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Analysing Report

Intelligent Mobile Travel Guide System (IMTGS)

Team: P1_0604T

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Prepared by: Lead Project Analyst (0604T)

Date: 13th February 2026



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1. Declarations

1.1. Declaration on AI Usage

AI-assisted tools were used in a supportive and non-substitutive way during the preparation of this Analysis Report for the Intelligent Mobile Travel Guide System for TravelMate, conducted under ICT2113: Software Modelling and Analysis.

AI was used in the following manner:

- AI tools were utilised to enhance the structure and clarity of written content.
- AI tools assisted in refining grammar, coherence, and maintaining a professional tone.
- AI tools supported the systematic organisation of analytical sections in alignment with prescribed methodologies, including BCIC and IRC.

1.2. Declaration on Plagiarism

Students are not allowed to copy assessment solutions from other individuals or sources. It is the students' responsibility to guarantee that their solutions are their own work. Meanwhile, the students must also ensure that their work is not accessible to others. Where such plagiarism is detected, both assessments involved will receive zero marks.

We hereby declare that:

- We fully understand and agree to the above-mentioned policy.
- We did not copy any materials from others or from other places.
- We did not share our materials with others or upload them to other places for public access.
- We agree that we will not disclose any information or material from the team project to others or upload it to any other places for public access.
- We agree that our project will receive a zero mark if any misalignment with the abovementioned policies is detected.

Declared by:

IMedia

Vendor for Intelligent Mobile Travel Guide System

Date: 11th February 2026

Signed By:

Tay Kai Wen, Joseph Goh Wei Jie, Choh Kaifeng, Raffael Davin Harjanto, Natalie Chia Shuxian



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2. Executive Summary

iMedia is a Singapore-based software company specializing in Information Technology (IT) solutions, with a strong focus on geospatial technologies and digital mapping integration. Located at **1 Punggol Coast Road, Singapore 828608**, iMedia delivers innovative and scalable IT services tailored to meet evolving business and industry needs.

The company's core expertise lies in developing robust software systems and geospatial solutions, leveraging advanced technologies such as the **Google Maps API** to create location-driven applications and intelligent mapping platforms. Through its technical capabilities, iMedia enables organizations to enhance operational efficiency, improve data visualization, and make informed, data-driven decisions.

With a commitment to providing reliable and future-ready digital services, iMedia positions itself as a strategic technology partner for organizations seeking customized software development and advanced geospatial integration solutions.

3. Incongruous Requirements Checklist (IRC)

We constructed a project-specific Incongruous Requirements Checklist (IRC) to guide the Breakdown activity in BCIC. The IRC includes checks for ambiguity, testability, duplication, atomicity, feasibility, external dependency risks, cross-requirement consistency, model coverage using CRaM, priority alignment, and modality correctness. The IRC was applied line-by-line to the Project Specification to identify incongruent requirements, which were subsequently clarified and revised during the Interpret stage.

4. Breakdown, Clarify, Interpret, Categorize (BCIC)

4.1 Breakdown

The objective of the Breakdown activity is to use the IRC to identify and separate incongruent business and technical requirements from congruent ones. Incongruent requirements are duplicated, ambiguous, non-testable, vague, or inconsistent with standards for formal requirement specifications. This ensures that any problematic requirements are systematically identified before moving into the Clarify and Interpret phases.

Duplicate Requirements

Having duplicate requirements creates confusion and inconsistency during design and testing stages, especially if only one requirement is updated. This results in increased documentation complexity and increases the risks of double implementation effort in vendor interpretation.

- REQ-USR-001 and REQ-USR-002 have similar duplicate requirements, allowing users to register, be authenticated, and enabling user access to personalised services.
- REQ-LOC-002 and REQ-DTL-002 have the same functionality across multiple sections, as both specify that the user should preview location details before navigation.



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Non-testable Performance Wording

- REQ-OPS-002 and REQ-LOC-003 state that they handle and support moderate increases in concurrent user activity without degradation of navigation or search performance, but “moderate” and “degradation” are not quantitative and therefore not measurable.

Vague Content

- REQ-DTL-001 states displaying essential details, but “essential details” are not defined. Additionally, different stakeholders may interpret “essential” differently, which results in difficulties in defining a clear data schema, confirming completeness during testing, and ensuring consistent implementation.
- REQ-DTL-003 states that the system may recommend locations based on *frequently searched places* and *relevance to the selected city*. The terms are not defined clearly, which may result in an inconsistent algorithm design, preventing validation of recommendation correctness and predictable system behaviour.

Contradiction in Cost Range vs Budget Cap

- REQ-FIN-001 does not explain what happens if the scope increases beyond SGD 250K, resulting in a higher risk of a mismatch between vendor estimation & CFO's budget expectation. This creates a risk for vendors underestimating costs to remain compliant, as well as to assume scope flexibility that may not exist.

External API Dependency Risk

- ITR-05 indicates that the system shall connect to the Google Maps API, but it does not explain the API usage limits and the cost of API Usage for the project. As a result, this may introduce risks such as unexpected operational costs due to high request volumes and vendors' underestimation of infrastructure costs.

Content Moderation Terminology Issue

- ITR-09 states that the system shall allow staff to “*police*” use comments. The term is informal and non-standard in requirement specifications, resulting in it being incongruent due to non-standard terminology.

4.2 Clarify

Goal: The goal of Clarify is to determine the authentic purpose and substance of priority incongruent requirements by cooperating with originating stakeholders, so that ambiguities, inconsistencies, and missing information can be resolved before requirements are rewritten in Interpret.

The Business Analyst coordinated a series of structured meetings with key stakeholders. The meetings are scheduled to ensure comprehensive clarification of each critical issue while respecting stakeholder availability and project timelines.



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#	Date & Time	Stakeholders Present	Issues Addressed
1	5 Feb 2026, 2.00 PM	CFO, CTO, Product Manager	Duplicate requirements (REQ-USR-001/002)
2	6 Feb 2026, 10.00 AM	CTO, DevOps Lead, Technical Architect	Non-testable performance (REQ-OPS-002, REQ-LOC-003)
3	7 Feb 2026, 3.30 PM	Product Manager, UX Lead, Business Analyst	Vague content definition (REQ-DTL-001)
4	8 Feb 2026, 4.00 PM	CFO, CTO, Account Manager	Budget constraints and cost contradictions (REQ-FIN-001)
5	9 Feb 2026, 11.00 AM	CTO, Technical Architect, External API Vendor	External API dependency risks (ITR-05)

Clarification on Duplicated Requirements

The BA arranged face-to-face meetings with stakeholders, using the pre-agreed agenda, to clarify the duplicated requirements in REQ-USR-001 and REQ-USR-002 and confirm whether they represent the same user capability

Clarification on Non-testable Performance Wording

The BA conducted stakeholder discussions to clarify what constitutes “moderate increases” in concurrent user activity and what is meant by “without degradation” of performance. Stakeholders were asked to specify measurable performance criteria, such as the maximum number of concurrent users to be supported and acceptable response-time thresholds for navigation and search functions. An agreement was reached on target performance metrics to enable objective verification.

Clarification on Vague Content

The BA engaged stakeholders to clarify the meaning of “essential details” in REQ-DTL-001. Stakeholders identified a minimum mandatory set of fields to be displayed for each location, including address, operating hours, distance from the user, user ratings, and contact information. This clarified scope will be used to rewrite the requirement into a precise and testable form in the Interpret stage.

Clarification on Budget Constraints and Cost Contradictions

The CFO confirmed that the S\$250,000 budget is a strict cap for the initial project phase. To prevent any misalignments, any change in scope extensions beyond the baseline will require a formal change request and additional funding approval.

Clarification on External API Dependency Risks

Discussions with the API vendor established specific usage tiers and monthly quotas for their Maps integration. To minimize costs, the team will implement request caching and automated usage alerts, ensuring high request volumes will not exceed the budget.



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4.3 Interpret

All incongruent requirements identified during the breakdown stage are refined and replaced by the interpreter activity with clear, precise, and standards-compliant requirement statements, assuming that stakeholder clarification has already confirmed the intended meaning. This converts & clarifies incongruent requirements into precise, measurable, and vendor-implementable requirements aligned with BCIC's operational objectives and technical constraints.

Interpretation of Duplicate Requirements

Issue Identified: REQ-USR-001 and REQ-USR-002 are duplicated and describe the same user capability.

Vendor Interpretation (iMedia):

- The duplicated requirements are consolidated into a single requirement to eliminate redundancy.
- REQ-USR-002 will be removed from the codified list.
- REQ-USR-001 will be rewritten to include complete registration and authentication scope.

Rewritten Requirement:

- **REQ-USR-001 (Revised – User Registration & Authentication)**

The system shall provide secure user registration and authentication functionality, enabling users to create accounts, log in, and access personalised features such as bookmarking and profile management.

Authentication shall support email/password login and enforce password security standards (minimum 8 characters, alphanumeric with at least one special character).

Precedence: Essential (3)

Interpretation of Non-Testable Performance Wording

Issue: "Moderate increases" and "without degradation" were not measurable.

Following clarification from the stakeholders, measurable thresholds were defined.

Rewritten Requirement:

- **REQ-OPS-002 (Revised – Peak Load Performance)**

- The system shall support up to 5,000 concurrent active users during peak travel periods.
- Under peak load conditions:
 - Location search results shall return within ≤ 3 seconds (95% percentile response time).
 - Navigation route generation shall complete within ≤ 5 seconds.
- System uptime shall be maintained at 99.5% availability during operational hours.

Precedence: Desirable (2)



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- **REQ-LOC-003 (Revised – Concurrent Search Handling)**
 - The system shall maintain defined performance thresholds (as stated in REQ-OPS-002) when handling concurrent search and navigation requests.

Clarification on Vague Content

The BA engaged stakeholders to clarify the meaning of “essential details” in REQ-DTL-001. Stakeholders identified a minimum mandatory set of fields to be displayed for each location, including address, operating hours, distance from the user, user ratings, and contact information. This clarified scope will be used to rewrite the requirement into a precise and testable form in the Interpret stage.

4.3 Categorize

The goal of Categorize is to organize all the interpreted requirements into a structured format that aligns with industry-standard Software Requirements Specification. This ensures that requirements are systematically codified and well-defined.

Requirements Organization and Codification

- **External Interface Requirements:** Includes ITR-05 (Revised), which defines the specific integration parameters, usage tiers, and caching strategies for Google Maps API.
- **Functional Requirements:** Includes consolidated and clarified requirements such as REQ-USR-001 (Revised) for user integration, REQ-LOC-002 for navigation previews, and REQ-DTL-001 (Revised) for essential location data fields.
- **Performance Requirements:** Includes REQ-OPS-002 (Revised) and REQ-LOC-003 (Revised), which now specify the exact thresholds for concurrent users (5000 users), response times (<3 s), and system uptime (99.5%).
- **Business and Financial Constraints:** Includes REQ-FIN-001 (Revised), which established that the S\$250,000 budget needs a formal change request for any extensions.

Business Analyst Actions

- **Template Setup:** Established the vendor’s stock SRS template within the GitHub Repository.
- **Requirement Integration:** Fitted all revised requirements (REQ-USR-001, REQ-OPS-002, etc.) and supporting models (UCD, Data Dictionary) into the template with minor structural adjustments.
- **Team Sanity Check:** Opened the repository to the entire project team to perform a sanity check, ensuring that all the requirements are contextually relevant, meaningful, and consistent before proceeding to the next method.

5. Repository

This repository contains the vendor-side artefacts for the Intelligent Mobile Travel Guide System (IMTGS) project. It documents the requirements analysis (BCIC) conducted on the customer’s



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Project Specification (PS), and the progression of refined requirements into the Software Requirements Specification (SRS).

Key Benefits

- Maintains a single source of truth for requirements
- Enables team collaboration and review
- Preserves change history and accountability
- Supports traceability and version control
- Reduces the risk of inconsistent or lost requirements during analysis

Repository Link:

<https://github.com/talentweb11/PD110---Intelligent-Mobile-Travel-Guide-Flutter-App>

6. Account Manager

Name: Natalie Chia Shuxian

Relationship with TravelMate (Customer): Established during tender and early analysis phase; primary liaison for stakeholder communication, clarification, coordination, and documenting stakeholder decisions for priority incongruities.

Experience

- Managed customer relationships during project initiation and analysis phases, ensuring clear communication between customer representatives and the delivery team.
- Facilitated structured clarification sessions to align stakeholder expectations and formally document requirement interpretations and agreed outcomes.
- Worked with stakeholders to refine broad or ambiguous business statements into clearly understood business expectations before formal requirement documentation.
- Ensured all scope clarifications and change discussions were recorded and formally acknowledged to prevent future disputes.
- Supported rollout readiness discussions by aligning stakeholders on business impact, user adoption expectations, and communication strategy.

How this experience strengthens IMTGS delivery:

- **Reliable Clarification Governance:** Quicker resolution of duplicated, vague, or non-testable requirements before formalising them into implementable vendor requirements.
- **Scope & Commercial Protection:** Prevents late requirement reinterpretation from being treated as included scope by ensuring all clarifications and changes are documented and confirmed.
- **Expectation Alignment on Performance & Quality:** Guides stakeholders in defining acceptable service expectations, such as user experience standards and acceptable response expectations, without committing to technical solutions.
- **Dependency Risk Communication:** Communicates external service constraints, such as third-party service limitations, at a business-impact level to allow stakeholders to understand potential service variability early.



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Observations:

- TravelMate stakeholders may describe requirements using broad terms (e.g., “essential details”) that require clarification into a minimum mandatory field set to avoid inconsistent implementation.
- Non-functional requirements are sometimes expressed subjectively (e.g., “moderate increases” / “without degradation”), so measurable targets (concurrency level and response time thresholds) require facilitated discussion to define acceptable service standards from a business perspective.
- The system’s reliance on external services (e.g., mapping/location APIs) introduces dependency risks (quota, latency, availability) that should be communicated early to prevent unrealistic performance expectations.

7. Risk Analysis

This section outlines potential risks identified and the strategies implemented to manage and mitigate them throughout the project lifecycle.

7.1. Potential Risks Identified

To objectively evaluate and prioritize these risks, a 5x5 risk matrix and detailed risk table were used to assess each risk’s likelihood and severity, producing a risk value. Refer to Appendix Figures 3-4.

The matrix visually ranks risks from red (highest) to green (lowest), enabling clear prioritization. Using this structured approach, the risks were ranked according to their calculated risk values, enabling clear identification of the highest priority risks.

These are the **8 potential risks** identified that are of utmost concern.

1. Customers will change their requirements too much, and expect it to be free of charge.
2. The customer will fight us whenever we want to defer significant changes that are too complex for the current project.
3. The customer will not provide us with some of the technical specs of the platform and its server environments, claiming security concerns.
4. The customer insists on features that are outside the vendor's expertise, causing resource strain.
5. The customer is not tech-savvy enough to understand explanations concerning the innovative nature of new software.
6. The tender bidding team underestimated the time necessary for requirements capture.
7. Such changes will not be cross-checked by the customer for obvious inconsistencies.
8. Account Manager is suddenly and unavoidably replaced in the middle of Requirements Engineering (RE).

7.2. Risk Mitigation Strategies



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To manage and mitigate the identified risks, a comprehensive risk management approach was established and applied.

IRC is used to identify and resolve inconsistent requirements at an early stage, ensuring clear and feasible scope alignment with the customer. In addition, the Account Manager is utilized to manage customer expectations, maintain alignment, and address scope adjustments as the project progresses. This ensures clear communication, both internally within the team and externally with the customer, thereby minimizing the risk of misinterpretation. In the event that the Account Manager is suddenly and unavoidably replaced during Requirements Engineering (RE), a knowledge transfer process is implemented to ensure continuity.

Collectively, these strategies minimize disruptions and support the smooth progression of the project.

8. Requirements Modeling

8.1. UseCase Diagram


The use case diagram is better refined and aligned with the GPV. Features that do not directly support and are not aligned with the goals of the systems are removed. Use cases such as accessing weather and news updates were removed to maintain a focused system scope, and minor naming refinements were made to improve clarity. Refer to Appendix Figure 5.

8.2. Data Dictionary

A data dictionary was created to formally define the system's key entities and attributes derived from the refined use cases. Refer to Appendix Figures 6 -11.

9. Sign Off

This section confirms that the Analysis Report for the Intelligent Mobile Travel Guide System has been reviewed and validated, reflecting the comprehensive analysis of the breakdown, clarification, interpretation, and categorization of the project's requirements.

Name	Title	Signature & Date
Tay Kai Wen	iMedia, Lead Project Analyst	 Date: 13/02/2026



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Appendix

INCONGRUOUS REQUIREMENTS CHECKLIST

1	Ambiguity	Are there any vague terms?
2	Testability	Can this requirement be objectively tested or verified?
3	Duplication	Does this requirement duplicate or overlap with another requirement?
4	Atomicity	Does the requirement contain more than one requirement
5	Feasibility	Is this requirement realistic given time, scope, budget, and technical constraints?
6	External Dependencies	Does the requirement depend on third-party APIs, vendors, or external systems?
7	Cross-Requirement Consistency	Does this requirement contradict any other requirement?
8	Priority Alignment	Is the priority realistic and aligned with project goals and scope?

* Each requirement is checked line-by-line against this IRC. Any failed check is logged as an incongruity and raised for stakeholder clarification.

Figure 1. IRC



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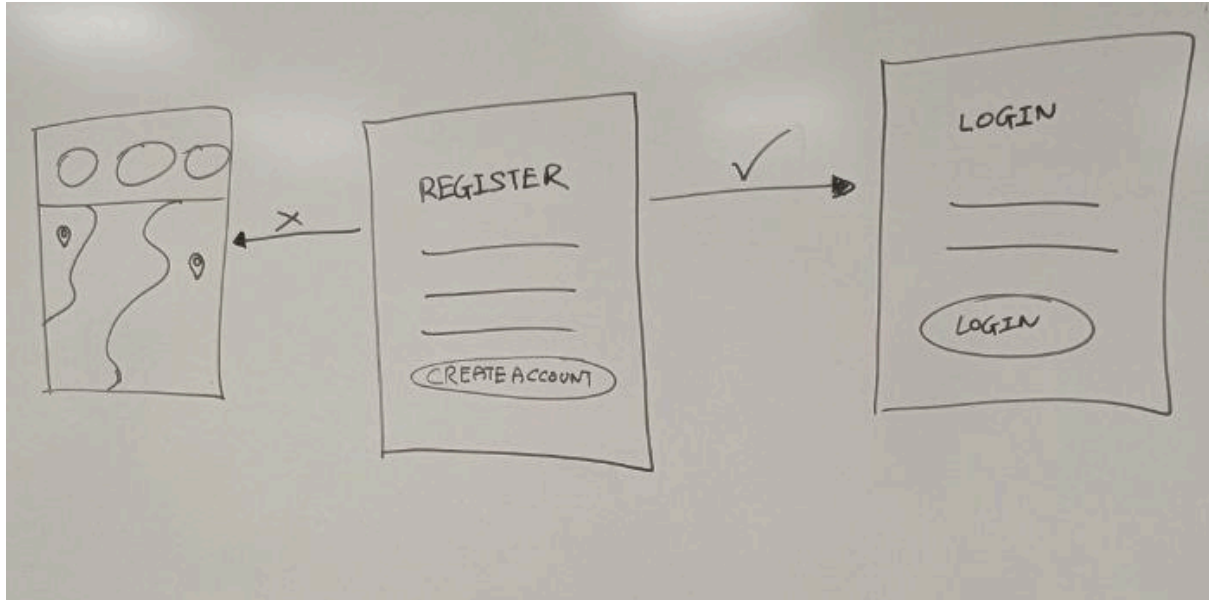


Figure 2. Napkin Prototype - Clarification on duplicating requirements



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SEVERITY LIKELIHOOD	INSIGNIFICANT 1	MINOR 2	MODERATE 3	MAJOR 4	CATASTROPHIC 5
ALMOST CERTAIN 5	MEDIUM 5	HIGH 10	VERY HIGH 15	EXTREME 20	EXTREME 25
LIKELY 4	MEDIUM 4	MEDIUM 8	HIGH 12	VERY HIGH 16	EXTREME 20
POSSIBLE 3	LOW 3	MEDIUM 6	MEDIUM 9	HIGH 12	VERY HIGH 15
UNLIKELY 2	VERY LOW 2	LOW 4	MEDIUM 6	MEDIUM 8	HIGH 10
RARE 1	VERY LOW 1	VERY LOW 2	LOW 3	MEDIUM 4	MEDIUM 5

Figure 3. Risk Matrix (5x5)



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Risk ID	Risk Description	Likelihood	Why?	Severity	Why?	Risk Value
R-01	Frequent requirements changes that are expected to be free of charge.	5	Frequent scope changes are common in projects.	4	Leads to scope creep and cost overruns.	20
R-02	Resistance on deferring complex changes.	4	The customer prioritises these complex changes.	4	Causes delays and resource conflicts.	16
R-03	Platform technical details are not provided.	3	Technical details may be withheld due to security or oversight.	5	Can cause major project disruptions or failure.	15
R-04	Insistence on features outside of expertise.	4	The customer is not aware of our extent of expertise.	3	Strains resources and causes delays.	12
R-05	Limited understanding of technical explanations regarding the new software.	4	The customer may not have domain experts on new software.	3	Leads to misunderstandings and misguided expectations.	12
R-06	Underestimated time needed for requirements capture.	4	Due to optimism or incomplete understanding.	3	Causes project delays and adjustments.	12
R-07	Changes are not validated for inconsistencies.	3	Validation of changes is often missed.	3	Results in errors and rework.	9
R-08	Account Manager suddenly replaced during RE.	2	Uncommon due to vendor continuity planning.	4	Disrupts communication and continuity.	8

Figure 4. Risk Table



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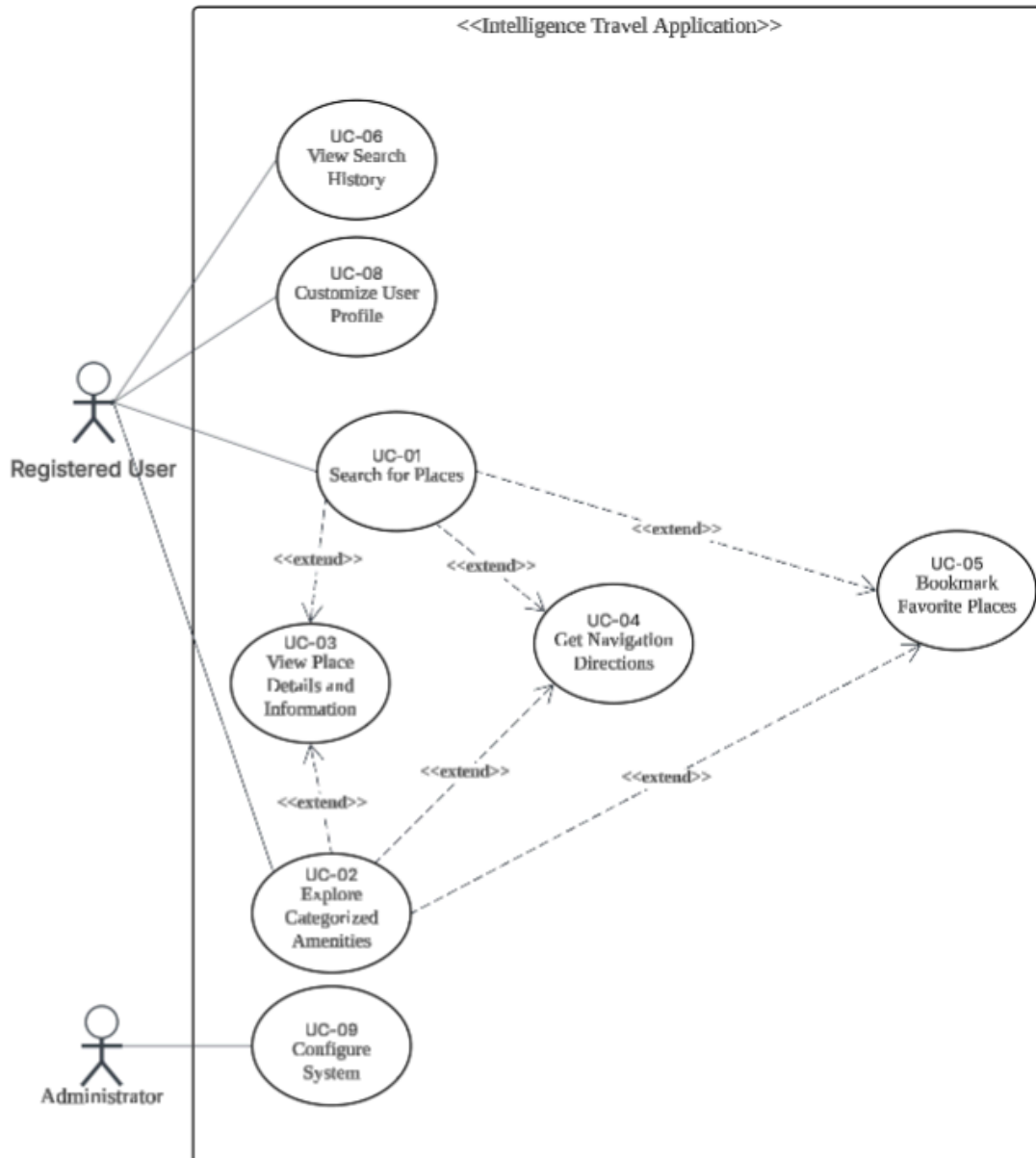


Figure 5. Revised Use Case Diagram



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User Account 			
Field	Description	Data Type	Constraints
userId	Unique user identifier	String/UUID	PK, Not Null, Unique
name	Display name	String	Not Null, max 50
email	Login email	String	Not Null, Unique, valid email
passwordHash	Hashed password	String	Not Null
role	User role	Enum	{REGISTERED_USER, ADMIN}
createdAt	Account created time	DateTime	Auto-generated

Figure 6. User Account Data Dictionary


Location 			
Field	Description	Type	Constraints
placeId	Unique place identifier	String/UUID	PK, Not Null, Unique
name	Place name	String	Not Null, max 100
category	Place category	Enum/String	Must be valid category
address	Full address	String	Optional, max 200
latitude	Latitude coordinate	Decimal	Range -90 to 90
longitude	Longitude coordinate	Decimal	Range -180 to 180
description	Short description	String	Optional, max 300
phone	Contact number	String	Optional
openingHours	Operating hours text	String	Optional

Figure 7. Location Data Dictionary


BookMark 			
Field	Description	Type	Constraints
bookmarkId	Unique bookmark id	String/UUID	PK, Not Null
userId	User who bookmarked	String/UUID	FK, Not Null
placeId	Bookmarked place	String/UUID	FK, Not Null
createdAt	Bookmark time	DateTime	Auto-generated
note	Optional user note	String	Optional, max 200

Figure 8. Bookmark Data Dictionary



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SearchHistory ▾			
Field ▾	Description ▾	Type ▾	Constraints ▾
historyId	Unique history id	String/UUID	PK, Not Null
userId	User who searched	String/UUID	FK, Not Null
queryText	Search keywords	String	Not Null, max 120
filters	Search filters used	JSON/String	Optional
searchedAt	Time of search	DateTime	Generated from time

Figure 9. Search History Data Dictionary

System Log ▾			
Field ▾	Description ▾	Type ▾	Constraints ▾
logId	Unique log identifier	String/UUID	PK, Not Null
level	Log severity	Enum	{INFO, WARN, ERROR}
source	Source component/module	String	Not Null, max 50
message	Log message	String	Not Null, max 500
userId	Related user (if any)	String/UUID	FK, Not Null
timestamp	Log time	DateTime	Auto-generated
requestId	Correlation id for tracing	String	Optional

Figure 10. System Log Data Dictionary

User Profile Settings ▾			
Field ▾	Description ▾	Type ▾	Constraints ▾
userId	Profile owner	String/UUID	PK/FK
preferredCategories	User preferred categories	JSON/String	Optional
language	App language	String/Enum	Optional
theme	UI theme	Enum	{LIGHT, DARK, SYSTEM}
updatedAt	Last updated	DateTime	Auto-updated

Figure 11. User Profile Settings Data Dictionary



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Organization Chart

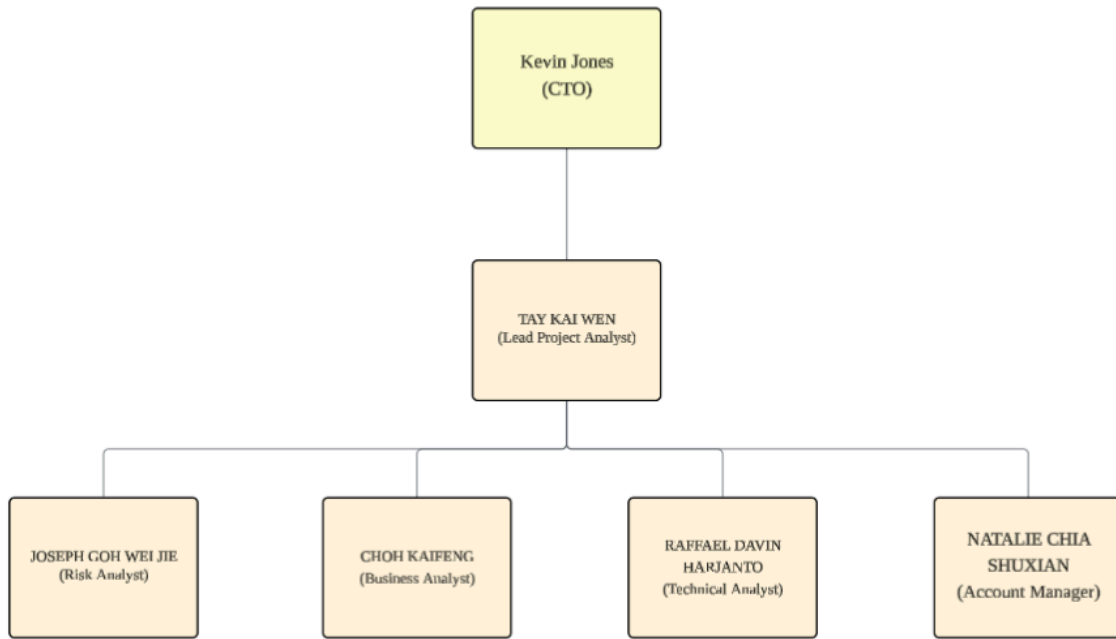


Figure 12. Organization Chart