Oil Palm Monitoring System Application

by

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(Business Information Systems)

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the

Business Information System Programme

UniversitiTeknologi PETRONAS

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Approved by,

_____

(Mr. SaipunidzamMahamad)

Department of Computer Information Science

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements and that the original work contained have not been undertaken of done by unspecified sources or persons.

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Date:

AMEERUL AFIF BIN AHMAD

ABSTRACT

Most of the mobile applications are mobile games, photography, social network, travel applications, education application and entertainment sites. However, even with all these interesting mobile applications, there are few applications that based on environmental information and monitoring system. One mobile application that that may be related to this is the 'Oil Palm Monitoring System Application'. The system is a monitoring system for the oil palm's production industry that developed for Google Android device's users. Generally, this mobile application focused on to develop an 'Oil Palm Monitoring System Application' that follows the needs and requirements of the users. Besides, this application aims to provide a harvesting activity planner which to convey the instruction from the manager to the supervisors and workers of the oil palm plantation regarding the future harvesting activities through the system. This dissertation will mainly focus on the introduction of the project, literature review, methodology used, result and discussion of the project and lastly the conclusion and recommendation resulted from this project. It is to be said that this application has its own potential to be commercialized and improved in the future.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

The usage of mobile devices nowadays had tremendously increasing among the people around the globe. People are more towards using the mobile devices like smart phone and tablet as it is portable and convenience. As the popularity of mobile devices grow, there are more than thousands mobile application have been developed and introduced in various functions and purposes.

Generally, a mobile application is application software designed to run on smart phones, tablet computers another mobile devices. Also called mobile apps, mobile applications usually help users by making them easier to connect to the internet services through their mobile devices. Mobile applications frequently serve to provide users with similar services to those accessed on PCs.

Most of the mobile applications are mobile games, photography, social network, travel applications, education application and entertainment sites. However, even with all these interesting mobile applications, there are few applications that based on environmental information and monitoring system. Being aware of the small number of mobile apps being developed in the agriculture industry, one mobile application that that may be developed that related to this is the 'Oil Palm Monitoring System Application'.

Basically, this project will be based on the study of the usage of mobile app for agriculture industry in general or more specific in oil palm industry. The 'Oil Palm Monitoring System Application' will use Android operating system for its operations as Android has large number of users thus it would be more users to download and use the application compared to other operating systems.

The main parts of this mobile application are providing information regarding the oil palm industry and planner in monitoring the harvesting process of the oil palm trees.

1.2 Problem Statements

The problem statements of this project are:

- Lack of information and available application on monitoring the production of crude palm oil especially for the new farmers.
- User can understand better the instructions from the manager regarding the harvesting activities through the harvesting activity planner application from the application.

In relation to this problem statements, at the current situation shows the lack of number of mobile application that focused on the monitoring the production of the crude palm oil. Furthermore, the problem of lack of information regarding the crude palm oil production always happens especially to the new farmers. They do not know the correct steps and procedures in order to harvest the oil palm trees.

In this case, an application which is static and contains too many words is unsuitable for the users as this application mainly targeted to the new farmers. They need simple but fully informative inputs so that they will be easier to apply the inputs for their plantations of palm oil. Other than that, the planner of harvesting activity may help the administrators of oil palm plantation to give the order to the supervisors and workers of the respective oil palm plantation. Besides, the expected user of the system may find easier to receive the order from the top management by just referring to their mobile phone.

At this current moment, a mobile application in monitoring the harvesting of oil palm trees has not been developed. There are a few existing mobile application for oil palm plantations in the market but only provides general information about the palm oil plantations. In addition, the design of these existing mobile applications is not attractive plus with the static and ineffective contents. Therefore the user will lose of interest to use the applications.

The mobile application that will be developed will provide user friendly interface and more dynamic and interactive elements. Furthermore, the user friendly features will make the application looks more attractive to be used by the users. The most important thing for the delivery of the application is all the features have to be satisfying the end user of the application.

1.3 Objectives and Scope of Study

1.3.1 Objective

The main objectives of this project including:

- To develop an 'Oil Palm Monitoring System Application' that follows the needs and requirements of the users.
- To provide a harvesting activity planner which to convey the instruction from the manager to the supervisors and workers of the oil palm plantation regarding the future harvesting activities through the system.

1.3.2 Scope of Study

There are several scopes of study of this project including:

- Research on harvesting activity of oil palm trees.
- Understand the flow and process of the mobile application.
- Implement and testing the prototype of the mobile application.

Generally, this project will focus on android devices users aged between 18 – 45 years who directly or indirectly related to the oil palm industry. Besides that, the area of the project would be in Malaysia to ensure the feasibility of the project.

1.4 Relevancy of the Project

The system is purposely to be developed to the person that directly or indirectly to the production of crude palm oil such as the plantation workers, farmers and managers specifically in the harvesting division. Being aware lack of monitoring system in the oil palm industry, this 'Oil Palm Monitoring System Application' will be proposed. The main parts of this mobile application are providing information regarding the oil palm industry and planner in monitoring the harvesting process of the oil palm trees. Therefore, this mobile application is very suitable to be used by the users as it would provide a complete guidance of production of crude palm oil.

1.5 Feasibility of the Project Within the Scope and Time Frame

In terms of time frame, this project requires a high time commitment in the development process. Since the research period is very short, the process of finding the research outcome and transfer it into the working system is quite challenging.

The time frame for this project to be developed is two semesters of study. For the first semester the project will be focused on the planning, analysis, research and design phase. Meanwhile, in the second semester will be developing the prototype and usability testing.

Moreover, in terms of technical, this 'Oil Palm Monitoring System Application' focuses on two different features which are providing information regarding the oil palm industry and planner in monitoring the harvesting process of the oil palm trees. Besides that, the function and process of the mobile application are feasible to program within the time frame.

1.6 Limitation

The limitations of this project development include:

- The desire users of this system need to have the Google Android device's and internet connection in order to access this mobile application. Besides that, the speed of the internet connection will determine the time to load the system's pages.
- The users are not really familiar in using the mobile application in their working life thus it needs some time for the users to adapt with the new system.

CHAPTER 2

LITERATURE REVIEW

2.1 Oil Palm Industry in Malaysia

2.1.1 History of Oil Palm Industry in Malaysia

Malaysia has a distinctive history of its oil palm industry. Basiron and Chan, (2000) stated that the oil palm industry in Malaysia started in 1871 where the seeds of oil palm arrived from Indonesia. There was Research & Development undertaken over the next four decades as the rubber companies saw the potential of the growth of crop. Besides that, the first commercial planting of oil palm trees was done in 1911 at Tenammaran Estate, Kuala Selangor (p. 1).

"The oil palm in Malaysia is over a century old. Introduced as an ornamental in 1871, the oil palm was commercially exploited as an oil crop only from 1911 when the first oil palm estate was established. Much has been written about the crop, its products and commercial trade" (Basiron & Chan, 2000).

2.1.2 Fertilization of Oil Palm Trees

Goh et al., (2009) stated that the fine responses of oil palm to fertilizer inputs were mainly recognized to the low fertility of highly weathered tropical soils or moisture stress and palms were better grown due to the suitable fertilizer management, the annual yield fluctuations may be reduced significantly.

Furthermore, fertilizers are suitably applied according to recommended practices for greatest uptake and utilization by the palms such as maximizes fertilizer use efficiency. For that reason, it is essential that the estate management understand the major factors controlling it such as timing, frequency, sources, placement and method of fertilizer application. (Goh et al., 2009, p.12)

2.1.3 Harvesting of Oil Palm Trees

Harvesting is a very essential activity in any agriculture industry. According to Khalid and Shuib (2014), low-cost and proficient harvesting processes are factors that guarantee excellent in returns. They also added the current methods of harvesting engage the use of a chisel or sickle, which need manual labour and the new mechanical harvesting of oil palm fresh fruit bunch (FFB) remains as an issue that needs to be addressed. (Khalid and Shuib, 2014, p.125)

Figure 1 Manual in-field transportation using the buffalo-cart (Khalid and Shuib, 2014)

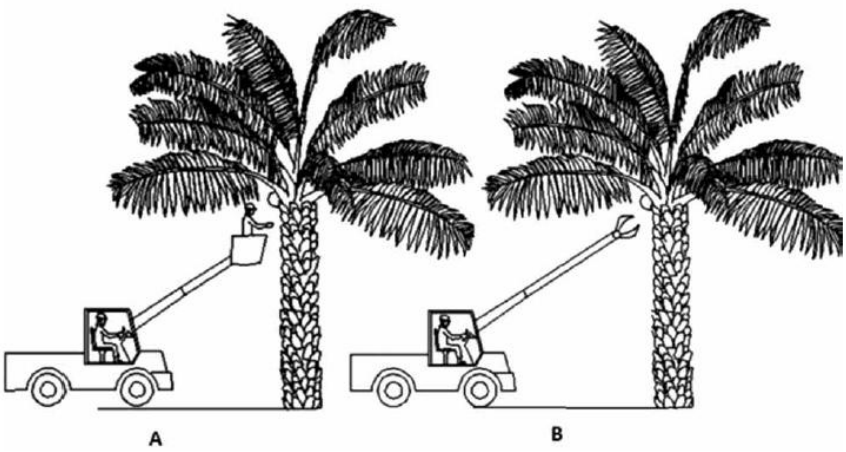


Figure 2 Concept of mechanical harvesting (Khalid and Shuib, 2014)

“In manual harvesting of oil palm, colour is the most important indicator for farmers to determine the maturity of the oil palm fruit called fresh fruit brunches (FFB)” (Ismail et al., 2009). It is added by Ariffin, (1985) in his journal which he stated that it possibly 20 to 22 weeks for a fruit bunch to ripen.

Besides that, fully mature oil palms generate 18 to 30 metric tonnes of FFB per hectare. The yield depends on a mixture of factors, including age, soil and climatic conditions, seed quality, quality of plantation management and the timely harvesting and processing of FFB.

Figure 3 Group of four oil palm fruit images serving as reference of four different classes of ripeness: top left is unripe, top right is under-ripe, bottom right is ripe, bottom left is overripe (Ismail et al., 2009)

2.1.4 Malaysian Crude Palm Oil

Generally, there are are two most common lauric oils traded in the worldwide which are Palm kernel oil (PKO) and coconut oil (CNO). The source of the former is from oil palm (*Elaeis guineensis* Jacq.) while the latter is from coconut palm (*Cocos nucifera* L.) which grow productively in tropical regions of Asia, Africa and Central and South America. Besides that, Malaysia is the major producer of PKO in the world. (Ibrahim, 2013, p.245)

Furthermore, Malaysia is one of the largest oil palm producers in the world. This is due to Malaysia having a large scale of resources of oil palm trees and good technology used in

order to produce the crude palm oil. As Ibrahim (2013) reported, “In 1970’s the production of crude palm kernel oil (CPKO) in Malaysia was around 200 000 t yr-1 by processing 500 000 t of palm kernels then it increased sharply in 2012 to 2.16 million tonnes of CPKO” (p. 245).

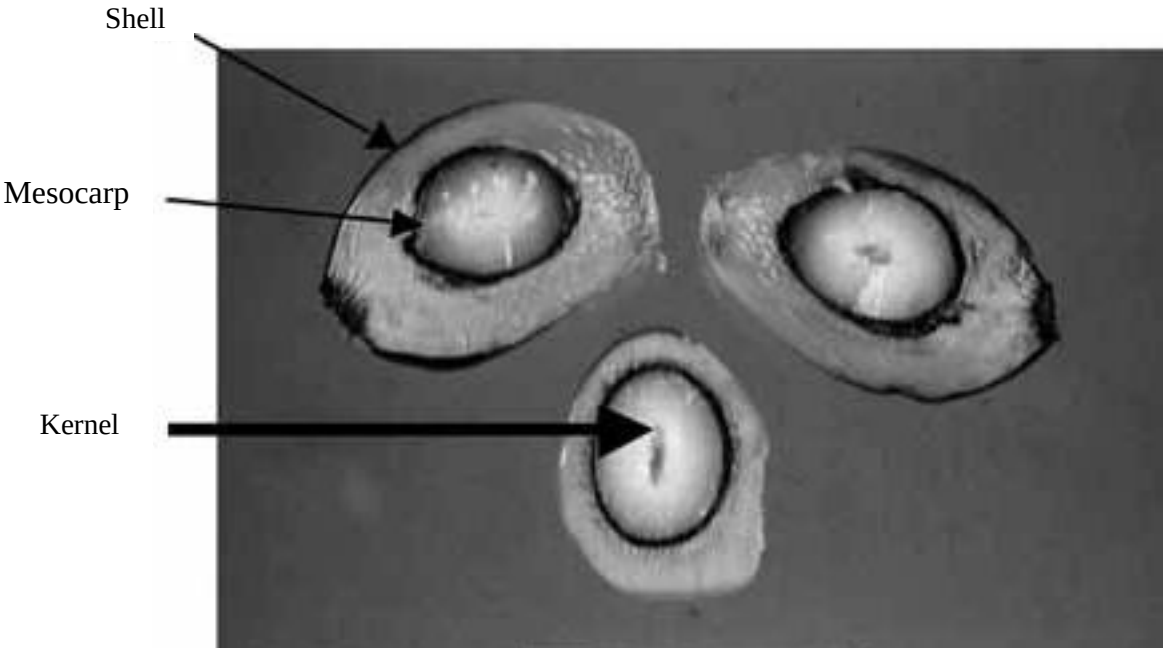


Figure 4 Cross-section of a palm fruit (Ibrahim, 2013)

2.1.5 Management System in Oil Palm Industry

Kamarulzaman and Mohayidin, (2011) emphasized that Malaysian firms are now transacting to use their capabilities in Knowledge Management System and Information Technology aggressively in their supply chain to improve their competitiveness. They also added that Malaysian palm oil industry is considered as one of the pioneers in this undertaking to use the system and it eventually resulted in the ideal climate, research and development (R&D), efficient milling and refining technologies, marketing strategies and effective use of management tools.

Moreover, the other main features in the system includes accurate timing, placement and methods of fertilizer application and right source of fertilizer, recommendation of optimum growing conditions for the oil palm to maximize nutrient uptake, and monitoring of growth, nutrition and yield targets. (Goh et al., 2009, p.10)

2.1.6 Authority of Malaysian Oil Palm

Since the oil palm industry is one of the important agriculture industries in Malaysia, the Malaysian Government has established the authorities to supervise and manage of this industry. It is supported by Basiron and Chan, (2000) in their journal where the oil palm to be better than rubber in early 1960s, the diversification into oil palm should be done and for that reason, the Deputy Prime Minister at that time, Tun Abdul Razak Hussein has formed three rural development agencies which are Federal Land Development Authority (FELDA), Federal Land Consolidation and Rehabilitation Authority (FELCRA) and Rubber Industry Smallholders' Development Authority (RISDA). The reasons why the authorities have been shaped are due to responsibility for planting the huge scale of oil palm in the rehabilitated or newly opened land.

According to Basiron and Chan (2000) "It was in 1969 when the Malaysian Agricultural Research Development Institute (MARDI) was established that the mandate for oil palm research was taken over from the Department of Agriculture" (p. 3).

The task was then handed to Palm Oil Research Institute of Malaysia (PORIM) subsequent of its establishment in 1979 while afterwards on 1 May 2000, Malaysian Palm Oil Board (MPOB) was established as the result of combination between PORIM and Palm Oil Registration and Licensing Authority (PORLA). (Basiron and Chan, 2000, p.3)

In addition, generally the task of MPOB is to maintain the well-being of the oil palm industry in Malaysia in all scopes of its activities through the research, development and services.

2.2 Comparative Study

Based on the research that had been done, there are two Oil Palm Management Applications that could be the same with the 'Oil Palm Monitoring System Application'. However, all the applications are the web-based application and yet not be applied by using the mobile application medium. The applications are 'Oil Palm Plantation Management' and 'Harvest *It'*. Even though these applications might have some similarities with 'Oil Palm Monitoring System Application', the 'Oil Palm Monitoring System Application' has its own distinctive features that made it different from the other applications.

Elements/ Application	**Oil Palm Plantation Management**	**Harvest *It***	**Oil Palm Monitoring System Application**
User Interface	Good but not attractive.	Just nice but not has clear system flow.	Good. The interface easier to be understood and used.
Ease of Use	Ease to use.	Ease to use	Very easy to use.
Human Computer Interaction	User need to key in the data in order to monitor the palm oil production	User need to key in the data in order to monitor the palm oil production	User need to check the data uploaded by the administrators in order to precede the harvesting activities.
Information Content	Good. Provide more information.	Good. Provide more accurate and reliable information.	Good. Provide more accurate, precise and reliable information. It also understandable by all the users.
Main Feature/ Functionality	Provide information on clear method	Provide all information for monitoring the palm oil	Have a understandable function that may help the user for monitoring the palm oil
Working Offline / Online	Offline	Online	Online
Target User	Plantations' Management	Plantations' Management	Plantations' Management and new farmers

Table 1: Comparison of other oil palm's application available with the Oil Palm Monitoring System Application

2.3 Mobile Computing

Mobile devices are a revolution as it has become an object tool used in our daily life use for communication purposes and to access information. The combination of mobile devices, third generation wireless services with multimedia capabilities, internet and portable technology, this allow data and information to be received “anywhere”, “anytime”, and by: anyone”. As the ability to retrieve data increase so will the need to retrieve data. This will result in application being built to cater to those needs thus having positive effect on the community as a whole. The paper focused on the impact that Mobile Computing and the opportunity that it opens for application development.

The process of obtaining or discovering new information is a form of learning. Without realizing it we go thru the process of learning in our daily life. Nature of receiving and obtaining information is changing due to the influence of mobile connectivity. Mobile connectivity increases learning opportunity thru project collaboration and media sharing.

2.4 Android

Android is software for mobile devices that has operating system, middleware and key applications. The architecture of the android is like a stack with Application being the top layer and Linux Kernel being the bottom layer of the Android. Core applications of Android include e-mail client, SMS program, calendar, maps, browsers and contacts which are mostly text input based.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

The methodology used in this project development is Waterfall methodology. The waterfall model is a methodology that always been used by software developer. The progress of the project development is flowing steadily downwards (like a waterfall) from the phases of Requirement, Design, Implementation, Verification and Maintenance.

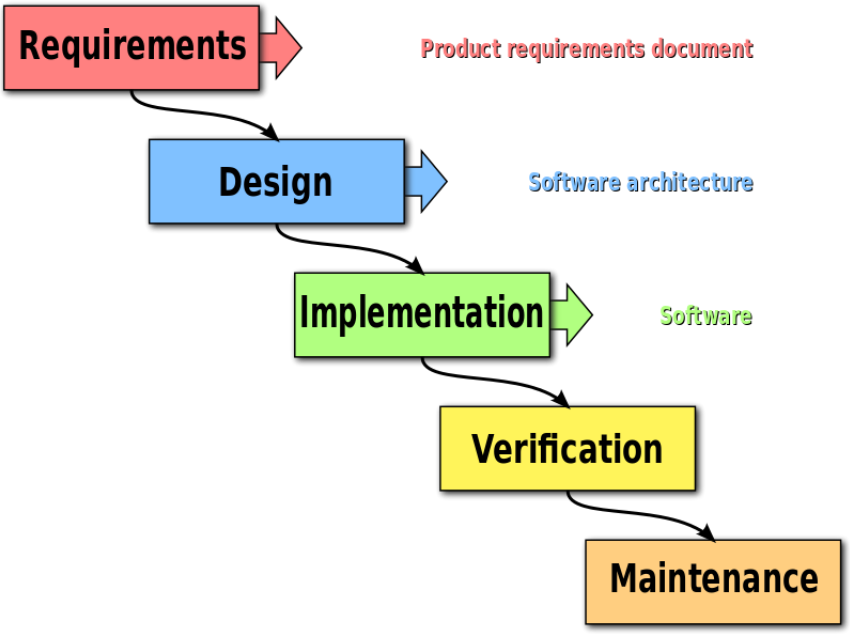


Figure 5: Waterfall model used for this project development

The diagram above shows clearly of the steps taken during the development. Besides that, the advantage of using this methodology is that help to reduce time consumption as the phases of the project development are done step by step. Therefore, the developer will know exactly what is going on in each of the phases. The next section will elaborate more on each of the phases encountered during the development of 'Oil Palm Monitoring System Application'.

3.2 Project Phases

Phase 1: Requirements

In order to start the project, the project developer needs to determine the problem statements of the project. Generally, the problem statements of this project are lack of information and available application on monitoring the production of crude palm oil especially for the new farmers. Therefore, the project developer must plan how to solve the problem.

After that, a research will be done on oil palm industry to have better understanding and clearer view of the subject matter. In addition, new findings may be obtained through studying a current system that already in the market. For example in this project a planner feature will be used in monitoring the harvesting process of the oil palm trees. This phase is vital as it is the foundation for the project and the planning phase will determine the course of direction for the project.

Phase 2: Design

The next phase of the methodology is design. System design documents are worked out in this phase on the base of the detailed requirements. The desire design of the project will give the priority for delivering the required functionality. Furthermore, in designing process the developer will develop of the software architecture design for the system that will describe the hardware, software and network infrastructure that will be used in the project.

For this 'Oil Palm Monitoring System Application', a story board has been developed to make sure that the developer knows the flow of the system page by page. In the developed story board, the interface shown the system's layout, buttons and display of the layouts like colours and images included in the system.

Phase 3: Implementation

The third phase of the methodology is the implementation. During this phase, system is developed according to its design. Features, environment, testing procedures are coded by using the programming language. For this 'Oil Palm Monitoring System Application', Java Script will be used as the main programming language followed by the other programming languages like HTML and PHP.

Phase 4: Verification

The next phase of the methodology is verification. In this phase, the complete mobile application will be transferred from the tools that the developer uses to develop it to Google Android mobile device and running it. It is then demonstrated to the user. Moreover, this testing ensures that the system features fit all the requirements described in respective documents. Then, if there is a problem discovered during this phase, it must be resolved by the developer of the system. This system testing will determine the success of the project as well.

Phase 5: Maintenance

The last phase of the methodology is maintenance. The system is monitored to ensure that it works properly and follow the requirements and for possible improvements during in-process reviews.

3.3 Testing and Evaluation

The output of the project would be a prototype. Hence, this eliminates the need for the system training. However, user acceptance test will be conducted to ensure the system developed is fully functioning. If the user testing meets their requirements, then this 'Oil Palm Monitoring System Application' would be a success project.

3.4 Key Activities

The key activities that had involved in this project development include a literature analysis, conducting a survey, design the system architecture, design the interface and code the system.

Basically, the literature analysis was carried out with the purpose to obtain a better understanding regarding mobile application development and oil palm industry. The literature review was the main foundation of this project. Without the clear view of the project's matter, the project would be hard to complete thus lead to the unsuccessful project.

Besides that, conducting a survey is a great key activity for this project. This is due to this project must be developed that meets the requirement of the users. By that, the developer had

conducted a survey session with people in this oil palm industry such as the plantation farmers and managers. This survey also will be counted as part of the raw requirements of the project before a deep analysis is conducted.

Moreover, design the system architecture will determine the overall work flow of the system. The system architecture is designed based on the requirement of the user. Then, the interface of the prototype was designed started with the main page and followed by the other sub-pages.

Lastly, the coding for the system was took place after the interface had been designed. Coding the system are the hardest part of the overall project development as failure to code with the right coding will resulted the system not working properly.

3.5 Tools Required

The tools required for the project development are hardware and software. The tools required would be explained further in the next section.

3.5.1 Hardware

The hardware used to develop this mobile application is computer. The specifications for the personal computer used are as follows:

Hardware	Specification
Operating system	Microsoft Windows 8
Processor	Intel CORE i3
Memory	8.00GB of RAM
Disk space	56GB

Table 2: Specifications of personal computer used

3.5.2 Software

- The platform used is Microsoft Windows 8 version 2013
- Tool to develop the system – Unity Software

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

In Chapter 3, there are explanations about the methodology involved in the 'Oil Palm Monitoring System Application' development. In this Chapter 4, the result of the system development is discussed in details.

4.2 User Needs Assessment and Analysis

The user needs assessment and analysis was carried out through a survey with parties that are related to oil palm industry like the farmers, supervisors, executives and managers that using the android device. The survey conducted involved 30 respondents aged between 19 and 45 year that use the android devices.

There are the occurrences whereby the targeted users not have the suitable application or lack choices of application that are suitable for them to use in order to monitor the crude palm oil production. This is proven during the survey conducted which they did not being introduced to the monitoring system application in the working environment.

Moreover, the result of the interview was recorded and tabulated in the form of chart so that it would we easier to refer and retrieve the data. Below is the data tabulated from the conducted survey:

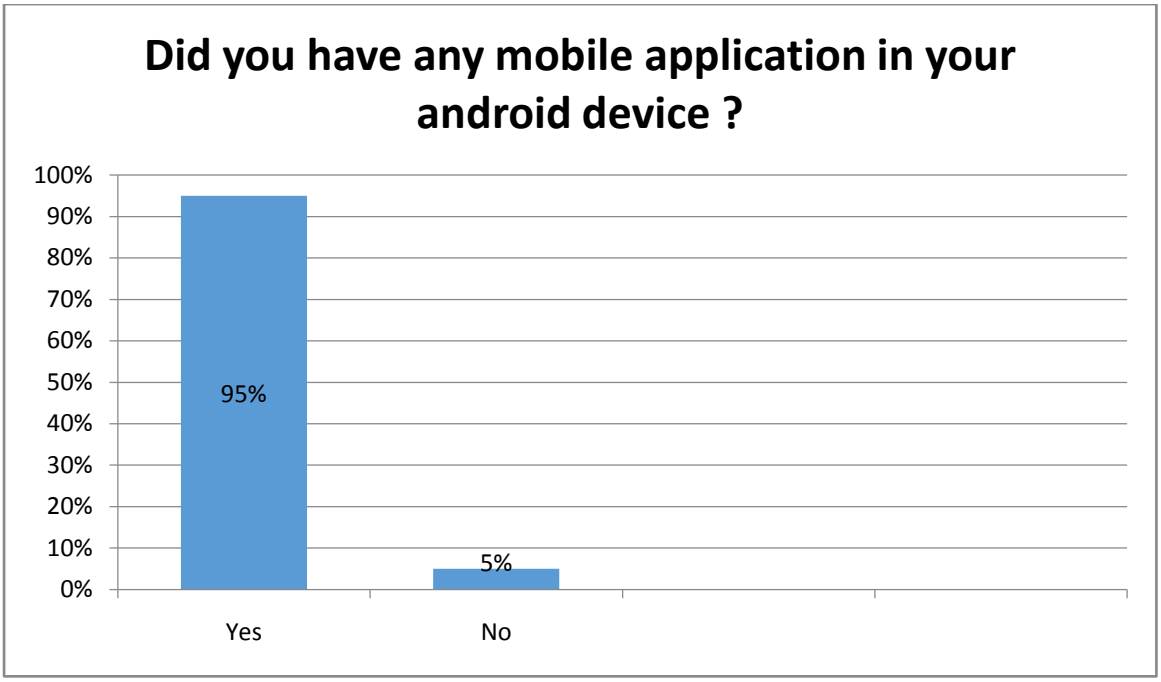


Figure 6: Survey question 1

The bar chart deals with the percentage of respondents that have any mobile application in their android device. It highlights that from 30 respondents, 95% (28 respondents) said that they have mobile applications in their android device while only 5% (2 respondents) said that they just use their android device for the basic function.

Therefore, we can say that most of the targeted users of 'Oil Palm Monitoring System Application' have downloaded the application in their android device hence this shows that there is no problem to introduce the of 'Oil Palm Monitoring System Application' as they aware to look at the available application in the Google Play Store.

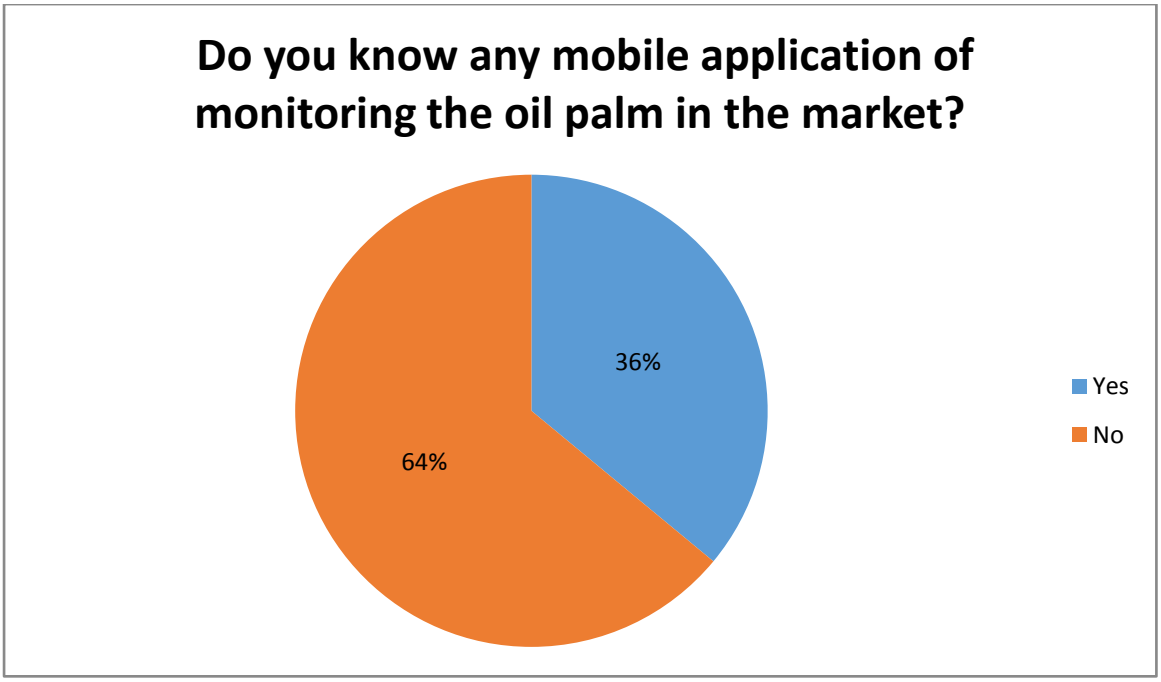


Figure 7: Survey question 2

The pie chart is about the percentage of respondents that know any mobile application of monitoring the oil palm in the market or not. It was recorded that from 30 respondents, 64% (20 respondents) said that they do not know any oil palm monitoring application in the market while the other 36% (10 respondents) aware of it.

With the tabulated data, this proves that there are still a lot of expected users of 'Oil Palm Monitoring System Application' still not aware of the existence of the application to monitor the oil palm. However, some of the executives and managers from the survey were aware of it due to their higher education level.

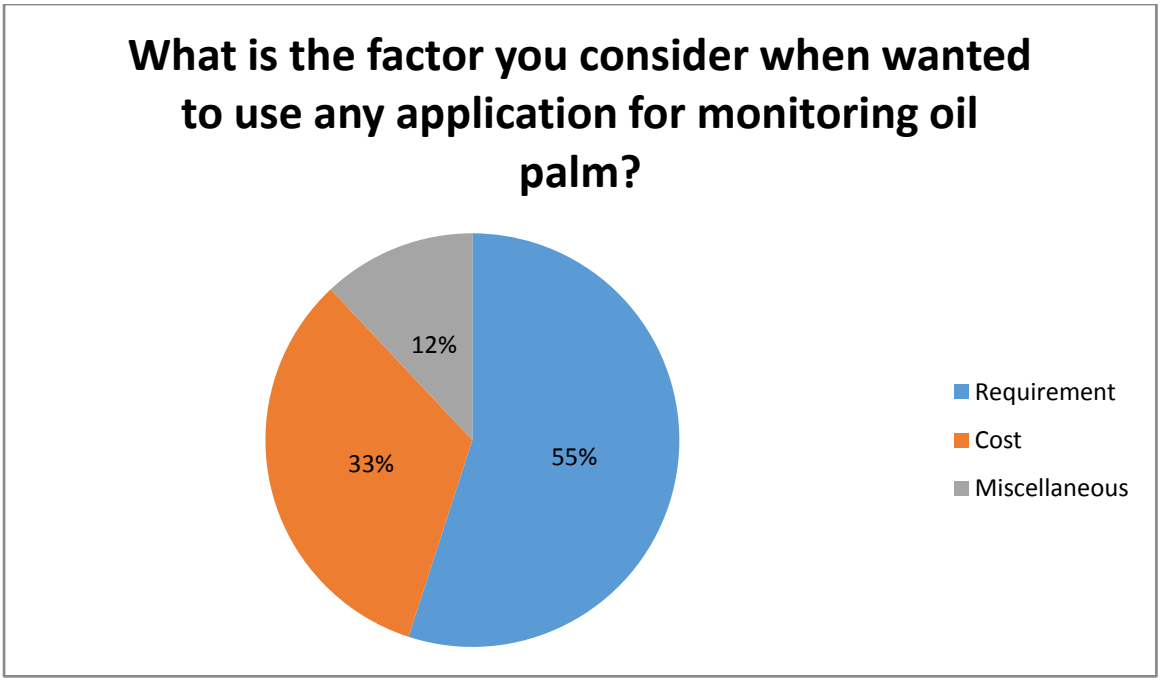


Figure 8: Survey question 3

The pie chart is about the factor that gets into consideration for the respondents when wanted to use any application for monitoring oil palm. It was recorded that the highest factor was the requirement which was 55% (16 respondents), followed by the cost with 33% (10 respondents) and lastly the miscellaneous with 12% (4 respondents).

From the pie chart, what we may say that the requirement is the first factor that takes into account to use an application for monitoring the oil palm. This is due to the users need to consider their needs and requirements first before proceed to use the application so that they will have a good user experience when use the system. For the cost factor, the respondents think that even the cost is quite expensive, if the application fulfils their requirements why not they invest in it. In addition, some of the respondents said that they do not want to invest their money for the new application due to they feel comfort with their current working style.

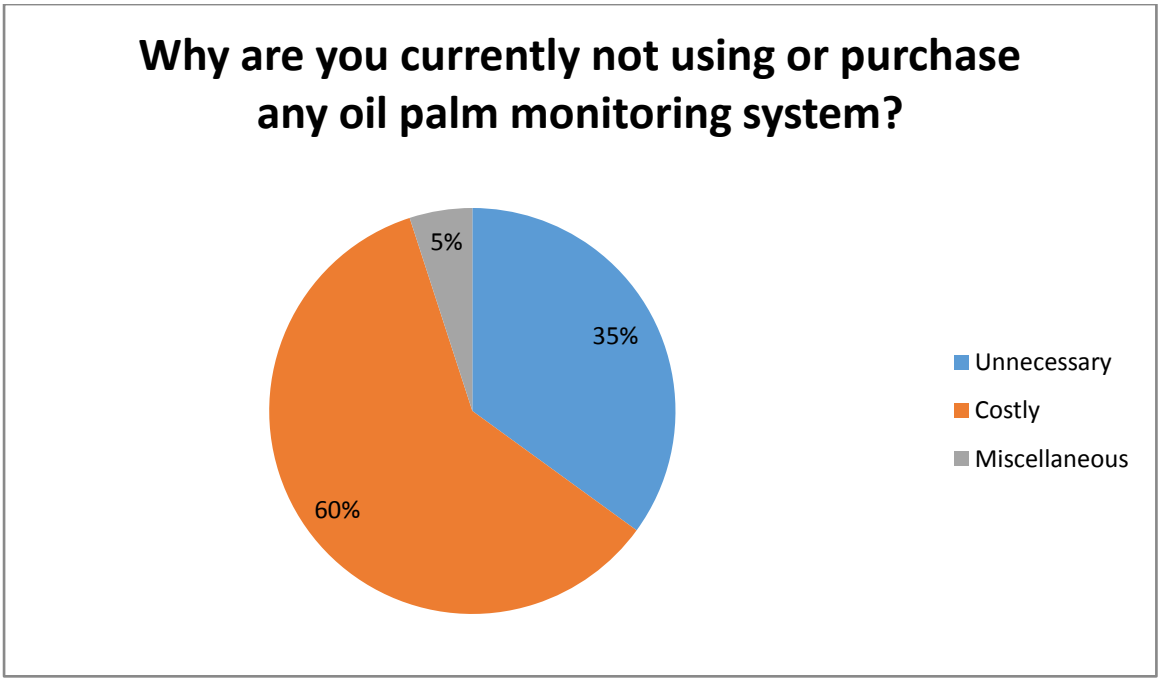


Figure 9: Survey question 4

The pie chart is about the reasons why the targeted user currently not using or purchase any oil palm monitoring system. It was recorded that the highest factor was the costly which was 60% (18 respondents), followed by the unnecessary with 27% (8 respondents) and lastly the miscellaneous with 13% (4 respondents).

From the pie chart, we may conclude that the main reason why the targeted user still not applying the oil palm application is the application is costly. They are not willing to invest their money to buy the application and they think that their existing system (manual) is still usable. The same reason was stated by the respondents that answered unnecessary which they do not think that the new application will help them much if it is applied.

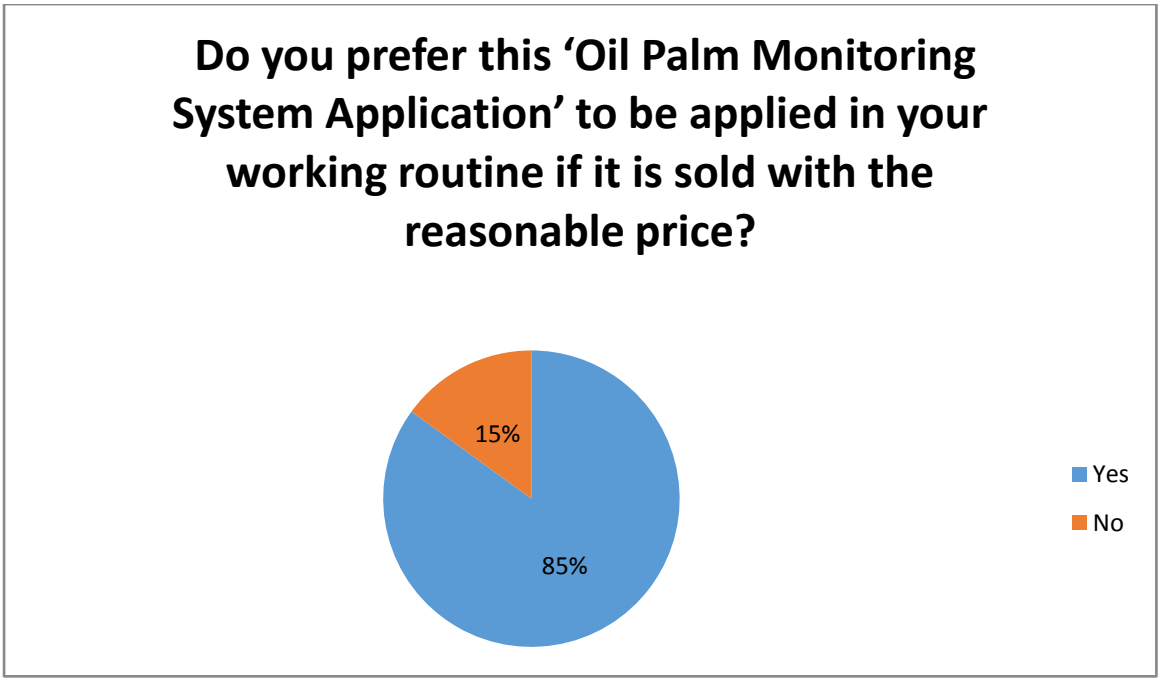


Figure 10: Survey question 5

The pie chart shows the percentage of the choice from the respondents whether they want to apply the 'Oil Palm Monitoring System Application' or not if it is sold with the reasonable price. It was recorded that 85% (25 respondents) selected to apply the application if the reasonable price is given while 15% (5 respondents) selected no need to apply the application in their working routine.

From the pie chart, we may say that the main reason why the targeted user prefer to apply the 'Oil Palm Monitoring System Application' in the working routine is the system is very suit with their requirement even though some of the targeted users consider the cost factor. However, with the features include in the system, they find that the 'Oil Palm Monitoring System Application' is interesting to be tested in their working routine. On the other hand, some of the users are not prefer to apply the system as they think it would burden them to handle if the system is applied in their working life.

4.3 Experimental and Modelling

Test had been done after development of the system had been completed. The objective of the test was to see areas which needed an improvement and to identify any system flaws.

One of the tests done was for compatibility. This was to test if the application is able to run on the android operating system. Four devices are test. Three of the devices were a smart phone while one was a table. Below shows the result of the test

Device	Results
Samsung Galaxy Ace Plus	Successful installation
Sony Erikson Xperia	Successful installation
HTC One	Successful installation
Samsung Galaxy Tab 10.1	Successful installation

Table 3: The compatibility test of the system

The figure above shows that the application has been successfully install in four different mobile devices. Hence, this proves the compatibility of the application with the android operating system.

The second test conducted was the user satisfaction test. The survey involved 15 respondents including the managers, executives and supervisors of the oil palm plantation. The components that are tested included:

- Ease of application installation
- Interface
- Functionality
- Application runtime
- Application presentation

Ease of application installation covers area on the ease the application can be install on the hardware. In other words, users did not find difficulty when installing the application.

For interfaces, it covers the aspects regarding the user friendliness of the interface and how easy the user can navigate from one interface to another. Interfaces focuses on it user friendliness and easement of use.

Functionality focuses on functions and features that have been created and seen if the function and features have meet the user requirements.

Runtime test on aspect on which the time is taken for the application to run on the devices and how long it would take to launch the application.

Presentation of the application focuses the overall attractiveness and visual appeal of the application.

Users would rank these components on a scale of one to five. The scale would convey meaning as follows:

1 = Very satisfied

2 = Neither satisfied or dissatisfied

3 = Very dissatisfied

Below shows the result of the test conducted:

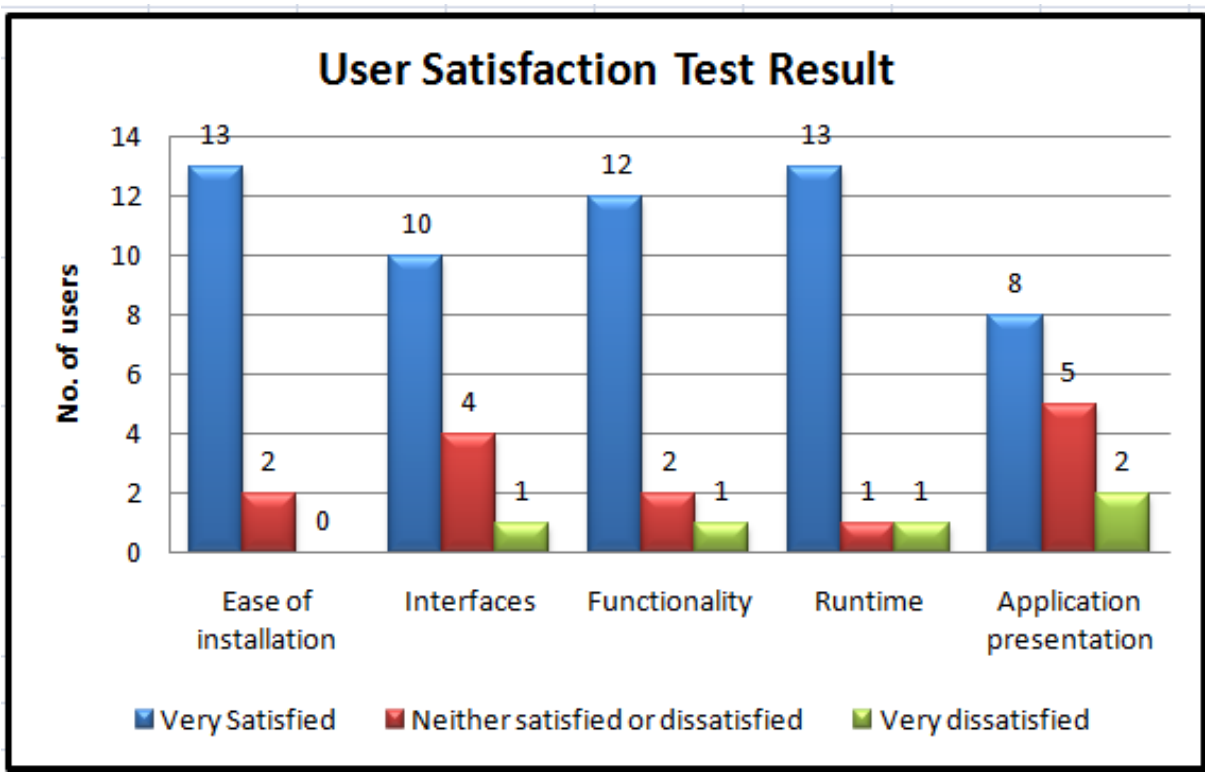


Figure 11: User Satisfaction Test

Based on the graph of User Satisfaction Test, it was recorded that the ease of installation was mostly very satisfied by the user as 13 out 15 users found it easy to install the application on their android devices. Besides, for the interfaces, 10 users were satisfied as for them the interfaces are easy to use while just one person out of 15 had dissatisfied with the interfaces as he think that the colour of the system on the interfaces are not interactive.

Furthermore, 12 users think that the functionality of the system had met their requirements and expectations. Only 3 users think that this application needs to be more additional features. The features will be added time to time to ensure that the application is getting more and more interactive.

Moreover, the satisfactory of system's runtime was high which 13 out of 15 said the runtime of the system was very swift. Lastly, the application presentation was just in average. Only eight users satisfied with the presentation of the system while others think that the system's presentation may be more presentable for the example put more icons and enlargement of the font is required.

4.4 Activity Diagram of the System

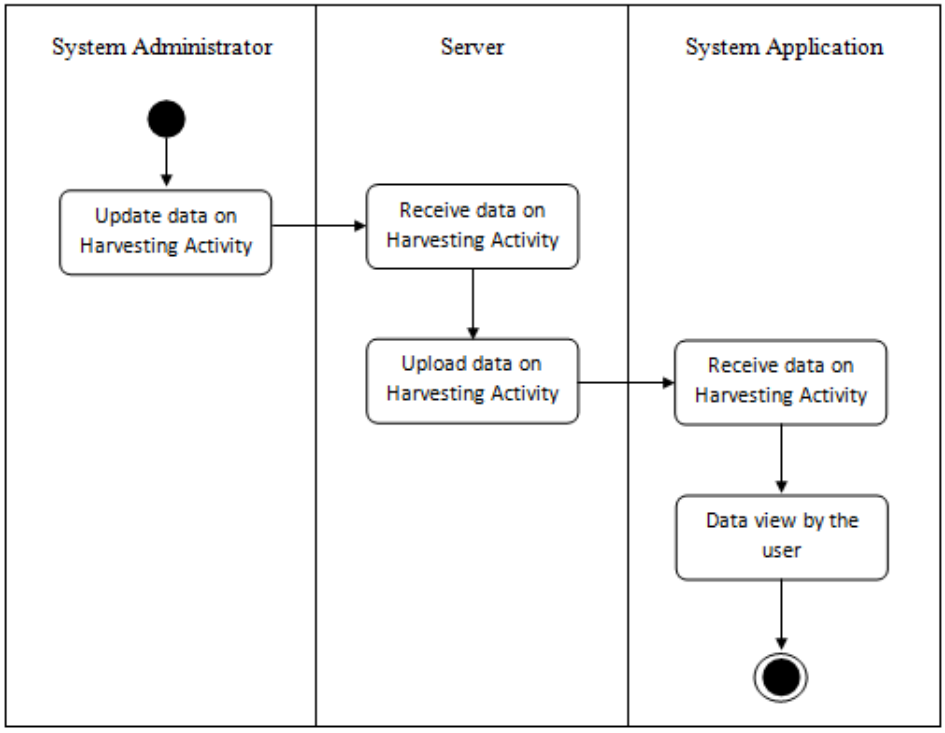


Figure 12: Activity Diagram of the System

4.5 Use Case Diagram of the System

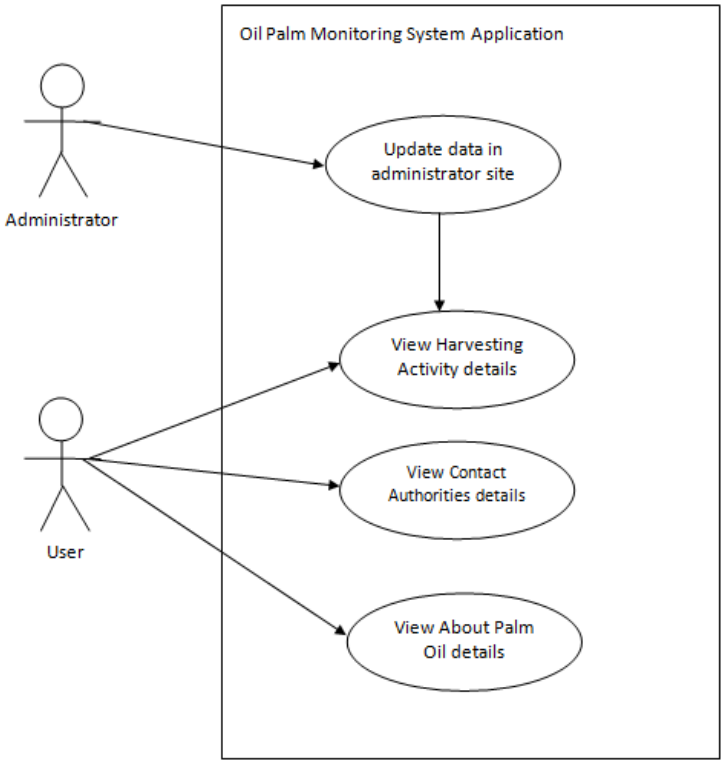


Figure 13: Use Case Diagram of the System

The use case diagram in Figure 12 shows the use case diagram that describes the set of actions that the system can perform. Based on the diagram, it shows the involvement of two parties which are the administrator and user of the system. The administrator can update the data for example addition and deletion of data in administrator site. The user then can view the data updated by the administrator in the user site. Furthermore, the users may also may able to view the authorities' profile such as the overview and contact details and view the information regarding the palm oil such as the information regarding the production and planting.

4.6 System Interfaces Screenshots

The system interface divided by two parts which are the user site (mobile application) and administrator site (web application). The user site was developed by using Unity Software while the administrator site was developed by using Dreamweaver Software. The following figures show the interface's screen shots of the user site and administrator site.

4.6.1 Home Page and Main Menu

Figure 14: Home Page and Main Menu Page

From the home page, user will then select the home page buttons that consist of About Palm Oil button, Contact Authorities button and Harvesting Activity button.

4.6.2 About Palm Oil Page

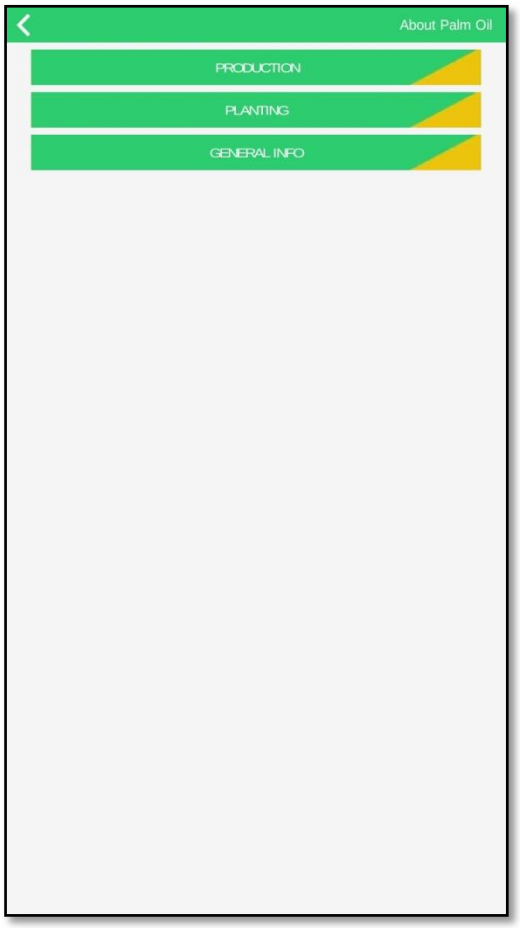


Figure 15: About Palm Oil Page

From the About Palm Oil Page, users will then select the buttons that consist of Introduction button, Planting button and General info button. Each of the buttons will deliver the respective information to the user.

4.6.3 Contact Authorities Page

Figure 16: Contact Authorities Page

From the page, there are four options of Authorities that may be chosen by the users which are FGV, FELDA, SIME DARBY Plantations and MPOB. Each of the authorities' icons may be clicked by the users to view the info regarding the respective company and its contact details.

4.6.4 Harvesting Activities Page

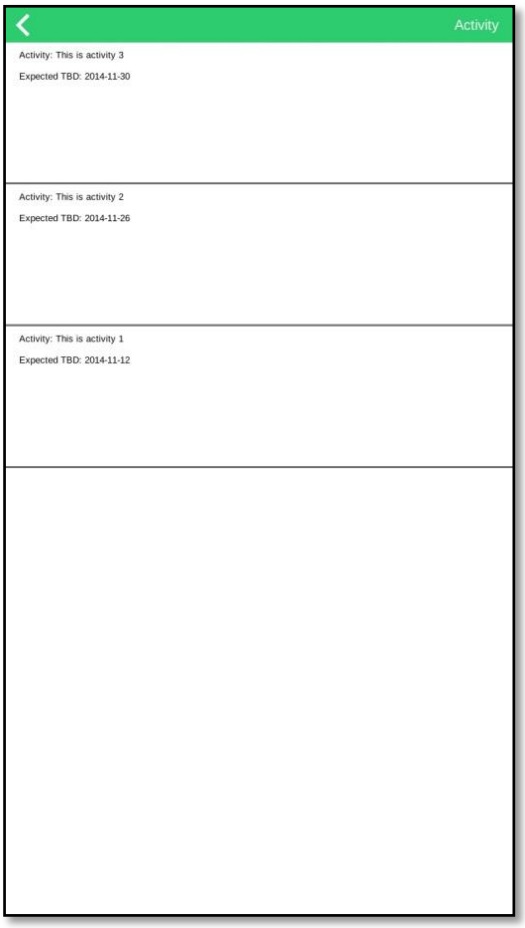
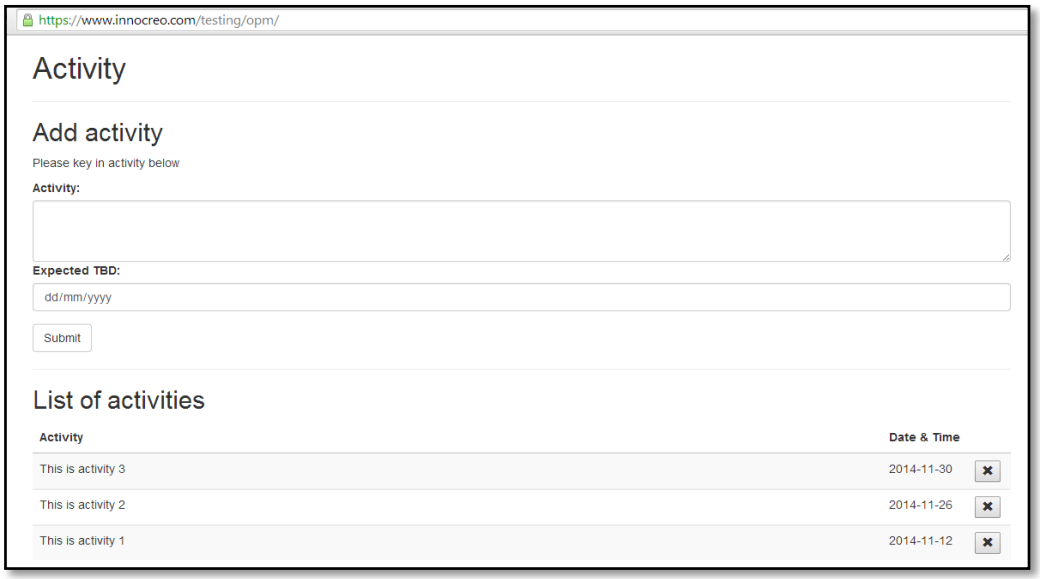


Figure 17: Harvesting Activity Page

From the Harvesting Activity page, the user may refer on the actions to be done in the harvesting process of oil palm trees and the expected date to be done. Besides, the information regarding the activity is uploaded by the system administrator from the user site.

4.6.5 Administrator site



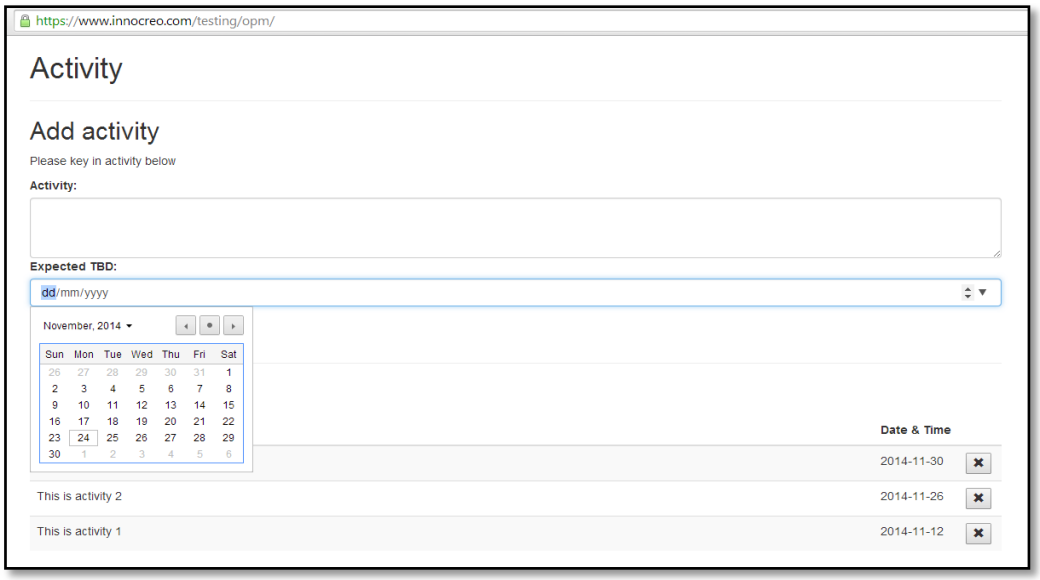


Figure 18 & 19: Administrator site of the system

From the Administrator site, he or she that manages the site may add the activity and expected date for each of the activity to be done. By just adding the information in the box and submit it, the information will be uploaded into the mobile application (user site) through the server. Besides, the lists of activities may be deleted by the administrator as well.

4.7 How System Will Help the Operations

The system will help the administrator of oil palm plantation in giving the information to the user of the system regarding the harvesting activities for example the fertilization and harvesting process. Besides that, a part of viewing the harvesting activity details, the user of the system also will be able to view the details of authorities' profile and contact and the general information regarding the oil palm. This system application may benefit the user especially the new farmers and planters as they had lack information regarding the oil palm plantation industry.

4.8 Object Recognition Method

To enhance the usability and performance of the system, the object recognition method should be developed in the future. The object recognition method is basically a new feature which the user of the system will be able to retrieve the information for example the information of oil palm seed's condition by snapping of its picture by using the built-in photo camera of mobile phone itself.

If this feature is introduced the farmers or planters may be able to check the condition of oil palm seed immediately. Thus, the interface of the home page of the system was included with the camera function button purposely for this future works.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

As for conclusion, people from oil palm industry are exposed to the new monitoring system called ‘Oil Palm Monitoring System Application’. Besides that, this mobile application would be helpful for all the users as it could motorize all related stuff of crude palm oil production. Furthermore, this system has the functionalities that have been designed to meet the project’s objectives and solve the problem statements.

Moreover, this project will be a good project for the entire expected user; people of oil palm industry when they wanted to use a mobile application to monitor their harvesting process of oil palm trees. In this dissertation report, it explained the details about the project itself which are project abstract, background of study, problem statements, and objectives. Other than that, the methodology also has been selected in order to develop the system which is the waterfall model. By the end of the day, this ‘Oil Palm Monitoring System Application’ should work fine and meet the users’ requirements.

5.2 Recommendation

This ‘Oil Palm Monitoring System Application’ may be added with the new features that may help the users more than what the system offers now for example by adding the objet recognition method. Furthermore, other than object recognition application in this system, the developer may add the voice recognition application in order to enhance the user’s satisfaction and experience when using the system. On top of that, this system may also be officially introduced by Malaysian Government in order to promote the usage of the system by the users.

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APPENDICIES

APPENDIX 1: Gantt Chart

Task/Month	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1.Define requirements/analysis								
1.1 Determine scope, time and expertise available								
1.2 Collection of reading materials (literature review)								
1.3 Conduct meeting with supervisor								
2.Design								
2.1 Design the system architecture								
2.2 Design the prototype								
3.Develop/Implementation								
3.1 Develop the prototype								
3.2 Linking the prototype Google Android mobile devices								
4.Testing/Final								
4.1 Test the prototype								
4.2 Analyze the results								
4.3 Finalize the prototype and analysis								

APPENDIX 2: Key Milestone

No.	Tasks / Activities	Milestones
1.	**Data Gathering and Requirement**	Week :1 – 6 (FYP 1)
	Research on previous related materials	Week : 1 – 4 (Literature Review Draft)
	Draft out System Requirement	
2.	**Analyzing**	Week :7 – 11
	Finalize Scope	Week: 7
	Develop Flow of each Module (Draft)	Week: 8
	Draft the interface requirement	Week: 9 – 11
3.	**Designing**	Week: 12 - 14
	Interface of User-side & Admin-side	
4.	**Implementation & Testing**	Week: 1 – 7 (FYP 2)
	Debugging	
	Validation	
	Verification	
5.	**Evaluation**	Week : 1- 7
6.	**Deployment**	Week : 8 – 9
		Week : 10 (Pre-SEDEX)

APPENDIX 3: User Needs Assessment and Analysis Survey Question

Universiti Teknologi PETRONAS

Computer Information Science Department

Final Year Project

'Oil Palm Monitoring System Application'

Survey Questionnaire

Name:

Gender:

Age:

Position:

Working Experience:

Questions:

1. Did you have any mobile application in your android device?
   Yes [ ] No [ ]

2. Do you know any mobile application of monitoring the oil palm in the market?
   Yes [ ] No [ ]

   If Yes, kindly state the name of the system: _____

3. What is the factor you consider when wanted to use any application for monitoring oil palm?
   Requirement [ ] Cost [ ] Miscellaneous [ ]

4. Why are you currently not using or purchase any oil palm monitoring system?
   Unnecessary [ ] Costly [ ] Miscellaneous [ ]

5. Do you think the object recognition method is helpful to monitor the palm oil production or not?
   Yes [ ] No [ ]

6. Do you prefer this 'Oil Palm Monitoring System Application' to be applied in your working routine if it is sold with the reasonable price?
   Yes [ ] No [ ]

APPENDIX 4: User Satisfaction Test Questionnaire

Universiti Teknologi PETRONAS

Computer Information Science Department

Final Year Project

'Oil Palm Monitoring System Application'

Usability Test Questionnaire

Name:

Gender:

Age:

Position:

Working Experience:

Questions:

1. How do you find the ease of installation of this application?
    i. Very Satisfied
    ii. Neither satisfied or dissatisfied Indifference
    iii. Very dissatisfied

2. Does the interface of the application user friendly?
    i. Very Satisfied
    ii. Neither satisfied or dissatisfied Indifference
    iii. Very dissatisfied

3. Do you find this application function effectively to assist the user?
    i. Very Satisfied
    ii. Neither satisfied or dissatisfied Indifference
    iii. Very dissatisfied

4. How is the runtime of the system?
    i. Very Satisfied
    ii. Neither satisfied or dissatisfied Indifference
    iii. Very dissatisfied

5. How is the application presentation? Are you satisfied with it?
    i. Very Satisfied
    ii. Neither satisfied or dissatisfied Indifference
    iii. Very dissatisfied