

CM2020 AGILE SOFTWARE PROJECT

TEAM NUMBER: 70

“WanderWise”

Meticulously curated hotel recommendation for travel enthusiasts to elevate their journeys with unmatched comfort, style and unmatched experience.

Team Members :

PREMANANTH LAVANYA

NEHA JOSEPH

BENJAMIN BIN ROSLAN

HAO ZHE MARCUS MUI

ALEX KENG HEEM LEONG

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1. Introduction

As we approach the culmination of our project journey, we stand at the threshold of achieving our primary goal: the development of a cutting-edge hotel booking website tailored for travellers seeking overseas accommodations. Throughout this endeavour, our team has remained dedicated to the core functionalities meticulously identified through comprehensive market research. Our efforts have been seamlessly divided into two teams: the front-end, responsible for the presentation and user experience, and the back-end, entrusted with the vital tasks of database management, data content enhancement, and refinement.

In our pursuit of project excellence, we have been guided by a Lead Scrum Master who has diligently ensured that each team member completes their designated tasks and that the project advances according to schedule. As we prepare to document our project's journey in this end-term report, we will delve into the various stages of our undertaking, offering insights into the initial project planning, the dynamic changes and adaptations it has undergone, the invaluable input garnered from user testing and feedback on our prototypes, and an in-depth examination of the technologies that have bolstered our project's creation.

In its present iteration, our hotel booking website stands as a testament to our collective efforts. It empowers users to seamlessly peruse a diverse array of accommodations available for booking, offering convenient sorting options by ratings or price. User convenience is at the forefront, with registration and login features allowing travellers to create accounts and effortlessly secure their desired accommodations. Moreover, our website grants users access to a comprehensive history of their past bookings, enhancing the overall experience.

As we chart the course towards the conclusion of this project, we invite you to join us on a journey through its evolution, challenges, triumphs, and the transformative technologies that have brought our vision to life. This report will culminate with a reflective analysis of our project's life cycle, celebrating our team's achievements, while also critically examining opportunities for improvement. Together, we have crafted a platform that caters to the needs of the modern traveller, and we eagerly anticipate the next chapter in our journey towards excellence.

2. Aims and Objectives

The aims and objectives of our hotel recommendation website includes two main aims, each accompanied by specific objectives. Aim 1 aims to provide users with tailored hotel recommendations based on their preferences, while Aim 2 focuses on streamlining the booking process and ensuring a seamless user experience. These functionalities stem from the market research and analysis of other competitors done in the midterm report.

2.1 Personalised hotel recommendations

Users will receive customised hotel recommendations based on their preferences in order to improve their entire travel experience and help them discover accommodation that fits their individual needs and interests. By providing customers with options that best match their unique interests and requirements, the website hopes to save them time and effort while searching for suitable hotels.

The objectives are as follows:

2.1.1 Develop a user profile system

- Implement a user registration and login functionality to create personalised user profiles.
- Design a user preference survey to gather information about user's travel preferences, such as location, budget, amenities and accommodation types.
- Develop an algorithm that analyses user preferences and matches them with suitable hotel options.

2.1.2 Enhance recommendation algorithm

- Research and implement advanced recommendation algorithms, such as collaborative filtering, content-based filtering, content-based filtering, or hybrid approaches.
- Integrate machine learning techniques to continuously improve the accuracy and relevance of hotel recommendations.
- Conduct through testing and validation to ensure the effectiveness and reliability of the recommendation algorithm.

2.2 Streamlined booking process

Streamlined booking process ensures a seamless user experience to make hotel reservation process convenient, efficient and user-friendly. The website aims to eliminate any unnecessary complexities, reduce friction points and provide a smooth and hassle-free booking experience for users.

The objectives are as follows:

2.2.1 Intuitive search and filtering functionality

- Design a user-friendly search interface that allows users easily input their desired travel dates, location and other relevant criteria.
- Implement advanced filtering options to refine search results based on price range, hotel ratings, amenities and other specific requirements.
- Optimise the search algorithm to deliver fast and accurate results.

2.2.2 Enhance user experience and support

- Develop a responsive and visually appealing user interface that is optimised for different devices, including desktop and mobile platforms.
- Implement interactive maps, high-quality images, and comprehensive hotel information to make informed choices.

2.2.3 Improve usability and accessibility

- Conduct usability testing and incorporate user feedback to enhance the website's ease of use and accessibility for users of all backgrounds and abilities.
- Ensure the website meets web accessibility standards, allowing individuals with disabilities to navigate and interact with the platform effectively.

3. Scope

3.1 Scope Description

The project scope encompasses the development of a user-centric hotel booking website designed to streamline the hotel reservation process. It leverages digital technology to provide a convenient and efficient alternative to traditional booking methods, significantly enhancing the user experience.

The COVID-19 pandemic and ever-evolving customer expectations have underscored the need for innovative, user-centric solutions in hotel booking. This project aims to address these challenges by leveraging modern technologies and design principles to enhance user experiences, simplify processes, and promote informed decision-making.

The platform's potential to enhance travel literacy, facilitate expert recommendations, and adapt to dynamic market conditions positions it as a catalyst for positive change within the industry. Furthermore, by providing a responsive, accessible, and multilingual interface, it intends to bridge gaps in the global market, ensuring that travellers from diverse backgrounds can access and enjoy its benefits.

As the project unfolds, it remains committed to continuous improvement and adaptation, always with an ear to the ground to meet evolving user interests and expectations.

3.2 User Acceptance Criteria

3.2.1 User Experience (UX)

User Story: As a travel enthusiast, I want to be able to search for hotels based on my preferences and easily make bookings, so that I can find the perfect accommodation for my trip and have a seamless booking experience.

User Registration and Authentication

- Users can register for an account effortlessly.
- Registered users can securely log in to their accounts.
- Passwords are securely hashed and verified for login, protecting against security threats.
- User sessions are maintained securely for continuous interactions.

Hotel Search and Booking

- Users can search for hotels based on location, dates, and preferences.
- Search results display relevant hotel listings with comprehensive information.
- Users can filter search results based on criteria such as price, location, and amenities.
- Hotel details pages provide in-depth information, including amenities, room types, prices, and ratings.
- Users can easily select rooms, specify guest numbers, and complete reservations efficiently.
- Reservation confirmations are provided with booking details.

User Account Management

- Users can view their booking history, including past and upcoming reservations.
- Users can modify or cancel existing reservations, adhering to hotel policies.
- An intuitive favourites list allows users to save preferred hotels for future reference.

Ratings and Reviews

- Users can rate and review hotels based on cleanliness, service, location, facilities, and room quality.
- User-generated ratings and reviews contribute to the overall hotel rating system.
- Users can view and sort hotel reviews effectively.

3.2.2 User Interface(UI)

User Story: As a user, I want the design of the hotel recommendation website to be visually appealing and intuitive so that I can easily navigate and find the information I need.

Responsive Design

- The website is responsive and adapts seamlessly to various screen sizes and devices, including desktop, mobile, and tablets.
- The user interface maintains visual appeal and modern design aesthetics across all devices.
- Navigation remains intuitive and user-friendly, ensuring effortless browsing.

Booking Process Efficiency

- The booking process follows a step-by-step flow that minimises user effort and confusion.
- Clear and prominent call-to-action buttons guide users through the booking journey.
- Secure payment processing is implemented to protect user information during transactions.
- Error handling provides meaningful error messages and guidance for users in case of input errors or system issues.
- The website complies with accessibility standards, ensuring an inclusive user experience for individuals with disabilities.
- The ratings and reviews section should be prominently displayed and allow users to sort and filter reviews.

Performance Optimization

- The website prioritises loading speed and performance, providing a seamless and responsive user experience.
- Content and data updates are efficiently managed by admin users to ensure accurate and up-to-date information.

3.3 Deliverables

In pursuit of our goal to revolutionise the hotel booking experience, our project entails the development and delivery of a range of essential deliverables, each contributing to the creation of a cutting-edge hotel recommendation website. These deliverables are not only vital for meeting the project objectives but also for providing a seamless and user-friendly platform for travellers and hotel enthusiasts.

1. Fully Functional Website

The primary deliverable is the fully operational hotel recommendation website itself. This includes all the integrated features and functionalities, ensuring that users can easily search for hotels, view detailed information, make reservations, and access their booking history.

2. Source Code

Alongside the website, the project will yield the complete source code that underpins the platform. This codebase will encompass both the front-end and back-end components.

3. Database Schema

To support the website's functionality, a well-structured and optimised database schema will be created. This schema will efficiently store user profiles, hotel data, booking information, and other relevant data to ensure quick and reliable data retrieval.

4. Project Report

A comprehensive project report detailing the journey of development, from inception to completion, will be generated. This report will provide insights into the project's planning, design, development, testing, and deployment phases. It will serve as a valuable reference for stakeholders and developers alike.

5. A Video to showcase the website

As an optional deliverable, the project team may consider creating a video showcase to visually demonstrate the key features and functionalities of the hotel recommendation website. This video will serve as a dynamic and engaging tool to introduce potential users and stakeholders to the platform's capabilities.

3.4 Exclusions

In the course of defining the project scope, it is imperative to acknowledge the specific features or functionalities that have been consciously excluded from our project's current iteration. These exclusions have been made with deliberate consideration and should not be perceived as drawbacks to our project; rather, they reflect strategic decisions taken to ensure the successful execution of our core objectives.

1. Payment for Bookings

Payment processing is a complex and highly regulated domain that necessitates the integration of a legitimate payment provider. Our decision to exclude this feature is grounded in practicality and resource constraints. Integrating secure payment systems involves legal, financial, and security

considerations, and requires substantial expertise. Given our project's current scope and resources, implementing payment processing would be a significant undertaking that could potentially divert focus from our primary goal - delivering a streamlined hotel recommendation platform.

Future Consideration: While payment functionality is not within the scope of our current project, we recognize its significance for facilitating seamless transactions. We remain committed to exploring the integration of payment services in future project iterations when the necessary resources and expertise become available.

2. Accessibility Options

Providing accessibility features, such as variable font sizes, support for multiple languages, and a dark mode, is crucial for ensuring an inclusive user experience. However, their exclusion at this stage is due to pragmatic considerations. Implementing comprehensive accessibility features can be time-intensive and may require thorough testing to guarantee compliance with accessibility standards.

Future Consideration: We fully acknowledge the importance of accessibility in our project. While these features are not part of our current scope, we commit to prioritising accessibility enhancements in future project phases, demonstrating our commitment to making the platform user-friendly for all individuals, regardless of their abilities or preferences.

3. User Reviews and Favourite Hotels

Enabling users to leave reviews and mark hotels as favourites is a valuable functionality that enhances user engagement and provides valuable feedback. However, their exclusion in this phase allows us to concentrate on core features and expedite the development process.

Future Consideration: The inclusion of user reviews and favourite hotel functionality is a potential avenue for enriching our platform in subsequent iterations. As we gather user feedback and refine our project, we will explore opportunities to introduce these features, thereby enhancing the overall user experience.

In summary, the exclusions detailed above were made with careful consideration and are aimed at ensuring the successful delivery of our project's primary objectives within the constraints of time, resources, and expertise. While these specific features are not part of our initial scope, they remain

on our radar for future enhancements and refinements to provide a more comprehensive and seamless experience for our users.

3.5 Constraints

In the pursuit of our project's objectives, it is crucial to acknowledge and address the constraints that have shaped our scope and approach. These constraints, while challenging, have played a significant role in shaping our project's direction and prioritisation.

3.5.1 Time Constraints

Time is a finite resource, and the availability of team members varies due to their existing commitments and responsibilities. Scheduling meetings, discussions, and development work posed a notable challenge. Additionally, the limited timeline imposed constraints on the depth and breadth of features we could include in the initial release.

Impact on Scope: To manage time constraints effectively, we had to prioritise specific features and functionalities, ensuring that core components received the necessary attention. While it may have restricted the scope of our project to some extent, this prioritisation allowed us to maintain a focused and efficient development process.

3.5.2 Resource Variability

Our project team comprises members with varying skill levels and expertise. This diversity, while valuable, introduced challenges in terms of resource allocation and skill utilisation. Ensuring that team members could contribute optimally to the project required careful planning and resource allocation.

Impact on Scope: To mitigate the impact of resource variability, our project scope was structured to leverage the strengths of each team member effectively. Tasks were allocated based on individual skills and expertise, ensuring that each member could contribute meaningfully to the project's success. This approach allowed us to optimise resource utilisation within the defined scope.

3.5.3 Budgetary Limitations:

Certain features or data sources, such as APIs, require financial resources for access or integration. Our project faced budgetary constraints, which necessitated alternative approaches to resource acquisition and utilisation.

Impact on Scope: The budget limitations led us to explore alternative resources and solutions for aspects that required financial investment. While this constraint did impact the scope, it encouraged resourcefulness and creativity in finding cost-effective alternatives and solutions.

constraints are an intrinsic part of project management, and their recognition and management are vital for achieving successful outcomes. While these constraints may have influenced the scope of our project, they have also driven us to make thoughtful decisions, prioritise effectively, and find innovative solutions. Acknowledging and addressing constraints is a fundamental aspect of responsible project management, ensuring that projects remain on track and deliver value within the defined limitations.

3.6 Assumptions

In the initial phases of our project during the midterm proposal, we established several key assumptions to guide our development process. These assumptions were grounded in user preferences and survey data that we collected at that time. As we move forward with our final project, we find it necessary to revisit and reaffirm these assumptions to ensure their continued relevance and alignment with our goals.

The assumptions are as follows:

Assumptions	Reasoning & Expectation as discussed in Mid-Term Proposal
Users prefer to book hotels through third party booking sites.	The survey results indicate that a significant percentage of respondents (61.1%) prefer to book hotels through third-party hotel booking sites. This suggests a user preference for the convenience and variety of options offered by these platforms.
Users rely heavily on online reviews and ratings when booking hotels.	The survey results show that 94.4% of respondents rely on online reviews or ratings when booking a hotel. This indicates a user's reliance on feedback from other travellers to make informed decisions about their hotel choices.
Elderly users require a user-friendly and simplified design.	The survey results reveal that the application design is made simple for the elderly to use, and greater preference is given to elderly people (age 65 and above) for appointment slots. This indicates a need to cater to the specific usability requirements of elderly users by providing an intuitive and user-friendly interface.

Personalised recommendation systems based on travel preferences are desired by users.	The survey results indicate that 88.9% of respondents would prefer a personalised recommendation system based on their travel preferences and past bookings. This suggests a user desire for tailored recommendations that align with their individual preferences and needs.
Users prioritise certain features and amenities when selecting a hotel.	The survey results reveal that users prioritise features such as Wi-Fi (11 mentions), swimming pool (3 mentions), and fitness centre (2 mentions) when choosing a hotel. This suggests that these amenities are important factors that influence user decision-making.

These assumptions, originally outlined in our midterm project proposal, continue to serve as valuable guiding principles for our final project. As we work toward delivering a robust and user-centric hotel recommendation website, we remain committed to aligning our development efforts with these assumptions to meet user expectations effectively.

It is important to note that we will monitor the validity of these assumptions throughout the project's lifecycle, and if any significant changes or developments occur that may impact their relevance, we will adjust our approach accordingly.

4. Limitations

In the pursuit of developing our hotel recommendation website, we encountered several challenges and limitations that tested our team's resolve and problem-solving capabilities. These limitations, spanning teamwork, knowledge, technical aspects, and time constraints, played a crucial role in shaping our project's trajectory.

4.1 Teamwork Limitations

Embarking on Collaborative Coding Projects: Our team's transition from solitary coding endeavours to collaborative coding marked a significant shift. In the past, we had honed our skills through individual coding projects where the entire front-end and back-end work coexisted within a single system, simplifying the compilation process. However, this project necessitated a different approach, compelling us to divide the workload into segmented tasks. This shift demanded not only a comprehensive grasp of coding methodologies but also the ability to independently compile various program segments—a skill we had to rapidly acquire.

Naturally, our journey was punctuated with errors and challenges as we navigated the complexities of integrating our diverse coding approaches. Nevertheless, our collective determination and unwavering teamwork guided us through these coding dilemmas. In the face of adversity, we persisted and triumphed over every issue that stood in our path. This journey through collaborative coding not only expanded our technical horizons but also strengthened our team camaraderie.

4.2 Knowledge Limitations

Diverse Skill Levels: Given the diverse backgrounds and skill levels of each team member, we encountered challenges in selecting the appropriate programming languages and libraries. The need for a common ground among all team members led to compromises, requiring some members to acquire new skills—a process that was neither swift nor straightforward. It involved rigorous learning, experimentation, and adaptation. However, the determination to bridge these skill gaps prevailed, driven by our shared commitment to the project's success.

4.3 Technical Limitations

Segmented Workload: A crucial strategy in our project was the allocation of different segments to individual team members. While this approach streamlined development, it introduced a unique set of challenges. Delays and pauses became evident, especially when one part of the project was reliant on the completion of preceding segments. To mitigate this issue, our team meticulously instituted concrete deadlines for each task and established transparent channels of communication. This deliberate coordination minimised delays and ensured the project's smooth progression.

4.4 Time Limitations

Schedule Diversities: Despite all team members being based in Singapore, our vastly different class schedules posed a substantial hurdle. Coordinating physical meetings for discussions and planning sessions proved challenging. Additionally, individual external commitments further complicated our efforts to synchronise our meetups and allocate sufficient time to the project. Consequently, the majority of our interactions occurred digitally.

To overcome these logistical challenges, our team adopted virtual meetings as the primary mode of communication. We convened online, without fail, at least once a week. These sessions served as invaluable forums for discussing the project's progress and sharing updates on individual contributions.

4.5 Additional Quality Limitations

In the pursuit of project excellence, we also encountered quality limitations. These included challenges related to optimising website performance for various devices and ensuring the seamless integration of external data sources. Additionally, the need for rigorous testing, especially in simulating user interactions and responses, posed a considerable quality assurance challenge. These quality limitations served as continuous motivators for our team to strive for the highest standards in the development of our hotel recommendation website.

5. Planning and Research

In the foundational stages of our project, we embarked on a comprehensive planning and research journey to ensure the success of our hotel recommendation website. Reflecting on our initial market research, it became apparent that the tourism and hotel industry was on a trajectory of growth and recovery from the COVID-19 pandemic. Our project aimed to contribute to this industry by offering a novel perspective on hotel booking through websites.

5.1 Market Research Insights

Building upon our initial market research, our team conducted further investigations, focusing on the critical design aspect of the website. Our findings indicated that 84.6% of users preferred a clean and minimalistic website design over cluttered ones [Kaniz, 2023]. Therefore, we made a strategic decision to adopt a cleaner and minimalistic approach in designing both wireframes and the actual website. This approach offered several advantages, including improved user efficiency, faster loading times, and a reduced risk of user abandonment due to slow loading [Making Websites Better, 2023].

Another crucial consideration was the need for a responsive website, given that 59.16% of web traffic originated from mobile devices in the 4th quarter of 2022 [Statista, n.d]. Failing to optimise for mobile users could result in a significant loss of potential users.

To ensure our website meets user expectations, we delved into understanding the features users typically sought in a hotel booking website. Our research uncovered key insights:

Easy Navigation: 94% of website visitors emphasised the importance of easy navigation, which underscored the need for a visible navigation bar in our design [Guta, 2019].

Search Functionality: Approximately 30% of users relied on search boxes [Babich, 2017], and a staggering 68% would leave a website with a poor search experience [AddSearch, 2020]. As a result, implementing a robust search function became a priority.

Our overarching goal was to create a hotel booking website that provided users with a seamless experience. This encompassed enabling users to access comprehensive hotel information and effortlessly book their preferred accommodations. The website aimed to achieve this through a single online browser accessible across multiple platforms.

Our project was strategically designed to tackle critical questions and upon further research and reflection, our team diligently addressed these key questions:

1. How could we develop a robust hotel booking system that catered to diverse user needs?

We developed a system that proactively checked for bookings and blocked out dates when users selected specific dates.

2. How could we effectively address and reduce issues like double bookings, which were identified as common challenges in our initial research?

Recognizing the complexity of completely eliminating double bookings, we acknowledged that this challenge required the involvement of a third-party system with more sophisticated capabilities. While our system effectively managed a smaller user base, its scalability to handle a larger user volume remained untested.

3. How could we implement a reliable system for tracking and managing hotel bookings?

We implemented robust booking tracking mechanisms to ensure users could conveniently monitor their reservations.

5.2 Project Management

Software development is an intricate process, prone to challenges without proper management. To navigate this complexity effectively, our team employed a set of tools and methodologies:

5.2.1 Gantt Chart

A Gantt chart provided a visual representation of our project's progression, enabling us to track milestones and tasks. This chart evolved dynamically as we encountered various scheduling challenges and worked towards our project's completion.

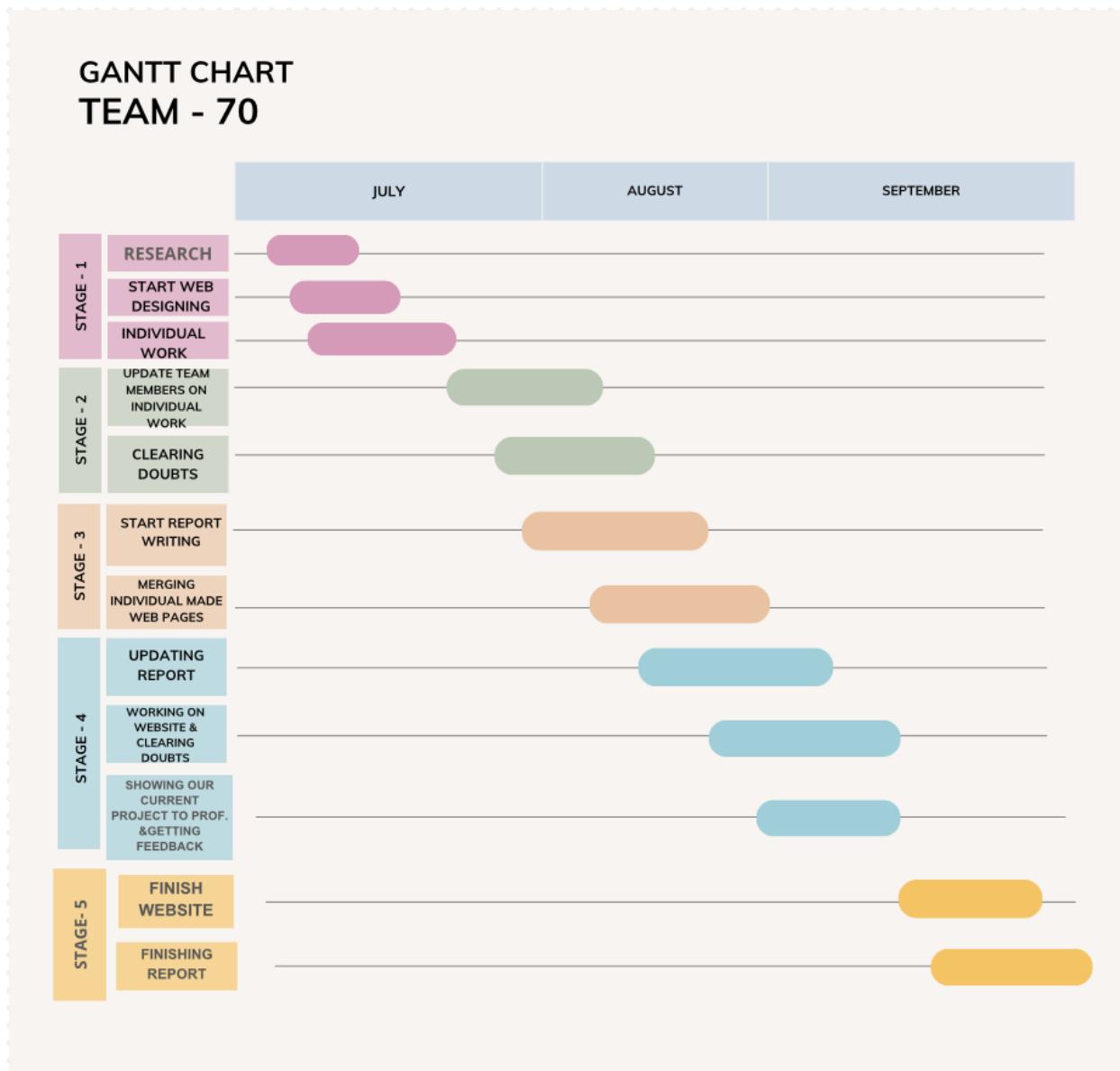


Figure 1: Progression Gantt Chart

The initiation of our website development project commenced at the close of July, with a subset of our team members diving into the task. This initial phase was marked by several challenges, primarily stemming from the diverse personal commitments and academic schedules of our team

members. Consequently, it was a rare occurrence for all team members to be present simultaneously, necessitating a flexible approach to our work structure.

Scheduling Complexities:

The complexities in coordinating team members' schedules were twofold. First, we had to accommodate personal commitments, which included work, family responsibilities, and other non-project-related obligations.

Individual and Collaborative Work:

Given the scheduling constraints, our team members often found themselves working individually or in smaller pairs. These pairs collaborated on specific project components, aligning their efforts to make the most of the available time and expertise. It was a strategic decision to work closely in smaller groups to maximise productivity during periods when full-team engagement was unfeasible.

Progress Tracking and Communication:

In light of these scheduling intricacies, effective communication emerged as a linchpin for our project's success. The team recognized the importance of transparency and collaboration, even during periods of individual work. Consequently, we diligently maintained channels of communication to ensure that every team member remained informed about the project's overall progress.

Technical Adaptations:

To address these scheduling challenges, our team adopted a set of technical adaptations:

Version Control: We employed version control systems like Git to allow team members to work on code independently. This facilitated the merging of code contributions and ensured that everyone had access to the latest updates.

Online Collaboration Tools: We relied on online collaboration tools, mainly communication apps, to maintain constant contact. These platforms enabled us to share progress updates, discuss roadblocks, and provide assistance when needed.

5.2.2 Team Roles

Our team was composed of individuals with diverse skills and responsibilities, each contributing to the successful development of our hotel recommendation website. Here is an overview of the key roles within our team:

1. Alex - Database Manager/Lead Developer

As the Database Manager and Lead Developer, Alex played a pivotal role in designing, implementing, and managing the database architecture of our website. He also took the lead in coordinating the development efforts of the team.

Responsibilities:

- Database design and management.
- Overseeing the technical aspects of the project.
- Coordinating with other team members to ensure seamless integration of front-end and back-end components.

2. Neha - Coordinator/Developer

Neha assumed the role of Coordinator and Developer, acting as a bridge between team members and facilitating smooth communication and collaboration.

Responsibilities:

- Coordinating team meetings and discussions.
- Supporting developers in their tasks. Assisting in project planning and organisation.

3. Benjamin - Developer

Benjamin contributed as a Developer, actively involved in coding and bringing our website to life.

Responsibilities:

- Developing specific features and functionalities.
- Collaborating with the team to ensure code integration.

4. Marcus - Developer

Marcus was a Developer focused on the technical implementation of the website's features and functionality.

Responsibilities:

- Coding and development of website components.
- Collaborating with other developers to achieve project goals.

5. Lavanya - Scrum Master/Developer

Lavanya took on the responsibilities of a Scrum Master, ensuring that our team followed Agile Scrum methodologies for efficient project management. She also contributed as a Developer.

Responsibilities:

- Facilitating Scrum meetings and sprint planning.
- Monitoring progress and removing obstacles.
- Actively participating in development tasks.

5.2.3 Agile Methodology

Our adoption of the Agile Scrum methodology played a crucial role in our project management approach, allowing us to efficiently navigate the challenges posed by different team members' schedules. This methodology enabled us to not only address scheduling conflicts but also provided a structured framework for tracking and recognizing individual contributions.

Agile Scrum Framework:

We chose the Agile Scrum framework for several reasons:

Flexibility: Recognizing that team members had varying schedules and commitments, we needed a flexible approach that accommodated these differences.

Iterative Development: Agile Scrum promotes iterative development, allowing us to continuously refine and improve our project.

Communication: It fosters regular communication and collaboration, ensuring that everyone remains informed and aligned with project goals.

Weekly Scrum Meetings:

While daily Scrum meetings are a standard practice in Agile, we adapted the frequency of our meetings to better suit our team's unique circumstances. We conducted weekly Scrum meetings to ensure consistent progress and accountability while respecting team members' schedules.

These meetings followed a structured format, focusing on three key questions:

What Have You Done Today? Team members reported on their progress, highlighting the tasks and achievements since the previous meeting.

What Are You Going to Do This Week? This question encouraged team members to outline their upcoming tasks and objectives for the week.

Do You Need Any Help With Issues Faced? It provided an opportunity for team members to seek assistance or address any challenges hindering their progress.

The decision to use a shared Google document for these meetings was driven by the need for collaborative and accessible communication. This approach allowed all team members to contribute their updates, insights, and questions asynchronously while being able to refer back to the document when needed. Discord served as the platform for real-time discussions and interactions when required.

Week 1

Marcus

1. Began working on the basic html code for the login page.
2. Continue working on the basic html code and hopefully able to implement some form of functionality.
3. So far no.

Lavanya

1. I've started to research about what is needed and wanted in a booking website from a user's perspective.
2. I will finish up the research and start to work on the database side.
3. No.

Alex

1. Worked on researching how to implement a calendar function in the website
2. Finish up and hopefully be able to implement it.
3. Nothing as of yet.

Benjamin

1. Today i read up on react and tailwind and tried to learn them.
2. I will try to implement some stuff using react and tailwind.
3. I may need some help in the actual implementation as i'm afraid it may be a little complicated.

Neha

1. Researched about databases
2. Will begin to build the database with the data that we require for our website
3. Nothing.

Figure 2.1: Scrum Meeting - Week 1

Week 3

Marcus

1. Started to fill in the skeleton of the report along with Benjamin
2. Will begin to assign parts of the reports to the team along with Benjamin
3. No.

Lavanya

1. Working on implementing a search bar in the website
2. Hopefully, finish implementing the search bar and be able to test it with our data
3. Nope

Alex

1. Working on some of the routing
2. Will work on the linking of the database with Neha.
3. No

Benjamin

1. Worked with Marcus in starting the report
2. Assign parts of the report to the team and work on the backend of our website
3. Nothing

Neha

1. Working on the linking of database
2. Will try to finish the linking of database with Alex's help
3. Nothing

Figure 2.2: Scrum Meeting - Week 3

Week 5

Marcus

1. Working on the connection of the database, making data retrieval work.
2. Will finish up the data retrieval of hotels
3. Getting help from Alex on some issues

Lavanya

1. Still working on html and tsx
2. Will try to work on the styling after
3. No issues thus far

Alex

1. Finished implementing the calender function
2. Will work on profile.tsx
3. Will need help on some of the routes (Lavanya or Benjamin)

Benjamin

1. Will help start working on the css
2. Will help Alex with routing
3. No issues

Neha

1. Working on profile.tsx
2. Might be able to work on some of the login issues
3. Nothing

Figure 2.3: Scrum Meeting - Week 5

The inclusion of images from our Scrum meetings provides a visual representation of our commitment to effective communication and collaboration, even in the face of scheduling constraints. These meetings served as valuable touchpoints for tracking progress, sharing updates, and addressing challenges, ultimately contributing to the success of our project.

6. Prototyping and Research

Our journey into prototyping and iteration began with the goal of translating our medium-fidelity wireframes, initially presented in our first project proposal, into functional prototypes. These prototypes served as the foundation for our project and underwent continuous refinement and

enhancement throughout the development process, guided by valuable input and insights gathered from user testing.

For our prototyping needs, we selected Figma as our primary tool. Figma is a web-based design and prototyping platform renowned for its real-time collaboration features, user-friendly interface, and robust set of tools for creating diverse interfaces and graphic designs. The choice of Figma offered several advantages that greatly facilitated our prototyping and iteration processes:

Real-time Collaboration: Figma's real-time collaboration features enabled our team members to work together seamlessly, regardless of their physical locations. This collaborative environment promoted effective communication and allowed multiple team members to contribute to the prototypes simultaneously.

Interactive Prototyping: Figma provided us with the capabilities to create interactive prototypes that closely simulated the functionality of our website. This interactivity was crucial for gathering feedback and comprehensively visualising the user experience, ensuring that the final product met user expectations.

Version Control and Consistency: Figma's cloud-based nature ensured that every team member consistently worked on the most up-to-date project files. This eliminated the risk of inconsistencies caused by multiple versions of the same design or prototype.

Efficient Iteration: Figma's robust toolset and collaborative features streamlined our iteration process. It allowed us to quickly implement changes, test different design ideas, and refine the prototypes based on user feedback, without the need for complex version management

6.1 First Prototype

In our Mid-term Submission, we introduced our initial low-fidelity prototype for the web application. The low-fidelity prototype serves as a foundational representation of the application's basic view and functionality. Its primary purpose is to provide users with a clear understanding of the application's flow and the range of services it offers.

As we progress in the development process, our prototypes will evolve from low-fidelity to medium and high-fidelity versions. These iterations will incorporate increasing levels of design detail, visual aesthetics, and interactive elements.

6.2 Second Prototype

In the early stages of our project, our primary objective was to create a functional prototype that encompassed the essential features necessary for the effective operation of the website. During this phase, our focus was primarily on functionality, and we temporarily set aside the design aspects, resulting in a prototype with a plain and minimalist appearance. Despite its simple aesthetics, this second prototype successfully incorporated key features, such as a functional search bar and a straightforward login system.

Below, you will find visual representations of our prototype, providing insights into the core functionalities and layout of the website at this early stage:

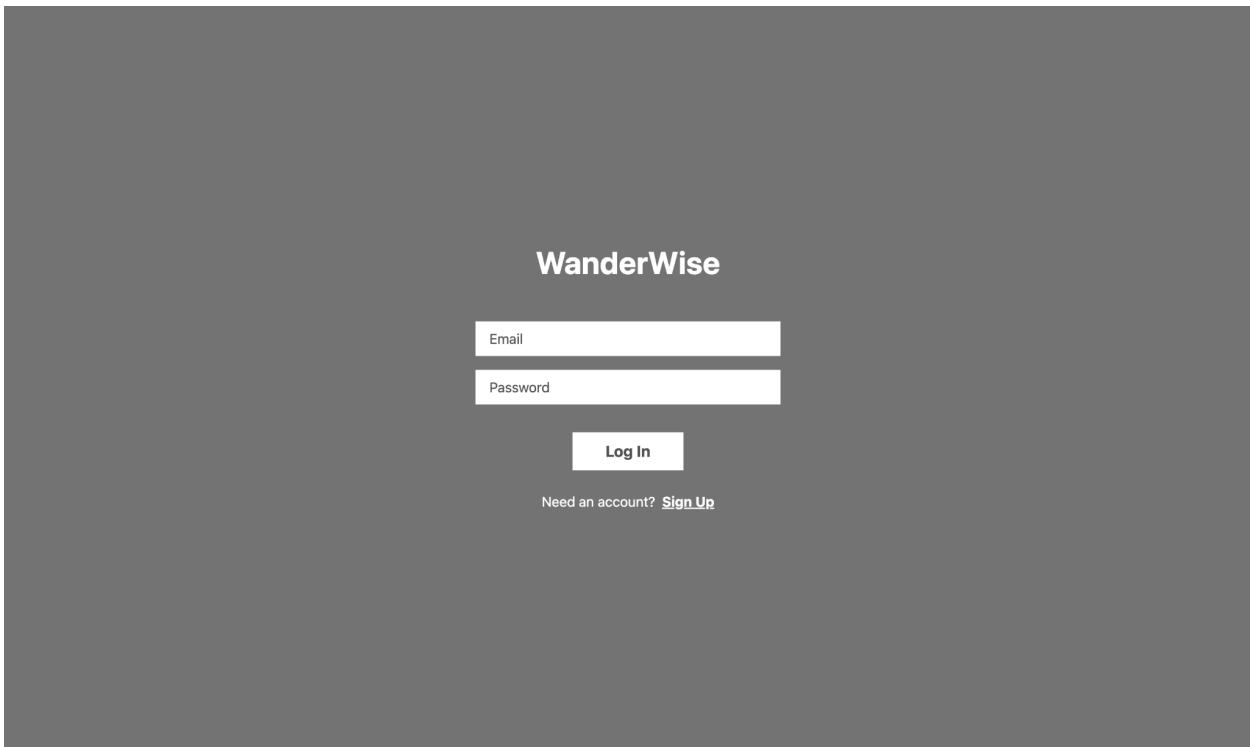


Figure 3.1: Login Page

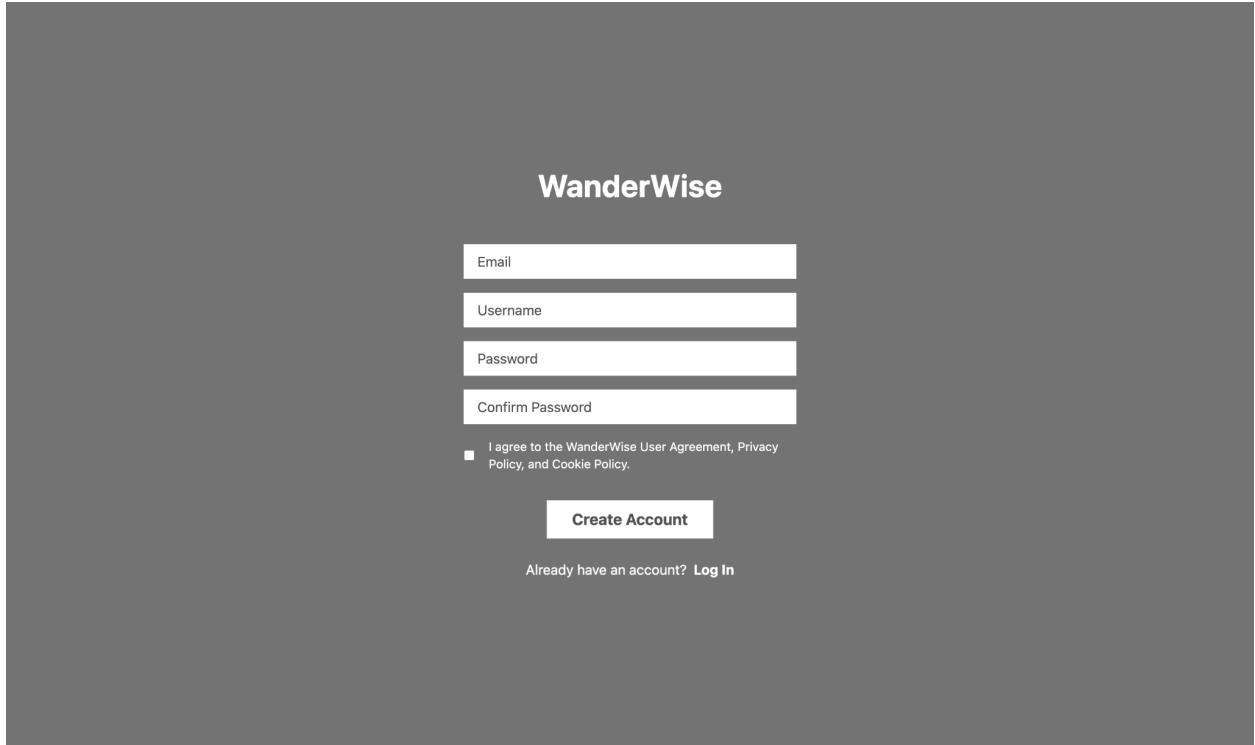


Figure 3.2: Register Page

Welcome to

WanderWise

Search Hotels

All Countries All Ratings

Mullingar Park Hotel
Mullingar, Ireland

Perfectly situated, The Bay View Hotel overlooks magnificent Donegal Bay. Blue Flag Finnra Beach is a 5-minute drive away and Slieve League Cliffs, the highest sea cliffs in Europe, just a 30 minute drive away.

[More >](#)

Hotel - Restaurant La Claire Foret
Morhange, France

Located in Morhange, 43 km from Parc des Expositions de Metz, Hotel - Restaurant La Claire Foret provides accommodation with a garden, free private parking, a shared lounge and a restaurant. This 3-star hotel features fr...

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Akademiehotel Jena
Jena, Germany

Situated near the football stadium in Jena, this hotel is affiliated with the Thuringian Social Academy's educational centre. It offers affordable accommodation, free WiFi and a complimentary ticket for local public transport...

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Fitzgeralds Woodlands House Hotel
Adare, Ireland 0000-

Set on the edge of Adare, Fitzgeralds is 10 minutes' from Limerick City. It offers an award-winning restaurant, a leisure club with a pool, the Revas Spa and free WiFi throughout. Rooms at Fitzgeralds Woodlands House have private bathrooms with luxury toiletries and fluffy towels. The also include beds adorned with Egyptian cotton sheets and goose-down duvets. The Fieldings of Adare...

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Egestorfer Hof
Egestorf, Germany 0000-

Our traditional country hotel near the half-timbered church in the heart of Egestorf, blends beautifully into the countryside. You will experience a sense of tradition here. The town of Egestorf lies on the edge of Lüneburg Heath natural reserve and is easy to reach via the Hamburg – Hanover motorway. We also feature in-house bowling facilities and a large reception room for up to 100...

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Zur Alten Schmiede
Naumburg, Germany 0000-

This traditional hotel is set in the historic heart of Naumburg, just a short stroll from the city's famous cathedral. Free WiFi is provided. The Hotel Zur Alten Schmiede offers bright, attractively equipped rooms in a prime location. You can quickly reach the city's attractions such as the Marienstor gate and Nietzsche-Haus from here. The hotel's modern conference facilities satisfy the...

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Adria Mobile Homes
Šibenik, Croatia 0000-

Set a short walk from a beach and surrounded by a pine tree forest, Adria Mobile Homes are situated in Šibenik area, in Solaris Camping. The guests can have a meal at the on-site restaurant or have a drink at the bar. Free WiFi in public areas and free parking are provided. All units are air-conditioned and offer a furnished terrace. Each has a seating and dining area as well as a flat...

[More >](#)

B&B Villa Angy
Korenica, Croatia 0000-

Featuring free WiFi and air conditioning, B&B Villa Angy is located in Vrelo Korenčko. Entrance 1 to the UNESCO-protected Pitvice Lakes National Park is 16 km away. Free private parking is available on site. The accommodation is fitted with a flat-screen TV. There is also a kitchen in some of the units, fitted with a microwave and fridge. Every unit comes with a private bathroom with a shower....

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Figure 3.3: Home Page

WanderWise [Log In](#)

Zur Alten Schmiede 0000- **USD 251.00**
 Naumburg, Germany / night

This traditional hotel is set in the historic heart of Naumburg, just a short stroll from the city's famous cathedral. Free WiFi is provided. The Hotel Zur Alten Schmiede offers bright, attractively equipped rooms in a prime location. You can quickly reach the city's attractions such as the Marientor gate and Nietzsche-Haus from here. The hotel's modern conference facilities satisfy the requirements of all business travellers. Built in the style of an old forge, the cosy restaurant is another highlight. Treat yourself to delicious specialities and wines from the Saale-Unstrut region.

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This 3-star hotel in Arnsberg offers fresh traditional German cuisine with organic food. The landmark Glockenturm tower is just steps away. All of the rooms at the Zum Landsberger Hof include cable TV, a seating area, and a modern bathroom. Wi-Fi is available for free. The Zum Landsberger Hof has secure bicycle storage facilities. Zum Landsberger Hof is located in the city...

Akademiehotel Jena Jena, Germany 00--- [More >](#)

Situated near the football stadium in Jena, this hotel is affiliated with the Thuringian Social Academy's educational centre. It offers affordable accommodation, free WiFi and a complimentary ticket for local public transport in Jena. The Akademiehotel Jena offers functional yet comfortable rooms. Guests can enjoy free dinner from Monday to Thursday. Guests with mobility problems will...

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Figure 3.4: Hotel Detail Page

You are now booking for:

Zur Alten Schmiede
Naumburg, Germany

0000- **USD 251.00**
/night

This traditional hotel is set in the historic heart of Naumburg, just a short stroll from the city's famous cathedral. Free WiFi is provided. The Hotel Zur Alten Schmiede offers bright, attractively equipped rooms in a prime location. You can quickly reach the city's attractions such as the Mariendorf gate and Nietzsche-Haus from here. The hotel's modern conference facilities satisfy the requirements of all business travellers. Built in the style of an old forge, the cosy restaurant is another highlight. Treat yourself to delicious specialities and wines from the Saale-Unstrut region.

Start Date YYYY-MM-DD

End Date YYYY-MM-DD

Submit

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Figure 3.5: Hotel Booking Page

Before progressing to the development of our third and final prototype, our team placed a significant emphasis on the value of user feedback and the overall user experience. In recognition of this, we undertook a user testing feedback initiative to gather insights and opinions on the second prototype. This feedback was collected through interviews conducted via an online survey distributed to selected participants. The survey featured a range of questions designed to pinpoint areas in need of improvement for our website.

Below, we provide visual representations of the user testing feedback received for our initial prototype, shedding light on the perspectives and suggestions of our participants:

Questions	Options	Response	Feedback
Are you satisfied with the general layout of the website?	Yes	10	Generally most of the responses were positive but some said that the star ratings were too small
	No	4	
Would you want to see more information about the hotels in the homepage?	Yes	3	Positive response again, but some of the responses said that some of the hotel's description may be bordering 'wordy' even when they voted 'It's sufficient'
	It's sufficient	11	
Any issues with the login?	Yes	0	NIL
	No	14	
What other functions would you like to see in our website?	Dark mode	3	May want to explore the option of having a dark mode
	Search dropdown	1	
	All good	8	
From the login page, Are we missing anything?	Yes	0	NIL
	No	14	

Figure 4: Results & Feedback of Survey on Second Prototype

These insights gathered from user testing feedback were instrumental in guiding our team's decisions for the development of the second prototype. By addressing the identified areas of improvement, we aimed to create a more refined and user-centric website in the subsequent iteration.

6.3 Third and Final Prototype

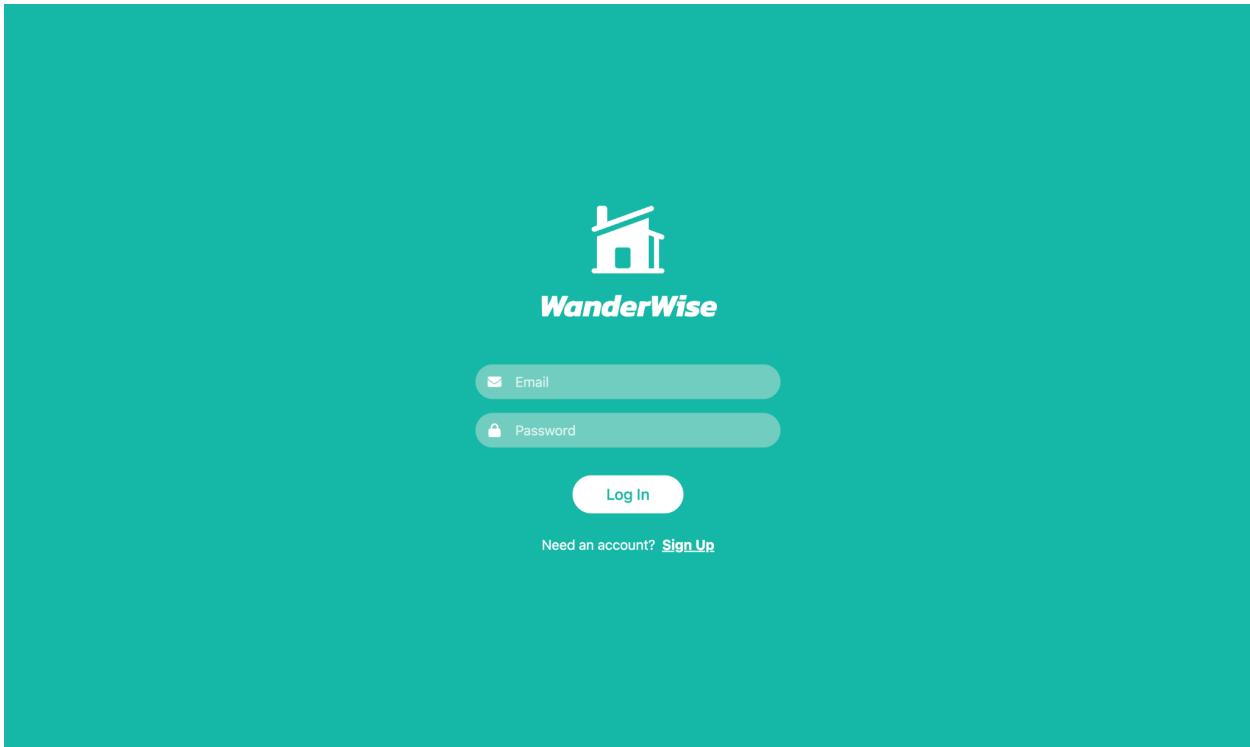


Figure 5.1: Login Page

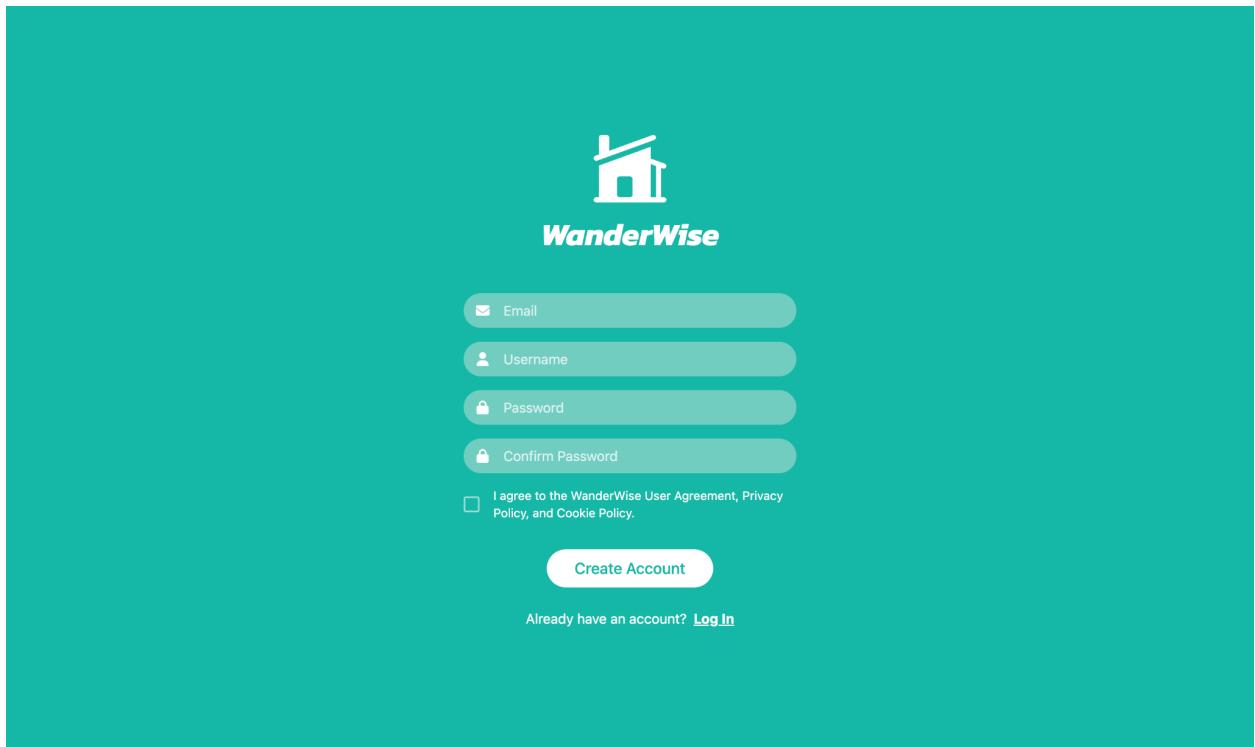


Figure 5.2: Register Page

Welcome to
WanderWise

Search Hotels

All Countries All Ratings

Mullingar Park Hotel, Mullingar, Ireland Perfectly situated, The Bay View Hotel overlooks magnificient Donegal Bay. Due Flag Hotel is a 5-minute drive away and Donegal Airport, the longest route in Europe, just a 30-minute drive away... More >

Hotel - Restaurant La Claire Foret, Montreux, France Located in Monthey, 40 km from Parc des Expositions de Monthey, Hotel - Restaurant La Claire Foret provides accommodation with a garage. This 3-star hotel offers a swimming pool and a restaurant. This 3-star hotel features... More >

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Egesteror Hof, Egester, Germany ★★★★☆ Our traditional country hotel near the half-timbered church in the heart of Egester, stands breath-takingly into the countryside. You will experience a sense of tradition here. The house is perfectly positioned on the edge of the Uelzener Heath Nature Reserve and is easily to reach by the highway A - 70 motorway. The area is located in a rural setting between forests and large meadow areas. The hotel's modern conference facilities satisfy the...

Zur Alten Schmiede, Naumburg, Germany ★★★★☆ This traditional hotel is set in the historic heart of Naumburg, just a few steps from the old town hall and the Frauenkirche. The hotel has a bar and a restaurant. The Zillertal-Bahn train station is located nearby in a prime location. You can quickly reach the city's attractions such as the Münzenberg gate and Niemitz-Haus from here. The hotel's modern conference facilities satisfy the...

Adria Mobile Homes, Sibenik, Croatia ★★★★☆ Set in a park near the beach and surrounded by a pine tree forest, Adria mobile homes are situated in the area of Sibenik County. The guests can have a meal at the on-site restaurant or have a drink at the bar. Free WiFi in public areas and free parking are provided. All units are air-conditioned and offer a furnished terrace. Each has a seating and dining area as well as a TV...

BBB Villa Amy, Kotor, Montenegro ★★★★☆ Features 24-hour room air conditioning. BBB Villa Amy is located in Kotor-Boka, Crvene 1, 10 m from the UNESCO protected Vrane Lake. Laundry facilities are available. On-site parking is available on site. The accommodation is fitted with a flat-screen TV. There is also a kitchen in some of the units, fitted with a microwave and fridge. Every unit comes with a private bathroom with a shower...

Castel Transilvania, Baia Mare, Romania ★★★★☆ Built in a style inspired by medieval architecture, Castle Transilvania offers its guests swimming pools and a sauna. Guests can also enjoy a massage service and a beauty treatment. Free WiFi is available in the entire property. Guests will find units decorated in dark brown and red tones. Fitted with a fireplace, the rooms feature air conditioning, a flat screen TV with satellite channels, a sofa...

Actor Hotel Budapest, Budapest, Hungary ★★★★☆ Close to the Danube River, Actor Hotel is 800 metres from the Gellert Boulevard and the Thermal Bath Station. The historic 19th century hotel is easily reachable as well from the nearby metro, bus and tram stations. Spend peaceful nights in the elegantly furnished and air-conditioned rooms before you set out for doing business or sightseeing in Budapest. All rooms are fitted with under-floor heating.

Breithorn Hotel, Aravis, Italy ★★★★☆ Situated near coffee shop and a bar in 10 minutes' drive from Veyta d'Aravis, Breithorn hotel Champsaur comprises 30 rooms 0.5 km from Aravis Champs d'Aravis. A comfortable stay at this hotel awaits you with stone baths and a hot tub. Champsaur centre can be reached within a minute walk. The 4-star hotel is not far from Champsaur Adventure Park.

Villa Polpo by Rentando, La Nucia, Spain ★★★★☆ The rental houses at the Villa Polpo by Rentando ensure you of a very warm welcome, offering highly rated, 5-star holiday home accommodations with three well-appointed houses. The property is offering 5 deals at up to 35% off on selected dates in August & September. Facilities include nearby parking, pool, free WiFi in bedrooms & all guest areas.

Best Western Hotel Acqua Novella, Spoltore, Italy ★★★★☆ Is located in the eastern and more peaceful area of Spoltore. It stands on a hillside, immersed on the coastline ideal location for a relaxing, quiet getaway with a wonderful climate and an amazing view overlooking the pristine blue waters of Spoltore, the breakfast room sets the scene for every moment of the day.

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Figure 5.3: Home Page

 [Log In](#)



Zur Alten Schmiede  **USD 251.00**
/ night

[Book Now](#)

This traditional hotel is set in the historic heart of Naumburg, just a short stroll from the city's famous cathedral. Free WiFi is provided. The Hotel Zur Alten Schmiede offers bright, attractively equipped rooms in a prime location. You can quickly reach the city's attractions such as the Mariendorf gate and Nietzsche-Haus from here. The hotel's modern conference facilities satisfy the requirements of all business travellers. Built in the style of an old forge, the cosy restaurant is another highlight. Treat yourself to delicious specialities and wines from the Saale-Unstrut region.





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Figure 5.4: Hotel Detail Page

 [Profile](#) [Log Out](#)

You are now booking for:

Zur Alten Schmiede ★★★★★ **USD 251.00**
/night

Naumburg, Germany

This traditional hotel is set in the historic heart of Naumburg, just a short stroll from the city's famous cathedral. Free WiFi is provided. The Hotel Zur Alten Schmiede offers bright, attractively equipped rooms in a prime location. You can quickly reach the city's attractions such as the Mariendorf gate and Nietzsche-Haus from here. The hotel's modern conference facilities satisfy the requirements of all business travellers. Built in the style of an old forge, the cosy restaurant is another highlight. Treat yourself to delicious specialities and wines from the Saale-Unstrut region.

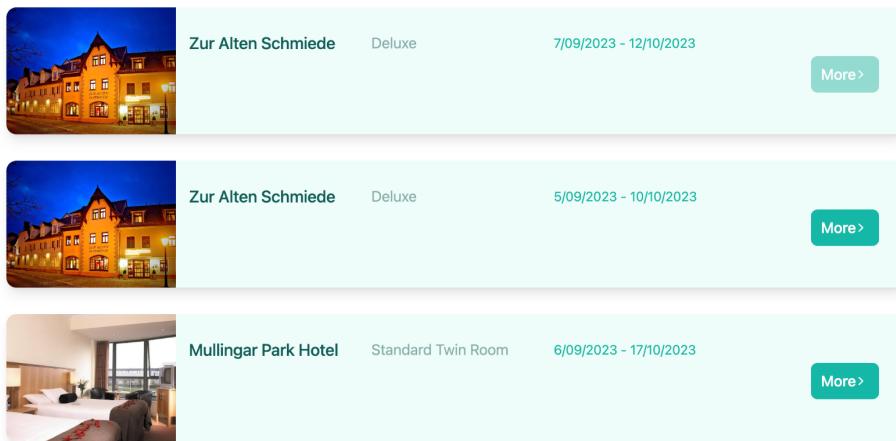
Submit

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Figure 5.5: Hotel Booking Page

Profile

Past Bookings



Update Details

[Update](#)

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Figure 5.6: profile Page

In the progression from our initial low-fidelity prototype to the third and final prototype, a significant transformation took place, primarily focusing on the design aspects of our web application. This iterative process was driven by valuable user feedback, and the final prototype reflects the culmination of these design enhancements.

Design Aesthetics: One of the most noticeable changes between the prototypes is the complete redesign of the application's visual elements. The colour scheme, layout, typography, and overall design aesthetics have undergone significant improvements. These enhancements were implemented to create a more visually appealing and user-friendly experience.

User-Centric Approach: The design changes were guided by a user-centric approach. The feedback received from user testing played a pivotal role in shaping the final design.

Enhanced Usability: Beyond aesthetics, the final prototype focuses on enhancing usability. User interface elements, such as buttons, navigation menus, and interactive components, have been refined to optimise user interactions and provide a smoother, more efficient experience.

7. Design

Our journey through the development process has witnessed a significant evolution in our approach, transitioning from a focus on functionality to a meticulous attention to aesthetics and usability. As we embarked on this transformative journey, our overarching goal was to build a robust framework for the website initially, and subsequently shift our focus towards refining its design and enhancing user experience. This transition was underpinned by valuable user feedback and a commitment to elevate various facets of our application.

7.1 Aesthetic Appeal

Responsive Design: We acknowledge the significance of responsive design in today's digital landscape. Tailwind CSS was chosen as our framework for ensuring responsiveness across various devices. This choice allowed us to craft visually appealing and adaptable layouts that seamlessly adjust to different screen sizes.

Consistency and Homogeneity: Our design underwent a comprehensive review, with a particular emphasis on consistency. We ensured that visual elements such as fonts, colour schemes, and spacing were uniform throughout the website. This not only enhances the overall look but also contributes to a harmonious user experience.

Streamlined Navigation: Effective web navigation is pivotal in user engagement. To enhance user appeal and usability, we meticulously designed the website's "cards" system, "grid system," "positioning and margins," and "feature scaling and sizing," among other components. These design elements contribute to an aesthetic and user-friendly interface.

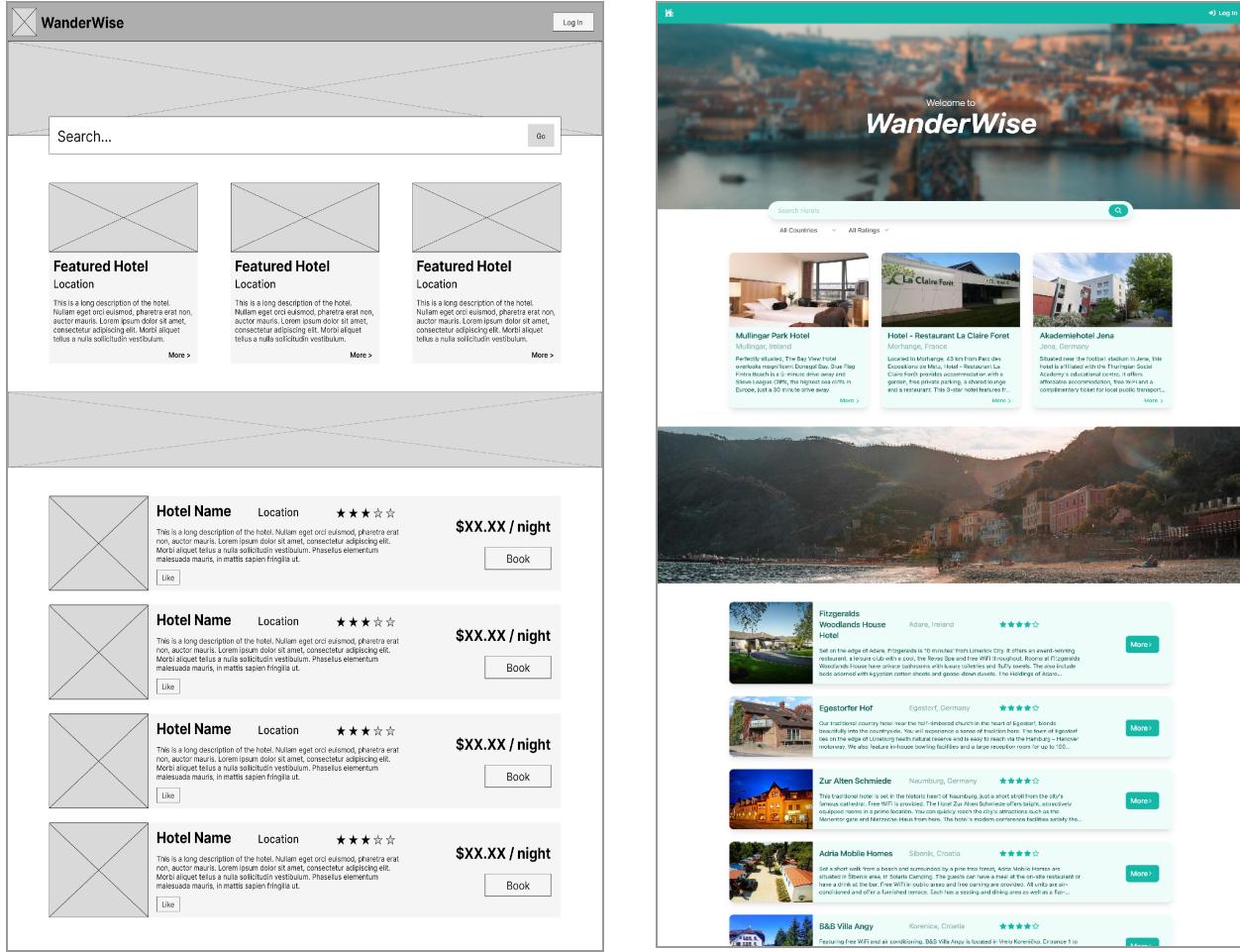


Figure 6: Comparison between the Initial and Final Design

7.2 Improved Navigation

Clear Menu Structure: The cornerstone of efficient navigation is a well-structured menu system. Our redesigned design incorporates logically organised menus with descriptive and user-friendly labels. The clear and logical organisation of menus, coupled with descriptive labels, ensures that visitors can easily find their way around. Whether they are seeking specific information or accessing various functions, each menu option is crafted to provide clear guidance, directing users to the relevant sections or pages with ease.

Dropdown Menus: For websites with an extensive array of categories and content, dropdown menus are indispensable. Our improved navigation design includes hierarchical dropdown menus, enabling users to explore the website's structure in a systematic manner. This hierarchical

presentation allows for swift and intuitive navigation, as users can drill down into specific categories and sections without unnecessary clicks or confusion.



Figure 7: Dropdown Menu

Search Bar: Incorporating a search bar into our navigation toolkit has proven invaluable, especially for larger websites with extensive content. The built-in search bar empowers users to enter keywords and swiftly locate specific content of interest. This feature significantly enhances user efficiency and satisfaction, ensuring that users can pinpoint relevant information with ease.

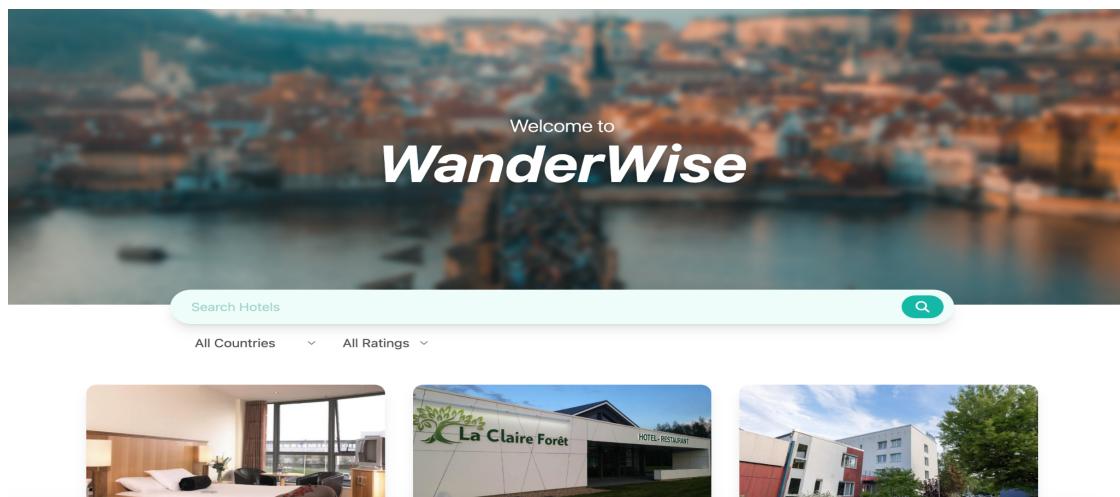


Figure 8: Search Bar

In summary, our redesigned design places a strong emphasis on both aesthetics and usability. It not only elevates the visual appeal of our website but also enhances user navigation through clear menus, hierarchical dropdowns, and an intuitive search bar.

8. System Development

8.1 Conceptualisation of Application

In the process of conceptualising our application, we meticulously mapped out its functionality to ensure that it meets the needs of our users effectively. This involved the creation of detailed use cases that outline the various actions users can perform within the system. Here, we provide an overview of these use cases along with their corresponding descriptions and associated pages:

Use Case	Description	Pages
Create User Account	Users have the ability to create an account and subsequently log in. This account creation process allows users to associate their bookings with their profiles for easy reference.	Login Page ("/login") Registration Page ("/register")
Search for Hotels	Users can search for hotels based on diverse criteria, including location, dates, and personal preferences. This search functionality enables users to find hotels that match their specific requirements.	Home Page ("/") Search Page ("/search")
View Hotel Details	Users can access comprehensive information about a particular hotel. This includes details on amenities, room types, prices, and ratings. This feature enables users to make informed decisions when choosing a hotel.	Hotel Detail Page ("/detail/[id]")
Make a Reservation	Users can select a room, specify the number of guests, and make a reservation for a specific	Hotel Detail Page ("/detail/[id]/book")

	period. This functionality streamlines the booking process and ensures a seamless user experience.	
Manage Bookings	Users can access a centralised location to view both past and upcoming bookings. While the ability to modify or cancel reservations was initially planned, this feature was excluded due to time constraints.	Profile Page ("/profile")
Add to Favourites	Users have the option to add hotels to their list of favourites for quick access and future reference. Although planned, this feature was also excluded due to time constraints.	Excluded due to time constraints
Provide Ratings and Reviews	Users can rate and review hotels based on their experiences. This valuable feedback system allows users to share their insights and opinions with others.	Excluded due to time constraints

Figure 9: Use Cases

8.2 Git and GitHub Repository

GitHub was instrumental in our project, offering the capability to work on various segments and components simultaneously through multiple branches. Developers used the GitHub Desktop application to commit changes to their respective branches.

However, a candid assessment of our commits reveals room for improvement. While some team members made commendable efforts to provide proper commit messages, others used non-standard formats or default commits when uploading files directly to GitHub. However, the challenge arose during branch merging, requiring effective communication to prevent unintentional overwrites of each other's work. This coordination was crucial for a seamless integration of different code segments.

8.3 Software Structure and Components

Our software structure is designed for efficient organisation. Non-routing components are located within the "lib" folder, which is further subdivided into:

1. "trpc" for tRPC API layer-related components.
2. "ui" for all UI elements, organised into subfolders as necessary.

Components outside these categories are placed directly in the root of the "lib" folder, ensuring a logical and accessible structure.

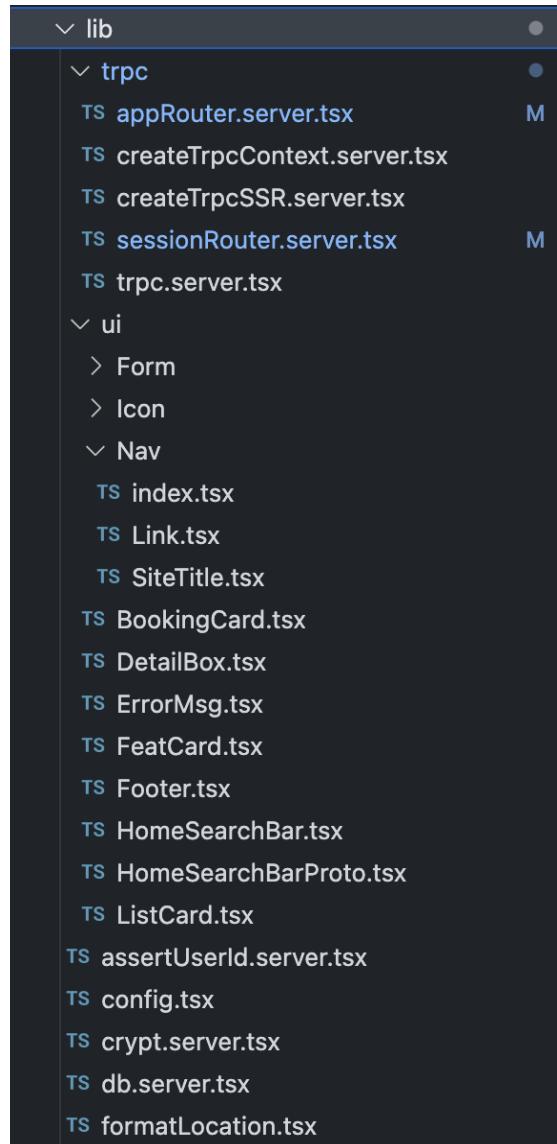


Figure 10: trpc & ui sub-folders

Our routes are organised within the "routes" folder in accordance with the Remix framework. Each route consists of the following components:

1. **React Component:** This component is responsible for rendering the visible content of the page.
2. **Loader Function:** If applicable to the route, this function loads data from the database.
3. **Action Function:** If applicable to the route, this function handles form submissions on the server.

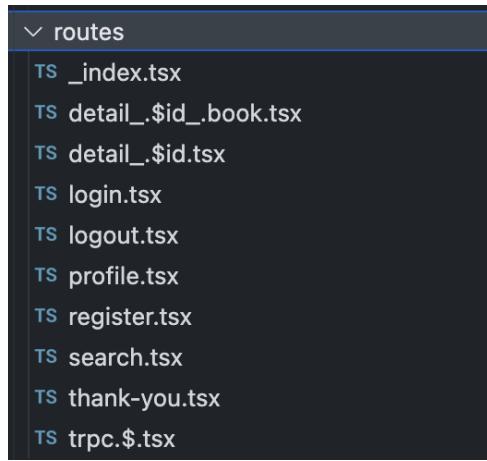


Figure 11: routes folder

Here is a summary of our routes:

- **"_index.tsx" (path: "/"):** Displays the home page.
- **"detail_.id_.book.tsx" (path: "/detail/[:room_id]/book"):** Displays the booking form for a specific room and handles booking submissions.
- **"detail_.id.tsx" (path: "/detail/[:room_id]"):** Displays the detail page for a specific room.
- **"login.tsx" (path: "/login"):** Displays the login form and handles login attempts.
- **"logout.tsx" (path: "/logout"):** Ends the user's session and redirects them to the login page.
- **"profile.tsx" (path: "/profile"):** Displays the user's profile page. If the user is not logged in, it redirects them to the login page. It also handles profile update submissions.

- **"register.tsx"** (path: "/register"): Displays the registration form for creating a new account and handles registration submissions.
- **"search.tsx"** (path: "/search"): Displays search results based on given parameters.
- **"thank-you.tsx"** (path: "/thank-you"): Displays a "thank you" message after a user has booked a room.
- **"trpc.\$.tsx"** (path: "/trpc/[params]"): Path used by the tRPC API layer for communication.

This structured approach ensures clarity and organisation within our project's routing system.

8.4 Black Box Testing

No.	Case	Input	Output	Conclusion
1.	Creation of account	1. Click "Login" 2. Click "Sign Up" 3. Fill in the fields and click "Create Account"	Brings the user to the login page Brings the user to the sign up page Brings the user back to the login page to enter their credentials	Pass
2.	Search for hotel	1. Enter search term into search box 2. Click search button 3. Select country filter 4. Select rating filter 5. Click on "Load More"	Brings user to the search results page Reloads results based on users filter choices Loads additional results on user interaction based on users search terms	Pass
3.	Reserve dates	1. Click on a particular	Brings the user to the	Pass

	for particular hotel	<p>hotel you want to book.</p> <p>2. Click the “Book now” button.</p> <p>3. Click on the calendar icon.</p> <p>4. Select the dates you want for reservation.</p> <p>5. Click on the “Submit” button.</p>	<p>description of the hotel page.</p> <p>Brings users to the login page.</p> <p>After login, it brings the user to the bookings page.</p> <p>The user selects the dates on the calendar.</p>	
4.	Checking of past bookings	<p>1. Click on “Login” and enter credentials</p> <p>2. Go to “Profile”</p>	<p>Brings user to the login page to enter their credentials</p> <p>Brings the user to the profile page so they can see their past bookings</p>	Pass
5.	Updating of personal details	<p>1. Click on “Login” and enter credentials</p> <p>2. Go to “Profile”</p>	<p>Brings user to the login page to enter their credentials</p> <p>Brings the user to the profile page so they can enter their personal details below</p>	Pass
6.	Logging In	<p>1. Click on “Login” and enter credentials</p> <p>2. Click on “Log In”</p>	<p>Brings user to the login page to enter their credentials</p> <p>Checks if the credentials entered matches with the database</p>	Pass

7.	Logging Out	1. Click on “Logout” button	User’s session is ended Brings user back to the login page	Pass
----	-------------	-----------------------------	---	------

Figure 12: Black Box Testing

8.5 Code Rundown

8.5.1 Data Structure and Database

To kickstart our project, we first defined the data structure required for our application. Given that we opted for a Node.js application, we chose to employ SQLite through Prisma ORM for our prototype. SQLite was chosen for its lightweight nature and quick setup, while Prisma provides the flexibility to switch to different database technologies with minimal modifications.

Below is an overview of the database schema used:

```
model User {
    id      String  @id
    createdAt DateTime @default(now())
    updatedAt DateTime @updatedAt
    email   String   @unique
    username String   @unique
    passwordHash String
    bookings Booking[]
}

model Hotel {
    id      String  @id
    createdAt DateTime @default(now())
    updatedAt DateTime @updatedAt
    name    String
    description String?
    address  String
    city     String?
    country  String
    imgSrc   String?
    baseRating Int?
    hid     String    @unique
    rooms   Room[]
    hotelImage HotelImage[]
}

model Room {
    id      String  @id
    createdAt DateTime @default(now())
    updatedAt DateTime @updatedAt
    name    String
    description String?
    price   Int
    featured Boolean @default(false)
    hotel   Hotel    @relation(fields: [hotelId], references: [id])
    hotelId String
    booking Booking[]
}

model HotelImage {
    id      String  @id
    createdAt DateTime @default(now())
    updatedAt DateTime @updatedAt
    src    String
    order   Int
    blurHash String
    width   Int
    height  Int
    hotel   Hotel    @relation(fields: [hotelId], references: [hid])
    hotelId String
}

model Booking {
    id      String  @id
    createdAt DateTime @default(now())
    updatedAt DateTime @updatedAt
    startDate DateTime
    endDate  DateTime
    user    User    @relation(fields: [userId], references: [id])
    userId  String
    room    Room    @relation(fields: [roomId], references: [id])
    roomId  String
}
```

Figure 13: Database Schema

8.5.2 Framework Selection

Next, we deliberated on the framework that would align with our project's requirements. We decided to adopt Remix, a framework built on React, offering native support for data loading and form submissions. Additionally, we introduced tRPC as an additional API layer to enhance data loading, separate from page loads and form submissions. tRPC's support for endless queries was particularly appealing for our search results page.

8.5.3 Routes

1. Home Page (path:"/")

Data Loading: The server retrieves a list of hotels for the homepage, including featured hotels. It preloads the list of countries for the filter dropdown menu.

Rendering: Hotel data is rendered into a listing using React. A search bar with filters allows users to search for specific hotels. The search field redirects users to the path “/search” upon submission. The navigation bar permits guests to access the login screen and logged-in users to visit their profile or log out.

```
export async function loader({ request }: LoaderArgs) {
  const { ssr, headers } = await createTrpcSSR(request);
  ssr.filterOptions.countries.fetch();

  const featured = db.room.findMany({
    include: { hotel: { include: { hotelImage: true } } },
    where: { featured: true },
    orderBy: { hotel: { baseRating: "desc" } },
    take: 3,
  });

  const listing = db.room.findMany({
    include: { hotel: { include: { hotelImage: true } } },
    where: { featured: false },
    orderBy: { hotel: { baseRating: "desc" } },
    take: 10,
  });

  return jsonHash(
    {
      ssr: await ssr.dehydrate(),
      featured: Promise.resolve(featured),
      listing: Promise.resolve(listing),
    },
    { headers },
  );
}
```

Figure 14: Home Page

2. Login Page (path: "/login")

Rendering: Displays a form prompting the user for their email and password. A link below the form directs users to the registration page for account creation.

Submission: Validates the submitted email and password against the database. Passwords are stored as hashes and checked using a constant time function to safeguard against timing attacks.

```
export async function action({ request }: ActionArgs) {
  try {
    const searchParams = new URL(request.url).searchParams;
    const redirectTo = searchParams.get("redirect") ?? "/";
    const formData = await request.formData();
    const data = schema.parse(formData);
    const { id, passwordHash } = await db.user.findFirstOrThrow({
      where: { email: data.email },
    });
    const didPasswordMatch = await crypt.verify(passwordHash, data.password);
    if (!didPasswordMatch) {
      return json({ error: "Incorrect email or password" }, { status: 400 });
    }
    return withSession(request, async (session) => {
      session.set("userId", id);
      return redirect(safeRedirect(redirectTo, "/"));
    });
  } catch (err) {
    console.error(err);
    return json({ error: "Incorrect email or password" }, { status: 400 });
  }
}
```

Figure 15: Login Page

3. Registration Page (path: "/register")

Rendering: Displays a form asking for the user's email, username, password, and password confirmation. A link below the form directs users to the login page if they already have an account.

Submission: Checks the submitted email and username against the database to ensure uniqueness. Passwords are stored as hashes and checked using a constant time function to protect against timing attacks.

```
export async function action({ request }: ActionArgs) {
  try {
    const issues = createCustomIssues(schema);
    const formData = await request.formData();

    const data = await schema.parseAsync(formData);

    const isEmailUnique =
      (await db.user.findUnique({ where: { email: data.email } })) == null;

    if (!isEmailUnique) {
      issues.email("Email already in use");
    }

    const isUsernameUnique =
      (await db.user.findUnique({ where: { username: data.username } })) == null;

    if (!isUsernameUnique) {
      issues.username("Username already in use");
    }

    if (issues.hasIssues()) {
      return json({ issues: issues.toArray(), error: null }, { status: 400 });
    }

    const passwordHash = await crypt.hash(data.password);

    await db.user.create({
      data: {
        id: createId(),
        email: data.email,
        username: data.username,
        passwordHash,
      },
    });

    return redirect("/login?registered=true");
  } catch {
    return json(
      { issues: null, error: "An error occurred while creating account" },
      { status: 400 },
    );
  }
}
```

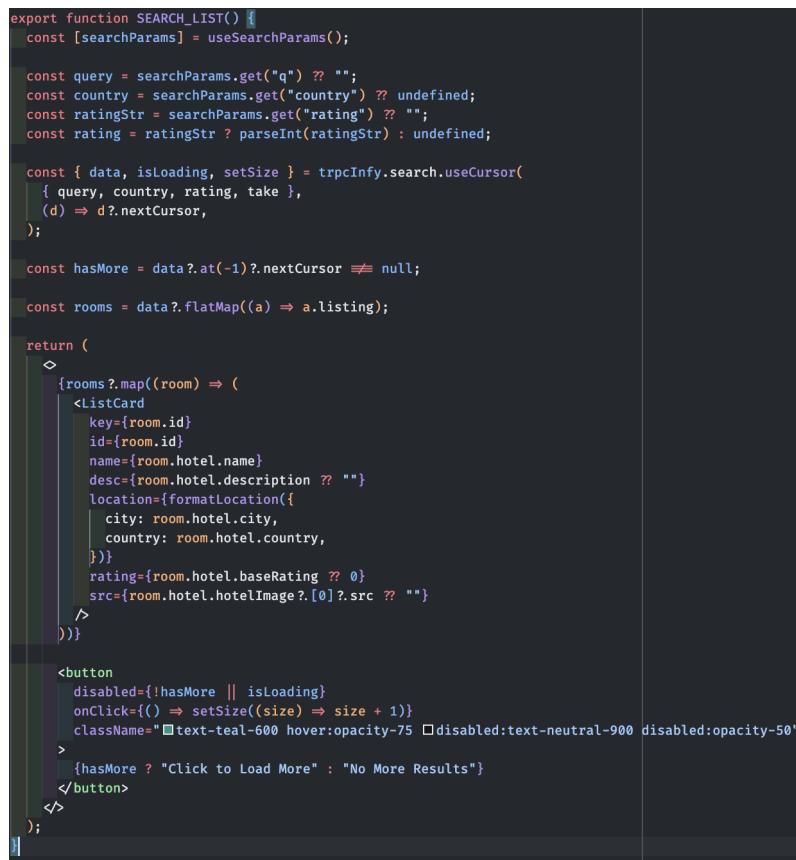
Figure 16: Register Page

4. Search Page (path: “/search”)

Data Loading: The search component forwards the search string, selected country, rating filter, cursor, and the number of results to return per load to the tRPC API layer. It checks the input against the database, searching for hotel and room names, as well as city and country names. The data is filtered based on the selected country and minimum rating. The cursor helps determine the displayed hotels and ensures only new results are returned.

Rendering: The results are rendered using a React component that maps the data to sub-components used throughout the application for displaying hotel listings. A button triggers the tRPC library to retrieve more data; if no “next cursor” is available, the button is disabled, indicating no more results.

Submission: If search parameters are modified, the search component updates the tRPC library function, prompting it to automatically retrieve new data from the API layer.



```
export function SEARCH_LIST() {
  const [searchParams] = useSearchParams();

  const query = searchParams.get("q") ?? "";
  const country = searchParams.get("country") ?? undefined;
  const ratingStr = searchParams.get("rating") ?? "";
  const rating = ratingStr ? parseInt(ratingStr) : undefined;

  const { data, isLoading, setSize } = trpcInfy.search.useCursor(
    { query, country, rating, take },
    (d) => d?.nextCursor,
  );

  const hasMore = data?.at(-1)?.nextCursor !== null;

  const rooms = data?.flatMap((a) => a.listing);

  return (
    <>
      {rooms?.map((room) => (
        <ListCard
          key={room.id}
          id={room.id}
          name={room.hotel.name}
          desc={room.hotel.description ?? ""}
          location={formatLocation({
            city: room.hotel.city,
            country: room.hotel.country,
          })}
          rating={room.hotel.baseRating ?? 0}
          src={room.hotel.hotelImage?.[0]?.src ?? ""}
        />
      ))}
      <button
        disabled={!hasMore || isLoading}
        onClick={() => setSize((size) => size + 1)}
        className="text-teal-600 hover:opacity-75 disabled:text-neutral-900 disabled:opacity-50"
      >
        {hasMore ? "Click to Load More" : "No More Results"}
      </button>
    </>
  );
}
```

Figure 17: Search Page

9. Analysis

In the context of the hotel booking website project, a comprehensive analysis reveals notable achievements, underlying challenges, the effective utilisation of technologies, and potential future enhancements.

9.1 Project Objectives and Achievements

The project's primary objectives included creating a user-friendly hotel booking platform with essential features such as user registration, hotel listings, filtering options, booking capabilities, and robust database management. Key achievements include:

User Registration and Login: Successful implementation of user registration and login systems, offering a personalised experience and enabling users to track their booking history.

Hotel Listings and Filtering: Implementation of hotel listings and filtering options based on user preferences, facilitating efficient hotel searches.

Booking System: Development of a booking system, allowing users to select check-in and check-out dates for reservations, enhancing the overall user experience.

Database Management: Establishment of a database schema for storing user data and hotel information, ensuring data integrity and efficient reservation management.

User Interface (UI) Design: A user-centric design approach resulted in a simple yet effective GUI, promoting user-friendliness and accessibility.

9.2 Challenges and Limitations

While achieving these objectives, the project encountered several challenges:

Teamwork Limitations: Adapting to collaborative coding and harmonising different coding styles presented initial challenges. However, the team successfully navigated these differences through coordination and integration efforts.

Knowledge Limitations: Varied levels of programming proficiency among team members necessitated compromises and learning curves. Overcoming knowledge gaps and reaching consensus required dedicated time and effort.

Technical Delays: Task assignments and dependencies led to time delays. Clear deadlines and consistent communication helped mitigate these delays.

Time Constraints: Coordinating team meetings and discussions amid conflicting schedules and commitments posed challenges. The predominance of online meetings limited in-person interactions.

9.3 Technologies and Tools

- The project harnessed a range of technologies and tools, including:
- Front-end Development: TailwindCSS and React.
- Back-end Development: Remix and tRPC.
- Database: Prisma and SQLite.
- Collaboration Platforms: GitHub.
- Project Management Tools: GanttProject.

10. Evaluation and Potential Project Scope

Our journey in creating a hotel recommendation website has been a remarkable experience marked by significant progress, valuable lessons, and a vision that exceeded our initial expectations. As we reflect on our project, we find it essential to assess our achievements, acknowledge potential areas for improvement, and explore the uncharted territory of untapped potential.

10.1 Project Evolution

When our team embarked on this mission, our objectives were clear but evolved as the project unfolded. This evolution was driven by our dedication to providing users with more than just a platform; we aimed to offer a flawless experience in finding the perfect accommodation.

Resource management played a pivotal role in our journey. We learned to balance people, time, and software tools effectively. Integrating open-source tools like GitHub and GanttProject became instrumental in our project management, enabling us to:

- Rigorously track work progress.

- Evaluate development stages.
- Identify milestones reached.

This streamlined workflow and optimised job assignments, ensures everyone's availability when required.

Our commitment to agility allowed us to adapt to shifting customer needs and market dynamics. We cultivated a deep understanding of agile methodologies, allowing us to remain at the forefront of innovation in developing our hotel recommendation website.

10.2 Untapped Potential

While we celebrate our achievements, we acknowledge that our application holds vast untapped potential. The dynamic nature of the hospitality sector continuously presents opportunities for improvement.

Location-Based Services: Connecting users with customised recommendations based on their real-time location to enhance the user experience.

Expert Consultations: Enabling direct Q&A sessions between travellers and local experts, offering invaluable local insights.

Destination Specialists: Providing users access to destination specialists for in-depth analysis and personalised recommendations, catering to specialised or less-travelled destinations.

AI-Powered Chatbots: Developing AI-driven chatbots for efficient user support and professional assistance.

Enhancing Travel Literacy: Utilising AI and machine learning to make itineraries and recommendations more user-friendly and comprehensible, empowering travellers to maximise their journeys.

Travel Information Access: Ensuring access to travel information, even in regions with limited resources or under challenging conditions, by incorporating robust features into our website. This guarantees traveller safety and offers tailored advice and itineraries catering to individual preferences.

By incorporating these elements, our hotel recommendation website can provide high-quality, affordable travel advice, reduce the stress associated with trip planning, and offer easier access to valuable travel information. We believe our website has the potential to significantly impact the future of personalised travel recommendations, enhancing the travel experience for individuals worldwide, regardless of their location or circumstances.

11. Conclusion

Reflecting on our team's initial project objectives outlined in the first proposal, we aimed to deliver a hotel booking platform that offers users personalised recommendations based on their preferences, coupled with a seamless booking process. Additionally, we aspired to create an aesthetically pleasing website through a minimalistic interface design to attract users. Although we had envisioned implementing additional features like a rating system and a dark mode, practical constraints, particularly time limitations and competing priorities, prevented us from realising these additions. Nonetheless, based on the results of user surveys, we are confident that our website has successfully achieved the core goals set forth in our initial report. Nevertheless, we acknowledge that there is ample opportunity for improvement in both the frontend and backend aspects of our project as we move forward.

12. Individual Reflection

Throughout the course of our hotel booking website project, I took on the combined role of Scrum Master and Developer. This position allowed me to gather vital knowledge about project management and practical development, giving me a well-rounded experience that I believe substantially influenced our team's success.

As the Scrum Master, my primary responsibility was to facilitate weekly stand-up meetings, sprint planning, reviews and retrospectives. These meetings played a crucial role in keeping our team aligned, ensuring that we remained focused on our objectives, and fostering an environment where team members felt comfortable to share their thoughts and concerns. It was here that we discussed progress, identified potential obstacles, and collectively brainstormed solutions.

As part of my responsibility, I worked to remove impediments that hindered the team's progress. This sometimes involved coordinating with other teams and our professor to resolve the issues promptly. Effective obstacle removal was essential for maintaining the team's momentum.

Balancing the responsibilities of a Scrum Master and Developer did present certain challenges. It required careful time management and prioritisation. There were times when I needed to focus on facilitating meetings and addressing team dynamics while meeting coding deadlines.

Additionally, the collaborative nature of our project presented its own set of challenges, particularly in terms of coordinating meetings and discussions. As our team members had varying timetables due to the different modules that they undertook, online meetings became the norm. While this allowed for flexibility, it also meant that we missed out on the dynamics of in-person interactions, which can sometimes facilitate quicker problem resolution.

With that, coordinating a team with a range of skill levels and working styles also presented some challenges. To maximise the team's collective strengths while resolving any knowledge gaps or variations in coding styles, it was essential to develop a culture of cooperation and respect as well.

Like all members, I also encountered technical challenges during the development process. Whether it was debugging complex code or integrating different technologies, these hurdles required problem-solving skills and collaboration with other developers. Debugging, in particular, was a significant aspect of my development journey. The process of identifying and resolving the issues within our database demanded meticulous attention to details. Yet, each bug that I encountered provided me with an opportunity to learn the value of patience and persistence.

Looking back, this project has been an incredible journey of development and learning. As I switched between the roles of Scrum Master and Developer, I developed a deeper appreciation for the intricacies of project management and software development. It reinforced the importance of adaptability, effective communication, and teamwork in achieving project success.

Moving forward, I am excited about the potential enhancements and improvements we can make to our hotel booking platform in the near future. The untapped possibilities, as mentioned in our project analysis, serves as a roadmap for future development. I believe that with the right approach and continued commitment to Agile methodologies, our team can further elevate our project and make a significant impact in the realm of personalised travel recommendations.

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