

**AI Powered Smart Tourism Platform
for Personalized, Safe and Sustainable
Travel Planning**

R25-006

Project Proposal Report

B.Sc. (Hons) Degree in Information Technology Specialized in Software
Engineering

Department of Computer Science and Software Engineering

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DECLARATION

I declare that this is my own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.


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Abstract

Tourism is a vital pillar of Sri Lanka's economy, being its highest-earning industry. Despite recent economic setbacks, the sector is seeing a resurgence in tourist interest. However, travelers face challenges due to the limited availability of platforms offering dynamic and personalized travel planning. Existing solutions often fail to address the diverse needs of travelers, leading to a suboptimal experience.

This research aims to develop a personalized recommendation system integrated with an itinerary planner, tailored specifically for Sri Lanka. The system will leverage collaborative filtering and content-based approaches to generate personalized travel plans based on user preferences. By enabling travelers to independently plan their trips, even without prior knowledge of the destination, the system will simplify the travel planning process.

The expected outcome is a user-centric platform that enhances traveler satisfaction and contributes to the growth of Sri Lanka's tourism sector by offering a seamless, personalized travel experience.

Key Words : tourism, personalized recommendation system, itinerary planner, collaborative filtering, content-based approaches, user-centric platform, dynamic travel planning,

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List of Abbreviations

AI	Artificial Intelligence
ML	Machine Learning
GDP	Gross Domestic Product
UI	User Interface
API	Application Programming Interface
SEO	Search Engine Optimization

1 Introduction

1.1 Background and Literature Survey

Artificial Intelligence (AI) has become a transformative force across various industries, significantly enhancing performance and enabling solutions to complex problems. Despite its widespread adoption in domains such as marketing [1] and medicine [2], the tourism sector has yet to fully leverage AI's potential [3]. As one of the world's most vital economic sectors, tourism was expected to contribute \$11.1 trillion to global GDP in 2024, accounting for 10% of the total. This record-breaking projection includes nearly 348 million jobs, demonstrating the sector's growing importance [4].

Tourism is also a cornerstone of Sri Lanka's economy, generating substantial foreign revenue through its natural beauty, cultural heritage, and historical landmarks that attract millions of visitors annually. However, the industry faces challenges in addressing the increasing demand for personalized, seamless, and adaptive travel experiences. Traditional trip planning methods, often reliant on travel agents or static itineraries, fail to accommodate the diverse preferences and needs of individual travelers, leading to suboptimal solutions.

Advancements in AI and machine learning (ML) present opportunities to address these challenges by revolutionizing travel planning processes. Personalized recommendation systems, which utilize techniques such as collaborative filtering, content-based approaches, and hybrid models, have demonstrated their effectiveness in various industries, including e-commerce and entertainment. These systems analyze user preferences and behaviors to provide tailored recommendations, offering significant potential for tourism. In this context, AI-driven platforms can generate customized suggestions for destinations, activities, accommodations, and itineraries, creating highly personalized travel experiences.

Research highlights AI's role in transforming tourism by simplifying trip planning and enhancing user satisfaction. AI-based travel planners reduce complexity by automating decision-making and generating dynamic recommendations [5]. Travelers increasingly prefer platforms that adapt to their unique needs and provide flexible, real-time options rather than static, one-size-fits-all solutions [6]. Furthermore, these platforms align with the growing emphasis on sustainable tourism by promoting eco-friendly practices and local, immersive experiences that resonate with contemporary values.

Despite these advancements, Sri Lanka's tourism sector lacks comprehensive, AI-driven platforms capable of meeting these evolving demands. Existing tools often fall short in providing dynamic personalization, real-time itinerary adjustments, and accurate guidance for travelers exploring unfamiliar destinations. Addressing this gap, this research proposes the development of an AI-powered smart tourism platform tailored to Sri Lanka. By combining advanced recommendation techniques, real-time customization, and user-centric design, the platform aims to enhance travel planning while fostering sustainable growth within the country's tourism sector.

Given these challenges, there is a need for a solution that combines AI techniques with a user-centric approach to create a personalized, seamless, and flexible travel planning experience. The development of an AI-driven smart tourism platform for Sri Lanka could bridge this gap, empowering travelers to plan their trips independently while enhancing their overall experience and contributing to the country's tourism sector growth.

1.2 Research Gap

Tourism is one of the most significant contributors to the global economy, with advancements in Artificial Intelligence (AI) offering transformative potential for the industry. However, despite its importance, the integration of AI-driven solutions within the tourism sector remains underdeveloped compared to other industries, such as e-commerce and healthcare [1][2]. While existing studies highlight AI applications in recommendation systems, virtual travel agents, and traffic prediction [3][5], they often focus on generalized global solutions and fail to address the specific needs of regions like Sri Lanka.

Research [3] identifies a lack of comprehensive AI platforms tailored for tourism, with most advancements concentrated around generic recommendation systems and predictive models. Similarly, [5] emphasizes AI's role in enhancing sustainability within tourism but overlooks its application in region-specific travel planning or dynamic itinerary adjustments.

Existing systems [7][8], demonstrate progress in areas like destination recommendations and personalization. However, they fall short in addressing critical gaps such as real-time itinerary adjustments and interactive customization features. These limitations underscore the need for AI-driven platforms tailored to Sri Lanka's unique tourism landscape.

Table 1 - Comparison between former Researchers

Criteria	Existing System [7]	Existing System [8]	Proposed System
Personalized Recommendations	✓ Location-based, collaborative filtering	✓ Collaborative filtering and hybrid models	✓ Advanced hybrid models combining content-based and collaborative filtering.
Real-Time Itinerary Adjustments	✗ No real-time updates	✗ Limited situational feedback	✓ Dynamic itinerary updates based on user inputs and constraints.

Interactive Features	✗ No drag-and-drop or visual customization	✗ No interactive tools	✓ Features a drag-and-drop itinerary builder for easy customization.
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By bridging these gaps, the platform aims to redefine the travel planning experience for Sri Lanka, promoting responsible tourism and setting a precedent for region-specific AI applications. This solution directly addresses the limitations of existing systems and aligns with the growing demand for personalized and seamless travel experiences.

1.3 Research Problem

The tourism sector globally has begun leveraging Artificial Intelligence (AI) to enhance personalization, efficiency, and user experience. However, Sri Lanka's tourism industry remains underserved by advanced AI-driven solutions tailored to its unique ecosystem. While existing systems [7] focus on static personalization and generalized recommendations, they lack critical features such as:

1. **Dynamic Real-Time Adaptation:** Inability to adjust itineraries dynamically in response to user inputs, preferences, or situational factors.
2. **Interactive and Collaborative Planning:** Absence of tools for flexible itinerary customization, intelligent group planning, and shared decision-making for group travelers.
3. **Visual and Intuitive User Experience:** Lack of drag-and-drop features, visual map-based interfaces, and customizable travel plans that provide users with greater control and engagement.
4. **Enhanced Recommendations:** Limited ability to suggest complementary locations or activities that align with selected destinations, reducing the depth of the travel experience.

This gap highlights the need for a comprehensive **AI-driven smart tourism platform** tailored to Sri Lanka's unique context. The proposed platform will enable users to create personalized, adaptable, and engaging travel plans, offering enhanced usability and addressing the needs of modern travelers. By incorporating features like dynamic itinerary adjustments, interactive planning tools, and budget previews, this solution aims to elevate the travel planning process while fostering growth in Sri Lanka's tourism sector.

- How can user preferences, such as destinations, budgets, and activities, and constraints like time and group size, be effectively collected to create personalized travel plans?
- How can AI-based systems dynamically generate multiple travel plans based on user inputs, including diverse combinations of destinations and activities?
- How can the system optimize travel plans for user preferences, such as proximity, time, or cost?
- How can the platform enable users to compare, select, and customize multiple travel plans intuitively?
- How can drag-and-drop and map-based interactive features enhance user engagement in itinerary planning?
- How can the platform ensure fast response times, lightweight operations, and seamless real-time interactions, even with a large dataset of destinations and user requests?

2 Objectives

2.1 Main Objective

The primary objective of this project is to develop an intelligent and dynamic tourism platform that enhances the travel experience by seamlessly combining personalized recommendations with optimized itinerary planning. Leveraging advanced AI, the platform will tailor travel suggestions and dynamically adjust itineraries based on user preferences and goals. It will also feature tools for collaborative group travel planning, efficient budget management, and real-time safety updates, ensuring a comprehensive and secure experience. By integrating these features, the platform will empower users to plan and enjoy their journeys with greater personalization, flexibility, and confidence.

2.2 Specific Objectives

a) Provide Real-Time Dynamic Itinerary Adjustments

Enable real-time modifications to travel plans, ensuring users can adapt their itineraries seamlessly based on changing preferences or situational factors.

b) Generate Personalized Recommendations

Develop a system that provides tailored travel suggestions by analyzing user preferences, constraints, and behaviors using AI-driven hybrid recommendation models.

c) Enhance User Interaction and Engagement

Introduce intuitive features like drag-and-drop itinerary builders and map-based interfaces to simplify customization and increase user satisfaction.

d) Suggest Nearby Attractions and Activities

Provide complementary recommendations for nearby attractions, accommodations, and dining options based on the user's selected destinations and preferences.

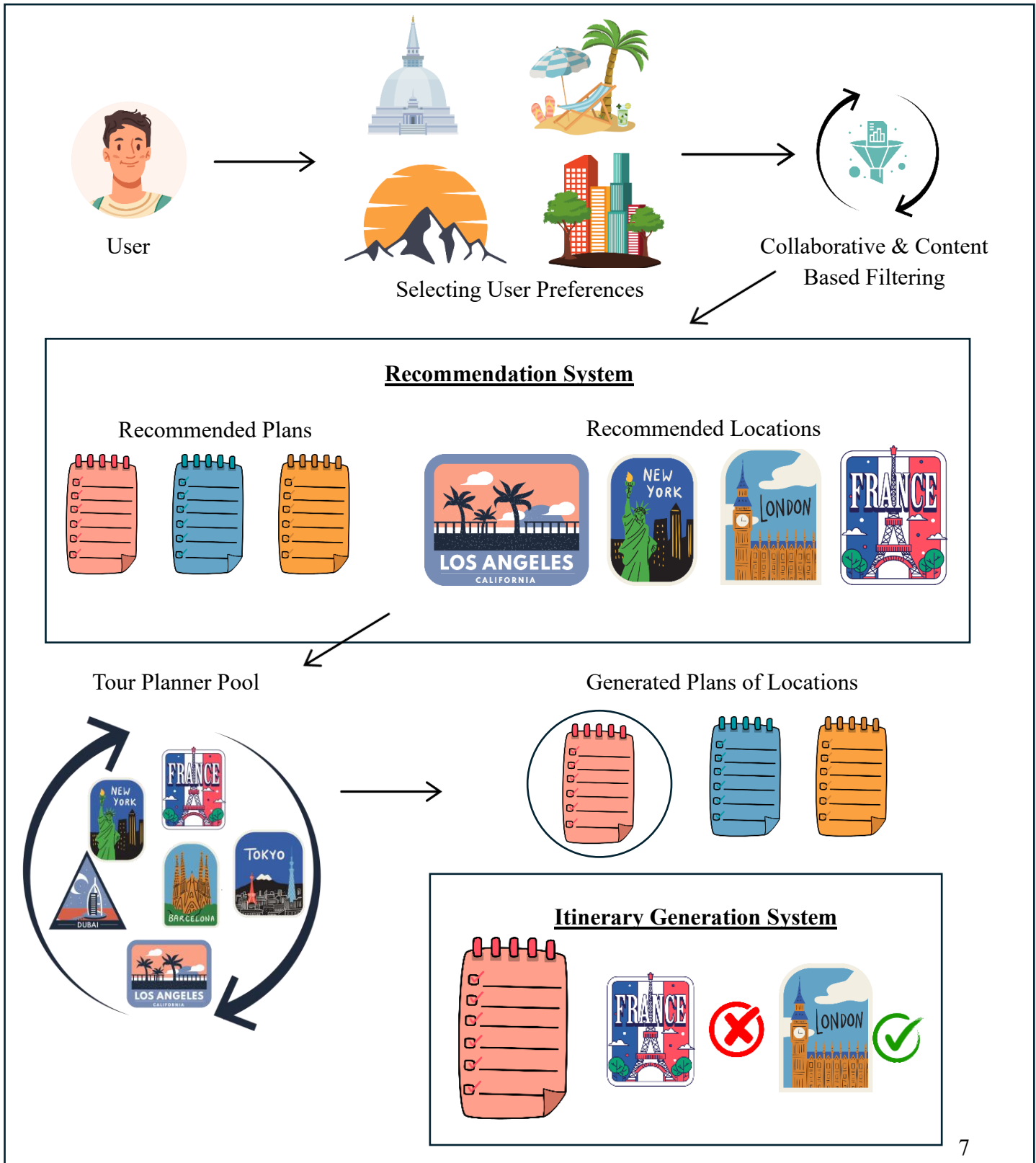
e) Ensure System Performance and Scalability

Deliver a lightweight, high-performance platform that guarantees fast response times and seamless interactions, even with a large volume of data.

3 Methodology

3.1 System Overview

Figure 1 - System Overview



The user begins by accessing the application and registering by providing personal details. Once registered, they are prompted to select at least three preferences from the available categories, such as activities or types of destinations. Using content-based and collaborative filtering algorithms, the system analyzes these preferences to generate personalized plans that align with the user's interests. Additionally, the system suggests related locations that match their selected preferences.

The user can then choose a pre-prepared recommended plan or customize their experience by selecting specific locations. These selected locations are added to a "Plan Pool," which serves as a collection of all preferred destinations. After specifying the number of days and travelers, the user clicks the "Generate" button, which creates three customized travel plans using the chosen locations.

The user can further refine these plans using an interactive itinerary planner, which allows them to modify and rearrange locations easily. Once satisfied, they can finalize their trip according to their preferences, ensuring a highly personalized and flexible travel planning experience.

3.2 Software Solution

3.2.1 Requirement Gathering

Sources of Requirements:

- Data collected from surveys and information provided by travel agents
- Analysis of existing tourism platforms to identify gaps and potential improvements.
- Brainstorming sessions to identify innovative features tailored to Sri Lanka's tourism.

User Needs:

- Users need personalized travel plans based on their preferences and constraints.
- Group travel planning, itinerary customization, and budget management features.

Functional Requirements:

- Registration and user profile management.
- Preference collection, including destinations, interests, and budgets.
- Real-time recommendation generation based on user inputs.
- Drag-and-drop functionality for itinerary planning.
- Ability to finalize and save travel plans.

Non-Functional Requirements:

- Real-time performance and low response times.
- Scalability to handle large datasets and high user traffic.
- Secure storage and transmission of sensitive user data.

3.2.2 Feasibility Study

Economic Feasibility:

- Development costs include tools, team salaries, and hosting fees.
- Revenue opportunities through premium subscriptions and tourism partnerships.
- Low-cost deployment using cloud services ensures financial sustainability.

Technical Feasibility:

- Tools and technologies: Next.js, TypeScript with React, Tailwind CSS for frontend; Express.js for backend; and MongoDB for database management.
- APIs for travel data (e.g., Google Maps API) ensure comprehensive coverage.
- Cloud-based hosting platforms and Docker ensure scalability, reliability, and consistency across environments.
- Python will be used for AI and ML models in the recommendation system and itinerary optimization.

Schedule Feasibility:

This platform is an independent solution and will be developed according to a well-defined timeline. The project phases include:

- Requirement gathering and design: 3 months.
- Development of key features: 5 months.
- Testing and debugging: 2 months.
- Deployment and launch: 1 month.

Agile development practices will be followed to ensure iterative progress, timely delivery, and the ability to adapt to changes.

3.2.3 Implementation

Frameworks & Tools:

- Next.js with TypeScript and React for dynamic, SEO-friendly, and interactive frontend development.
- Tailwind CSS for rapid and responsive UI design.
- Express.js for efficient and scalable backend development.
- MongoDB for flexible NoSQL database management.
- Google Maps API for location data integration.
- Docker for containerized environments to ensure consistency.

Modules:

- **User Module:** Registration, login, and preference collection.
- **Recommendation Module:** AI-based content and collaborative filtering for recommendations.
- **Itinerary Module:** Tools for plan generation, customization, and finalization.
- **Admin Module:** Management of destinations, preferences, and user data.

Development Steps:

- Develop user registration and preference selection features.
- Implement the AI-powered recommendation engine using Python libraries (e.g., scikit-learn, TensorFlow).
- Build the itinerary planner with dynamic generation capabilities.
- Integrate frontend, backend, and external APIs.

3.2.4 Testing

Testing Methods:

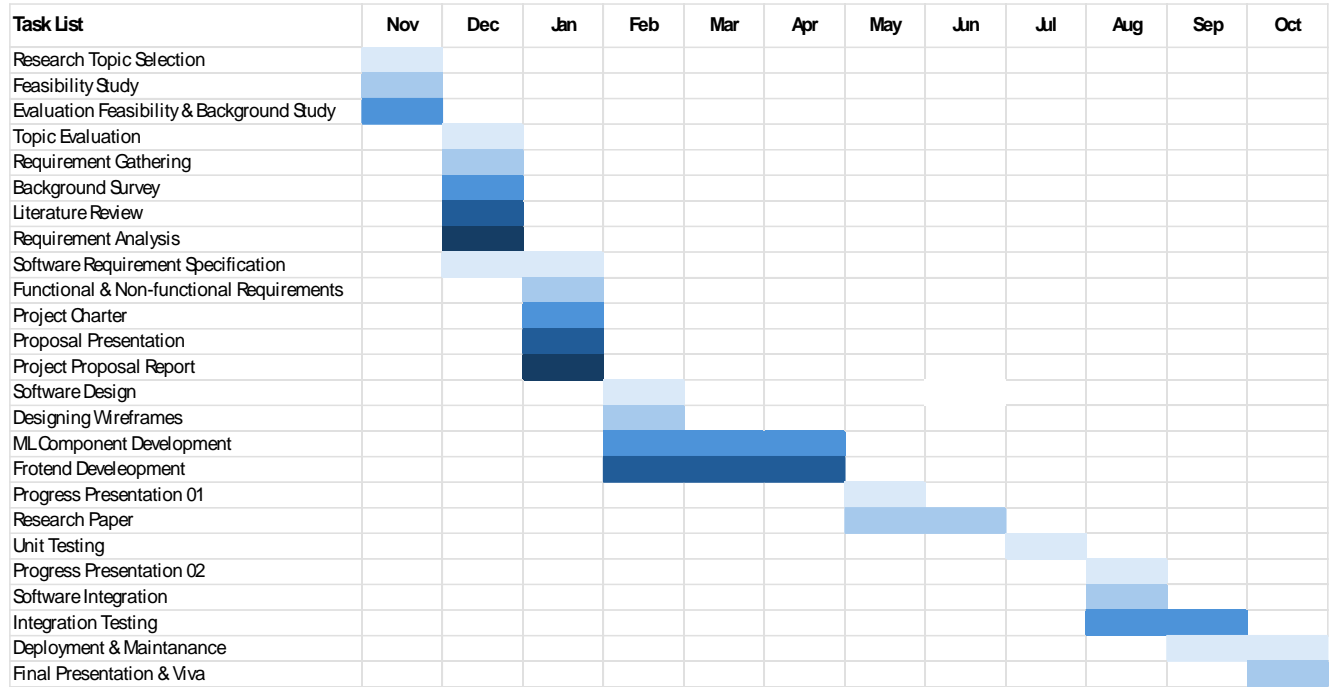
- **Unit Testing:** Test individual features (e.g., recommendation algorithms) using Jest for frontend components and PyTest for backend logic.
- **Integration Testing:** Ensure smooth interaction between modules with tools like Postman and Mocha.
- **System Testing:** Verify platform functionality and performance end-to-end using Cypress.
- **Usability Testing:** Collect user feedback for platform usability.
- **Performance Testing:** Optimize response times for real-time operations using Apache JMeter.

Tools:

- Jest for frontend component testing.
- Cypress for end-to-end testing.
- Postman for API testing and validation.
- PyTest for backend logic testing.

3.2.5 Timeline

Figure 2 - Gantt Chart



3.2.6 Risk Management Plan

Table 2 - Risk Mitigation Plan

Risk Category	Risk	Mitigation
Technical Risks	Integration challenges between frontend and backend.	Conduct early integration tests between modules during development.
		Use well-defined APIs with proper documentation and version control.
	Failure of AI models to deliver accurate recommendations.	Use pre-trained models as a fallback while refining custom models.
		Perform rigorous testing on real-world datasets before deployment.
Operational Risks	Miscommunication or unclear roles within the team.	Hold daily stand-up meetings to discuss tasks and resolve blockers.
		Use task management tools like Jira or Trello to assign and monitor tasks.
	Team member unavailability due to unforeseen circumstances.	Cross-train team members to handle overlapping responsibilities.

		Maintain detailed documentation so others can pick up tasks seamlessly.
Schedule Risks	Delays in meeting milestones due to underestimated task complexity.	Break tasks into smaller, manageable subtasks during sprint planning.
		Monitor progress closely using Gantt charts and adjust deadlines as needed.
	Dependencies on external APIs causing delays.	Identify and integrate essential APIs early in the project timeline.
		Maintain fallback mechanisms, such as alternative APIs or dummy data for testing.

4 Commercialization

4.1 Target Audience

Independent Travelers:

- Individuals who prefer to plan their trips without relying on external travel agents or pre-packaged tours.
- Travelers looking for a personalized and flexible planning experience tailored to their specific interests and preferences.

Group Travelers:

- Friends, families, or colleagues planning trips together who need collaborative tools for itinerary creation and group decision-making.
- Groups unfamiliar with Sri Lanka who require recommendations for must-visit destinations and activities based on shared interests.

First-Time Visitors to Sri Lanka:

- Tourists who are new to the country and need curated plans showcasing Sri Lanka's unique attractions, such as beaches, cultural landmarks, nature reserves, and heritage sites.
- Individuals looking for user-friendly guidance to navigate unfamiliar locations.

Repeat Visitors:

- Travelers who have visited Sri Lanka before and want to explore lesser-known destinations or activities.
- Those seeking personalized itineraries that go beyond mainstream tourist attractions.

Local Tourists:

- Residents of Sri Lanka exploring different regions of the country for leisure or cultural experiences.
- Individuals seeking budget-friendly or eco-friendly travel options within the country.

4.2 Market Strategies

Our marketing strategy aims to position the platform as the ultimate travel planning solution for individuals and groups visiting Sri Lanka. To achieve this, we will:

1. **Social Media Campaigns:** Leverage platforms like Instagram and Facebook to showcase user-generated content, travel itineraries, and destination highlights.
2. **Collaborations:** Partner with local businesses, hotels, and restaurants to promote the platform while offering exclusive deals to users.
3. **University and Tourism Board Outreach:** Collaborate with universities and tourism boards to promote the app as a modern and accessible solution for exploring Sri Lanka.
4. **Referral Program:** Encourage user growth through a referral program, rewarding users with discounts or premium features for inviting friends.

This targeted approach ensures maximum visibility and engagement while promoting Sri Lanka's rich tourism potential.

5 Budget

Since the outcome of the proposed project is a software-based solution, there are no hardware components involved in the implementation. The primary source of costs will be the subscription fees for cloud services, such as hosting and storage, as well as third-party APIs required for the platform's functionality.

Additionally, minor costs are expected for domain registration and any marketing materials needed for demonstration purposes.

The estimated costs are detailed in the table below:

Table 3 - Budget Plan

Type	Cost (lkr)
Internet and Web Hosting	10 000
Domain Registration	3 000
Publication Cost	12 000
Miscellaneous	10 000
Total	LKR 40 000

The estimated budget provided above is based on current assumptions and available pricing for tools, services, and APIs. However, these costs are subject to change depending on factors such as changes in API usage rates, adjustments in hosting requirements due to increased data volume or user demand, and additional features that may arise during the development phase. A contingency budget has been included to account for these potential fluctuations, ensuring the project remains adaptable and within financial constraints.

6 Summary

The proposed project aims to develop an AI-driven smart tourism platform tailored for Sri Lanka, offering personalized recommendations, dynamic itinerary generation, and real-time customization. This platform will cater to both individual and group travelers, simplifying travel planning and enabling seamless exploration of the country's attractions.

The platform leverages modern technologies like Next.js, TypeScript, MongoDB, and AI models to provide user-centric features such as drag-and-drop itinerary planning, collaborative tools, and personalized suggestions. By addressing the gap in Sri Lanka's tourism sector, this solution aims to enhance user satisfaction and support the local tourism industry.

The project follows a structured methodology, focusing on scalability, efficiency, and adaptability, while keeping costs minimal through the use of accessible tools and resources. Upon completion, the platform will lay the groundwork for potential future developments, ensuring its long-term value and usability.

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