DEVELOPMENT OF CROPIFY: MOBILE APPLICATION FOR CROP CULTIVATION, NOTIFICATION AND ALERT SYSTEM

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ABSTRACT

Mobile application development is the process of creating software for portable devices like smartphones and tablets. The mobile application development process can vary depending on the type of app being developed, the platform it is being developed for, and the development methodology being used. These applications can be used for a wide range of purposes, including gaming, social networking, productivity, and more. In agriculture, the usage of mobile applications has also increased due to the awareness of the use of modern technology in the field of agriculture. Mobile applications can be very helpful in improving agricultural practices by providing farmers and agricultural workers with access to useful information and tools. Mobile application can be use in agriculture to manage crops, soil testing, livestock management, market information, education, and training. Mobile app development typically involves a combination of software engineering, user interface design, and testing. The software development process is divided into five phases which are data collecting, application design, implementation, testing, and maintenance. This project focus on developing a mobile application of information system for planting activities and alert system for crop planting. The system has 2 components which are a mobile app for user and a web-based administration page for administration purpose. This application helps farmers to plant and manage the crop from planting until harvesting. This application will send activity reminder to farmers as well as weather forecast data via app notification and SMS a day before each activity. The mobile application is designed to assist farmers and crop cultivators in optimizing their agricultural practices through

efficient management, timely notifications, and proactive alerts. By leveraging the capabilities of mobile technology, the application aims to empower farmers to make informed decisions and enhance crop productivity while minimizing risks and losses.

Keywords: Crop cultivation, mobile application, agricultural application

INTRODUCTION

Malaysia produces vegetables for both domestic consumption and export. Vegetables were planted on 61,614 hectares of land nationwide in 2020, producing 1,030,064 metric tonnes. With a total production of 361,971 tonnes in 2020, Pahang was the largest state in Malaysia for vegetable planting and production, followed by Johor (208,260 tonnes) and Kelantan (128,327 tonne).

The export value of vegetables in Malaysia decreased from RM999,744,530 in 2019 to RM828,475,030 in 2020, according to the Agro-Food Statistics 2020 (MAFI) (Statistik Tanaman Sayuran dan Ladang 2020). Despite an increase in vegetable crop production from 2019 to 2020, Malaysia is still unable to handle such high import costs. The agricultural sector of the nation is now dealing with several issues, such as a shortage of trained labour and reputable agricultural experts, high input costs, and a less-than-encouraging level of private sector and youth engagement. Additionally, the farm has low crop productivity and a lot of unutilized agricultural area. Therefore, actions must be done to address these issues.

The usage of mobile application started in 2008 when the Apple Store was officially launched. The Android operating system, which was introduced to the market in 2008, also had a big impact on the history of mobile app development. Android has the potential to bring forward an industry transformation that has been long overdue (Haseman C. 2008). The open-source nature of the Android operating system made it easier for developers to create application for the platform, and it also helped to increase the number of application available on mobile devices.

With the emergence of new technologies like augmented reality and machine learning, mobile app development continued to advance and expand in the years that followed, providing new opportunities for app developers. The rapid development of mobile-enabled information services and the quick rise of mobile phones provide a solution to overcome the current information asymmetry in areas such as agriculture, healthcare, and education. (Hetal Patel & Dharmendra Patel, 2016). Mobile applications are becoming an essential aspect of modern life and are utilised for a variety of activities, including social networking, entertainment, business, and productivity. Agricultural mobile phone applications are revolutionising the sector by assisting smallholder farmers in making better decisions.. By offering meteorological data, agricultural market trends, pest and disease damage identification, and guidance on pesticide and fertiliser use, these applications address the information demands of farmers (So Pyay Thar et al, 2020). It is important to notice that the mobile application ecosystem has grown exponentially, with the number of application available in app stores reaching millions, and the number of active mobile users is even higher, making mobile application development a key point in the technology industry.

According to data from a 2019 report by App Annie (https://www.data.ai/en/), Malaysia ranked as the 17th largest market for mobile app downloads in the world. The report also found that Malaysians spend an average of 3 hours and 15 minutes per day on their mobile devices, with most of that time spent on social media and messaging application. In addition, online shopping, and ride-hailing application also popular in Malaysia. This shows that the acceptance of mobile app usage among Malaysian especially younger generation. Most smartphone users, according to Deshdeep, N, spend 86% more time on mobile applications than on websites (14%). The application offers greater performance and a better user experience due to a page on a website takes longer to load than it does on a mobile app (Hu Y, et al, 2019). This project focuses on developing a mobile application with an alert and information system for vegetables and crop planting activities. From planting to harvest, this application aids farmers in managing their crops. A day before each activity, this app will notify farmers by app notification and SMS with weather forecast information as well as an activity reminder. Farmers must select the sort of vegetable they want to grow and fill the project details. The schedule will be created based on the day that planting will begin. The planting and crop maintenance schedules are then generated automatically by this application. Throughout the planting season, the app will remind farmers to complete every task. This app helps farmers maintain their crops more easily, increases agricultural yields to enhance farmers' revenue, and lowers risks like disease attacks and nutritional deficiencies. It is expected that this software would inspire the next generation to get involved in agriculture. The purpose of this study was to provide documentation of the process used to evaluate the functionality of a mobile application that was specifically targeted at new farmers who wanted to get involved in agriculture.

MATERIALS AND METHODS

The development of Vegetable Cultivation and Alerts System was carried out from January 2022 until May 2022. It was developed in Bahasa Malaysia on the Android platform. The Android platform was chosen because, according to publicly available poll data, it is the most popular smartphone platform in Malaysia (Statista 2021). The method for designing a mobile application was adopted from the Software Development Life Cycle (SDLC) model. Methodologies for the Software Development Life Cycle (SDLC) are techniques for ensuring that software meets established requirements (Sujit Kumar et al., 2013). These approaches impose various levels of discipline on the software development process in order to make it more efficient and predictable. The software development process is divided into five phases: data collecting, application design, implementation, testing, and maintenance. SDLC has been described as one of the best approaches for producing mobile applications, and an integrative literature study concluded that SDLC is one of the main techniques for developing mobile applications. (Inukollu V. et al., 2014). SDLC is basically a whole development process with structured and rational actions required to develop mobile application. This paper would only

address the requirement gathering, design, implementation and testing phases of *Crop Cultivation and Alert System mobile application.*

DATA COLLECTION

The main purpose of this mobile application is to send the planting schedule and activities to the user. The schedule is including the action that must be taken by farmer to manage their plot for example what type of herbicide or pesticide must farmer use and what kind of fertilizer is recommended for farmers. All the data were provided by Horticulture Research Centre from their research finding.

APPLICATION DESIGN

This app was created with the goal of producing high-quality user interface (UI) components. It refers to what the user may communicate with and view. The goal of UI design is to make user interaction as simple and effective as possible in order to achieve users' goals. The app is a cloud-based system to enable real-time data sharing and update. All records will be stored into cloud server and can be retrieved anytime by any user as mentioned in figure 1. The workflow of the application process is mentioned in figure 2.

Figure 1: Cloud-based application system

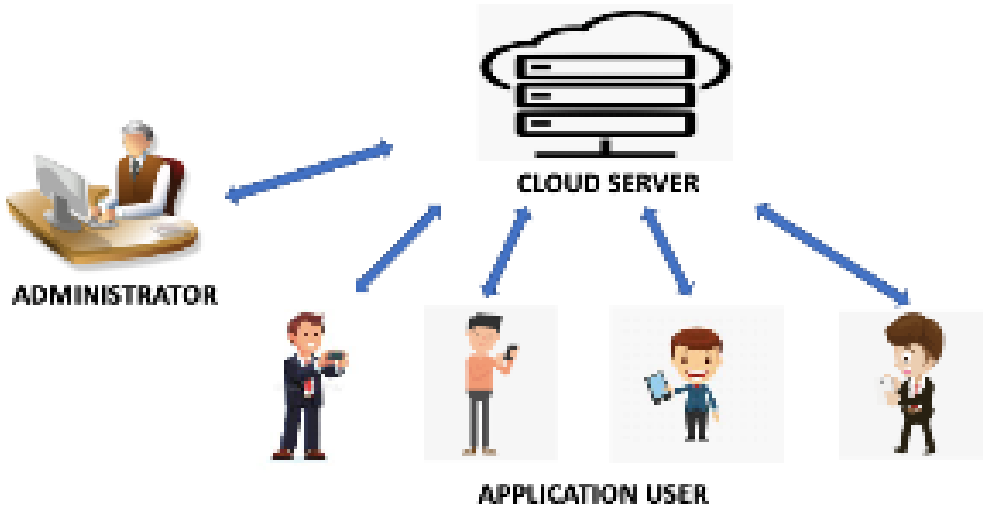
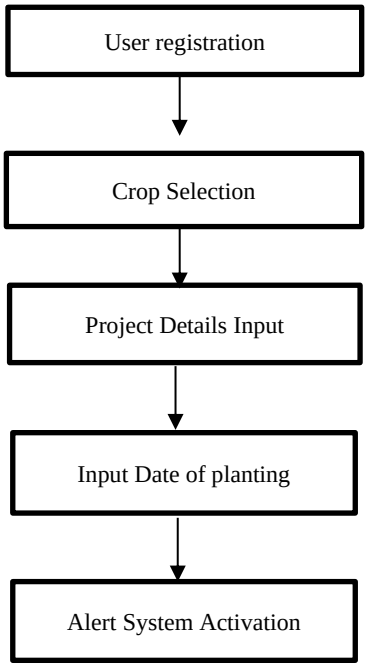


Figure 2: Workflow of Mobile application process



APPLICATION DEVELOPMENT

Figure 3: Mobile app login page

Figure 4: List of available crops

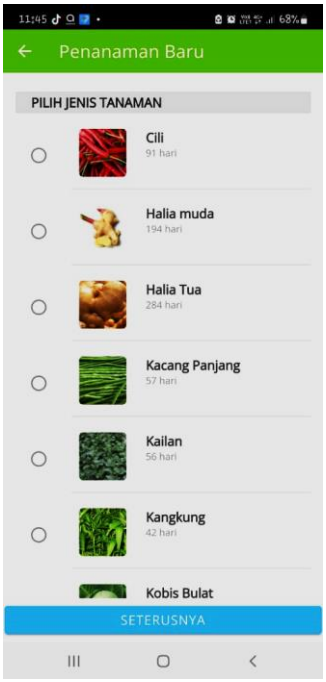


Figure 5: Information input for the project

Figure 6: List of activities

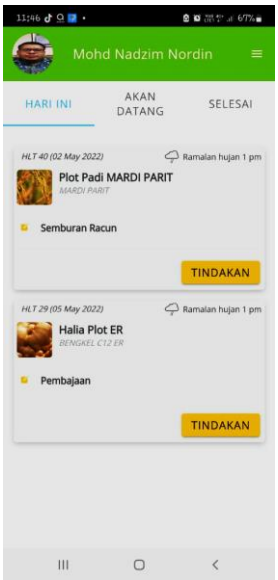


Figure 7: Weather forecast data

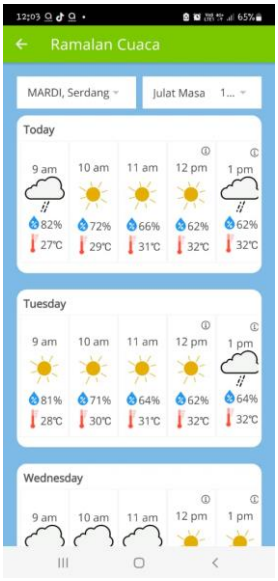


Figure 8: Web-based administration page

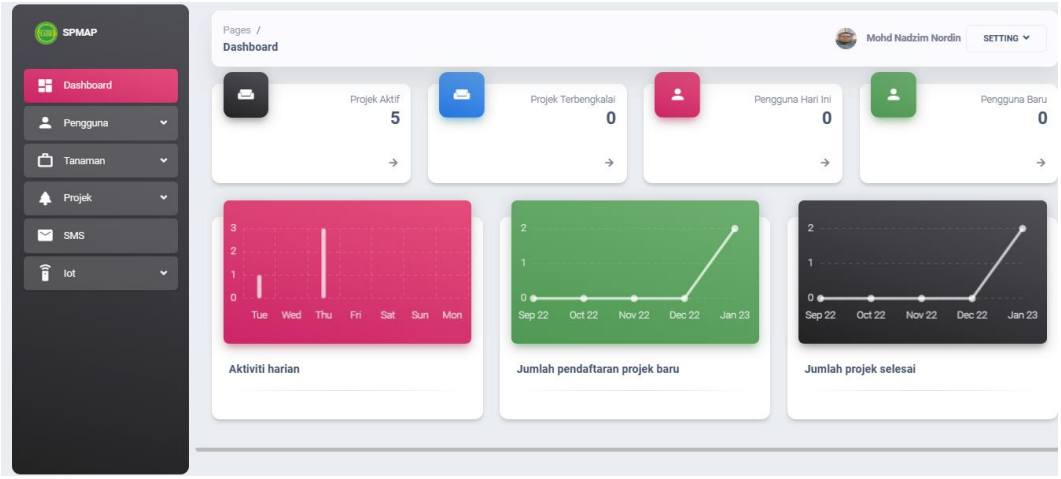


Figure 3 show the log in of the mobile app. User need to log in based on ID registered in the system. Figure 4 show the available crop in the system and the administration able to update new crop at any time needed. Figure 5 show the input that user must filled in before creating a new project. This includes name of the project, location, size of the plot and type of soil. The user also can assign another registered user in the list, and these users will receive the notification message and able to manage the cultivation activities. The farmers will receive notification through their mobile phone and SMS according to the list of activities once the project is activated. The application also integrates with weather data sources to provide real-time weather updates and forecasts for the user's location as mention in figure 7. By receiving weather information, farmers can plan and adjust their cultivation practices accordingly. The mobile application will be managed by admin using web-based system as mentioned in figure 8.

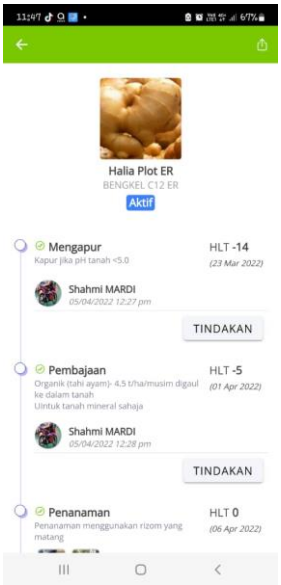
RESULTS AND DISCUSSION

IMPLEMENTATION

The app was used in several projects in Engineering Research Centre. The project includes low land cabbage planting in MARDI Kundang and ginger planting in MARDI Engineering Research plot as mentioned in figure 9. This app also has been used in the paddy planting in MARDI Parit. This shows that this application not only can be used for vegetable crops, but also can be used on other crops such as paddy, maize, pineapple etc. Figure 10 showed the list of activities for each project. Users need to update their activities by clicking the action button on the list. User also can add comment or photo regarding to the activity. The users of this application found that this application help them to manage their plat according to the proper timetable and they also can easily manage their plot and their workers well.

Figure 9: List of registered plot

Figure 10 : List of activities



CONCLUSION

The mobile application for crop cultivation, notification, and alert system is designed to empower farmers with valuable tools and information. From users' feedback, this app helps them to manage their operations more efficiently by providing them with tools such as crop management activity and weather forecasting and supervise their plot well. This app also helps them improve the communication between farmers and their workers making them to smoothly manage and maintain their plots. The farmers also can get information regarding their plot quickly and enable them to act quickly if there any disease attack or lack of nutrient. Users with minimum knowledge in agriculture also can manage and planting their crops very well. By integrating crop management features, personalized notifications and alerts system, weather monitoring, and a knowledge hub, the application aims to optimize farming practices, improve crop yields, and support farmers in making data-driven decisions. With the existence of this application, it is hoped that more people will be able to venture into the field of agriculture and subsequently be able to increase the national food self-sufficiency level (SSL).

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