UTM UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

SECJ 2203: Software Engineering

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PROJECT PROPOSAL

Dengue Prevention and Education System

Dengue Defender

Team Name: Dengue Defender

Team Members:

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Presentation Video Link:

https://drive.google.com/file/d/18D8tPq7GUqd7yxr1lSnjhmEfaWhw-w2J/view?usp=drive_link

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1. Introduction

Nowadays, dengue fever has become a pressing health issue in Malaysia, yet many people still lack awareness about this illness. To mitigate this issue, we are going to develop a Dengue Prevention and Education system to raise user awareness and support prevention measures. Our goal is to include user-friendly features and interactive gamification in order to attract more users to engage with this system, thereby raising public awareness and helping to control the spread of dengue.

Need (N)	This augmented reality (AR) app is designed to enhance the existing systems' functionality. For example, the existing system provides image recognition that offers relevant information but performs poorly with real-time information. After conducting research we found that users face difficulties accessing the system when they are offline or in rural areas with low connectivity. Consequently, users are unable to report data and require high data usage while using it. Besides, user engagement is limited due to dull and unengaging interactions. As a result, there was a need for a new approach to integrate this system.
Approach (A)	Currently, the existing system does not provide real-time updates on health issues, making it difficult to stay informed of the latest information and status. Therefore, our system will offer up-to-date information about dengue cases and alert users when they enter high-risk areas. Furthermore, we will address connectivity issues in low-network areas by including low resolution of maps that requires less data. Users will also be able to download the latest information when they have Internet connection so that they can access it later when offline. Additionally, we will include interactive gamification, Kahoot which has leaderboards, into the system. The game content is mainly about dengue prevention, case statistics, high risks zones and many more.
Benefit (B)	A bundle of benefits that satisfies user needs will be gained. Firstly, users will immediately receive notification when they enter high risk zones, allowing them to take preventive action by avoiding the area and staying informed about dengue cases and recommended precautions that should be taken at that time. Besides, low data usage in viewing low resolution maps will be convenient for users who face

	high data costs. Moreover, the incorporation of interactive gamification will make users more interested in those challenges activities that increase knowledge and have motivation to report mosquito breeding sites or suspected dengue cases.
Competitor (C)	In fact, some similar systems already exist in this market. For instance, there are systems like iDengue that show statistics of dengue death cases for each state, MySejahtera app that provides infectious diseases tracker and systems that provide games related to dengue topics. However, there are some differences in our proposed system. Our system will immediately prompt users when they enter red zones to alert them. We will provide low-resolution maps that allow users access in low-connectivity areas so that real time updates and data reporting can be made immediately. We also provide a leaderboard feature that will motivate users to engage more with this system.

2. Existing Systems

The existing dengue awareness and prevention systems in Malaysia, primarily *iDengue untuk Komuniti* and *MySejahtera*, rely on semi-digital methods without a fully integrated, interactive platform made especially to inform the public about dengue prevention and encourage active engagement. As an informative tool, *iDengue untuk Komuniti* offers up-to-date information on high risk areas and dengue hotspots throughout Malaysia. Geographical heat maps and dengue case information are available to users, which are helpful for comprehending impacted regions. Nevertheless, the platform lacks interactive elements that would motivate users to take an active role in dengue preventive initiatives, and its design is static. There are no location-based, real-time notifications that may let users know when they enter a high-risk area. The lack of these alerts reduces the app's ability to encourage users to take early preventive action and raises the possibility that they would miss important information regarding dengue hotspots in their area.

Similar to this, *MySejahtera* is a popular health app in Malaysia for tracking infectious diseases in general. It covers a variety of health issues but does not specifically address dengue awareness and prevention. Although the app offers users information on a variety of medical issues, accessing dengue-specific information necessitates browsing through many pages because the information is included into more general health data. As a result, it is less effective as a focused dengue preventive method. Additionally, similar to *iDengue untuk Komuniti*, *MySejahtera* does not offer location-based dengue warnings. This is because users have to manually check for updates, the app's ability to assist users in avoiding dangerous areas or taking preventive measures depending on their current location is reduced. Furthermore, *MySejahtera*'s strong dependence on dependable internet access presents difficulties for people living in remote or underdeveloped locations, making it more difficult for people who could be most vulnerable to get timely dengue information.

Malaysia's present dengue preventive strategy has serious flaws, as seen by the absence of interactive and interesting elements on both platforms. *MySejahtera* and *iDengue untuk Komuniti* doesn't provide gamification features like leaderboards, challenges, awards or quizzes that might encourage users to participate more frequently and reinforce dengue preventive information. Without these characteristics, the applications are largely data-driven and don't pique users' attention over the long run, particularly with younger audiences who benefit from engaging, game-like learning experiences. An excellent strategy for raising awareness of dengue is interactive and gamified health education, which has been shown to enhance knowledge retention and motivate users to adopt preventive measures. In the absence of these captivating components, static data might not be enough to sustain the required level of public interest and continuous usage of these applications, which are essential for successful dengue preventive initiatives.

Features	Dengue Prevention and Education System	MySejahtera	iDengue untuk Komuniti
Dengue Case Statistics	Yes	Yes	Yes
High-Risk Zone Alerts	Yes	No	No
Interactive Features	Yes	No	No
Gamification Elements	Yes	No	No
Offline Accessibility	Yes	Yes	Yes
Educational Content	Yes	Yes	Yes

Table 1: Comparison of Existing Systems

3. Proposed System

We develop these specifications for our suggested system after compiling a list of all the issues with the AS-IS system. To improve dengue preventive efforts in Malaysia, an Augmented Reality (AR) Dengue Awareness and Education Application, Dengue Prevention and Education system, is the suggested approach. This platform overcomes the shortcomings of existing awareness efforts, which often lack interesting, real-time information to successfully educate the public, by utilizing augmented reality and interactive elements. With distinct roles and responsibilities for utilizing and contributing to the system, the mobile-based system is designed to reach users from a variety of demographics, including members of the general public, local health officials and community leaders. By combining gamified components, real-time data and instructional AR models, the application provides a dynamic and user-centered approach to learning that makes dengue awareness approachable, instructive and enjoyable.

The core of the system is an instructional component that makes learning about dengue prevention interesting by using augmented reality representations. In order to better understand how and where mosquitoes thrive, users can explore simulated breeding areas and interact with 3D models of the mosquito life cycle. Users are guided by interactive instructions on how to get rid of these breeding grounds, including how to spot stagnant water or potential mosquito habitats. Through the use of augmented reality (AR) technology, users are immersed in their actual surroundings, highlighting potential risks and providing direct instruction on preventive measures.

The app includes gamification features like challenges, quizzes and a reward system to further increase user involvement. Users can earn points, badges and social network shareable milestones by completing virtual tasks in which they must locate and “remove” simulated mosquito breeding sites. Leaderboards promote healthy competition amongst users, and can even organize group challenges to foster collective actions within neighborhoods. These features encourage users to return to the app and actively participate in preventive efforts by making learning about dengue prevention a joyful experience.

In order to provide users with the most recent information on dengue outbreaks in their area, the app also incorporates real-time dengue data from local health officials. The app uses geolocation to deliver tailored warnings to users in high-risk locations, warning them of increased dangers and suggesting preventive measures. Furthermore, forecasting future alerts is aided by predictive analytics, which is based on previous outbreak data, weather patterns and trends in mosquito activity. Based on reliable data insights, this functionality enables users to make well-informed decisions about preventive actions.

In order to guarantee that users may access educational materials regardless of internet availability, the system also supports offline data access for locations with poor connectivity. Secure logins with password-protected accounts allow users to verify their identity, and role-based permissions ensure that sensitive data is protected. During the peak mosquito seasons, automated notifications keep users informed about high-risk zones and provide reminders about preventive practices. Admins receive insights into engagement levels within communities, allowing them to measure the effectiveness of preventive campaigns.

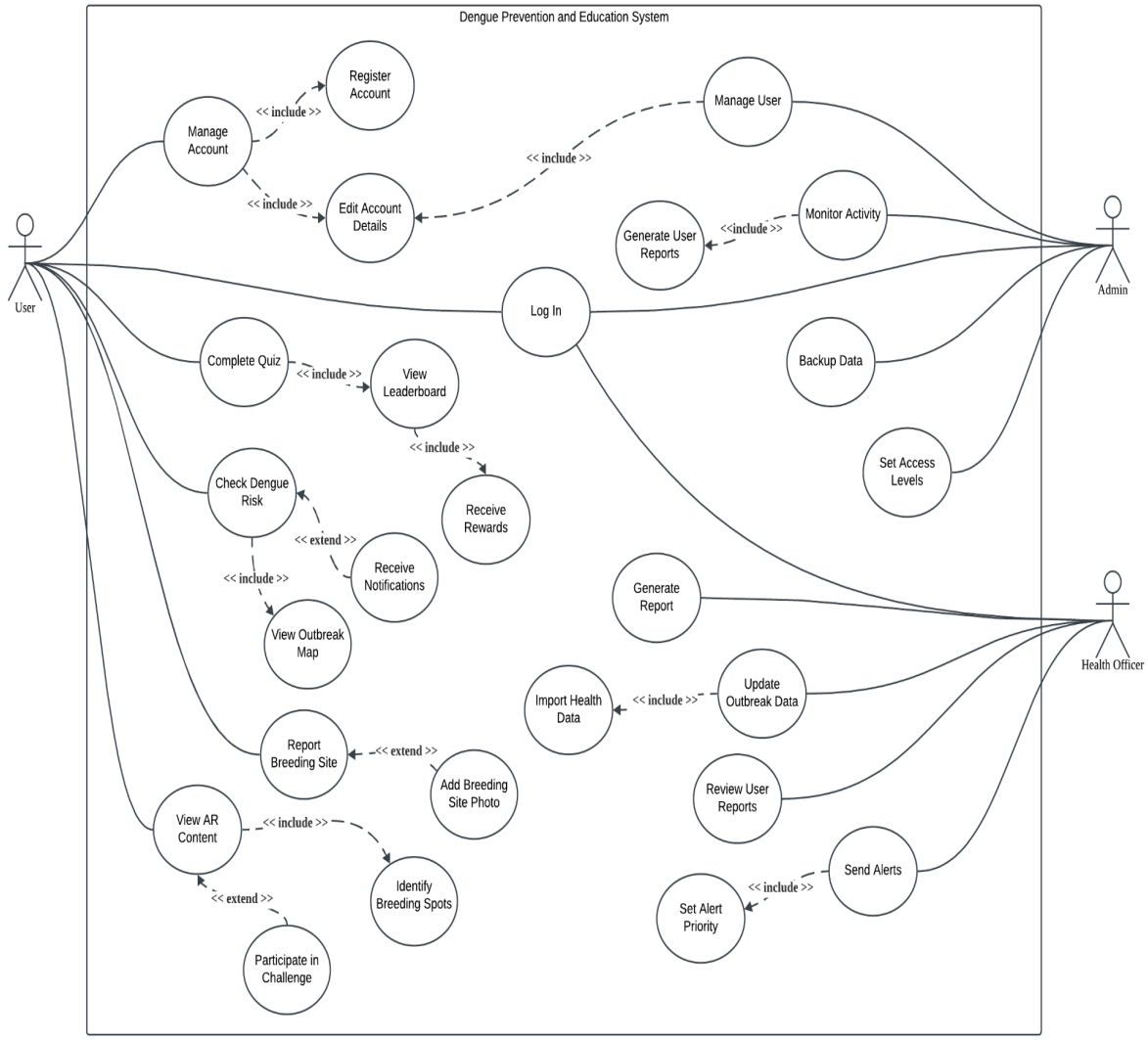


Figure 1: Use Case Diagram of Dengue Prevention and Education system

4. Software Process Model

The production of a software system can be lead by a set of related activities through a software process [3]. In order to make a simplified representation of a software process, a software process model, also known as the Software Development Life Cycle, will be planned out and hopefully smoothen the process of developing the software. There are a few types of general process models, after some consideration done on the case study, we have chosen incremental development, along with applying the agile approach.

Incremental development was selected for this system due to its nature that some components and changes could be made during the iteration as only the fundamental requirements are listed out in the first increment, while the others remained undelivered [4]. Most of the time, the first proprietary will be given to develop the riskier or crucial functions first, in this context it will be the AR scanning function and the database of dengue cases around the country. This development model is similar to the way we solve problems, as we will tend to work through the solutions in a sequence of steps, and heading back when we uncover a mistake. Therefore, the costs will be effectively lowered, as changes are easier to make during the development period. Moreover, the customers will be receiving the latest development as soon as possible, and their feedbacks can be gathered for further improvements. By combining with Agile approach, where the rapid functionality delivery and the adaptability to the changing customer requirements are main priority, we can ensure that the development process are up to the customers requirements and high frequency of the latest process's delivery[5].

Here are the **detailed activities covering the aspect of SDLC.**

Increment 1:

	Duration (Weeks)	Assigned Member	Activities	Deliverables
Specification analysis	1	Ngeow Zhi Yu	• Research and analyze the system's requirements • Compile stakeholder requirements during the interview • Specify the requirements and first increment	• Analysis report • Requirement document

Software design and development	2	Jason Joel Johnny	• System functionality design • First increment development	• System Architecture diagram • Design Document • First increment source code
Validation and Testing	1	Lee Jian Ai	• Requirements checking for developed code • System testing and analysis	• Test result • Validation report
Implementation	1	Ahmad Muzhaffar Prihantony	• Distribute prototype for customers to try • Gather customer's feedback	• Prototype package and guide • Customer feedback analysis report • Product first draft

Increment 2:

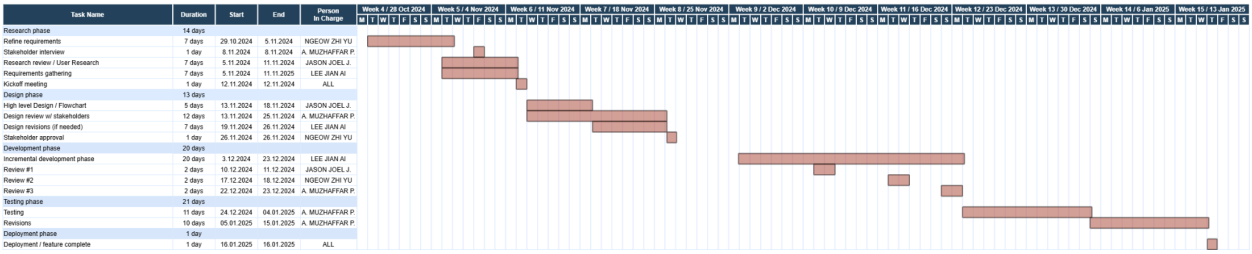
	Duration (Weeks)	Assigned Member	Activities	Deliverables
Software design and development	2	Jason Joel Johnny	• Enhance previous system functionality design • Second increment development	• Improved design Document • Second increment source code
Validation and Testing	2	Ngeow Zhi Yu, Lee Jian Ai	• Requirements checking for updated code • System testing and analysis	• Test result • Validation report
Implementation	1	Ahmad Muzhaffar Prihantony	• Distribute second prototype for customers to try	• Prototype package and guide

			• Gather customer's feedback	• Customer feedback analysis report • Product second draft

Increment 3:

	Duration (Weeks)	Assigned Member	Activities	Deliverables
Software design and development	2	Jason Joel Johnny	• Third increment development	• Improved design Document • Third increment source code
Validation and Testing	1	Ngeow Zhi Yu, Lee Jian Ai	• Requirements checking for updated code • System testing and analysis	• Test result • Validation report • Enhanced source code
Implementation	1	Ahmad Muzhaffar Prihantony	• Distribute third prototype for customers to try • Gather customer's feedback	• Prototype package and guide • Customer feedback analysis report • Final product

5. Project Schedule



Task Name	Duration	Start	End	Person In Charge
Research phase	14 days			
Refine requirements	7 days	29.10.2024	5.11.2024	NGEOW ZHI YU
Stakeholder interview	1 day	8.11.2024	8.11.2024	A. MUZHAFFAR P.
Research review / User Research	7 days	5.11.2024	11.11.2024	JASON JOEL J.
Requirements gathering	7 days	5.11.2024	11.11.2025	LEE JIAN AI
Kickoff meeting	1 day	12.11.2024	12.11.2024	ALL
Design phase	13 days			
High level Design / Flowchart	5 days	13.11.2024	18.11.2024	JASON JOEL J.
Design review w/ stakeholders	12 days	13.11.2024	25.11.2024	A. MUZHAFFAR P.
Design revisions (if needed)	7 days	19.11.2024	26.11.2024	LEE JIAN AI
Stakeholder approval	1 day	26.11.2024	26.11.2024	NGEOW ZHI YU
Development phase	20 days			
Incremental development phase	20 days	3.12.2024	23.12.2024	LEE JIAN AI
Review #1	2 days	10.12.2024	11.12.2024	JASON JOEL J.
Review #2	2 days	17.12.2024	18.12.2024	NGEOW ZHI YU
Review #3	2 days	22.12.2024	23.12.2024	A. MUZHAFFAR P.
Testing phase	21 days			
Testing	11 days	24.12.2024	04.01.2025	A. MUZHAFFAR P.
Revisions	10 days	05.01.2025	15.01.2025	A. MUZHAFFAR P.
Deployment phase	1 day			
Deployment / feature complete	1 day	16.01.2025	16.01.2025	ALL

Figure 2: Gantt Chart for the Proposed Project

Full image:
https://drive.google.com/file/d/1HtIz8V8NHSkCimFkBJjl4R-HKKlV84Tc/view?usp=drive_link

6. References

[1] World Health Organization (2024), Dengue and severe dengue,

https://www.who.int/en/news-room/fact-sheets/detail/dengue-and-severe-dengue

[2] MySejahtera Unit, Ministry of Health, Malaysia (2022), Infectious Disease Tracker,

https://mysejahtera.moh.gov.my/en/infectious-disease-tracker/introduction

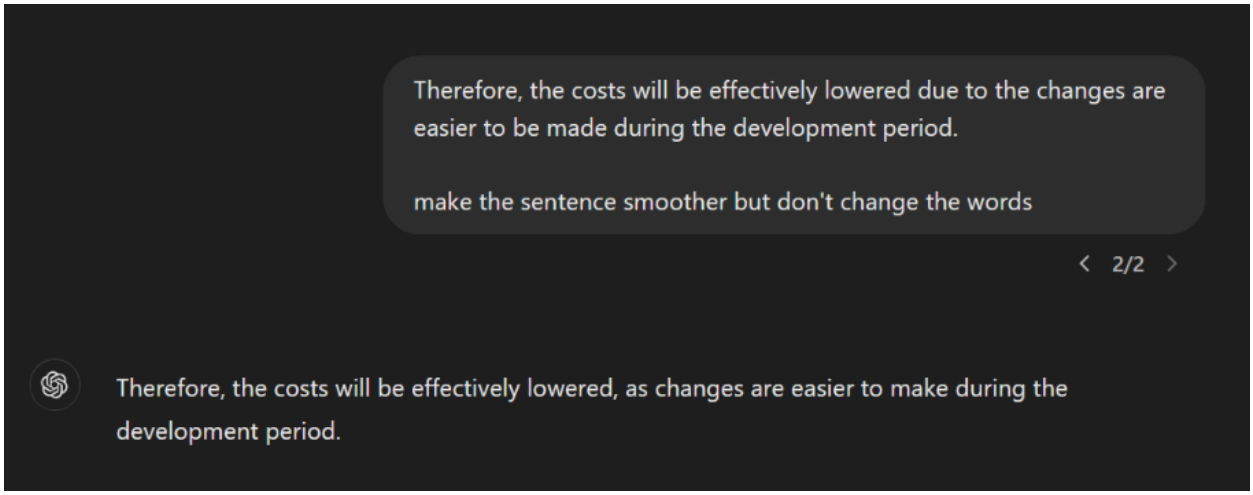
[3] F. Aziz, "iDengue - Official Portal of Ministry of Science, Technology and Innovation" Oct. 27, 2020. https://www.mosti.gov.my/perkongsian-maklumat/idengue/

[4] I. Sommerville, *Software Engineering, Global Edition*. Pearson Higher Ed, 2016.

[5] A. Alshamrani, "A comparison between three SDLC models Waterfall Model, Spiral Model, and Incremental/Iterative Model," *www.academia.edu*, Feb. 2015, [Online]. Available: https://www.academia.edu/10793943/

[6] K. Petersen and C. Wohlin, "The effect of moving from a plan-driven to an incremental software development approach with agile practices," *Empirical Software Engineering*, vol. 15, no. 6, pp. 654–693, Jul. 2010, doi: 10.1007/s10664-010-9136-6.

Appendices



Incremental
- It is easier to get customer feedback on the development work that has been done
– Customers can comment on demonstrations of the software and see how much has been implemented
• More rapid delivery and deployment of useful software to the customer is possible
– Customers are able to use and gain value from the software earlier than is possible with a waterfall process

Agile approach
– focus on iterative development and the reduction of overheads in the software process
– The primary characteristics are rapid delivery of functionality and responsiveness to changing customer requirements
– The improvement philosophy: the best processes are those with the lowest overheads and agile approaches can achieve this
make relation between these two and write a few sentences on it.

The **Incremental** and **Agile** approaches share a common focus on delivering functional software to customers quickly and incorporating feedback throughout the development process. In the Incremental model, customer feedback is gathered at each stage, allowing users to provide input based on the portions of the software already implemented. This approach enables earlier delivery and deployment of valuable features, similar to Agile's emphasis on rapid functionality and responsiveness to changing requirements. Agile methods further streamline this process by minimizing overhead and promoting iterative development, making it possible to adapt continuously while keeping the process efficient. Together, both approaches ensure a customer-centered, flexible development process that emphasizes early and frequent delivery.