demand for digital travel solutions, providing users with a centralized hub for planning, booking, and managing their trips. With real-time information and a user-friendly interface, *Travel Smart* offers access to essential travel services such as destination guides, accommodations, transportation options, and tours.

Key features of *Travel Smart* include personalized recommendations based on user preferences, the ability to create and manage detailed itineraries, and access to special offers and deals tailored to specific destinations. The platform also incorporates real-time updates on costs, transport schedules, and accommodation availability, ensuring that travelers have all the information they need at their fingertips.

Travel Smart not only simplifies the travel planning process but also enhances the overall experience by providing timely notifications, access to user reviews, and feedback options. These features help users make informed decisions, save time, and enjoy a more seamless travel journey from start to finish. The platform's focus on convenience, personalization, and efficiency makes it a valuable tool for modern travelers looking for a comprehensive solution to all their travel needs.

2.2 Mobile Devices Usability

The usability of Travel Smart plays a critical role in ensuring that users can access and interact with the platform efficiently. Given the diverse range of devices users rely on, including smartphones and tablets, the design of the platform must accommodate different screen sizes and input methods. One of the major challenges in developing Travel Smart is ensuring a smooth and intuitive user interface that works seamlessly across various devices without compromising functionality.

Like many other mobile applications, users may face difficulties when interacting with smaller screens, especially in tasks such as filling out forms, navigating complex menus, or accessing detailed information on tours and accommodations. To address these issues, Travel Smart incorporates a responsive design, ensuring that key features like destination search, booking, and itinerary planning remain accessible and easy to use on both small and large screens.

Performance is another essential aspect of Travel Smart. To ensure quick loading times, especially on mobile devices, the platform has been optimized for minimal page load, reducing the amount of scrolling and improving the overall user experience. Additionally, security features have been integrated into the platform to protect user data, such as booking information and personal details

With the increasing number of mobile operating systems, such as Android, iOS, and others, Travel Smart is designed to be compatible across platforms, ensuring broad accessibility. This flexibility allows users to enjoy the same functionality and smooth experience, regardless of the device or operating system they are using. The platform also supports add-on features, like notifications and special offers, providing users with timely information and enhancing the overall travel experience.

3. RESEARCH FOCUS

The primary focus of this research is the development and implementation of *Travel Smart*, a comprehensive travel platform designed to streamline the travel planning and booking process. The aim is to create a user-friendly platform that allows users to access information about destinations, accommodations, tours, and transportation options, all within a few clicks. The platform offers personalized recommendations based on user preferences, ensuring a tailored and convenient travel experience.

After the development phase, usability tests were conducted to evaluate how effectively the platform meets user needs on both desktop and mobile devices. The research specifically focused on optimizing the user interface, reducing the number of steps required to complete tasks, and improving the overall experience for travelers. The project aims to provide users with the ability to plan and book their travel from anywhere, at any time, offering real-time updates on costs, availability, and special offers.

By addressing common pain points in the travel planning process, *Travel Smart* enhances accessibility, improves efficiency, and ensures that users have a seamless, enjoyable experience from start to finish.

4. THE PROPOSED SYSTEM

The proposed Travel Smart platform is designed to offer a comprehensive solution for travelers, integrating multiple essential services into one easy-to-use system. The platform will maintain databases for destinations, accommodations, transportation options, and available tours, allowing users to easily access this information in real-time. By connecting to the platform’s information system, users can explore destinations, compare costs, and review accommodation availability, all from a single interface.

Travelers can register with a unique username and password to access personalized features. Once logged in, users can create and manage itineraries, search for tours, and book accommodations directly through the platform. After making a reservation, users will receive a confirmation message with a unique booking code for validation. Additionally, users can review or modify their reservations through the “Dashboard” and then to "Booking History" link, which allows them to track all upcoming travel plans.

The system also includes links to special offers and promotions, where travelers can view and select deals for various destinations. A "Wishlist" section will provide up-to-date travel tips and recommendations to enhance user experience and knowledge about specific regions or attractions. Finally, a "Contact" link will provide users with contact details for customer service, helping them resolve any issues related to bookings or inquiries. This comprehensive system aims to streamline the travel process, making it easier and more efficient for users to manage their trips.

Implementation Details

- **ReactJS**: Chosen for its component-based architecture, allowing for reusable UI elements and easy scalability.
- **Bootstrap**: Used for responsive and mobile-first design, ensuring a consistent layout across different devices.
- **Firebase API Integration**: Integrated to handle user authentication, real-time data management, and hosting of dynamic content.
- **SCSS/BEM/HTML/XML**: SCSS with the BEM methodology was employed to maintain clean, organized, and scalable CSS, while HTML and XML were used for content structure and external data integration.

5. RESEARCH QUESTION

What are the main usability challenges that affect user experience with regards to travel planning and booking on the Travel Smart platform?

6. EXPERIMENTAL DESIGN

To address the research question, an experiment was designed to test the usability of the *Travel Smart* platform by having participants engage in typical travel planning tasks, such as booking accommodations or scheduling tours, using both desktop and mobile devices. The experiment focused on evaluating how effectively users could navigate the platform, complete bookings, and access essential travel information.

The usability testing involved 9 participants with moderate experience in using travel platforms. They were asked to perform specific tasks, such as searching for a destination, comparing accommodation options, and creating an itinerary, within a controlled environment to minimize external distractions. The experiment was recorded for later analysis to identify potential usability issues that may hinder user performance or satisfaction.

The devices used in the experiment were chosen based on their ability to display high-quality visuals and provide responsive touch interaction. Mobile devices with multi-touch displays, high screen resolution, and intuitive interfaces were utilized to ensure that the participants' experience mirrored real-world travel planning scenarios. This allowed for a thorough assessment of the platform's usability across different device types, with a particular focus on mobile interactions.

6.1 Interface Design

The interface design of *Travel Smart* has been carefully crafted to meet modern web design usability standards, particularly for mobile devices where screen space is limited. The goal was to create an intuitive and responsive user interface that allows users to easily navigate and interact with the platform while accessing travel-related information and services.

During the usability test, participants were assigned a series of tasks to evaluate the platform's interface and navigation efficiency. The tasks were given one at a time to simulate real-world travel planning scenarios. The list of tasks included:

1. Log in using a provided username and password.
2. Search for a destination and book accommodation for a specific date.
3. Ensure that the booking is confirmed and registered in the user's itinerary.
4. Search for available tours in the selected destination.
5. View detailed transport options for the selected tour.
6. Access travel guides to find local attractions near the accommodation.
7. Locate and view contact details for customer support.

These tasks were designed to test various aspects of the platform's interface, such as ease of navigation, task completion efficiency, and the clarity of visual elements on mobile devices. The results from these tasks helped identify areas of improvement in the design, ensuring that *Travel Smart* provides an optimal user experience across all device types.

6.2 How to Set-up and Run

1. Prerequisites:

Node.js and npm installed on your machine.

Firebase account set up.

Basic knowledge of React JS and Bootstrap.

2. Clone the Project Repository:

Clone the *Travel Smart* project from your version control system to your local machine

```
git clone https://github.com/your-travel-smart-repo.git
```

3. Install Dependencies:

Navigate to the project folder and install all the required dependencies using npm.

```
cd travel-smart
npm install
```

4. Configure Firebase:

Initialize Firebase in your React project by installing the Firebase package if not already installed:

```
npm install firebase
```

Create a Firebase project in the Firebase Console.

Enable **Firebase Authentication** (for user login) and **Firestore Database** (for real-time data storage).

Go to **Project Settings** and under the **Your Apps** section, click on **Add Firebase to your web app**. Copy the configuration details (API key, Auth domain, etc.).

Create a .env file in your project's root directory and add the Firebase configuration to it

```
REACT_APP_FIREBASE_API_KEY=your-api-key
REACT_APP_FIREBASE_AUTH_DOMAIN=your-auth-domain
REACT_APP_FIREBASE_PROJECT_ID=your-project-id
REACT_APP_FIREBASE_STORAGE_BUCKET=your-storage-bucket
REACT_APP_FIREBASE_MESSAGING_SENDER_ID=your-messaging-sender-id
REACT_APP_FIREBASE_APP_ID=your-app-id
```

5. **Run the Development Server**:

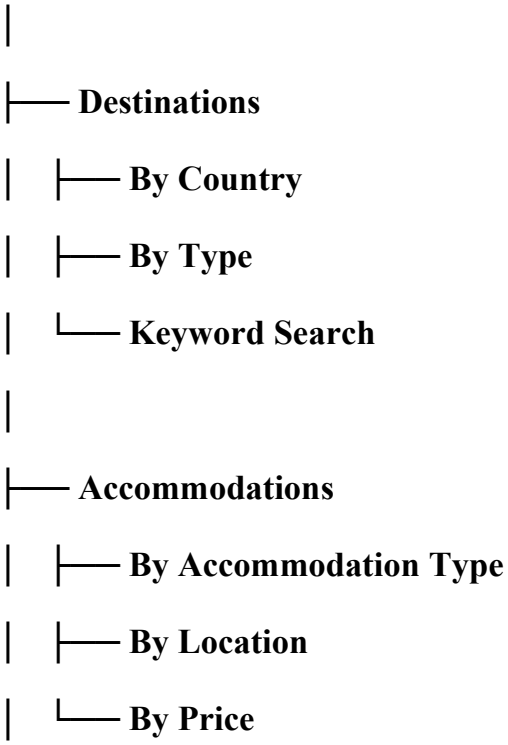
Start the React development server with npm.

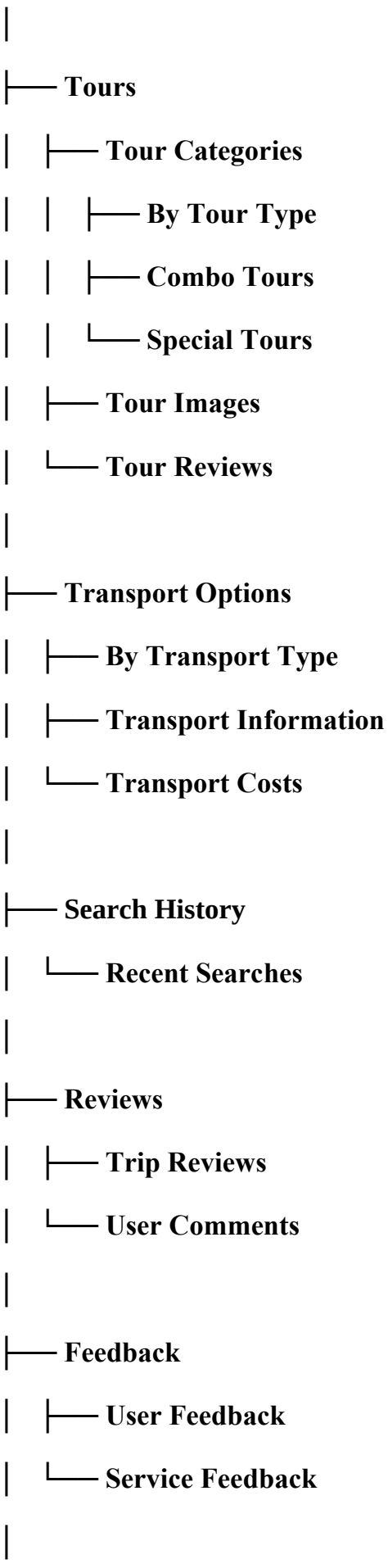
```
npm start
```

This will run the app locally, typically accessible at http://localhost:3000.

6.3 Function Hierarchy

Travel Smart




Tours
Tour Categories
By Tour Type
Combo Tours
Special Tours
Tour Images
Tour Reviews
Transport Options
By Transport Type
Transport Information
Transport Costs
Search History
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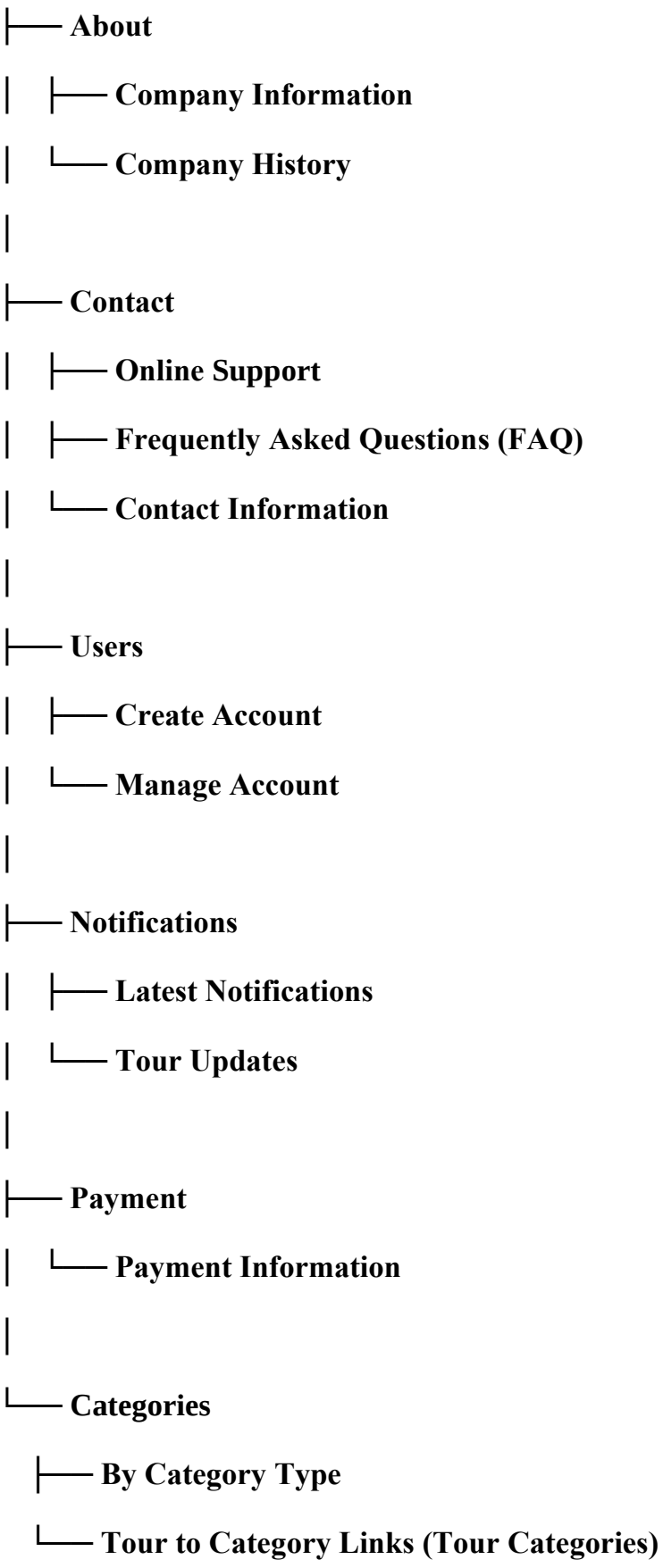


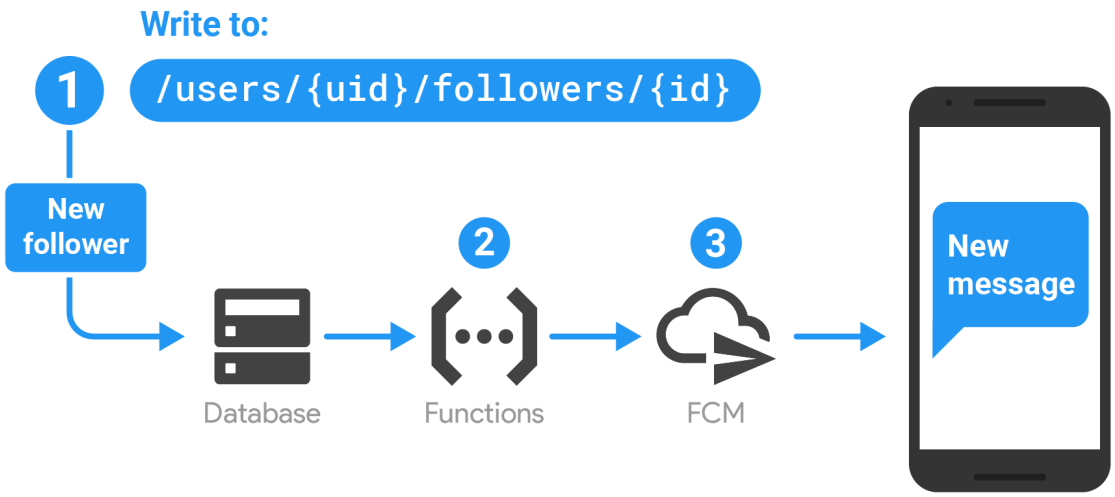
6.4 Firebase Integration

Cloud Functions gives developers access to Firebase and Google Cloud events, along with scalable computing power to run code in response to those events. While it's expected that Firebase apps will use Cloud Functions in unique ways to meet their unique requirements, typical use cases might fall into these areas:

- Notify users when something interesting happens.
- Perform database sanitization and maintenance.
- Execute intensive tasks in the cloud instead of in your app.
- Integrate with third-party services and APIs.

Notify users when something interesting happens

Developers can use Cloud Functions to keep users engaged and up to date with relevant information about an app. Consider, for example, an app that allows users to follow one another's activities in the app. Each time a user adds themselves as a follower of another user, a write occurs in the Realtime Database. Then this write event could trigger a function to create Firebase Cloud Messaging (FCM) notifications to let the appropriate users know that they have gained new followers.



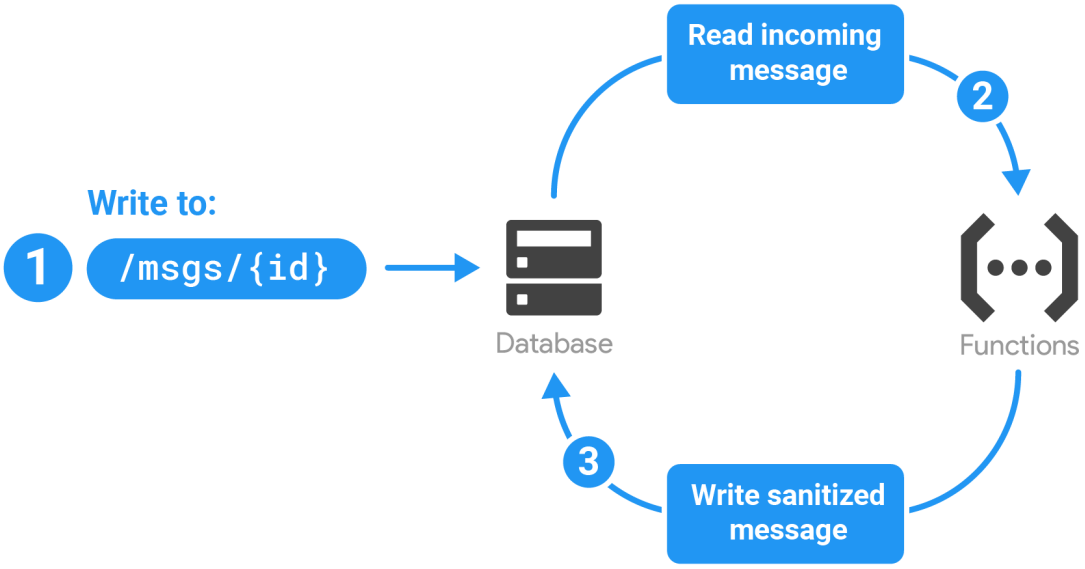
1. The function triggers on writes to the Realtime Database path where followers are stored.
2. The function composes a message to send via FCM.
3. FCM sends the notification message to the user's device.

Other interesting notification use cases

- Send confirmation emails to users subscribing to a newsletter.
- Send a welcome email when a user completes signup.
- Send an SMS confirmation when a user creates a new account.

Perform database sanitization and maintenance

With Cloud Functions database event handling, you can modify Realtime Database or Cloud Firestore in response to user behavior, keeping the system in your desired state. For example, you could monitor write events and change the format (for example, change to all uppercase) of certain strings in users' messages. Here's how that could work:



1. The function's database event handler listens for write events on a specific path, and retrieves event data containing the text of a messages.
2. The function processes the text to change strings to uppercase.
3. The function writes the updated text back to the database.

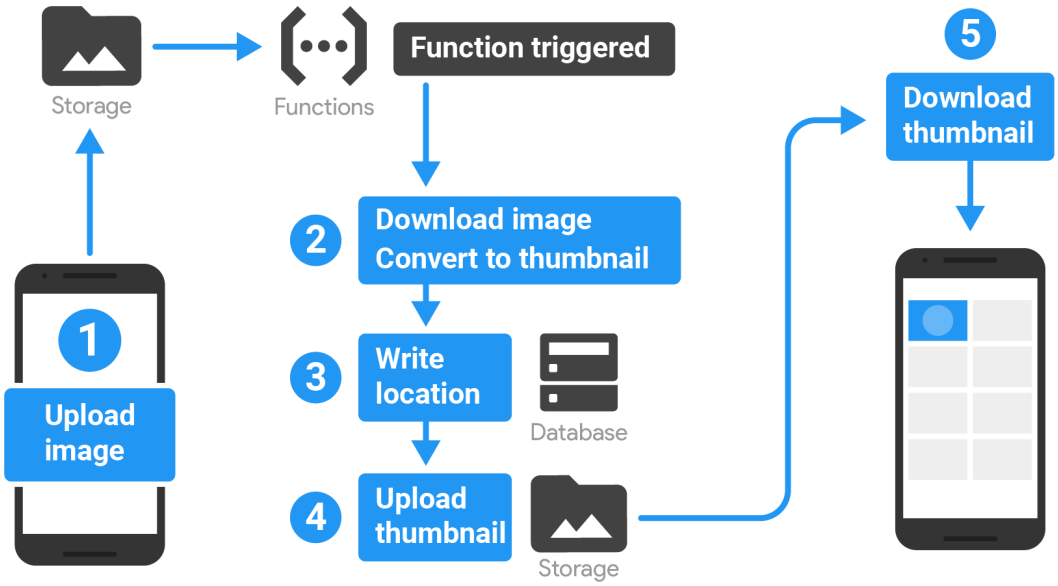
Other database sanitization and maintenance use cases

- Purge a deleted user's content from Realtime Database.
- Limit the number of child nodes in a Firebase database.
- Track the number of elements in a Realtime Database list.
- Copy data from Realtime Database to Google Cloud BigQuery.
- Convert text to emoji.
- Manage computed metadata for database records.

Execute intensive tasks in the cloud instead of in your app

You can take advantage of Cloud Functions to offload to the Google cloud resource-intensive work (heavy CPU or networking) instead of running it on a user's device, improving the responsiveness of your app. For instance, you could write a function to listen for image uploads to Cloud Storage, download the image to the instance running the function, modify it, and upload it back to Cloud

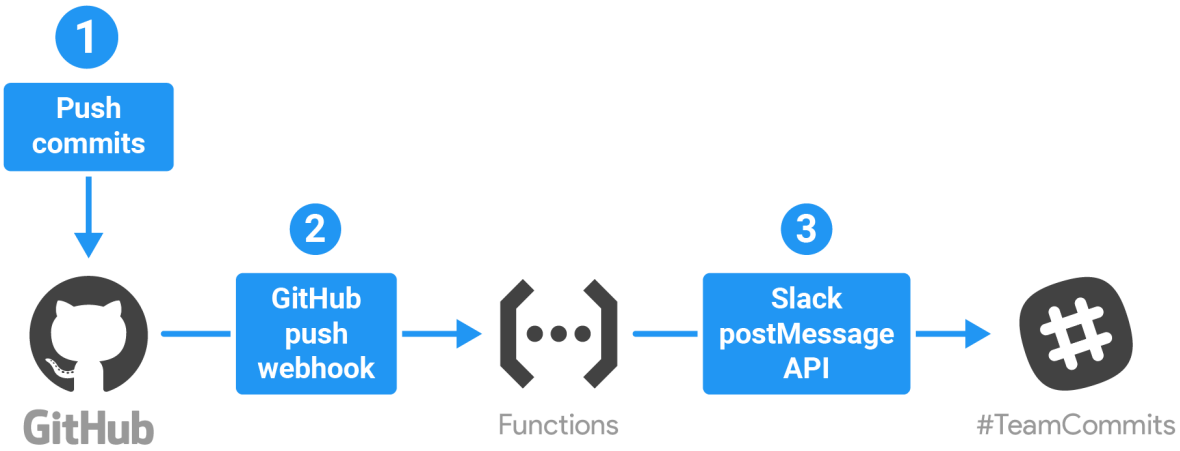
Storage. Your modifications could include resizing, cropping, or converting images with tools like sharp or Pillow.



1. A function triggers when an image file is uploaded to Cloud Storage.
2. The function downloads the image and creates a thumbnail version of it.
3. The function writes that thumbnail location to the database, so a client app can find and use it.
4. The function uploads the thumbnail back to Cloud Storage in a new location.
5. The app downloads the thumbnail link.

Integrate with third-party services and APIs

Cloud Functions can help your app work better with other services by calling and exposing web APIs. For instance, an app used for collaboration on development could post GitHub commits to a workgroup chat room.



6.5 The Experiment

The experiment to evaluate the usability of the *Travel Smart* platform was conducted by recording participants as they interacted with the system, simulating real-world travel planning scenarios. Two cameras were used: one to capture the participants' facial expressions and the other to record their interactions on the mobile device screen. These recordings were synchronized to provide a comprehensive view of the users' experience, which was later analyzed to verify observations made during the test.

Participants were given an overview of the experiment before starting, and a pre-test questionnaire was distributed to collect demographic data. The aim of the test was to assess the platform's usability in terms of efficiency, effectiveness, and user satisfaction. The evaluation metrics were based on the ISO 92401-11 usability standard.

During the experiment, participants were encouraged to think aloud as they performed tasks, and two observers were present to take notes and monitor the sessions. After completing the tasks, users filled out a questionnaire using a 5-point Likert scale to rate their experience. Qualitative feedback was also collected to gain further insights.

The usability of *Travel Smart* was measured through three key criteria:

- Effectiveness: Measured by the number of successfully completed tasks.
- Efficiency: Evaluated based on the time taken and the number of clicks needed to complete each task. Participants were instructed to perform tasks at their own pace rather than rushing, as speed was not the main focus of the study.
- User Satisfaction: Measured through post-test questionnaires, with the ISO definition of satisfaction being the "comfort and acceptability of the system to its users."

This thorough experimental design provided both quantitative and qualitative data, allowing for a comprehensive assessment of the *Travel Smart* platform's usability.

7 RESULT

The effectiveness, efficiency, and user satisfaction of each task performed during the usability test are analyzed individually. The purpose is to provide a clear understanding of how well the participants were able to navigate the Travel Smart platform and identify any issues that may have affected their experience.

For each task, the specific actions taken by users, as well as any difficulties encountered, are discussed in detail. This helps to illustrate how different device platforms, especially mobile devices, influence the overall usability of the system. Feedback on ease of use, navigation flow, and task completion times is evaluated, allowing for a deeper insight into the user experience.

By examining user behavior for each task, we can identify trends in how effectively users interact with key features such as searching for destinations, booking tours, or managing itineraries. These insights are critical for understanding the strengths of the platform as well as areas where improvements are needed to enhance usability across various devices. This detailed analysis will guide further refinements in the design and functionality of Travel Smart.

7.1 Participants

Nine individuals participated in the usability testing of *Travel Smart,* each bringing a diverse range of experience with travel platforms and mobile technology. The participants, aged between 25 and 38 years, included four men and five women. All participants owned smartphones, including devices such as iPhone, Samsung Galaxy, and Huawei, though their familiarity with mobile web browsing varied significantly.

Six participants were frequent users of travel-related platforms, with extensive experience in booking accommodations, flights, and tours through mobile apps or websites. The remaining three participants had minimal exposure to travel platforms, typically using their phones for basic functions like messaging, social media, and calls. Despite this, all participants were comfortable with smartphone use and eager to test the *Travel Smart* platform.

Out of the nine, five regularly used their smartphones to browse travel-related websites or apps, while four primarily used them for other activities like music, messaging, and photography. Though some participants had less experience with mobile travel apps, all were keen to explore *Travel Smart*'s features, making them an ideal group for assessing the platform's usability across different experience levels. The diversity in familiarity with travel technology ensured a comprehensive analysis of how the platform performed for both seasoned and novice users.

7.2 User Performance

Before beginning the test, several participants mentioned that having prior experience with the Travel Smart platform would have improved their confidence in navigating it, particularly on mobile devices.

Task 1: For the first task, all nine participants successfully logged in using the credentials provided. Despite the combination of letters and numbers in the password, they had no issues completing this task.

Task 2: In the second task, participants were asked to book accommodations. While most participants initially struggled to locate the correct button, six out of nine eventually selected the "Book Now" button after a brief moment of confusion. Three participants mistakenly clicked on "Tours" or "Destinations" at first but quickly corrected their actions. As a result, the task took slightly longer than expected to complete.

Task 3: Task 3 involved verifying the reservation in the user's itinerary. Five participants easily completed the task by navigating to the "My Itinerary" section, while the remaining four believed that the confirmation page was sufficient and did not check the itinerary. These participants were marked as having incomplete results for this task.

Task 4 and **Task 5**: These tasks involved searching for available tours and comparing transport options. For task 4, six participants succeeded, though two needed a second attempt, and one participant failed due to navigating outside the Travel Smart platform to search for information. Task 5, despite being similar to task 4, was completed successfully by all participants on the first try, demonstrating improved familiarity with the interface.

Task 6: For task 6, participants were asked to access a travel guide and then return to the platform to find transport information. While all participants successfully opened the travel guide, only five were able to return to the platform and complete the task. The others had difficulty navigating back to the main site after accessing the external guide.

Task 7: In the final task, users needed to contact customer support. Four participants failed to complete the task, as they could not return to the platform after the previous task. Of the remaining five, three clicked on the wrong link initially but managed to correct their mistake on the second attempt.

This section highlights both the successes and challenges participants faced while using Travel Smart, providing valuable insights into areas that need improvement for a smoother user experience.

7.3 Data Analysis

The usability evaluation results for Travel Smart were analyzed to assess the user experience while performing various travel planning tasks on both mobile and desktop interfaces. The analysis focuses on identifying any usability problems participants encountered, as well as measuring their satisfaction with the platform. The following sections highlight key insights regarding task completion, time efficiency, and user satisfaction.

Effectiveness:

Concerning task completion, out of 10 tasks, all 8 participants were able to successfully complete tasks #1 and #5, such as booking accommodations and searching for destinations. However, only 5 participants managed to successfully complete task #4, which involved navigating to the "Tour Categories" section and filtering specific tours. The mean total number of tasks completed was 7.5 out of 10.

Efficiency:

The average time spent completing all tasks was approximately 9 minutes. Task #1, which involved a simple destination search, was the fastest, with participants completing it in an average of 30 seconds. In contrast, task #6, which required accessing and navigating through tour reviews, took the longest (2 minutes 40 seconds) due to the need for extensive scrolling on the mobile interface. Table 2 below compares the minimum number of keystrokes required to complete the tasks with the actual number recorded during the evaluation.

Task	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
Min. Keystrokes	3	4	2	3	2	5	2
Avg. Keystrokes	3.2	5.5	2.1	3.7	2.5	7.2	2.6

User Satisfaction:

To assess user satisfaction, we used a USE Questionnaire based on a 5-point Likert scale, focusing on the following aspects:

- Perceived Usefulness: Participants rated the system's usefulness at 4.47 out of 5, indicating that most users found the platform helpful for travel planning.
- Ease of Use: The average rating for ease of use was 4.26, suggesting that while the system was generally user-friendly, some minor challenges were reported, particularly with navigation on mobile devices.
- Ease of Learning: With an average score of 4.68, users found it easy to learn how to use the platform, especially for common tasks such as booking accommodations or searching for destinations.
- Error Recovery: Participants rated 3.85 when asked how easily they could recover from mistakes, indicating that while the system allows users to correct errors, there is room for improvement in guiding users through the recovery process.
- Overall Satisfaction: The overall system experience on mobile devices received a score of 4.5, reflecting a positive yet slightly varied experience, with mobile usability requiring some optimization.

8. CONCLUSION

Through the evaluation of the Travel Smart platform, it became evident that while the system shows promising potential in terms of usability, there are areas that require further improvements, particularly regarding mobile experience. The lab-based evaluation helped eliminate issues like long loading times or broken connections, ensuring the focus was on the user interface and experience.

One notable issue encountered was the challenge users faced when navigating longer web pages on mobile devices, such as the "Tour Categories" page, which led to excessive scrolling to locate the relevant information. This can be addressed by implementing features such as an in-page search function or optimized layouts for mobile viewing.

Furthermore, several improvements could significantly enhance the platform's usability, including:

- **Enhanced Search Functionality:** Allow users to search within pages, especially on lengthy pages, to locate information more quickly.
- **Bookmark Manager:** Adding the ability to save and organize favorite destinations, tours, or guides into folders for future reference would greatly improve user convenience.
- **Offline Viewing:** Enabling users to save travel itineraries, guides, or destinations for offline viewing when an internet connection is unavailable could add flexibility for travelers.

Additionally, button labels and navigation should be more intuitive. For example, labels like "Tour Booking" or "Accommodation Search" should be clearly distinguishable to prevent confusion. Ensuring users always know where they are within the site and how to navigate back easily is key to improving the overall user experience.

Finally, it is important to give users the flexibility to adjust how they view content. While some users may prefer a "fit-to-screen" layout, others might want to zoom in on specific sections. The platform could support multiple layout modes for better adaptability, especially on mobile devices. Displaying page load times and offering users feedback on their current position on long pages would also improve navigation efficiency.

In conclusion, while Travel Smart demonstrates significant strengths in user satisfaction and ease of learning, further improvements in mobile usability and flexibility will ensure a more seamless experience across various devices and user preferences.

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