

# Malay Talking Scheduler for Visually Impaired

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SESSION 2017/2018

FACULTY OF COMPUTING AND INFORMATICS

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# Malay Talking Scheduler for Visually Impaired

BY

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## **Abstract**

In this project, an appointment reminder application with assistive technology will be developed for people who have visual impairment such as low vision or blindness in order to make their daily scheduling much easier. The application is called BM Reminder, as the name suggests it is a Malay talking scheduler. Appointment reminder and daily scheduler were developed with high usability and valuable functionality in mind. Text-To-Speech API will assist the user throughout the application to make the process more user-friendly. The design are made with few requirements in mind which will be discussed later on. The user just has to download the application called BM Reminder and no internet connection is required throughout the process of using it. When the project ends, the user will be able to add new appointment, record appointment detail, add reminder for appointment, read current date and time, check appointment, read appointment details and play appointment record detail and read every touches from the user.

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# **Chapter 1: INTRODUCTION**

## ***1.1 Project Overview***

Smartphone has come a long way since back then, now not only can it perform the primary activity which consists of texting and calling, but have grown into having video calls, personal digital assistants (such as Google Assistant, Siri, Alexa, Bixby, Cortana), media player, GPS navigation, video games and digital camera. Mobile applications today bring us more advance experiences by utilizing the mobile functions brilliantly. Such as applications for online shopping, online social media and GPS navigation.

Mobile applications are made with user-friendliness in mind, so they are very straightforward for normal users. However, the story is different for users with disabilities mainly blind or visually impaired because of keyless screen on smartphones. Devices with touch screen possess a major accessibility barrier for visually impaired users.

Those who are visually impaired normally use traditional devices such as talking watch and tactile watch to inform them the present date and time. Their first method of choice is not by using smartphones to check the time because of their disabilities.

In order to ease the struggle of visually impaired and blind people who regularly operate utilizing touch screen devices and also to alert them date and time, the concept of creating mobile application: BM Reminder was initiated.

The idea of introducing BM Reminder is to aid blind or visually impaired users in keeping their appointment reminder and daily schedules to be in track by using smartphones. This application is made to be user friendly for blind or visually impaired people by enabling them to interact with their smartphones by touching the screen. When the user touches the objects at the screen, it will respond by reading out the information.

## ***1.2 Problem Statement***

Daily life of visually impaired people is tough as they have difficult time in completing tasks. Because of their disabilities, keeping track of the present time is a problem. Furthermore, they also face the issue of jotting down appointments unlike normal people. This problem then may cause them to be late, miss or forget any schedules or appointments.

Besides that, a broad range of possibilities are presented by touch screen devices, although many of them are inaccessible for people affected by visual impairment. Regular mistakes of making selections and wrong inputs are made by the visually impaired users, when the smartphones do not interact back. It may even be possible that they cannot even operate the smartphone.

Mobile screen reading software such as VoiceOver for iOS devices and TalkBack feature for Android devices assist the users by giving them the accessibility to distinguish what is the object on the screen through dragging user's finger all over the screen. Nonetheless, there are few mobile applications that are not compatible with the software, thus causing the software to read numbers instead rather than the correct text. Moreover, normal applications have small objects in the screen which gives

difficulties for the visually impaired users to touch a particular object accurately without touching them all.

To solve the problems that are stated above is where this project comes in by showing the visually impaired users the gradual approach to check or add their appointments. The useful features and user friendliness that comes with the mobile application BM Reminder will surely solve all the mentioned issues for visually impaired users.

### ***1.3 Project Goal***

A mobile application specially made for the visually impaired and blinds that comprises setting up reminders for the users, adding appointment information through record list view selection inputs from the users and also supplying Text To Speech (TTS) support for the users across the whole usage of the application.

### ***1.4 Project Objectives***

At the end of the project, the final product Taking Diary for Visually Impaired and Blinds: Daily Schedules and Appointment Reminders mobile application should be able to:

- To assist visually impaired people by increasing their time awareness by supplying appointments and appointment reminders for daily schedules.
- To provide a gradual approach in checking or adding the appointments along with the help of Text To Speech (TTS) guide
- Text To Speech (TTS) guide throughout the whole application
- To construct event schedules in an organized manner

## ***1.5 Scope***

### ***1.5.1 Product Perspective***

The BM Reminder is an application for mobile which supports the users by strengthening their time awareness through supplying them with time reminders for everyday appointment and schedules. The application will be mainly built for android based smartphones. It should be made downloadable for free from the Play Store.

### ***1.5.2 Product Functions***

The mobile application will provide basic functions such as daily schedule reminders, add appointments and check appointments. The key of this mobile application is to allow interactions to happen by letting the users to get information whenever they touch something on the application. In this way, the users are easily aware of the things they touch and what options they have selected.

### ***1.5.3 User Characteristics***

The main audience users for this mobile application are those who are visually impaired and blind. They can use the mobile application without much difficulties thanks to the user friendly design. Furthermore this mobile applications is also suitable to be used by the elderly.

#### ***1.5.4 Assumptions and Dependencies***

First of all, the assumption for the mobile application is that smartphones possess enough performance capabilities to support it. For instance, if the smartphones lack the resources to support it, then it may not work as intended. The second assumption is that the users are using android operating systems on their smartphones with the addition of running Android 4.0 and above. Finally, the last assumption is that the high proportion of colour contrast is appropriate for all peoples with low vision. This is due to the different percentages of low vision and the type of different diseases that the users may have. Thus, different people may have different level of visibility.



## Chapter 2: Background Study

### 2.1 Literature Survey

People with visual impairment can be separated into two types, whether they have partial vision loss or cannot see at all. According to the estimates done by the World Health Organization (WHO), around 285 million people around the globe are affected by visual impairment (“Visual impairment”, 2014). About 39 million people from that huge amount are completely blind and the rest of them suffer from low vision. It is expected that the visually impaired individuals’ number will increase to a massive 929 million by the year 2020. The main source of moderate and severe visual impairment are caused by uncorrected refractive errors. It happens when the images from the outside world cannot be clearly focused by the eye. Whereas the leading cause of blindness is caused by cataracts. It occurs when the eye’s natural lens are clouded.

As stated by the CDC and the World Health Organization, the classification of visual acuity and impairment involves (**Ananya Mandal, 2012**):

- Low visual acuity means vision between 20/70 and 20/400 with the best possible correction, or a visual field of 20 degrees or less
- Blindness is defined as a visual acuity worse than 20/400 with the best possible correction, or a visual field of 10 degrees or less
- Legal blindness in the US means visual acuity of 20/200 or worse with the best possible correction, or a visual field of 20 degrees or less.
- Visual acuity of 20/70 to 20/400 (inclusive) is considered moderate visual impairment or low vision.

Smartphone is taken from combining the terms smart and phone. Taken from google dictionary, a smartphone is a mobile phone which could perform many of the functions that a computer could, mainly having internet access, a touchscreen interface, and an operating system which is capable of executing downloaded applications Oxford Dictionaries (2015). In this era, the use of traditional mobile phones are becoming lesser due to the introductions of smartphones and their functionalities. The use of touch screen technology offers significant advantages from ease of use, speed, device size, and assistive technology. Touch screen devices also offers a wide set of possibilities for visually impaired people which are mostly inaccessible.

Study has been carried out by **Oliveira, Guerreiro, Nicolau, Jorge, and Gonçalves (2011)** on visually impaired people with a set of text-entry methods which are QWERTY, MultiTap, NavTouch and BrailleType. QWERTY method is similar to the traditional computer keyboard layout with the addition of screen reading software. MultiTap utilizes the same selection and exploration mechanism of the prior method but the presented layout is identical to keypad-based devices. NavTouch method is gesture-based with adaptive layout. It allows the user to make gestures anywhere on the screen. Finally, BrailleType gives advantage for those who already know Braille alphabet. It works by having six large targets which represents each of the dots positions on the touch screen. Studies shows that BrailleType is the least error prone while MultiTap is the most error prone. This is because the faster methods are more error prone than the slow ones.

Slide Rule told by **Kane, Bigham, and Wobbrock (2008)** is developed to solve the issue of making the users to visually locate objects on the screen by using gestures input and audio output to allow blind people have interaction with the touch screen. A study showed that Slide Rule was much faster than the Pocket PC and 7 out of 10 participants preferred it more. There are few design principles that Slide Rule has to have in-order to develop cohesive and an efficient set of interaction techniques. First is risk-free exploration, it is necessary to allow the user to scan the entire screen using one finger without executing any action. It gives feedback as the items are touched by reading out the names. Second, operate at finger resolution, not screen resolution. By using this design even targets that are close together and small can be read while maximizing the quantity of items per screen. Third, reduce demand for selection accuracy. It is not necessary for the user to tap on an object accurately, however they need to notice the object utilizing their index finger and subsequently make a tap indication anywhere on the screen utilizing their middle finger. Fourth, quick browsing and navigation. The users need to be able to swiftly browse through each page by moving their finger down the screen, and use flick gestures to flip between pages of items. Fifth, intuitive gestural mappings. Arbitrary gestures are avoided while natural gesture mappings are used by Slide Rule. Lastly, enable users to query location and return home at any time. Users should be able to return home or recognize the current screen they are on by executing quick flicking gestures.

The creator of Talking Diary did an interview before with the blind and visually impaired peoples from MAB which stands for Malaysia Association for the Blind. Screen reading software which can identify the objects on the screen using VocieOver and TalkBack with touch screen smartphones were acknowledged. Thus, in the end

the recommendation and feedback provided by them were used as the part of the requirements for the application. Parts of the requirements for creating BM Reminder were also considered from the idea of the application the Talking Diary.

Normally keeping track of time is a problem for visually impaired people. However, with the technology we have now there are new ways that can be used to help them. First, talking watches and clocks can be used to easily obtain the time with just a press of a button told by **Sandy (2016)**. The watch will speak the present time in an understandable human voice. Furthermore, it also has features such as alarms and calendars which can be set easily and independently by the user. Second, Braille and tactile watches are more common among blind people. For braille watches, the regular numbers have raised dots near them to clarify the time. The users can tell the time just by touching the orientation of the small and large hands and the dots.

In this modern age the tech giants have introduced new solutions to reduce the troubles faced by visually impaired people and blind people when it comes to utilizing touch screen devices. Google has introduced Google **TalkBack Hildenbrand (2014)** for Android based smartphones while Apple has introduced VoiceOver (**"Accessibility", 2015**) for iOS based smartphones. Both do have the common functions such as text input, screen reader, navigation and others. Nowadays smartphones all come with these functionalities inside as part of their features. There are also new applications that help visually impaired people in their everyday life told by **Scherffius (2015)** such as LookTel, KNFB Reader App, TapTapSee, Color ID Free, and Be My Eyes which can be downloaded from the application store.

## **Review on Screen Reader Software**

### **VoiceOver (iOS)**

Apple's VoiceOver is a screen reader based on gesture which allows users that have low vision or blind to interact with their iPhone and iPad by means of the touchscreen. It also supports many of the Braille displays for those who are blind. Furthermore told by **Scott (2013)**, features such as 'Screen Curtain' are included which allows the display to be turned off while leaving the screen sensitive to touch.

### **TalkBack (Android)**

Google's TalkBack is an Accessibility Service that aids vision-impaired users by allowing them to enjoy and interact with their devices. It utilizes vibration, spoken word and other audible feedback to notify you what you're touching, what's on your screen and what can do with it. To make it work the users just have to use their finger to discover what is on the screen, when you touch any element that can be acted on, the content is read back to you.

## Review on Font Type

Fonts are important as they give significant benefits to readers who possess low vision. For example, Proper fonts with fixed width allows the users with low vision to have higher reading speeds and a much better reading acuities.

Research carried out by Drs. Mansfield, Legge, and Bane at the University of Minnesota **McCarty (2010)** expressed that there are few rules that can benefit the low-vision readers by improving their reading performance, the rules include:

- Employ fonts without serifs (APHont, Verdana, Arial, Helvetica).
- Employ fonts with a fixed width (APHont, Verdana, Arial, Helvetica).
- Use bold letters whenever possible.
- Use APHont, Verdana, Arial, or Helvetica as the default font in electronic media.
- Be sure to provide good contrast between the background color and the print color. (Black on white is good, but for many readers white on black--or yellow on black is better.)
- Make sure the print size is large enough for your reader to use comfortably.

## Review on software development tools

### Android Studio

Based on IntelliJ IDEA, Android Studio was made the main IDE for Android app development. Told by (**“Meet Android Studio”, 2013**) it provides more features that enhances the productivity when creating Android apps, for instance:

- A flexible Gradle-based build system
- A fast and feature-rich emulator
- A unified environment where you can develop for all Android devices
- Instant Run to push changes to your running app without building a new APK
- Code templates and GitHub integration to help you build common app features and import sample code
- Extensive testing tools and frameworks
- Lint tools to catch performance, usability, version compatibility, and other problems
- C++ and NDK support
- Built-in support for [Google Cloud Platform](#), making it easy to integrate Google Cloud Messaging and App Engine

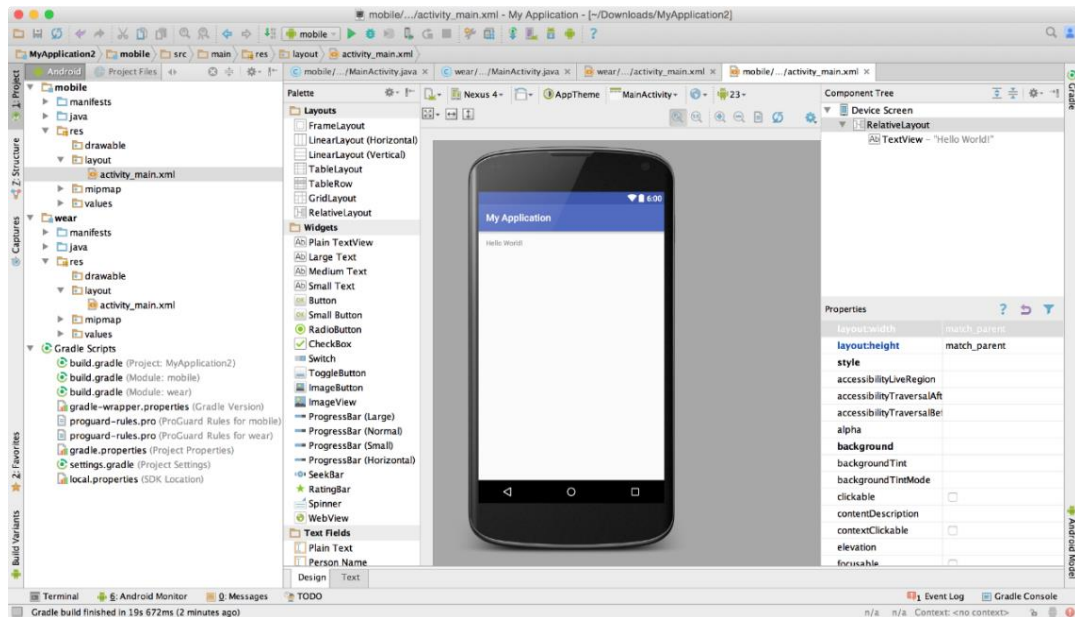


Figure 2.1 Android Studio

## Eclipse

Based on Java, this development platform is known for its plug-ins that enable developers to create and try-out codes that are written in other programming languages. Development environment supplied by Eclipse comprises of Eclipse CDT for C/C++, Eclipse Java development tools (JDT) for Java, and Eclipse PDT for PHP, along with others.

The main attraction of this software is that it can support Android Development Tools in short ADT is a plugin that is built to give the user a strong and an integrated environment where they can build Android applications mentioned by **Staff (2012)**. The capabilities of Eclipse are extended thanks to the ADT to quickly create new Android projects, add components that are based on the Android application UI, create an application UI, debug the applications using the provided Android SDK tools, and also export signed or unsigned .apk files so the user can distribute their application.



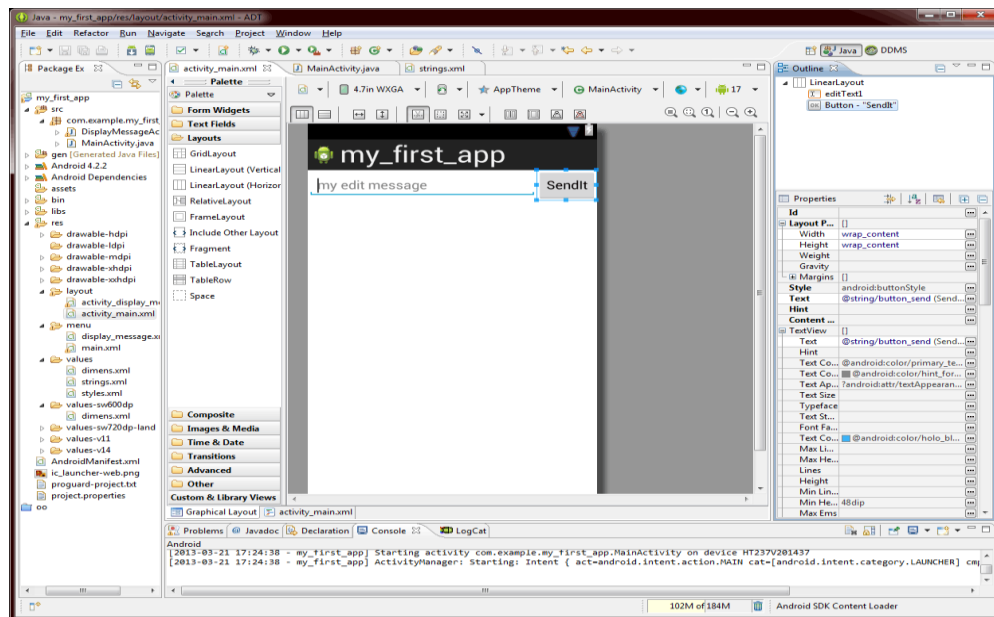


Figure 2.2 Eclipse

## 2.2 Problems to be solved

At the present time, there are numerous amount of appointment scheduler applications available for smart phones ready to be downloaded. Although there are so many of them, but most of them are not made to be user-friendly for the visually impaired and blind people to utilize. The user interface of the application is made to be packed full of objects and fancy colours which does not help visually impaired users in any way simultaneously making them more prompted to make mistakes.

Normally this kind of mobile applications asks the users to type or select lots of different type of inputs such as time, date and appointment detail. Using these way of taking inputs is troublesome for visually impaired users because it is difficult for them to type the inputs using a touch screen device.

To help the visually impaired people, mobile applications with the help of voice interaction is highly valued. This is because visually impaired users will know what they have selected, touched or done with the help of the voice feedback.

Furthermore, colour contrast also plays a key factor which affects the visibility of the text. To ensure higher level of visibility, higher ratio of colour contrast should be selected.

### ***2.3 Technological Background***

The mobile application for the visually impaired do have suitable Application Programming Interfaces (API) that can be implemented.

Google Android Text to Speech (TTS) API is one of the techniques used by Android developers for making text to be readable by the system. This API makes mobile applications to be user-friendly for visually impaired users. When the users touch the objects in the screen, the objects will respond by speaking or reading out the content aloud.

Eventually Google Android released a method which serves to override smartphone physical keys. Volume key is one of the physical key that can be programmed with a new purpose. For instance, we can make the volume key to select list view item. Additionally, it can be used to lessen the utilization of touch screen input by the users while increasing the precision of inputs.

## ***2.4 Proposed Solution***

The BM Reminder is designed and built to be a standalone Android based mobile application which can operate without the help of Google TalkBack. It was designed with few ideas in mind.

First, interaction with the smartphone by the users. Every time a short press is done by the user, the system will read out details. To make this happen, Text to Speech (TTS) API will be integrated with the mobile application. By doing this, all the text view, list view, buttons, and other objects will be able to read text when the action is done.

Second, the design has to be simple. The user interface for BM Reminder will be preserves as simple as possible. User input is given in a way that it minimizes wrong input from the users. All the objects in the application are designed to have less number of objects as possible and are made to be large.

Although there is a high probability that a visually impaired user may make mistake when it comes to typing text input, however the BM Reminder will not need the user to do so. This is done by only making use of the list view and buttons that are implemented as selection input. The volume key is utilized to choose list view item while the buttons are implemented with larger size. To minimize further possibilities of making errors, the list view scroll is disabled.

Furthermore, to ensure higher level of text visibility for low vision users, a high ratio of colour contrast is picked. Level of visibility normally varies among peoples, but by choosing higher ratio it ensures more users will have a better view. The colours

that are chosen to be used for this mobile application are white(#ffffff), black(#000000), yellow(ffff66) and dark blue(#000080).

- Background: Black, Foreground: White, Ratio: 21:1
- Background: Black, Foreground: Yellow, Ratio: 19.75:1
- Background: White, Foreground: Dark Blue, Ratio: 16.01:1

The default font chosen for this mobile application is Helvetica font. According to study, the characteristics that are needed for a low vision reader to improve their reading experience is granted by Helvetica font. It possess fixed width without serifs and between fonts.

In a nutshell, the above solutions will make the BM Reminder a better mobile application that can fulfil visually impaired users need than the any normal appointment reminder mobile applications.

## Chapter 3: REQUIREMENTS

### 3.1 System Overview

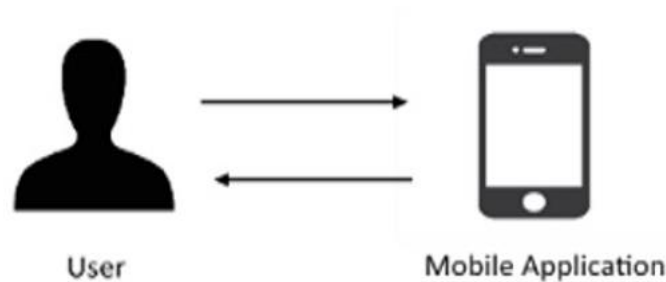


Figure 3.1 System Overview

The mobile application's system is demonstrated according to the above figure, BM Reminder is made for the visually impaired and blind people.

The system is useable by any kind of users. Despite that, the features are designed specifically to assist visually impaired users. Internet access is not required for the users to enter the mobile application using their smartphones.

### 3.2 Functional Requirements

#### 3.2.1 Add New Appointment

New appointment can be added by the user through the application's main menu. When user creates a new appointment, it requires the user to choose the desired date, time, record appointment detail and the reminder. User's voice will be used to record the appointment detail. User can play back the record when previewing the appointment.

### ***3.2.2 Check Appointment***

Check appointment is available on the application's main menu. Check appointment is done by the user by choosing Semak Pelantikan button which will show all the appointments available in a list view. User can further check the appointment detail in more detail by clicking on Halaman Seterusnya button located at the bottom of the screen. If there are no appointments, a page to show that no appointments are found will be shown.

### ***3.2.3 Play Appointment Detail***

The recorded voice note when adding appointment can be played after choosing the appointment details.

### ***3.2.4 Appointment Reminder***

When choosing the reminder time for the appointment, the user is given the choice of having and not having a reminder. The reminder will prompt the user when the according to the chosen reminder and it can work even if the user is outside of the application. User can dismiss the reminder by tapping on it.

### ***3.2.5 Read Every Touch from User***

The mobile application is built in a way where the users are allowed to randomly short press along the screen and the system will give response on each touch. Instructions will be triggered when objects such as the button, text view and list view are touched.

### ***3.2.6 Shake Phone to know Date and Time***

The date and time are voiced out when the user shakes the smartphone on the main page.

## ***3.3 Quality Requirements***

### ***3.3.1 Availability***

This application is made to be available even when offline, which means internet connection is not a must to use its functions.

### ***3.3.2 Usability***

The mobile application is targeted to be used by visually impaired and blind people. Therefore, the main focus of this application is the interaction between the application and the user. The application is made to be user-friendly, so the users shall have minor difficulties when learning to use them.

### ***3.3.3 Portability***

The mobile application will be run on Android operating system consisting of Android version 4.0 and above only.

## ***3.4 Software Development Life Cycle***

The process of producing software with the lowest cost and highest quality in the least time is known as Software Development Life Cycle. It involves comprehensive strategy on how to alter, develop, maintain and change a software system. The stages involved are plan, design, build, testing, and deployment.

### 3.5 Constrains

#### 3.5.1 Deadline

The deadline for this project is on 8/02/2018.

#### 3.5.2 Development Environment

Java and Extensible Markup Language (XML) are used in building this application on Android Studio.

### 3.6 Use Case Diagram

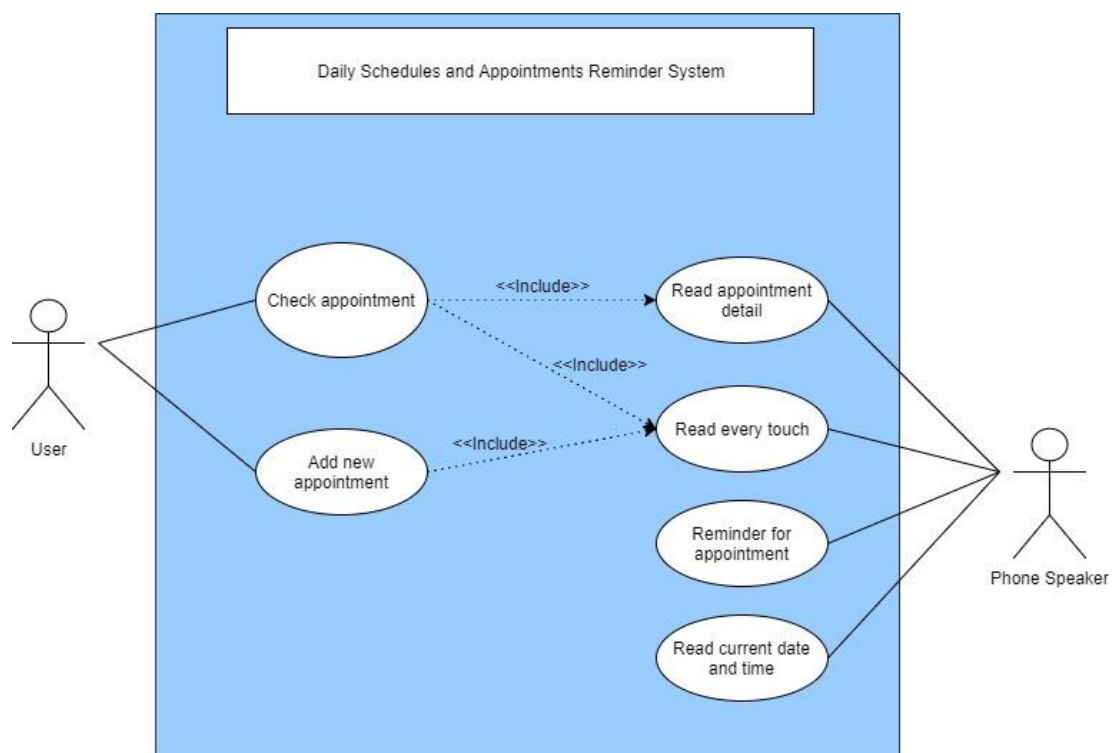


Figure 3.2 Use Case Diagram



### **3.6.1 User Modules**

Option to add new appointment and check appointment is given to the users. Check appointment use case has read appointment detail from phone speaker function. Both of users use cases have the same functionality of read every touches use case from the phone speaker.

### **3.6.2 Phone Speaker Modules**

Phone speaker plays the task of reminding users about the appointment, read appointment detail, read every touch and read current date and time. It plays a big role in preserving the interaction between the user and the smartphone.

## **3.7 Context Diagram**

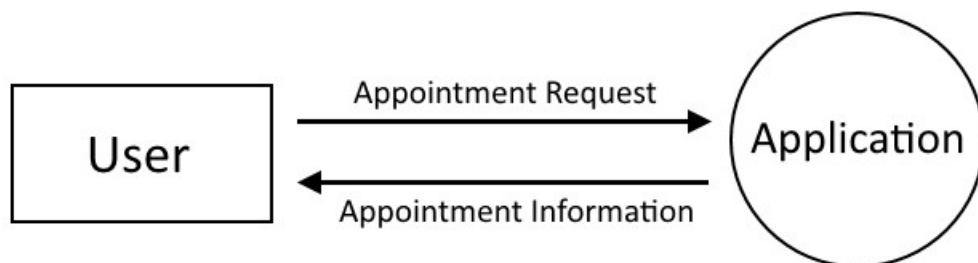


Figure 3.3 Context Diagram

Appointment request such as check or add appointment can be made by the user to the application. Hence, the application will return the information that the user needs.

## Chapter 4: DESIGN

### 4.1 Sequence Diagram

#### 4.1.1 Add New Appointment Diagram

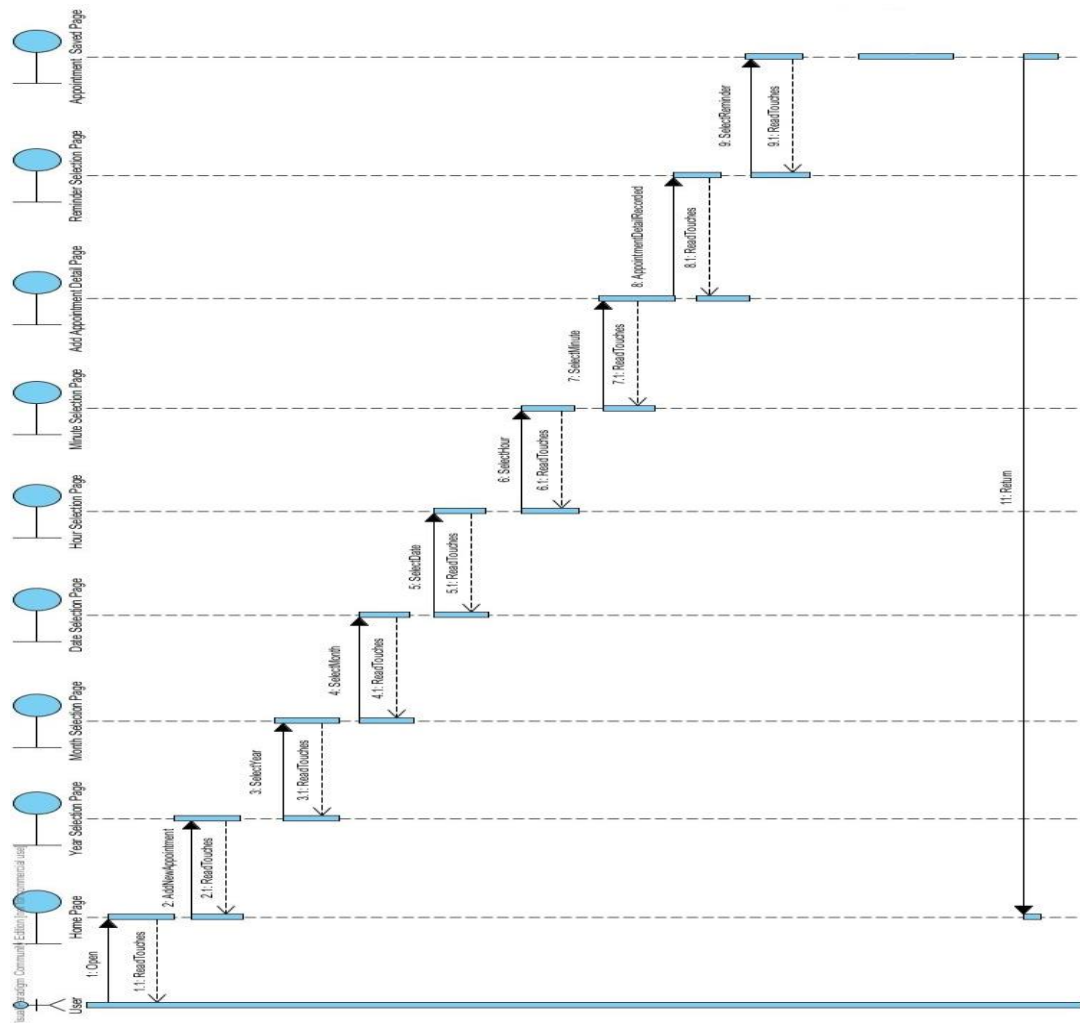


Figure 4.1 Sequence Diagram: Add New Appointment

Figure 4.1 shows add new appointment sequence diagram. Add new appointment from the actor user and read every touch use case from the actor phone speaker is what forms add new appointment. The sequence starts by the user selecting add new

appointment at the main menu. Then it will go to the Year Selection Page followed by Month Selection Page, Date Selection Page, Hour Selection Page and Minutes Selection Page. After gathering all the details of date and time, it will bring the user to record appointment details. The recorded voice memo is then stored into the user's phone storage. Finally, the Reminder Selection Page, it is optional for the user to pick a reminder for their appointment. All the acquired appointment details will be stored in the phone storage. When all of this process is complete, the user will be able to go back to the Main Menu after pressing the appointment has been saved button.

### 4.1.2 Check Appointment Diagram

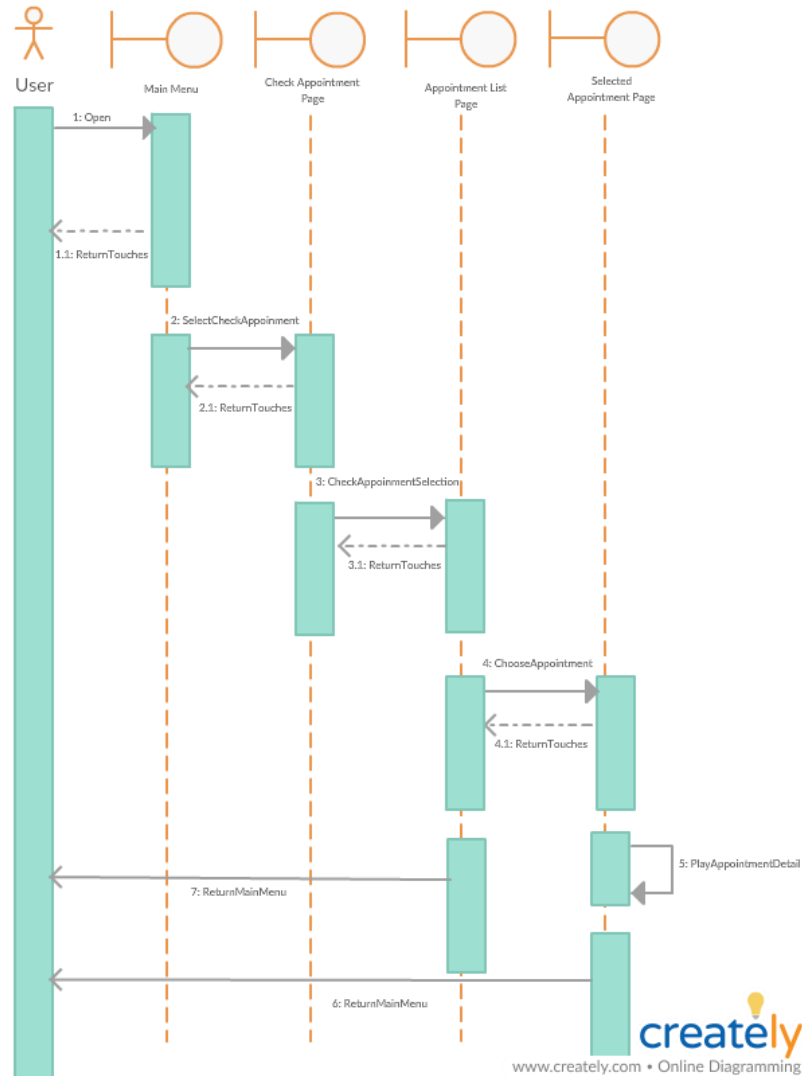


Figure 4.2 Sequence Diagram: Check Appointment

In this sequence diagram it has check appointment use case from the actor user and read every touches and read appointment detail use case from actor phone speaker. There are four conditional sequences found in this diagram. First, the technique used to view appointment. View appointment will show list of all the appointments. After that, user is given the options to choose whether to return to main menu or next page

for more details in the appointment list page. While inside the more details page, if play memo is selected, it will play the memo that is asked.

#### 4.1.3 Reminders for Appointment Diagram

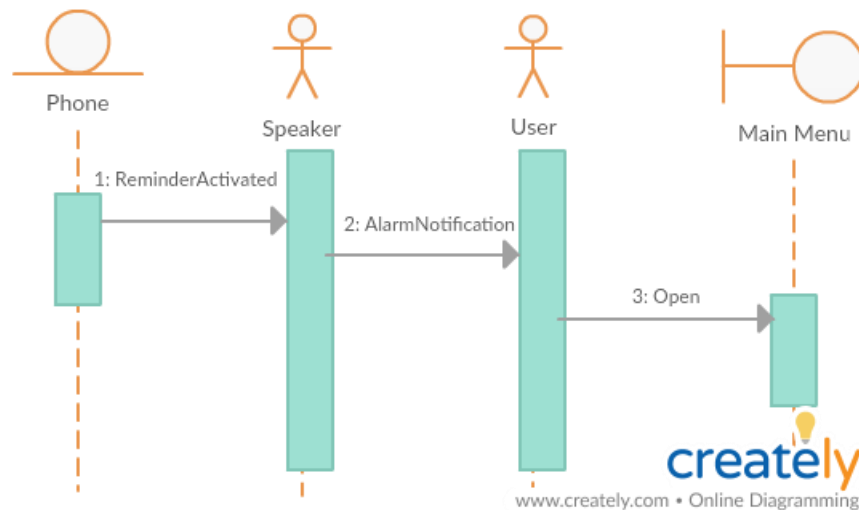


Figure 4.3 Sequence Diagram: Reminders for Appointment

Figure 4.3 shows reminder for appointment sequence diagram. It is based on reminders for appointment use case from the actor phone speaker. The above sequence diagrams shows clearly the course of reminders of appointment being initiated. When the user closes the alarm, the page will be navigated main menu.

#### 4.1.4 Read Current Date and Time

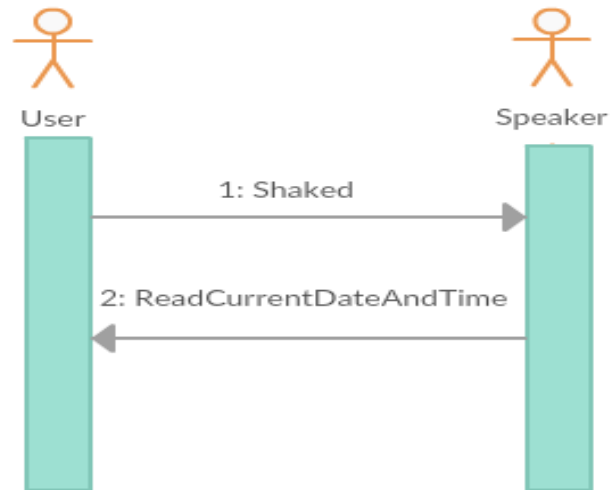


Figure 4.4 Sequence Diagram: Read Current Date and Time

Figure 4.4 shows the sequence diagram for read current date and time. It is based on read current date and time use case from actor phone speaker. The event will be triggered when the user's phone is shaken at the main menu.

## **Chapter 5: IMPLEMENTATION**

### ***5.1 Implementation Plan***

The main idea of project implementation is to build a mobile application. In order to make the development process easier to understand, it is split into five main modules. The modules 1, 2, 3, 4 and 5 are the main components found in this application which have been implemented. This mobile application is built using Java which is mainly used for the application functions and Extensible Markup Language (XML) for the application layouts. All the process of building the application took place in Android Studio.

#### ***5.1.1 Module 1: Use of Text To Speech (TTS) Application Programming Interface (API) in interacting with users***

This is the most vital module for this application as it allows interaction to happen between the application and the user. It is implemented throughout the whole application and instructions are given when the button, text view or the list view are selected by the user.

#### ***5.1.2 Module 2: Use of volume key to select list view***

Better precision and control is given to the user with this module. As list view item are very long, to ease their problems in selecting inputs, the volume key up and down will be utilized to choose the list view item while the scroll list is disabled.

#### ***5.1.3 Module 3: Use of reminder for appointment***

This module is needed so the user can set reminder for appointments.

#### ***5.1.4 Module 4: Use of recorder Application Programming Interface (API) to record down appointment detail***

User's voice is used to help them record their appointment details. After the recording is completed, the voice memo will be saved directly on the user's phone storage. When users view their appointment detail, they can listen back to the voice memo again.

#### ***5.1.5 Module 5: Shake phone to read present date and time***

This module assists users who want to know the present date and time by shaking their smartphones. It is a great way in letting the users to be aware, so that they will not miss out on any appointments or make mistakes.



## 5.2 Implementation

### 5.2.1 Main Menu

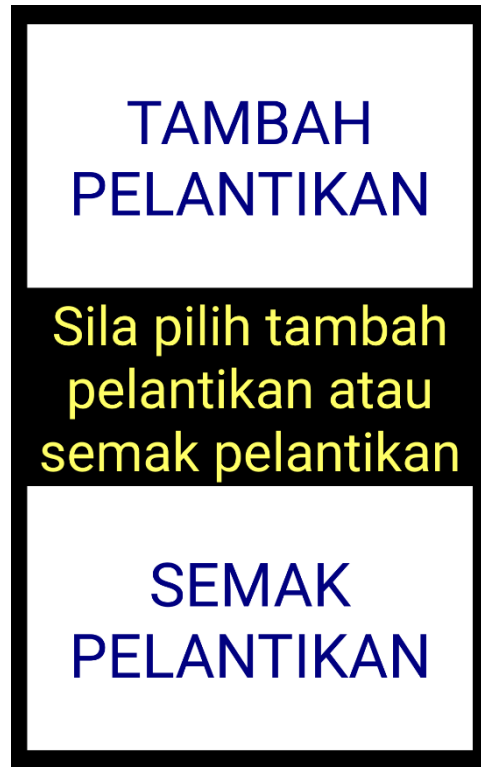


Figure 5.1 Implementation: Main Menu

The main menu for the application is showed on the above figure. There are two options given to the user, first on is to Tambah Pelantikan button to add new appointment and the other is Semak Pelantikan button to check appointment. Feedbacks or response is given by the system whenever the user taps on any part of the screen. Single tap an object such as button or text view will trigger its instruction while a longer pressing is needed to proceed to any other activities.

### 5.2.2 *Select Year Page*



Figure 5.2 Implementation: Select Year Page

This page is for the user to pick the year of the appointment. The scroll function for the list view on this page is disabled. Thus to choose the year the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by long pressing on the Halaman Sebelumnya button which can be found on top of the screen. To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen. When the user proceeds the chosen year of the list view will be recorded.

### 5.2.3 *Select Month Page*



Figure 5.3 Implementation: Select Month Page

This page is for the user to pick the month of the appointment. The scroll function for the list view on this page is disabled. Thus to choose the month the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by longer pressing on the Halaman Sebelumnya button which can be found on top of the screen. To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen. When the user proceeds the chosen month of the list view will be recorded.

#### 5.2.4 *Select Date Page*



Figure 5.4 Implementation: Select Date Page

This page is for the user to pick the date of the appointment. The scroll function for the list view on this page is disabled. Thus to choose the date the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by longer pressing on the Halaman Sebelumnya button which can be found on top of the screen. . To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen. When the user proceeds the chosen date of the list view will be recorded.

### 5.2.5 *Select Hour Page*

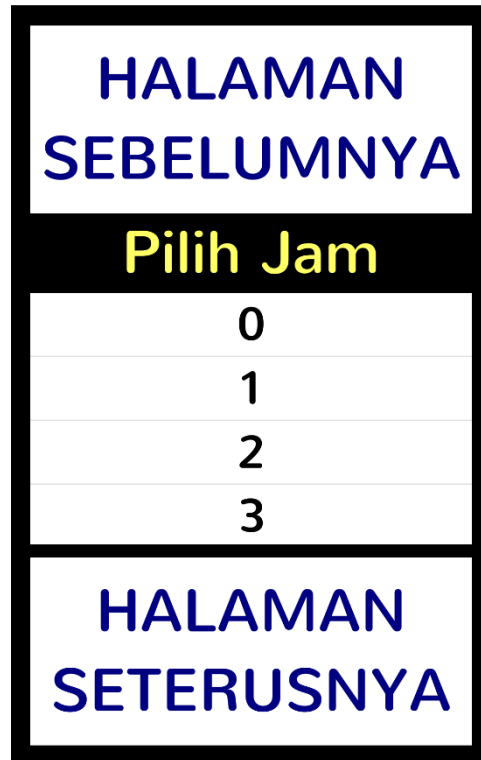


Figure 5.5 Implementation: Select Hour Page

This page is for the user to pick the hour of the appointment. The scroll function for the list view on this page is disabled. Thus to choose the hour the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by tapping on the Halaman Sebelumnya button which can be found on top of the screen. To proceed to the next page, users can longer press Halaman Seterusnya button found at the bottom of the screen. When the user proceeds the chosen hour of the list view will be recorded.

### 5.2.6 *Select Minute Page*

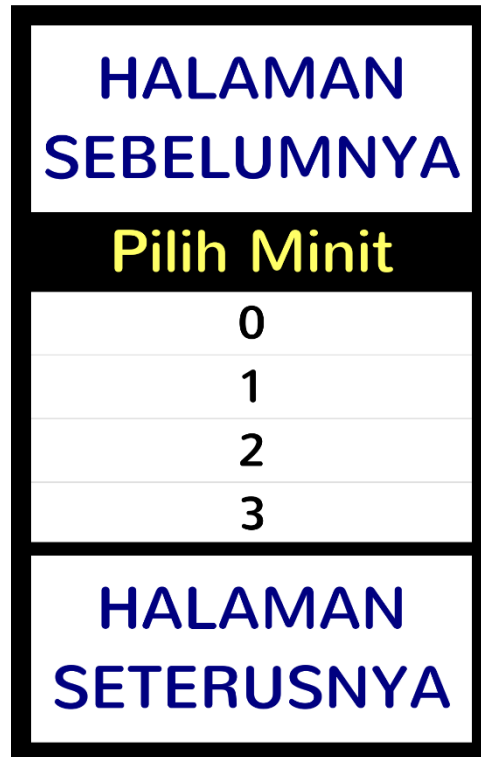


Figure 5.6 Implementation: Select Minute Page

This page is for the user to pick the minute of the appointment. The scroll function for the list view on this page is disabled. Thus to choose the minute the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by longer pressing on the Halaman Sebelumnya button which can be found on top of the screen. . To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen. When the user proceeds the chosen minute of the list view will be recorded.

### 5.2.7 *Record Appointment Detail Page*



Figure 5.7 Implementation: Record Appointment Detail Page

This page is for the user to record appointment detail. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by tapping on the Halaman Sebelumnya button which can be found on top of the screen. . To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen. User can press Bermain Atau Berhenti button to listen back to the recording.

### 5.2.8 Add Reminder Page



Figure 5.8 Implementation: Add Reminder Page

This page is for the user to pick the reminder of the appointment. The scroll function for the list view on this page is disabled. Thus to choose the minute the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by longer pressing on the Halaman Sebelumnya button which can be found on top of the screen. To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen. When the user proceeds the chose the reminder from the list view it will be recorded.



### 5.2.9 *Appointment Saved Page*

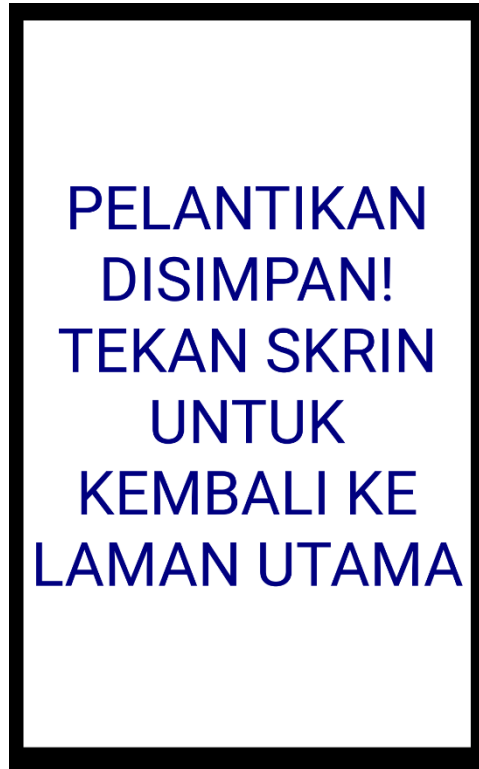


Figure 5.9 Implementation: Appointment Saved Page

The page above is shown to indicate that the appointment has been saved and is the last page for add appointment. Tap on the screen will trigger its instruction. When the above screen is long pressed, the user will be brought back to the main menu.

#### 5.2.10 Check Appointment Page



Figure 5.10 Implementation: Check Appointment Page

This page is for the user to choose which appointment to further view. The scroll function for the list view on this page is disabled. Thus to choose the appointment the user has to do it by utilizing the volume key to choose up or down. Single tap an object such as button or text view will trigger its instruction. Users can go back to the previous page by longer pressing on the Halaman Sebelumnya button which can be found on top of the screen. . To proceed to the next page, users can press Halaman Seterusnya button found at the bottom of the screen.

### 5.2.11 Appointment Detail Page



Figure 5.11 Implementation: View Appointment Detail Page

This page shows the chosen appointment's page. Single tap an object such as button or text view will trigger its instruction. To proceed to the main menu, users can longer pressing Halaman Utama button found at the top of the screen. To play the memo of the particular appointment user can longer pressing Memainkan Rekod button located above the Padamkan Pelantikan button. Furthermore, in order to go back to list of appointments, user can long press on Halaman Sebelumnya button to do it.

### 5.2.12 *No Appointment Page*

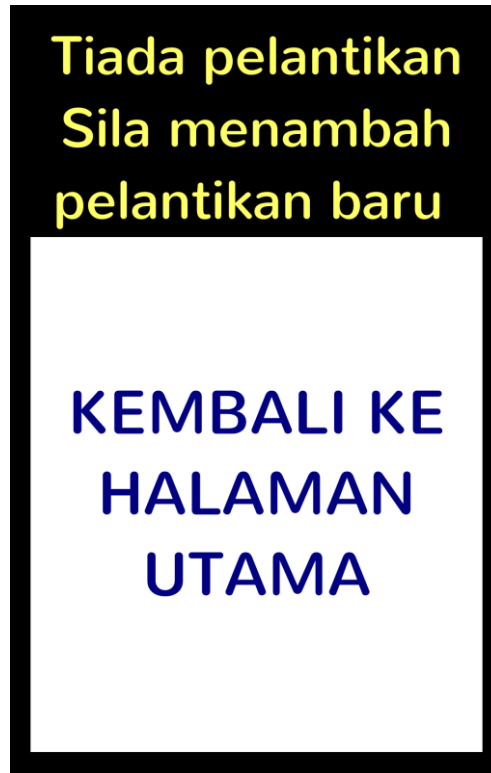


Figure 5.12 Implementation: No Appointment Page

This page shows the no appointment found page. Longer pressing an object such as button or text view will trigger its instruction. To proceed to the main menu, users can press Halaman Utama button found at the bottom of the screen.

### 5.2.13 *Stop Alarm Page*

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**HENTIKAN  
PENGGERA**

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Figure 5.13 Implementation: Stop Alarm Page

This page shows the stop alarm page. Longer pressing an object such as button or text view will trigger its instruction. To proceed to the main menu, users can press Hentikan Penggera button found at the screen.

## **Chapter 6: TESTING**

### ***6.1 System Testing***

#### ***6.1.1 Test Cases***

Each functions of the mobile application are tested with the test cases below:

- Click 'Pelantikan Baru' button
- Click 'Halaman Sebelumnya' button
- Click 'Halaman Seterusnya' button
- Choose list view item by utilizing volume key
- Click 'Pelantikan Disimpan' button and navigate back to Main Menu
- Click 'Semak Pelantikan' button
- Click 'Kembali Ke Halaman Utama' button
- Click 'Halaman Utama' button
- Click 'Memainkan Rekod' button
- Click 'Hentikan Penggera' button
- Press empty spaces on the layout
- Shake phone to read current date and time
- Start record appointment detail clicking volume key up button
- Stop record appointment detail clicking volume key down button
- Long press on all objects

Test Cases	Expected Result	Pass/Fail
Click 'Pelantikan Baru' button	Display Select Year Page	Pass
Click 'Halaman Sebelumnya' button	Navigate to the previous page	Pass
Click 'Halaman Seterusnya' button	Navigate to next page	Pass
Choose list view item by utilizing volume key	List view item is chosen	Pass
Click 'Pelantikan Disimpan' button and navigate back to Main Menu	Show Main Menu	Pass
Click 'Semak Pelantikan' button	Show View Appointment Page	Pass
Click 'Kembali Ke Halaman Utama' button	Show Main Menu	Pass
Click 'Halaman Utama' button	Go back Main Menu	Pass
Click 'Memainkan Rekod' button	Play the appointment detail record	Pass
Click 'Hentikan Penggera' button	Stop the alarm and back to Main Menu	Pass
Press empty space on layout	Instructions will be given by voice	Pass
Shake phone to read current date and time	Current date and time will be voiced out	Pass
Start record appointment detail by clicking the volume up key	Record the appointment	Pass
Stop record appointment detail by using volume down key	Stop recording the appointment	Pass
Long press on all objects	Voice instruction or label	Pass

Table 6.1 Test Cases

## 6.2 Unit Testing

Unit testing stands for software development process where the smallest testable pieces of the program are defined as units, where they are independently and individually inspected for an acceptable operation. Normally a programmer conducts this testing as they have better understanding of the codes.

## **Chapter 7: CONCLUSION**

Overall this project is done in a stable and solid flow. A lot of research has been done throughout the months to help me get a much better understanding and foundation regarding visually impaired people, mobile applications and the most crucial part is to be well informed about the requirements needed to develop a mobile application for people who face disabilities. My exposure towards mobile application development life cycle has also been enhance with the preparation of this project.

When I was doing background study on the fields involved, I managed to establish the functionalities and the requirements for the BM Reminder. The concept, process flow and data flow is also formed. All the ideas are clearly explained using diagrams. Android Studio is utilized for designing the screen layout for the mobile application. In order to make this application easier to develop, I divided the works into few different modules. Through the process of doing this project, it has enhanced my programming skills mostly revolving around developing Android based mobile applications.

However, I still faced some problems when doing this project. First of all is the variety of different answers that are found online. When I was clueless about how to do a particular function I will look it up on the web, but most of the answers I get from the web are different. This problem is solved by researching even further to find the answer that is the most suitable to be used for my application. The next problem is the heavy usage of running Android Studio. The process of building and running the mobile application each time utilizes a lot of time. For instance, every time a code is added or changed I have to rebuild the application and it takes quite some time for it



to build the application. The physical memory used by Android Studio is also very high.

All the objectives for this project have been accomplished. The main goal for this project was to design and develop a mobile application that is capable of helping visually impaired people's time awareness. Thanks to the use of Text To Speech (TTS) in the form of giving instructions, a step by step technique is made possible to be used by add and check appointment.

There are few add-ons that serve as the future work for this project, first is to add a delete appointment function at selected appointment page for the user to delete unwanted appointments. Second, is to add a reminder that can serve to notify users daily, weekly or monthly. This can reduce the need for the users to create more of the same appointments at different days, weeks or months to keep them alerted. Third is a way for the users data to be stored on the internet, this is so if the user accidentally deletes an important appointment and needs it back.

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## **APPENDIX A: MEETING LOGS**