Project Proposal[1] **:** *Enhancing Park Guide Training and Management: A Digital Solution for Sarawak's National Parks and Nature Reserves*

Background / Problem Description

Sarawak Forestry Corporation (SFC) is undertaking a digital transformation initiative to enhance the training and management of park guides across the Sarawak's national parks and nature reserves. The current park guide training and licensing system relies on manual processes, leading to less efficiency in tracking the guide process, handling registration, managing certifications, and ensuring compliance. Additionally, the park guides also face challenges in accessing the training due to rigid schedules, long training durations, and limited availability of updated learning materials.

To address these issues, SFC aims to develop a comprehensive digital problem that automates park guide management, provides flexible and interactive training, and integrates AI-driven performance monitoring. This initiative will not only improve administrative efficiency but also enhance the quality of the guiding services, promote sustainable eco-tourism, and ensure conservation best practices.

This project seeks to modernise Sarawak's park guiding system while preserving its natural heritage by adopting digital solutions, including AI-based personalised training, an IoT system for biodiversity protection, and cybersecurity measures.

Scope

The scope of the project includes defining the project goals, objectives, and features which aims to eliminate the identified issues. By outlining these elements, the project can be streamlined, and the team is able to focus on the critical aspects that complete the project. Additionally, certain limitations and constraints will also be acknowledged which may post certain challenges to the team during development. These will help set clear expectations and ensure that the project remains on track to meet its desired outcomes.

Goal / Aims

The primary goal of the project is to enhance the professionalisation and efficiency of park guide management in Sarawak's national parks and nature reserves by implementing a digital solution. The system aims to streamline the process of managing the park guides' training, certification, and licensing process, while providing flexible, interactive, and up-to-date content to make business decisions. By integrating AI for performance monitoring and biodiversity education, the projects aim to empower the park guides with tolls and knowledge to elevate the quality of the service with necessary cybersecurity measures incorporated into the solution. Additionally, the implementation of an IoT system and augmented reality/AR training technologies will further support the SFC's efforts in ensuring the sustainable growth of ecotourism in Sarawak.

[1] This document is by no means a "full project proposal". It has been simplified and customised for the purposes of MSP teaching. The full project proposal includes many other sections which have not been discussed during the first few weeks of MSP teaching.

Objectives

Park Guide Management System: This system helps to simplifies administrative tasks for park guide to enhance the operational efficiency and ensures data compliance.

Flexible Digital Training Platform: An interactive platform that allows park guides to complete training, bridging knowledge gap with up-to-date content.

Interactive Digital Guidebook: A digital guidebook with interactive features such as interactive maps, multimedia content, and real time update to enhance user experience and ensures up-to-date information.

Incorporate with AI: An AI-based analytics system to monitor guide performance and provide personalised training recommendations for better targeted content / training. Guides can also access personalised training modules and use AI for biodiversity identification.

Cybersecurity Measures: Cybersecurity measures such as role-based access control (RBAC) and encryption of stored data in compliance with data protection regulations.

IoT system: An IoT system will be implemented to monitor and aid in sending alerts regarding illegal activity (such as poaching or harming) to endangered flora and fauna in forest reserves by SFC.

Augmented Reality / AR: AR technology will be used to provide immersive training for park guides, better improving knowledge and practical skills through a more interactive online training method.

Constraint and Limitations

Time constraints: The team is expected to complete the project within one semester, with only two sprints allocated for the development phrase. Alongside other commitments and workloads from the semester, the team is further tied down on time for development.

Knowledge gap: Some of the features within the project requires technology that may be new to the team such as implementation of AR / VR, which posts a potential knowledge gap. The requirement of implementing a cross-platform application requires the team to use frameworks that support multi-platform development, which is something the team needs to improve on too.

Budget constraints: Based on the requirements, there might be a budget limitation for acquiring tools or hosting service which could affect the quality of the project. Request for development funding may also take time due to corporate procedures, further adding on time constraints.

Technological Challenges: The integration of advanced technologies such as IoT, AI, and AR/VR may require significant technical expertise, especially in remote area with limited internet access.

Stakeholders

The stakeholder of this park guide system can be divided into primary stakeholders, who will be using the system directly and the secondary stakeholders, who will indirectly affect the system.

Primary Stakeholders

1. Sarawak Forestry Corporation (SFC) Officials (Admin and System Manager)

This group of people are in charge of overseeing and managing the park guide training and licensing process.

Interest:

- Administrative tasks such as park guide registration, qualification, and certification management for park guides
- Setting up training schedules for park guides
- Monitor endangered species, using the system to track environment conditions and possible unauthorised activities
- Analyse visitor feedback and guide performance to better improve tourism services through data-driven information and decisions

2. Park Guides

This group of users will consist of the trainees and licensed guides that will bring the visitors around the national park.

Interest:

- Keep track of certifications and receive notifications
- Access the training materials available inside the system which will be provided by the admin
- Sign up for related on-site trainings programs
- Receive notification from admin, for events such as new required certifications or programs

3. Visitors and Tourists

This group of people are the visitors who want to experience the beauty of natural flora and fauna in the parks.

Interest:

- Access digital guidebooks with interactive park routes and wildlife information
- Provide feedback and ratings on park guides
- Utilise AI identification tools in the application to enhance their visitor experience

Secondary stakeholders

1. Tourism agencies

Interest:

- Ensure trained and certified park guides for higher-quality visitor experiences
- Access up-to-date information on park attractions and activities.

2. Technology Providers and Developers

Interest:

- Ensure smooth functionality and cybersecurity of the system.
- Provide technical support for AI-powered training and biodiversity monitoring.

Deliverables and schedule

Deliverables of the Project

The project will deliver a comprehensive solution, with complete codebase for all required platforms (mobile & web application), as well as the sprint meeting and review documents that show the progress throughout the development phase. Next, trained AI models and associated datasets will be included to enable personalised training and biodiversity identification. Additionally, a functional IoT system will be delivered for real time monitoring. A simple user manual will be created to provide users with a basic guide for operating the system. Finally, a live project presentation and demonstration will be conducted to demonstrate the complete system, showcasing its full functionality and features.

Initial Release Schedule

Product Backlog

The product backlog outlines the key modules and functionalities that will be developed and delivered throughout the project. This part of the project serves as a roadmap, guiding the development phase by ensuring core features are addressed first.

Product Backlog Id.	Product Backlog Item	Dependencies (Product Backlog Id.)	Business Value (1 least – 10 most)	Release Schedule (Sprint #1 | 2 | 3 | …)
1	Account Management System	-	10	Sprint #1
2	Park Guide Qualification and Certification Module	1, 5, 8	10	Sprint #1
3	Interactive Map Module	1	10	Sprint #1
4	Analytics and Reporting Module	1	8	Sprint #1
5	AI Module (For personalise training recommendations and Biodiversity Identification)	1,5	9	Sprint #1 & Sprint#2
6	IoT Module	3	8	Sprint #2
7	Notification and Alert Module	1, 6	6	Sprint #2
8	AR Module	-	6	Sprint #2

Project Timeline

The project is mainly divided into multiple phases, with each phase focusing on different aspects of the project process to ensure the project can be completed within the required timeline. The Scrum methodology will be used for this project as it provides agile and iterative development, allowing continuous improvement and flexibility. Next, the development phases are divided into 2 sprints, each consisting of 10 days, followed by sprint planning, review, and documentation phases. This structure ensures a continuous feedback loop and efficient progress tracking. The whole development phase will be expected to take around 20 days or 3-4 weeks in total. The timeline may change based on the needs of the project.

Development in Sprint 1 will begin on core features such as the account management system, park guide qualification and certification module, and interactive map module. During sprint planning, tasks and deadlines will be set and backlog items will be broken down while addressing dependencies. After Sprint 1, a sprint retrospective review will be conducted to reflect on the team's progress and address any blockers. Sprint documentation will also be prepared to ensure current progress is documented for future references. For Sprint 2, spanning from days 11 to 20, will focus on advanced features and system integration such as the AI module, IoT module, notification and alert module, and AR module. After that, sprint planning, review, and documentation phases will be held as stated previously.

Furthermore, throughout the development phase, Trello Board will be used to track tasks and progress throughout the project. By using Trello, all the backlog items, tasks will be organised, assigned, and tracked. Additionally, GitHub will be used as well for version control and code repository, ensuring that all code changes are tracked and reflected to all team members.

Solution Direction

The team has gone over various discussions to see what fits the business use case, the team's skillset, and the feasibility of completing the project within the timeframe of 1 semester. Tools used to evaluate each solution include SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis and KoST (Knowledge, Skill, and Technology Gaps) analysis. Using these analysis techniques, the team can filter and go through the ideas to formula a solution that is impactful to the business' use case.

Problem Domain Lack of an efficient management system and training system for park guides			
Potential Solution	**SWOT**	**KoST**	**Final Decision**
Park Guide Management / Interactive Map Platform	**Strength:** Unifies all required tools to a single interface to be used by the park guides, admins, and visitors to the park, allowing for more streamlined management and visitor experience **Weakness:** People who are less digitally literate may find it hard to use **Opportunities:** Management platform can be extended to improve other operations in the company, such as transactional record and staff management **Threats:** Some park guides may not have stable internet connection / powerful / suitable device to run the platform	**Knowledge Gap:** Not applicable **Skill Gap:** Team would need to learn new languages such as React Native for faster development and cross platform compatibility **Technology Gap:** Not all team members have access to all required devices (mainly iOS, Android) to do testing and development	Accepted

Park Guide Performance Monitoring and Training (AI and Data Science Driven)	**Strength:** Allows for better personalisation and decision making when managing and providing training park guides, based on data-driven feedback from customers **Weakness:** Requires the corporation of the visitors to give truthful and valid feedback about the park guides for the system to be more effective. Time is also needed to test the system out **Opportunities:** Able to better train park guides based on what they need **Threats:** Visitors may give false feedback about the park guides, which will affect the system efficiency	**Knowledge Gap:** Not applicable **Skill Gap:** Not applicable **Technology Gap:** Not applicable	Accepted
Plant identification mobile platform (Real-time)	**Strength:** Allows for an immersive and fast way for park guides to identify plants on the spot **Weakness:** Hardware requirements will be a limitation due to the usage of real-time object identification **Opportunities:** Can be scaled to fit and adapt into other applications the company may use **Threats:** The data the AI model provides may be confidential to the company	**Knowledge Gap:** Not applicable **Skill Gap:** Not applicable **Technology Gap:** Lacking time and datasets to make a reasonable model with decent accuracy, especially since it is real time, the team may not have strong enough hardware	Rejected

Plant identification mobile platform (via photo taking / image recognition)	**Strength:** Allows for a fast way for park guides to identify plants on the spot **Weakness:** Not applicable **Opportunities:** Can be scaled to fit and adapt into other applications the company may use **Threats:** The data the AI model provides may be confidential to the company	**Knowledge Gap:** Not applicable **Skill Gap:** Not applicable **Technology Gap:** Lacking time and datasets to make a reasonable model with decent accuracy	Accepted
IoT system for endangered plant protection	**Strength:** Able to assist in monitoring endangered plant conditions using sensor and environment monitoring. Alarm systems allow for immediate response from unauthorised activity notification **Weakness:** Plants in uncontrolled environments may be harder to set up **Opportunities:** Job opportunities from more technical fields **Threats:** Damage and maintenance of equipment used such as sensors and alarms	**Knowledge Gap:** Not applicable **Skill Gap:** Not applicable **Technology Gap:** Hardware limitations (may not have access), and limited number of site visits throughout the development phase to test the IoT system	Accepted

Virtual Reality / Augmented Reality Training for Park Guide	**Strength:** Immersive learning experience, closest thing to hands-on when learning things online **Weakness:** Requirement of good hardware to run the application **Opportunities:** Can be incorporated to the visitor side as well for visiting (in cases such as when an animal is missing / area is temporarily closed) **Threats:** Not applicable	**Knowledge Gap:** Require some research as the team has never done anything related to AR / VR **Skill Gap:** The team requires some time to grasp the skillset needed to development an AR / VR platform **Technology Gap:** Equipment would be required if the solution were to be done towards using VR headsets	Accepted
Park Guide Daily check-in system	**Strength:** Allows for close monitoring of park guide daily duties and completed training modules through manual check in using mobile applications **Weakness:** Requires strict enforcement to let everyone cooperate **Opportunities:** Could be integrated with the check in system for other staffs **Threats:** Park guides may be dissatisfied with the tight monitoring and lack of flexibility	**Knowledge Gap:** Not applicable **Skill Gap:** Not applicable **Technology Gap:** Not applicable	Rejected

From the table above, we can see that only the daily check-in system and real-time plant identification application are rejected due to either hardware limitations, or solution efficiency in solving the problem. The accepted solutions will be combined and discussed in the later sections, alongside cybersecurity measures (not mentioned in analysis as it is a non-negotiable part of the application).

Chosen Solution Direction

The proposed solution is a comprehensive digital platform that integrates park guide management, AI-powered training, biodiversity monitoring using IoT, cybersecurity measures, and interactive digital resources. This system will be developed as a web and mobile application, ensuring accessibility for park guides, administrators, and visitors. The chosen technologies and frameworks will allow for seamless integration of these features while maintaining scalability and security.

The solution follows a modular architecture, ensuring that different components such as user management, AI analytics, IoT monitoring, and interactive maps can function independently while working together cohesively.

High-Level Design

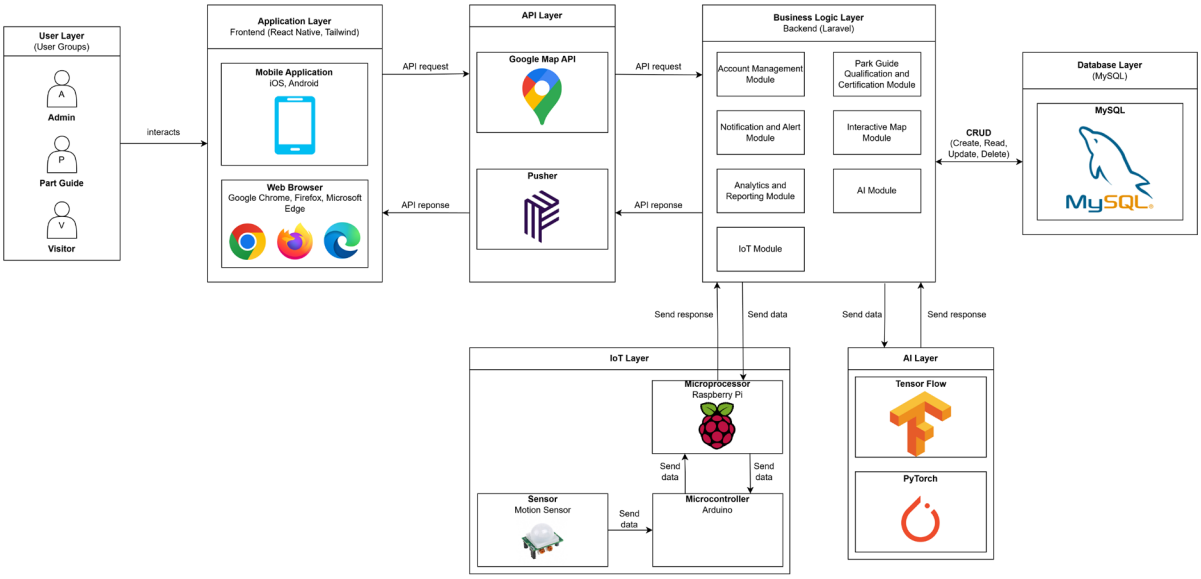


Figure 1: Solution High Level Diagram

The system will be structured into the following tiers:

1. **Frontend (User Interface Layer)**

- Technologies: React Native Web (Web), React Native (Mobile)
- Users: Park Guides, Visitors, Admins
- Features:
    - Park Guide Dashboard for training progress tracking
    - AI-powered biodiversity identification tool
    - Interactive digital guidebook with maps and multimedia
    - Secure admin portal for park guide management

2. **Backend (Business Logic Layer)**

- Technologies: Laravel
- Features:
    - User authentication
    - Secure role-based access control (RBAC)
    - Monitoring and alert management for IoT data
    - Encourages Model, View, Controller (MVC) design pattern

3. **Database Layer**

- Database: MySQL
- Features:
    - Stores user information, training progress, AI recommendations, and visitor feedback
    - Ensures data integrity and security
    - Logs IoT sensor data for biodiversity monitoring

4. **API Layer**

- Technologies: Google Map API (Park map), Pusher (Notification)
- Features:
    - Google Map API
        - Provide interactive maps about park routes, wildlife, activities and accommodations
    - Pusher
        - Enable notifications for training updates, license renewals, and visitors feedback

5. **IoT Layer**

- Devices: Raspberry Pi, Arduino, Motion Sensors
- Features:
    - Triggers alerts on unauthorised activities (poaching detection)
    - Provides real-time monitoring via web and mobile applications

6. **AI Layer**

- AI Technologies: TensorFlow.js, PyTorch (for personalised training analytics)
- Features:
    - AI-based species recognition for plants and insects
    - AI-powered personalised training recommendations
    - Guide performance analytics based on visitor feedback

The selected solution ensures that park guides receive interactive and AI-enhanced online training experience, biodiversity monitoring is automated through IoT, and visitor experiences are enriched via digital tools. React.js and React Native enable cross-platform accessibility. The AI and IoT integrations ensure innovation, making the system efficient, future-proof, and aligned with SFC's conservation efforts.

Quality Management

SMART

To ensure the quality of the final product is of expected standard, guidelines using the S.M.A.R.T. framework is established to be referred consistently throughout the project development process.

Objective

Deliver a fully integrated, secure, and high-performing Park Guide Management System – including mobile & web application, AI-driven training, IoT monitoring, and comprehensive documentation, which meet defined user and performance benchmarks by the final delivery deadline.

a) Specific

Develop a complete solution covering all functional areas: a multi-platform application (mobile and web), AI modules for personalised training and biodiversity identification, IoT integration for real-time monitoring of endangered flora, and robust cybersecurity measures. Accompany the system with full source code, technical documentation, user manuals, and training materials.

b) Measurable

- Achieve system functional uptime of at least 99% (before cloud deployment)
- Ensure interactive components (e.g., digital guide maps and multimedia content) load within 5 seconds in 95% of user sessions
- Attain a minimum AI identification accuracy of 70%
- Maintain a test coverage of 90% or more with zero critical bugs at final integration

c) Achievable

Leverage technologies and frameworks that allow for cross platform for faster development within the 4-week sprint. The team will be using the scrum framework, regular sprint reviews and feedback will also benefit the team in making the product more achievable within the limited time span. The team's expertise and skillsets also allow for a stronger foundation for the project success.

d) Realistic

The project scope has been carefully evaluated in collaboration with Sarawak Forestry Corporation (SFC) to ensure it is feasible and aligned with stakeholder expectations. The team will prioritise core functionalities that provide the greatest value to park guides, visitors, and SFC, ensuring efficient resource allocation and timely delivery. To maintain focus and prevent scope creep, the project will follow an agile development approach with clearly defined milestones, regular stakeholder feedback, and continuous reassessment of priorities. This structured approach ensures that the final system meets quality, security, and performance standards within the given timeframe and resources.

e) Time-bound

Phase 1: Research & Planning (Weeks 1-3)

- Gather and analyse project requirements with Sarawak Forestry Corporation (SFC).
- Conduct stakeholder meetings and proposal discussions to finalise the scope and objectives.

Phase 2: Core Development (Weeks 3-8)

- Execute two development sprints (each sprint lasting 2 weeks) to implement backlog items.
- Develop and integrate key features, including the Park Guide Management System, AI-driven training, IoT monitoring, and security measures**.**

Phase 3: Testing & Optimisation (Weeks 9-10)

- Perform comprehensive system testing, including unit, integration, and user acceptance testing (UAT).
- Gather stakeholder and user feedback to refine and improve functionality, performance, and usability.

Phase 4: Finalisation & Deployment (Weeks 11-12)

- Complete technical documentation, user manuals, and training materials for system adoption.
- Conduct final presentation and official handover of the system to SFC.

Definition of Done (DOD) & ISO / IEC 25010

Besides using the S.M.A.R.T. framework, the project's quality will be measured using Definition of Done (DoD) and Quality Attributes from ISO/IEC 25010. DoD ensures that each feature is fully developed, tested, secured, and documented before release, preventing incomplete or faulty functionalities (Karolina, 2021). Meanwhile, ISO/IEC 25010 defines eight key quality attributes—Functional Suitability, Reliability, Performance Efficiency, Usability, Security, Compatibility, Maintainability, and Portability—ensuring the system meets industry standards (Britton, 2021). By integrating DoD and ISO 25010, the project ensures the Park Guide Management System is fully functional, high-performing, secure, and aligned with Sarawak Forestry Corporation's (SFC) requirements and user expectations.

The table below outlines the Definition of Done (DoD) for each backlog item, along with the ISO/IEC 25010 quality attributes used to evaluate them. The sub-attributes of these quality attributes will be used to define the specific quality criteria for each backlog item. Full details of ISO/IEC 25010's attributes and sub-attributes can be found through this link - ISO 25010.

No	Product Backlog Item	Quality Attribute	Definition of Done	Justification
1.	Account Management System	Confidentiality	The system must support role-based access control (RBAC), ensuring only authorised users can access certain features.	Ensuring a secure authentication system is crucial to prevent unauthorised access and protect user data. RBAC enhances system security by restricting access based on user roles (Admin, Park Guide, And All Users), granting various privilege levels based on their respective use cases
2.	Park Guide Qualification and Certification Module	Functional completeness	- Park guides must be able to register, upload certifications, and track their progress in the system. - The system must allow administrators to verify, approve, and renew certifications, with automatic reminders sent to guides before expiration.	A structured qualification and certification system ensures that only trained and certified guides operate in the parks, maintaining professional standards and compliance. Automated renewal reminders reduce manual tracking effort and prevent expired licenses.

3.	Interactive Map Module	Performance Efficiency	- Must load within 5 seconds in 95% of test cases, even under normal traffic conditions. - The system must support at least 100 concurrent users accessing the map without degradation in performance.	Slow-loading maps frustrate users and reduce engagement, while poor scalability can cause failures during peak hours. Optimising performance ensures a smooth and reliable experience for all users.
4.	Analytics and Reporting Module	Functional appropriateness	- Visitors can successfully submit evaluation forms providing feedback on park guides' performance and overall experience.	Gathering visitor feedback is crucial for monitoring guide performance and identifying areas for improvement. The ability for administrators to analyse and assess guides' performance ensures that training programs can be adjusted based on real-world feedback. Accurate reporting allows park management to maintain high service standards, recognise outstanding guides, and provide additional training when needed.
		Functional correctness	- Administrators can view, filter, and analyse individual park guide performance reports based on visitor feedback, training progress, and other relevant metrics.	
5.	AI Module (For personalise training recommendations and Biodiversity Identification)	Functional appropriateness	- AI must provide personalised training recommendations based on guide performance feedback.	AI-driven training improves learning effectiveness for park guides, while accurate biodiversity identification enhances conservation efforts and educates guides on native species.

		Functional correctness	- The AI-powered biodiversity identification system must correctly identify at least 70% of species in test scenarios**.**	
6.	IoT Module	Functional appropriateness	The system must detect unauthorised activity (e.g., poaching or human interference) and trigger an appropriate response within 5 seconds of detection.	Real-time detection of unauthorised activity ensures immediate response to poaching or habitat disturbances, preventing harm to endangered species. Besides, accurate environmental data collection (temperature, humidity) is crucial for monitoring ecosystem health, ensuring reliable decision-making in conservation efforts. A minimum 90% accuracy compared to scientific benchmarks prevents misinterpretation of data, reducing the risk of ineffective conservation actions.
		Function Correctness	IoT sensors must accurately collect and transmit environmental data (e.g., temperature, humidity) with at least 90% accuracy compared to benchmarked scientific instruments.	
7.	Notification and Alert Module	Functional correctness	Notifications must be delivered successfully in 95% of test cases to all the users.	Timely notifications ensure that guides stay informed and comply with required training and certifications.

8.	AR Module	Learnability	It ensures that park guides can quickly understand and interact with the system without extensive training. The AR training interface must be intuitive and user-friendly, allowing guides to complete a training session with minimal assistance. Interactive tutorials and guided walkthroughs should be included to help users navigate the AR environment efficiently.	A well-designed learnable AR system reduces the time required for new guides to adapt, ensuring they can focus on acquiring essential conservation and eco-tourism skills rather than struggling with the technology. The AR module enhances user engagement and knowledge retention by incorporating clear instructions, interactive prompts, and gradual learning progression, making training more effective and accessible.

Resources

This section goes over the various resources required to complete this project.

Knowledge, Skill Sets, Experiences

- Team members possess knowledge or prior experience in the required fields (Software Development, Internet of Things, Cybersecurity, Artificial Intelligence, Data Science)
- Able to use React Native to create cross platform applications (across Android, iOS, web)
- Able to wire and utilise IoT-related equipment (sensors, actuators, microcontrollers, etc.)

Commitment

- Team members able to commit across the 2 sprints over the semester
- Willing to communicate with the team as soon as something arises

Cost

- For the prototype being produced until the end of the semester, the team will be leveraging on borrowed materials and tools to complete the project
- If the client were to implement the team's solution, a cost analysis of the tools, services, and other required costs is provided below to better gauge the required costs for proper deployment and maintenance

Equipment

- IoT related (Arduino, Raspberry Pi, Temperature, Humidity, air quality, PIR motion, light, GPS sensors, alarms, power bank)
- Cloud service (Amazon Web Services)

The roles of each of the team members is also provided to not just set expectations for the team moving forward, but to ensure the team is clear on who is doing what, ensuring separation of concerns during the project's development. Regardless, each team member is still able to help and participate with other role's duties as they deem suitable to ensure the project's completion within the required time frame.

Name	**Expertise**	**Scrum Role**	**Project Role**
Gavin Ng Qi Long	Cybersecurity, IoT	Scrum master	Team Leader
Kelvin Wong Lee Thian	Software Development, Data Science	Developer	Repository Manager
Jesse Ting Wen Kai	AI, Data Science	Developer	Secretary
Austin Chung Khai Rui	AI, Software Development	Developer	Developer
Guilbert Lam Li Cai	Software Development	Developer	Developer
Thaddeus Chong Zhuo Liang	Software Development, IoT	Developer	Developer
Ivan Bong Xi Yan	Data Science	Developer	Developer

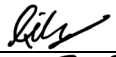
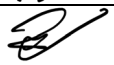
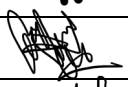
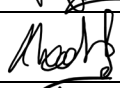
Cost Analysis

This section will be going over the various costs required for the development. As mentioned previously, the team will be requesting equipment to borrow from the university to minimise any costs during the development phase. This analysis may be used as a reference if the development were to be reproduced.

No.	Name	Cost per unit	Quantity	Total Cost	Reference
Hardware					
1.	VR Headsets (Oculus Quest 3, HTC Vive)	**RM2178**	**1**	**RM2178**	Click here to view
2.	Raspberry Pi 4 (4GB RAM)	**RM273**	**6**	**RM1638**	Click here to view
3.	MicroSD Card (32GB)	**RM47**	**6**	**RM282**	Click here to view
4.	DHT22 (Temperature & Humidity Sensor)	**RM22**	**6**	**RM132**	Click here to view
5.	MQ-135 (Air Quality Sensor)	**RM9**	**6**	**RM54**	Click here to view
6.	PIR Motion Sensor	**RM4**	**6**	**RM24**	Click here to view
7.	LDR (Light Sensor)	**RM5**	**6**	**RM30**	Click here to view
8.	LoRa SX1278	**RM26**	**4**	**RM104**	Click here to view
9.	Arduino Uno	**RM29**	**6**	**RM174**	Click here to view
10.	Power Bank	**RM20**	**6**	**RM120**	Click here to view
11.	GY-NEO6MV2 Flight Control GPS Module	**RM22**	**6**	**RM132**	Click here to view
Subtotal				**RM4868**	
Software	**Name**	**Cost per month**	**Quantity**	**Total Cost**	**Reference**
1.	IoT Platform (AWS IoT Core) (6 device, 20000 messages per month)	**RM0.61**	**-**	**RM0.61**	Click here to view
2.	Database (Amazon RDS for PostgreSQL) **(db.m4.large)**	**RM260.4**	**-**	**RM260.4**	Click here to view
3.	Amazon AWS EC2 for hosting **(t4g.micro)**	**RM13.55**	**-**	**RM13.55**	Click here to view
Subtotal				**RM274.56**	
Grand Total				**RM5142.56**	

Approval Signatures:

Project Team

	Name of student	**Student Id**	**Signature**	**Roles**
1	Gavin Ng Qi Long	102767763		Team Leader
2	Jesse Ting Wen Kai	102769808		Secretary
3	Austin Chung Khai Rui	102770017		Developer
4	Kelvin Wong Lee Thian	102775290		Repository Manager
5	Guilbert Lam Li Cai	102769633		Developer
6	Thaddeus Chong Zhuo Liang	101234091		Developer
7	Ivan Xi Yan BONG	104387668		Developer

Project Sponsor

Tutor's name (on behalf of the client)	**Signature**
Ts. Dr. Lee Sue Han	

List of references

Bojdak K 2021, *What is the Definition of Done (DoD) in software development?,* Future Processing, viewed 8 March 2025, <https://www.future-processing.com/blog/what-is-the-definition-of-done-dod-in-software-development>.

Britton J, 2021, *What Is ISO 25010?*, perforce, vieved 8 March 2025, <https://www.perforce.com/blog/qac/what-is-iso-25010>.