Faculty of Computer Science and Information Technology

FINANCIAL LITERACY MOBILE APPLICATION FOR UNIMAS

UNDERGRADUATE STUDENTS

Liew Zhao Ting

Bachelor of Computer Science with Honours (Software Engineering)

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LIEW ZHAO TING

This project is submitted in partial fulfillment of the

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ABSTRACT

The lack of financial literacy among university students might lead to financial difficulties such as debts. The need to improve individual thoughts on their financial literacy to have better financial management so they can implement good financial management in the future. Hence, the project intends to develop a financial literacy mobile application for UNIMAS undergraduate students to teach financial literacy. By utilizing the use of mobile application, the mobile application can teach financial literacy especially UNIMAS undergraduate students. By analyzing the literature review, three existing mobile applications were used to teach financial literacy. The mobile application provides expense tracker features as a tool to understand their financial by tracking their spendings and making wise financial decisions. In addition, usability testing will be carried out after the proposed mobile application is implemented to evaluate the usability of the mobile application by collecting feedback from user. Functional testing will be used to ensure the developed mobile application will be tested and ready for deployment. The methodology used in the proposed project is Rapid Application Development (RAD). This proposed project in Final Year Project 1 aims to design and develop to teach financial literacy and to evaluate the usability of the proposed mobile application to UNIMAS undergraduate students. Final Year Project 2 outlined the implementation and testing phase of the proposed mobile application based on the requirement analysis and system design that was defined. Furthermore, when the proposed mobile application had been deployed, functional testing such as unit testing, as well as usability testing were carried out to collect feedback from actual users. Finally, one of the proposed mobile application's limitations is that the system does not support platforms apart from Android, no multilingual support and auto-scanning feature. The future work is to overcome the limitations in order to enhance the mobile application by implementing cross-platform frameworks, adding multilingual support and auto-scanning receipt feature in the future.

ABSTRAK

Kekurangan literasi kewangan dalam kalangan pelajar universiti mungkin membawa kepada masalah kewangan seperti hutang. Keperluan untuk menambah baik pemikiran individu mengenai literasi kewangan mereka untuk mempunyai pengurusan kewangan yang lebih baik supaya mereka dapat melaksanakan pengurusan kewangan yang baik pada masa hadapan mereka. Oleh itu, projek ini berhasrat untuk membina aplikasi mudah alih literasi kewangan kepada pelajar sarjana muda UNIMAS untuk mengajar literasi kewangan. Aplikasi mudah alih mengajar literasi kewangan, terutamanya kepada pelajar sarjana muda UNIMAS. Ia menggunakan penjejak perbelanjaan untuk memahami dan membuat keputusan kewangan yang bijak. Selain itu, ujian kebolehgunaan akan dijalankan selepas cadangan aplikasi mudah alih dilaksanakan untuk menilai kebolehgunaan aplikasi mudah alih dengan mengumpul maklum balas daripada pengguna. Selain itu, ujian kebolehgunaan dan kefungsian akan dijalankan selepas cadangan aplikasi mudah alih dilaksanakan. Ujian tersebut akan menilai kebolehgunaan dan memastikan aplikasi mudah alih siap digunakan. Projek ini menggunakan kaedah Rapid Application Development (RAD). Projek yang dicadangkan dalam Projek Tahun Akhir 1 bertujuan untuk mereka bentuk dan membinakan untuk mengajar literasi kewangan dan menilai kebolehgunaan aplikasi mudah alih yang dicadangkan kepada pelajar sarjana muda UNIMAS. Projek Tahun Akhir 2 melaksanakan dan menguji aplikasi mudah alih berdasarkan analisis keperluan dan reka bentuk sistem. Ujian berfungsi dan kebolehgunaan telah dijalankan untuk mendapatkan maklum balas pengguna. Akhirnya, salah satu had aplikasi mudah alih yang dicadangkan ialah sistem tidak menyokong platform selain Android, tiada sokongan pelbagai bahasa, dan ciri pemindahan automatik. Kerja masa depan adalah mengatasi had tersebut dengan mengimplementasikan rangka kerja pelantar silang, sokongan pelbagai bahasa, dan ciri pemindahan resit automatik.

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CHAPTER 1 : INTRODUCTION

1.1 Project title

Financial Literacy Mobile Application for UNIMAS Undergraduate Students.

1.2 Introduction

Financial literacy refers to the ability to understand and to use their financial skills in an effective way such as budgeting and investing. The need to improve individual thoughts on their financial literacy to have better financial management so they can implement good financial management in the future. The habit of financial management by educating from young age could affect their lives and security in long-term duration (Mueangpud et al., 2019). Financial decision had to figure out all by themselves when they learn and practice financial decisions in their university life (Sabri et al, 2008). University students had their first time experienced on their financial freedom without the supervision from their guardian (Ariffin et al, 2017).

By using mobile application as a digital tool, it can improve their financial decisions and raise awareness on how to manage their finances in a responsible way. The demand on developing a mobile application to improve financial management for the youth is needed as they carry with their mobile phone most of the time (Mueangpud et al., 2019). Therefore, financial literacy mobile application can be used as a tool to teach financial literacy especially for university students.

1.3 Problem statement

Nowadays, the lack of financial literacy among university students might lead to financial difficulties such as debts. According to the study of Malaysian Insolvency Department, a total of 64, 632 Malaysian were declared bankrupt in the past five years (Berisha & Meszaros,

2018). According to a study in Malaysia on analysing the financial literacy among university students by using behavioural approach, the study has shown that university students are lack of financial knowledge, and it is important to cater effective ways to improve awareness on financial knowledge, financial skills, and financial behaviour among university students (Yahaya et al., 2019). Hence, there is a need to teach undergraduate students on financial literacy among undergraduate students in UNIMAS by using mobile application.

1.4 Objectives

The project objectives are:

i.   To design and develop a mobile application to teach financial literacy to UNIMAS undergraduate students.

ii.   To evaluate the usability of the mobile application to teach financial literacy to UNIMAS undergraduate students.

1.5 Methodology

The methodology to be carried out on this project is Rapid Application Development (RAD). RAD is a development model that focuses to rapid prototyping and speedy feedback. The project can be broken down into smaller parts and it is easier to keep track of the project's progress. In addition, RAD takes a shorter time to complete and able to produce a quality project compared to waterfall modal. The following figure shows the main phases in Rapid Application Development.
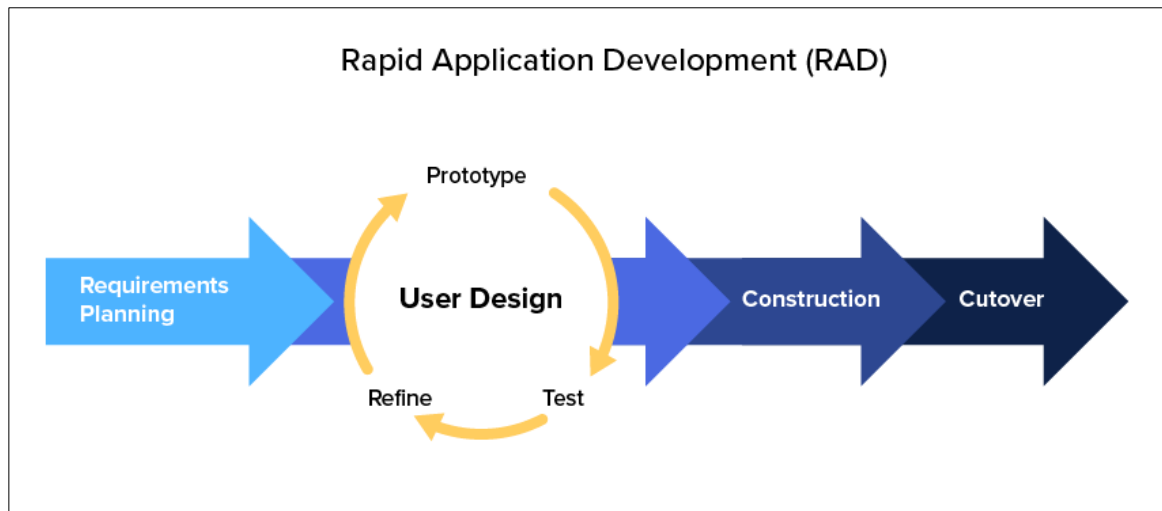
Figure 1.1: RAD methodology development phases ("Rapid Application Development (RAD) Model: An Ultimate Guide For App Developers in 2022," 2022)

1.5.1 Requirements Planning

In this phase, system requirement will be collecting by reviewing existing mobile applications and questionnaires. By reviewing existing mobile application, the specifications can be tested out to collect information. By doing questionnaires with UNIMAS undergraduate students, it will provide a better understanding on creating a better process. Hence, it will have a better project outcome.

1.5.2 User Design

During this phase, the development will be taking place. Prototypes will be shown to user to collect feedback and comments. By collecting feedback from user, the mobile application can be improved until the project requirement are met. Throughout prototyping, the feasibility can be evaluated through this phase so the mobile application can have better structure for future updates.

1.5.3 Construction

In this phase, it is an important stage of development where all user requirements are met, and user feedbacks are crucial.

1.5.4 Cutover

The final phase is the implementation phase will be deployment where the mobile application will be in live environment. Documentation such as user manual to guide the users on how to use the mobile application.

1.6 Scope

The target users of this mobile application will be the UNIMAS undergraduate students. There will be login system to the system's account to be accessed.

The limitations are the project Android-based development so only android users are allowed to access to this mobile application.

1.7 Significance of project

The digital delivery of financial literacy is important, and individuals are making use of the digital tools (OECD, 2021). The mobile application is developed to act as a digital tool to evaluate the usability of the mobile application to teach financial literacy as to improve the awareness on importance of financial literacy among UNIMAS undergraduate students.

1.8 Expected outcome

At the end of this project, this android mobile application will be developed to teach financial literacy. The mobile application features allow user to track expenses and view reports on expenses. The feature in the mobile application allows user to track their spendings, analyse expenses and making wise decisions generally. This mobile application provides features that

allows users to learn to how to manage their finances wisely by analysing their expenses. Hence, the mobile application encourages the users to make better financial decisions. Hence, this mobile application will be design and develop to teach financial literacy and to evaluate the usability of the mobile application to teach financial literacy to UNIMAS undergraduate students.

1.9 Project schedule

The project schedule is divided into two parts which is Final Year Project 1 and Final Year Project 2. This project started from 10 October 2022. Based on Figure 1.2, it shows the project schedule for Final Year Project 1. The important submission dates of the Gantt chart are the deadline set by the Faculty of Computer Science and Information Technology. Figure 1.3 shows the Final Year Project 2 Gantt chart which is the estimated time frame according to RAD methodology phases.

Chapter 1 is the introduction of this project. This chapter consists of introduction, problem statement, the objectives, methodology, scope, significance of project, expected outcome, and project schedule. The introduction describes the background of financial literacy and the description of this project. The problem statement explains on the lack of financial literacy among university student and thus provides the reason this mobile application to be developed. The methodology to be used for this project will be using Rapid Application Development (RAD) and the scope describes the limitation which is the boundaries of the proposed mobile application to be developed. The project schedule describes the timeline including important submission dates and the preparation durations. Lastly, the expected outcomes describe the outcome of the project including planned features.

Chapter 2 is the literature review of the existing mobile applications. This chapter discuss on the review on existing mobile application that is similar to the project and the weaknesses and strength of the existing features will be analysed.

Chapter 3 is the requirement analysis and design which is the methodology used for development for the overall project. The methodology will be using Rapid Application Development (RAD) to develop for this project. This chapter will consist of data flow diagram (DFD), flowchart and user interfaces to create the prototype of the project.
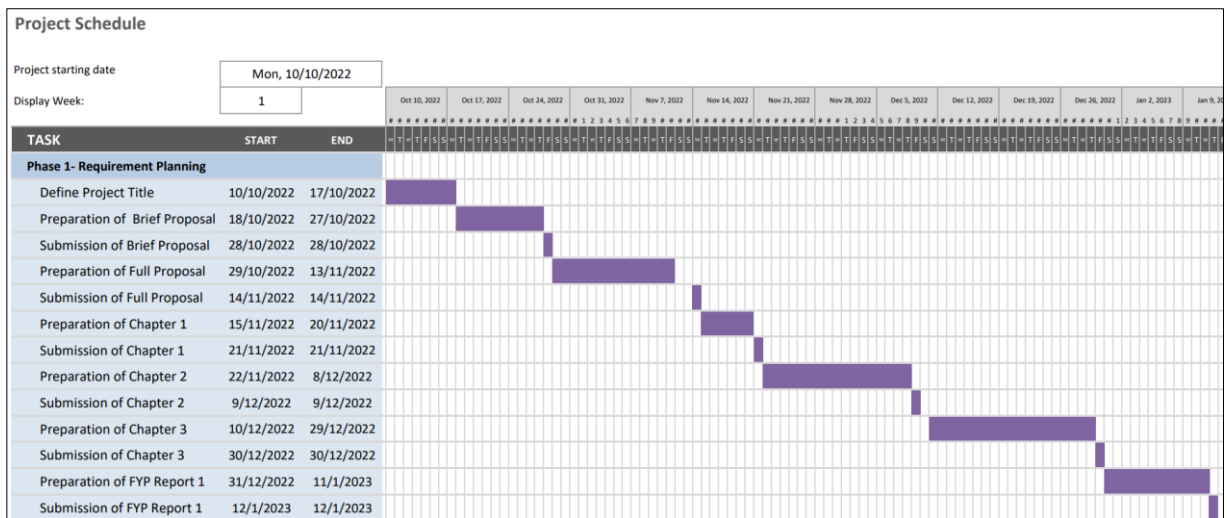
Figure 1.2*:* Project Schedule for FYP1
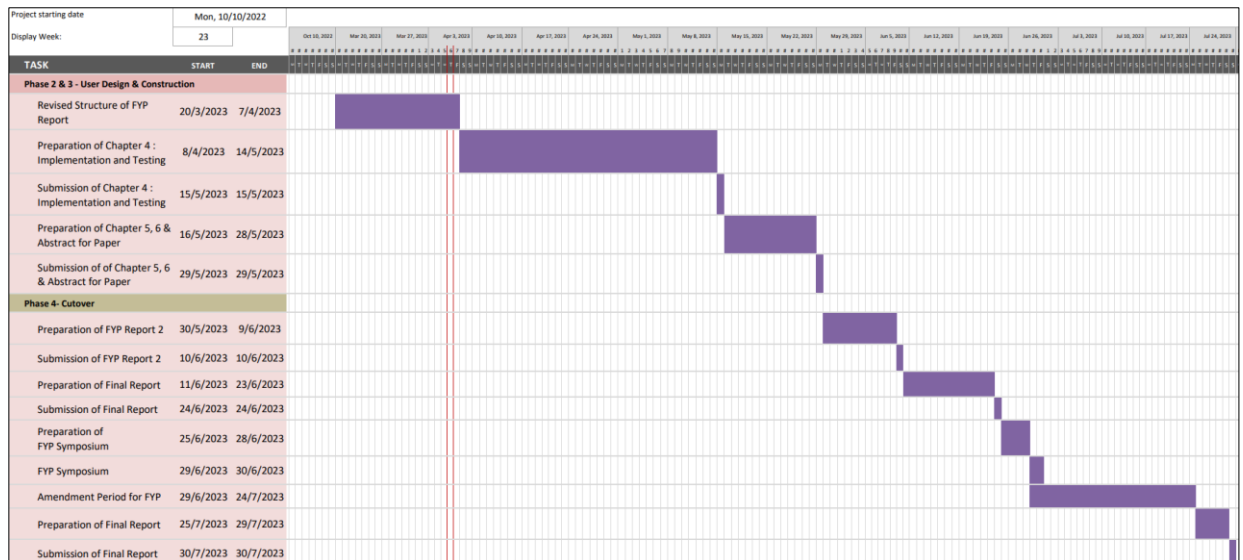
Figure 1.3: Project Schedule for FYP2

1.10 Summary

Based on this chapter, the proposed project to design and develop and to evaluate the usability of the mobile application to teach financial literacy to UNIMAS undergraduate students. This chapter describes the introduction, problem statement, the objectives, methodology, scope, significance of project, expected outcome, and project schedule. The introduction describes the background of financial literacy and the description of this project. The problem statement explains on the lack of financial literacy among university student and thus provides the reason this mobile application to be developed. The methodology to be used for this project will be using Rapid Application Development (RAD) and the scope describes the limitation which is the boundaries of the proposed mobile application to be developed. The project schedule describes project outline, the timeline including important submission dates and the preparation durations. Lastly, the expected outcomes describe the outcome of the project including planned features.

CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

In this chapter, the existing mobile application will be reviewed on their strengths, weaknesses, and the features. A comparison on the technical features is analysed between the existing mobile applications. By comparing the features of the mobile applications, some of the features maybe adapted into the proposed project with the existing strengths and weaknesses.

2.2 Current scenario analysis

A survey found that the financial literacy among college and university students are low in Malaysia, and by encouraging students on savings, it will play a crucial part in financial literacy (Yew et al., 2017). Universities should emphasize on educating financial knowledge for students to prepare them before entering into working culture (Yew et al., 2017). In addition, a study had demonstrated the importance of including financial management course in the university curriculum so that the students are made aware of the significance of good financial (Yahaya et al., 2019). Hence, a financial literacy mobile application that provides tools on financial management are able to teach university students on financial literacy.

One of the general types of knowledge on financial literacy are planning and budgeting. There are few methods on managing expenses which are paper forms, spreadsheets, and software (Blog, 2022). Paper forms manages expenses manually and on a budget. A significant amount of paperwork that needs to be requested and approved is the drawback which occasionally might be difficult to file, find, or track, or get lost in transit. Spreadsheets is a manual way to track and manage expenses. The spreadsheets frequently have paper receipts attached to it. It is a tasking method, however if data is not managed properly, it can occasionally become disorganized. Lastly, using software to manage expense reports is creative

and effective It lessens workload and allows for seamless completion of all expense management processes, including request, verification, approval, and data analysis (Blog, 2022). One of the technological advancements that is currently thought to represent a new paradigm in education is mobile technology. Therefore, by utilizing software like mobile application on managing finances are a good way to teach financial literacy among undergraduates in UNIMAS.

2.3 Reviews on similar existing mobile application

Further information about each similar mobile application to the proposed project will be discussed in this chapter. As for the analysis, three existing mobile application that are close to my project had been selected to be reviewed. Three of the existing mobile application will be compared which are World of Money, Money Manager and Expenses and Finance Records. All three systems are financial literacy mobile application that teaches financial literacy, and these applications can be downloaded in Android Play Store.

2.3.1 World of Money

World of Money is one of the financial literacy mobile applications that provides financial contents for all ages category accordingly. This mobile application offers videos lessons that covers on the majority financial topics such as budgeting, taxes and paying for college. One of the strengths are the videos are bite-sized size that last around 2 to 4 minutes for better user engagement. Another feature is that it provides flashcards for user to learn more about information on finance according to their age category and topics. This is also convenient for the user to learn if they are unable to watch video at that the moment and it takes shorter learning time than video. Therefore, there are not many features in the application.

The weaknesses are the mobile application requires internet connection to be able to access the mobile application itself and the loading time for the videos might take depending on internet connection. In addition, another weakness is there are no hands-on tools or features like expenses tracker that helps user on learning to manage their finance.
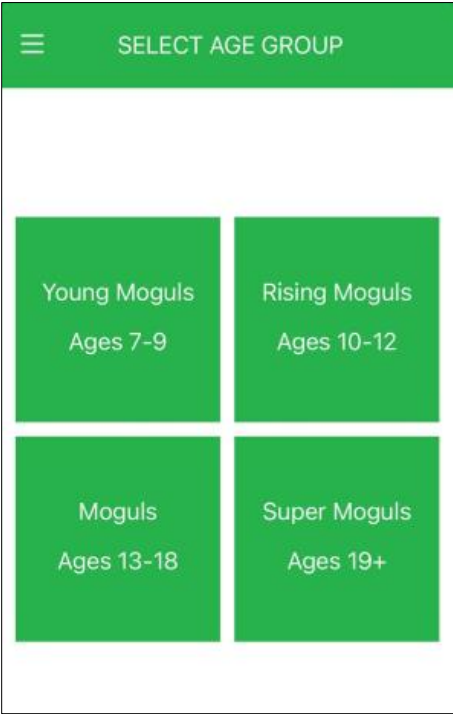
Figure 2.1: Categories based on age groups for financial literacy videos page
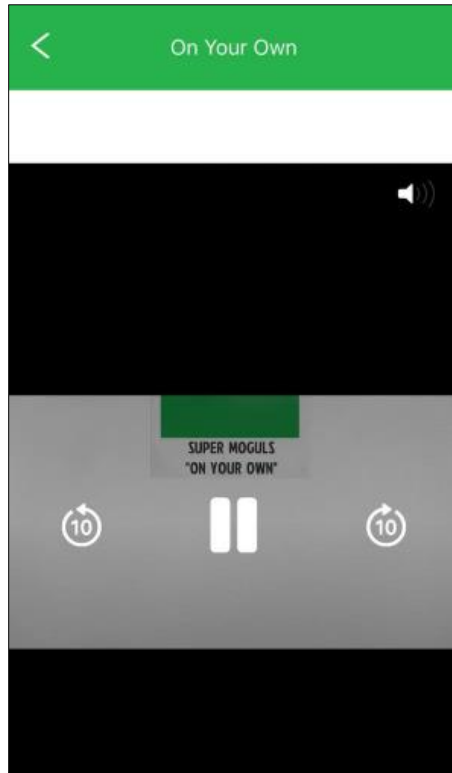
Figure 2.2: Bite-sized financial literacy video page
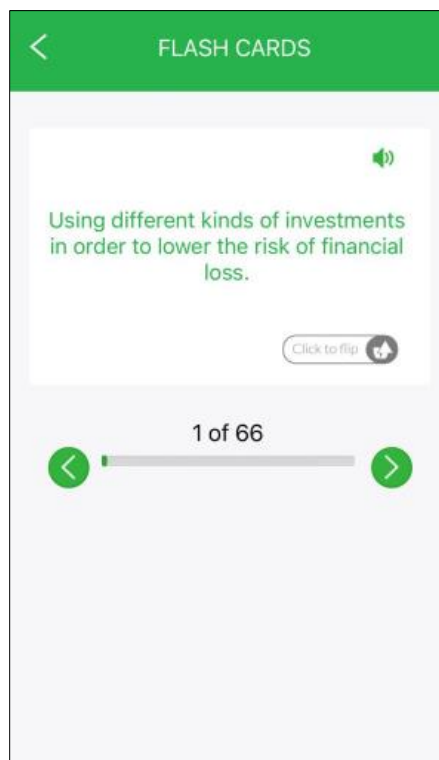
Figure 2.3: Flashcards page

2.3.2 Money Manager and Expenses

Money Manager and Expenses is a personal financial management mobile application. The strength of this mobile application is it is able to view, create, update, and delete expenses that helps user to record their finances. Another strength is the users are able to view the charts on the expenses so they can analyse their spendings and make a financial decision by the charts. There are also charts generated based on the expenses by period. Overall, the transaction records are display so that user able to track their transactions easily.

However, the weakness of this mobile application is there are no additional content for user to learn more on general financial literacy.
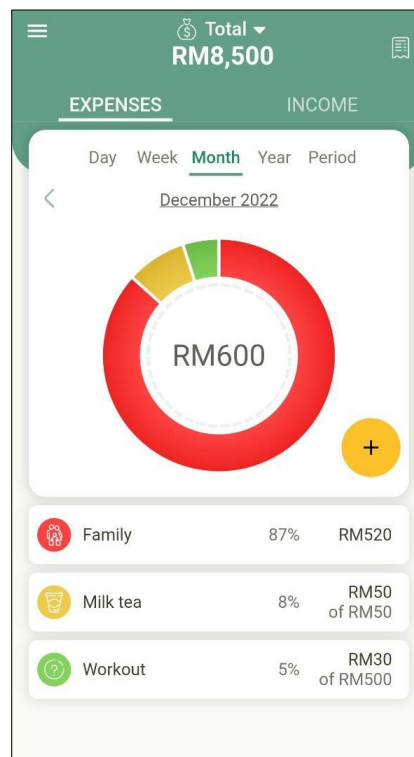
Figure 2.4: Money Manager and Expenses Homepage
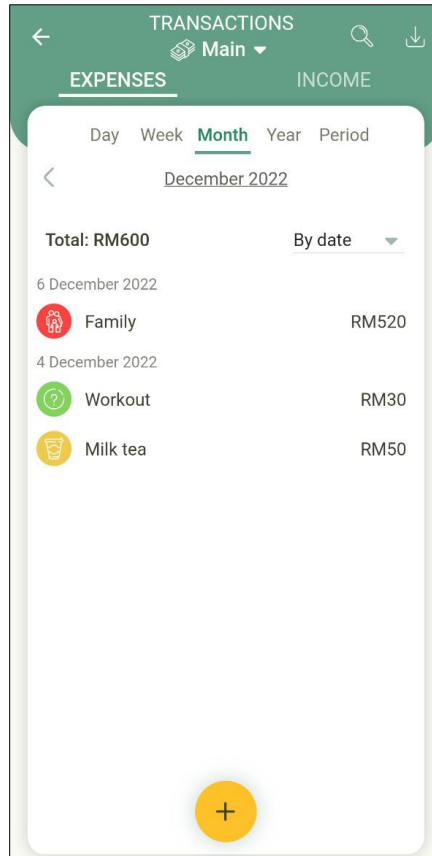
Figure 2.5: Transaction Records Page
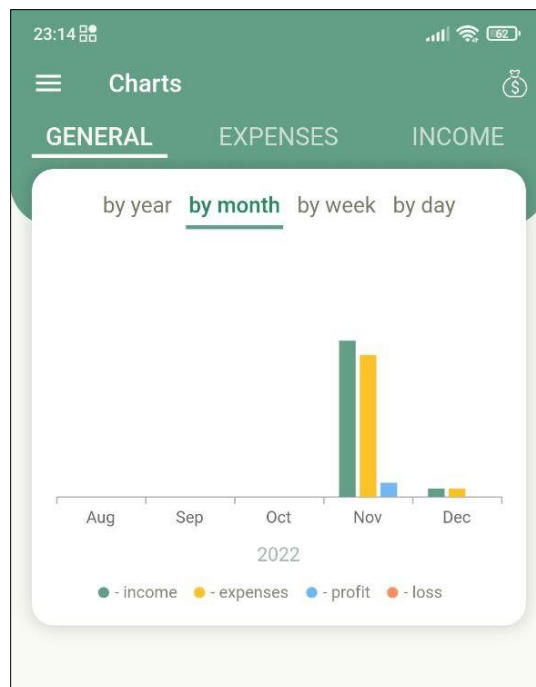
Figure 2.6: Charts Page
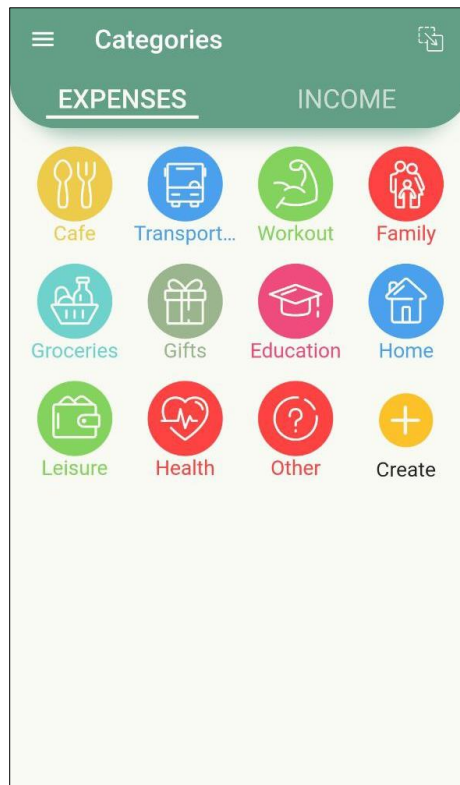
Figure 2.7: Categories page

2.3.3 Finance Records

Finance Records is personal financial management mobile application. The user interfaces are simpler than Money Manager and Expenses. The features are similar to Money Manager which are the view, create, update, and delete expenses, the charts, categories and view all transaction records.

The weakness of Finance Records is it does not have advance features such as searching and export records which it not convenient for the user.
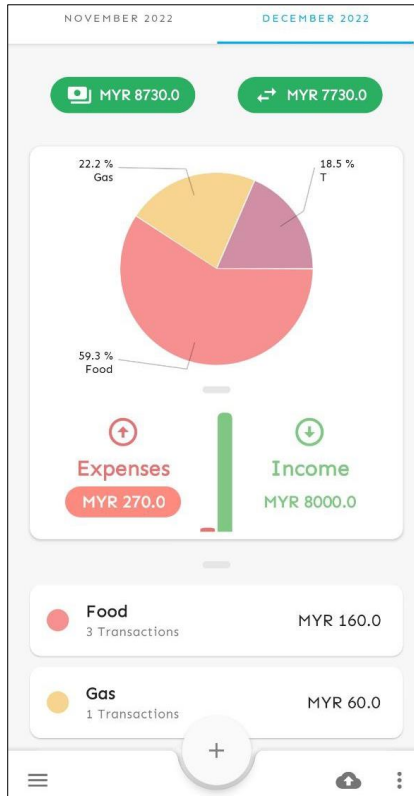
Figure 2.8: Expenses Page monthly
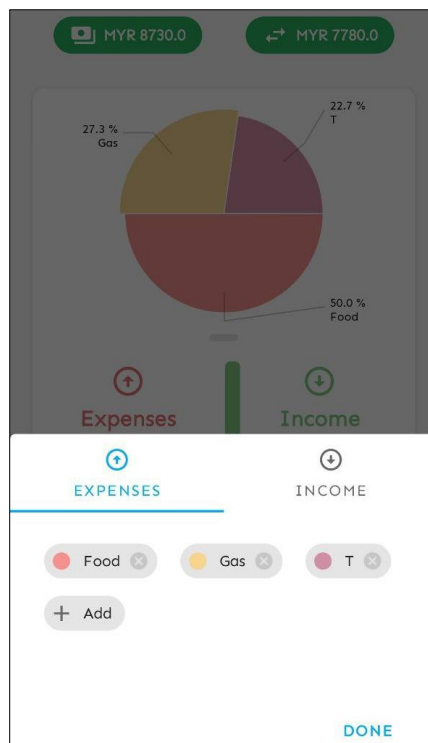
Figure 2.9: Manage categories page
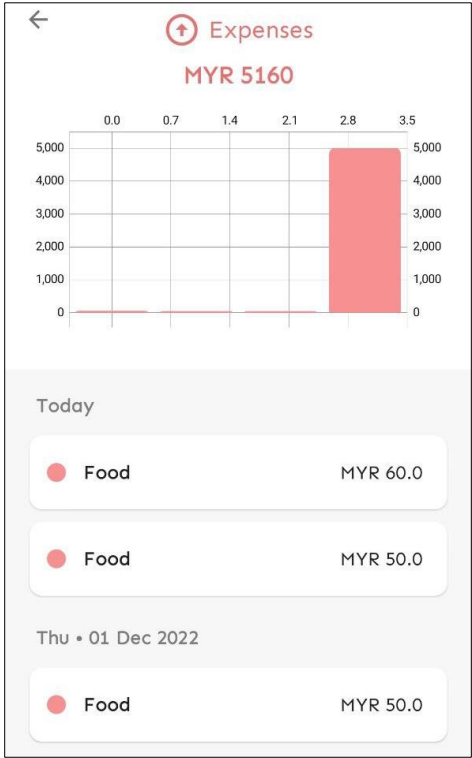
Figure 2.10: Expenses Graph with transaction records Page

2.4 Comparison Table

Features	Existing mobile application			Proposed mobile application
	World Of Money	Money Manager and Expenses	Finance Records	Financial literacy mobile application for UNIMAS undergraduates
Create, view, update, and delete on expenses	✗	✓	✓	✓
Display charts	✗	✓	✓	✓
View total amount balance left	✗	Carry forward balance left to the next month	No carry forward but view balance by monthly individually	View total expenses balance left by monthly
Set currency	✗	✓	✓	✗
Searching transaction records	✗	✓	✗	✓
Bite -sized video	✓	✗	✗	✓
Set notification for daily reminder	✗	✓	✗	✓
Flashcards	✓	✗	✗	✗

Download report	✗	✓	✗	✗

Table 2.1: Comparison between three existing mobile application and the proposed mobile application

2.5 Discussion

Table 2.1 shows a summary comparison of the features of the three mobile application under review. The features are derived from World of Money, Money Manager and Expenses and Finance Records. The comparison of features between the three reviewed mobile application is create, view, update, and delete on expenses, display charts, view total amount balance left, set currency, searching records, download report, set notification for daily reminder, flashcards, and bite-sized videos.

Three of the mobile application teaches financial literacy. World of Money is a financial literacy education mobile application while Money Manager and Expenses and Finance Records are personal finance management mobile application. World of Money provides educational content learning such as flashcards and bite-sized videos only while Money Manager and Expenses and Finance Records has no financial education learning content. On the other hand, Money Manager and Expenses and Finance Records allows user to create, view, update, and delete on expenses, display charts, and set currency. Money Manager and Expenses will carry over any remaining balance from the previous month into the current month when showing the total amount of balance left, but Finance Record does not, although the total balance can still be viewed by monthly separately. The use of categories allows users to manage their expenses such as food, salary, groceries, and many more, saving time by selecting a category rather than inputting the details. Money Manager and Expenses are the only mobile application that are able to set notification for daily reminder among the three existing mobile application. Lastly, searching records is a great feature because it saves time when going

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through records, and downloading reports is useful when saving it to a mobile application for record-keeping or other purposes. Nevertheless, except Money Manager and Expenses, the other two mobile applications do not support searching and downloading reports.

Therefore, the features from the existing mobile application to be adapted into the proposed mobile application is the create, view, update, and delete on expenses because it allows users to easily track and manage their expenses, which is essential for creating and sticking to a budget and gaining a better understanding of their financial situation. The second feature is displaying charts. This feature allows users to easily visualize their expenses and gain a better understanding of their financial situation. Displaying charts can provide a more intuitive and interactive way for users to view and analyse their financial, making it easier to identify patterns and areas for improvement. Next feature that adapted from the existing mobile application is to view the total amount of expenses by monthly. This feature is important as it allows users to easily track their current financial status and understand their available funds at any given time. This information is crucial for budgeting and making financial decisions, as users need to know how much money they have available to them at any given moment. Next feature to be adapted to the proposed mobile application is searching for records. This feature allows users to easily find, and access specific transactions and it is useful for users who want to quickly find a specific transaction record. The next feature to be adapted is bite-sized video. This feature allows users to teach financial literacy which helps user to learn more about financial literacy concepts such as budgeting, emergency funds, investment and so on. The last feature to be adapted from the existing mobile application to the proposed mobile application is set notification for daily reminder. This feature set notifications for daily reminders to input expenses in the proposed mobile application to help users to stay organized and ensure that their financial data is accurate and updated to the latest transactions.

2.6 Summary

As a conclusion, this chapter discussed the literature review on three reviewed mobile application which are World of Money, Money Manager and Expenses and Finance Records. The reviews are based on the features of the mobile applications. Following that, a comparison of three reviewed mobile applications was conducted. In reviewing process, several weaknesses and advantages were discovered. The proposed mobile application will help students gain a better understanding of their personal finance and make more informed decisions about their money. Overall, the features will be developed in the proposed mobile application to teach financial literacy among undergraduate students in UNIMAS by providing a platform for managing their expenses.

CHAPTER 3 : METHODOLOGY

3.1 Introduction

This chapter will discuss in detail on each phase of the Rapid Application Development (RAD) methodology that will be used in the development of the proposed mobile application. The proposed mobile application will be described in detailed based on the findings of the previous chapter's literature review. First, the RAD methodology development phases are requirement planning, user design, construction, and cutover phase. In the requirement planning phase, there are 4 sub sections which will be broken down into user requirements, functional requirements, non-functional requirements and hardware and software requirements. For user design phase, the section consists of analysis and design which is prototype, refine and test phase such as data flow diagram, entity relationship diagram, data dictionary, wireframes, navigation flow and controls and testing design. Figure 3.1 shows the main phases in the Rapid Application Development (RAD) model.
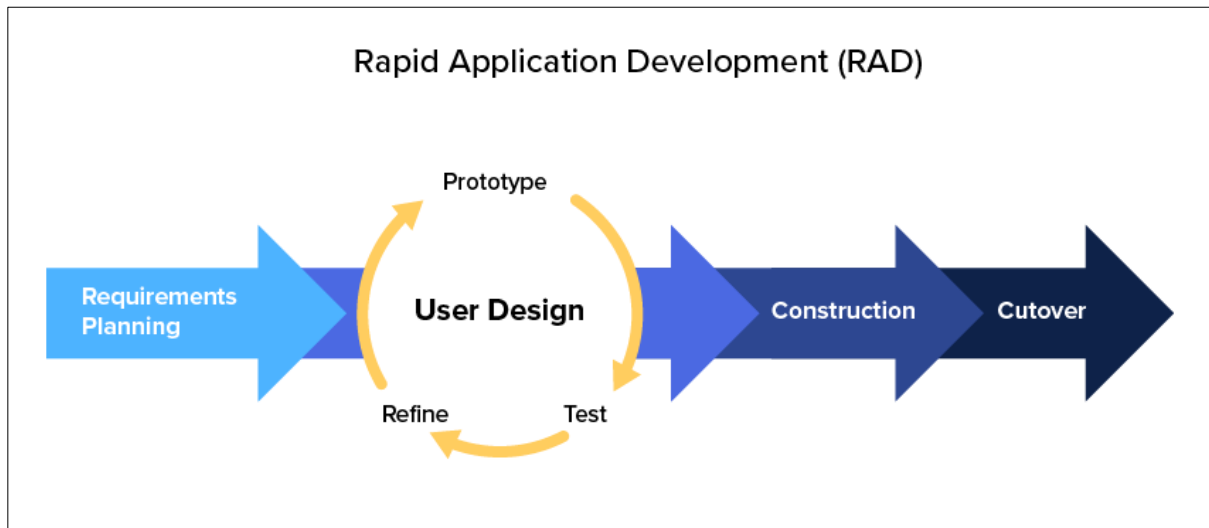
Figure 3.1: RAD methodology development phases ("Rapid Application Development (RAD) Model: An Ultimate Guide For App Developers in 2022," 2022)

3.2 Methodology

The methodology to be carried out on this proposed project is Rapid Application Development (RAD). RAD methodology is an incremental, iterative approach that prioritises speed and flexibility. It aims to shorten the time by cutting down on the upfront design and planning phases and by providing working prototypes as soon as possible. The project can be broken down into smaller parts and it is easier to keep track of the project's progress. In addition, RAD takes a shorter time to complete and able to produce a quality project compared to waterfall modal. The RAD methodology phases for the proposed mobile application are requirement planning, user design, construction, and cutover phase. Figure 3.2 shows the methodology phases for the proposed mobile application.

3.2.1 Requirements Planning

In this phase, the requirements gathering process will be collected with questionnaires by using Google Form to the users to understand the basic requirements needed. The tools for the questionnaires. As the proposed mobile application's target users are UNIMAS undergraduate students, 3 users from each faculty will be the users on answering the questionnaires. Once the requirements have been collected, it will provide better understanding during development process and to continue on next phases of the methodology.

3.2.2 User Design

This phase consists of 3 sub phases which is prototype, refine and test. After the taking collecting requirement, the requirement collected will use to build the prototype. The tool to be used to build the prototype is Adobe XD and the technique used is user interface (UI) prototyping. After building the prototype, testing will be implemented by using questionnaires

to the users. Next, to refine based on the testing, amendments will be made according to the user's feedback on the prototype testing by using Adobe XD tool.

3.2.3 Construction

In construction phase, the development of the proposed mobile application will be implemented based on the user's requirements gathered and implemented based on the prototype design finalized. The tools to be used to develop the mobile application are Android Studio with Java and Kotlin programming language, Firebase as database and the technique will be implementing Object-Oriented Programming.

3.2.4 Cutover

The final phase of the methodology will be training users on how to use the mobile application and testing will be conducted to test the usability of the mobile application. The technique used will be questionnaires and observations. Documentation such as user manual will be used to guide the users on how to use the mobile application.
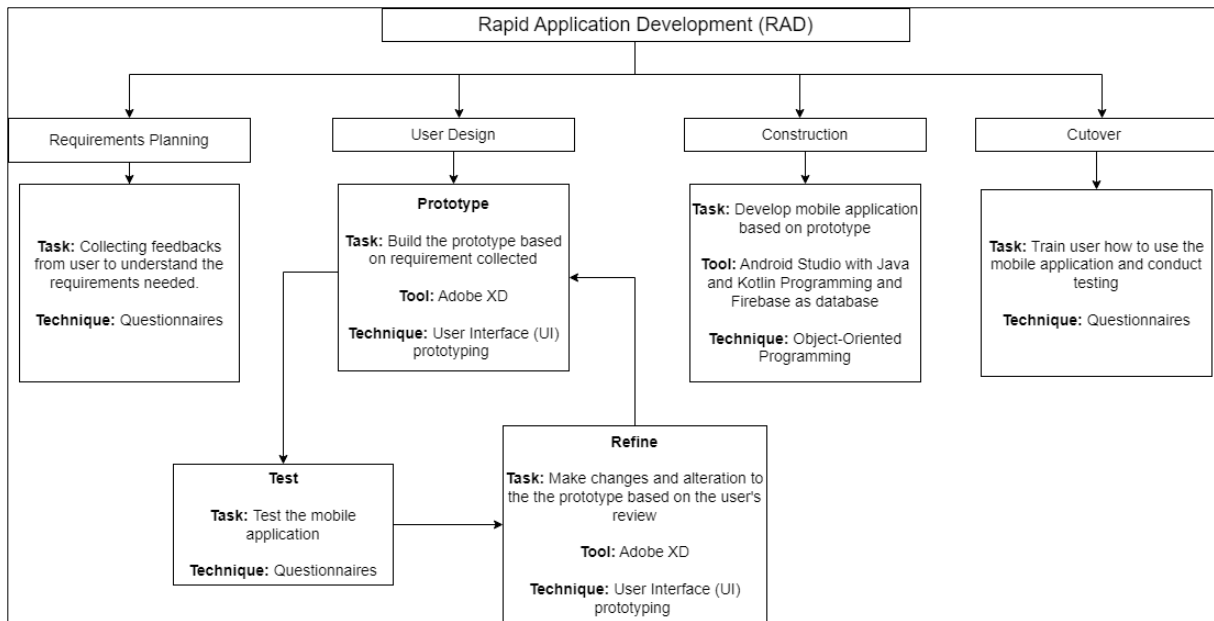
Figure 3.2: RAD methodology development phases for the proposed mobile application

3.3 The Proposed Work

In the previous chapter, the analysis from literature review conducted with three mobile applications which is financial literacy mobile application that has similar features with the proposed mobile application that can teach financial literacy to UNIMAS undergraduate students. With the analysis, the proposed mobile application will be implementing tracking expense tool on teaching financial literacy to the target users. With this feature, it allows user to select the category of expenses such as food, transportation, rent, utilities, education, groceries, and other categories. This could help users learn to understand their overall financial situation. Next, the proposed feature is to display the detailed analysis chart which be suitable that allows the user to check their spending patterns over time which will be helpful on understanding their financial situation and identify the expenses that they might overspend. Next proposed mobile application feature is managing transaction records such as search, update and delete. This feature allows users to easily find, and access specific transactions and to manage their transactions accordingly. The next feature is to view total amount of expenses left by monthly. This feature is important as it allows users to easily track their current financial

status and understand how much they have spent in total by that month. Another feature is able to set notification for daily reminder. This feature set notifications for daily reminders to input expenses in the proposed mobile application to help users to stay organized and ensure that their financial data is accurate and updated to the latest transactions. Moreover, videos are also available in the proposed mobile application for user to learn budgeting and financial literacy topics. Last but not least, the quiz function is intended to access the user's understanding of financial literacy concepts that user learnt from the financial literacy videos from the mobile application or previous understanding on financial literacy. Overall, the proposed mobile application can be useful for teaching financial literacy to UNIMAS undergraduate students by learning how to manage their finances efficiently and making wise financial decisions based on their spendings. The proposed mobile application is an effective way to teach financial literacy because it includes the features that a similar mobile application required.

3.4 Requirements

The requirements planning and analysis for the proposed mobile application is involved user requirements that gathered through questionnaires, and functional requirements, non-functional requirements, and hardware and software requirements.

3.4.1 User Requirements

User requirements are important because they help to ensure that the final product meets the needs and expectations of the target users. By understand the needs and expectations of the users allows project's scope to be defined and ensure that the final product meets these requirements. It also enables in prioritising features by identifying the essential features of the mobile application that are most useful to users. Therefore, user requirements are crucial in the

proposed project because it helps to ensure that the final product meets the needs and expectations of the target users. The gathering data technique used were defined in detail using questionnaire.

3.4.1.1 Analysis on Questionnaire

A questionnaire is conducted 30 respondents by using Google Form to the target users which are the UNIMAS undergraduate students. As there are a total of 10 faculties in UNIMAS, 3 students from each faculty were chosen as the respondents so that it the result will be more accurate into achieving the objective of this proposed project. Questionnaire were used because interviewing each user would be time consuming due to the large number of people who needed to be interviewed. Figures below show the analysed data from the questionnaire, which is presented using various types of charts.

3.4.1.1.1 Demographic

Based on Figure 3.3 to Figure 3.7, it shows the demographic profile of the respondents from UNIMAS undergraduate students. Figure 3.3 and 3.4 shows that all respondents are UNIMAS undergraduate students, and 3 respondents from each faculty were the respondents. Figure 3.5 shows that that 76.7% of the respondents are female and 23.3% of them are male. Figure 3.6 shows that 17 respondents have monthly income below RM600, 9 respondents that has more than RM1101 monthly income, 3 respondents have between RM801 - RM1000 and only 1 respondent has monthly income range between RM601 - RM800. Figure 3.7 shows that most of the respondent's age range from 22 - 23 years old which consists of 19 respondents, followed by 9 respondents who were 20 - 21 years old and only 2 respondents were 24 years old and above. There is no respondent's age below 19 years old and below.
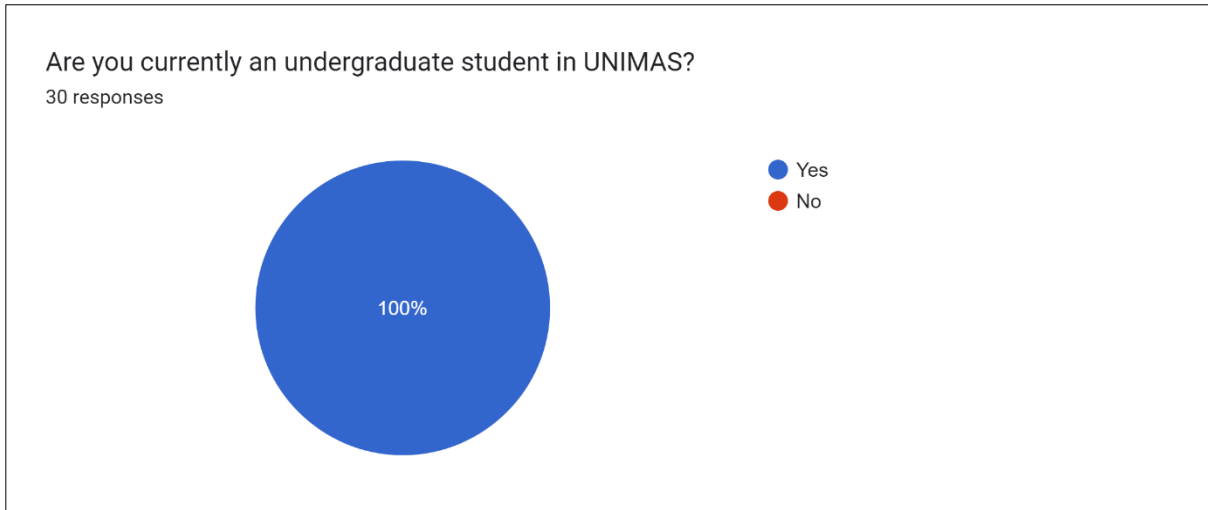
Figure 3.3: Respondent's educational level analysis
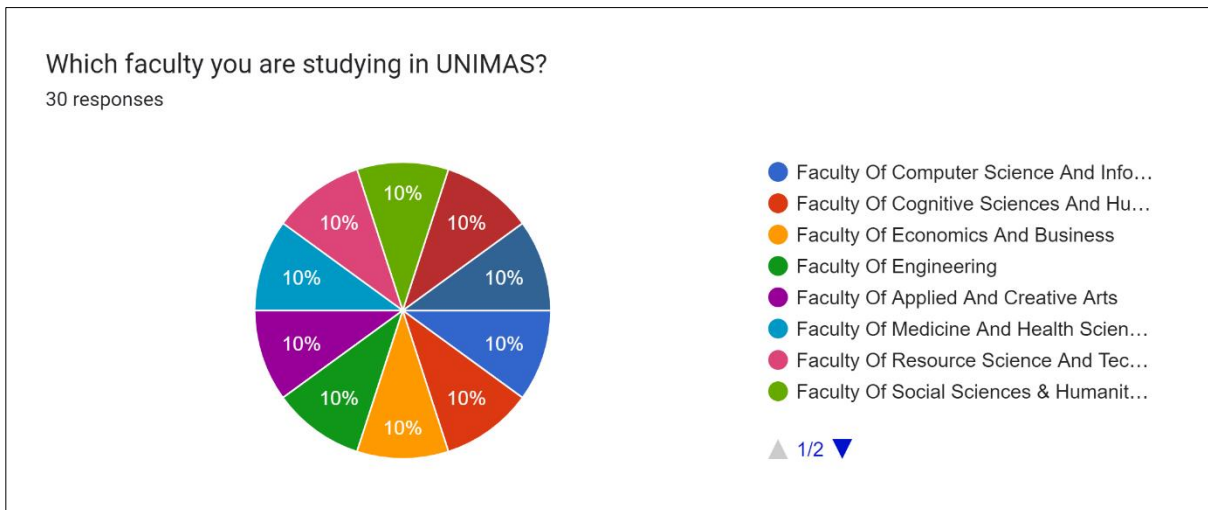
Figure 3.4: Respondent's faculty analysis
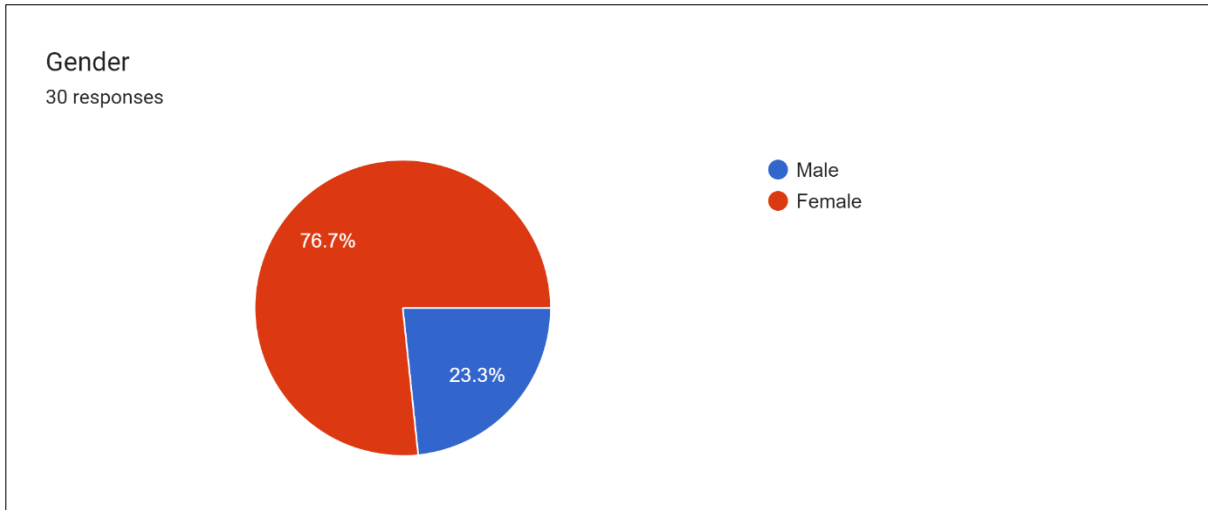
Figure 3.5: Respondent's gender analysis
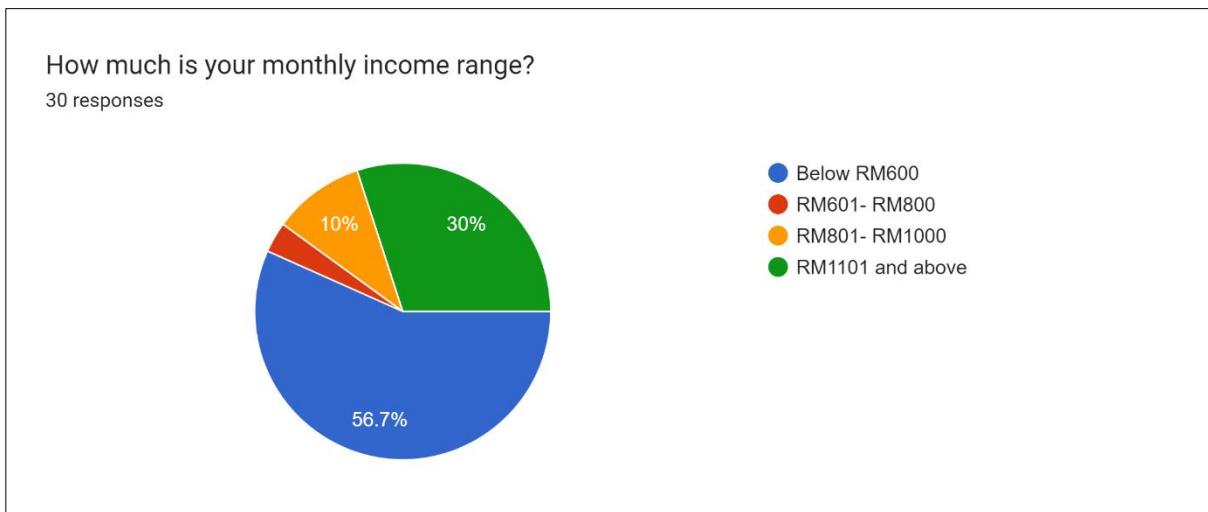
Figure 3.6: Respondent's monthly income range analysis

What is your age group?
30 responses

- 19 years old and below
- 20 - 21 years old
- 22 - 23 years old
- 24 years old and above

63.3%

30%
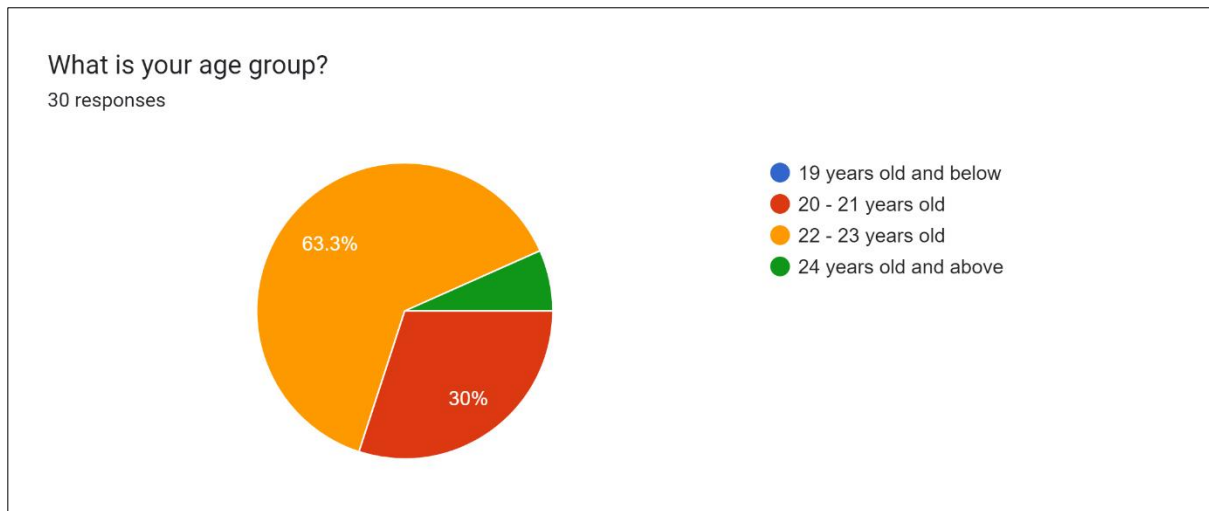
Figure 3.7: Respondent's age group analysis

3.4.1.1.2 User Perspective

Next, the following figures shows analysed result of the user perspective on the financial literacy mobile application. The linear scale 10 indicates the most agreed to the statement while scale 1 indicate being the least agreed to the statement.

In Figure 3.8, the data shows 46.7% being the most respondents that has scale 5 which is moderate level of financial literacy while 16.7% has the scale of 2, 10% is scale 6 and scale 7, 6.7% is scale 3 and others 3.3% were scale 1,4 and 6. There were no respondents on scale 9 and 10.
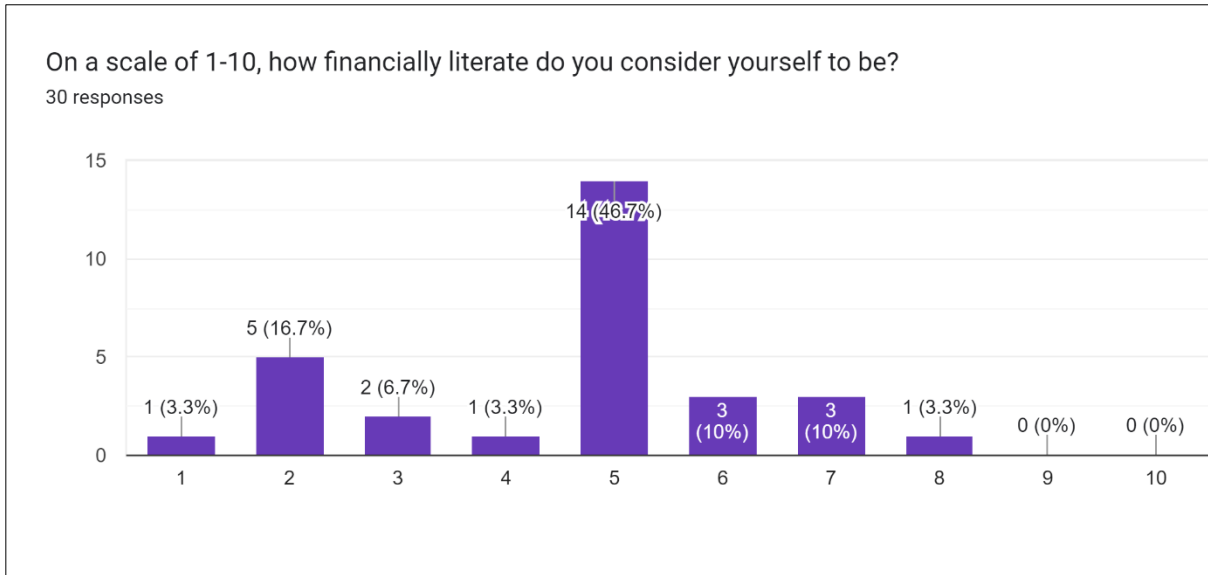
Figure 3.8: Analysis on respondent's financial literacy

Figure 3.9 shows that the confident level on respondent's financial decision ability. 40% of the respondents has scale 6, 23.3% has moderate scale, 13.3% is scale 7, 10% is scale 4, 6.7% is scale 3 and 6.7% is scale 8.
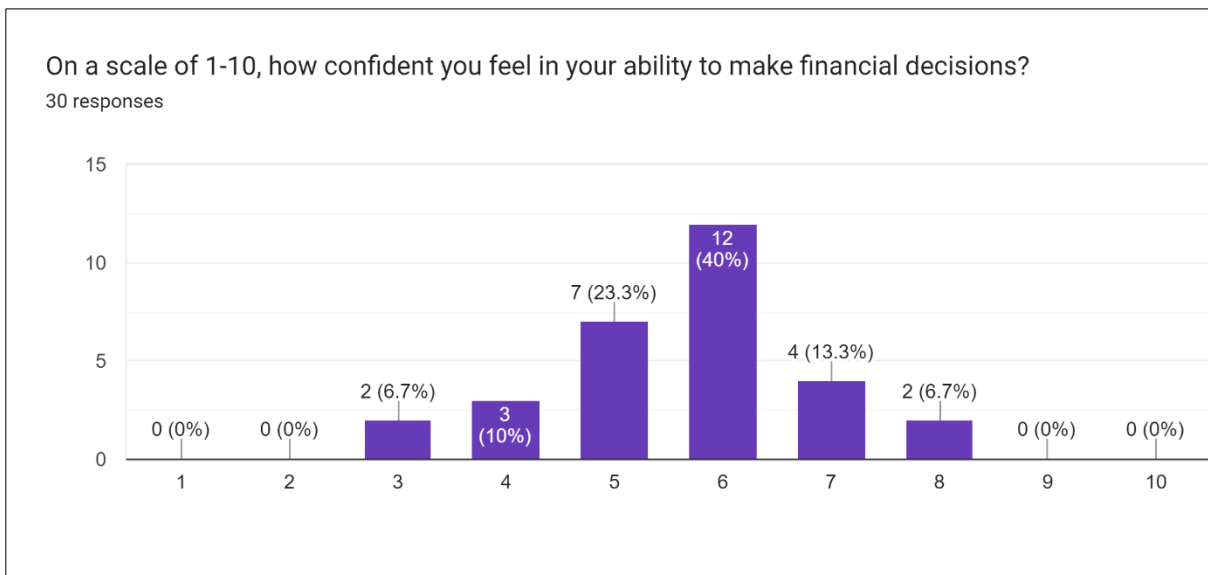
Figure 3.9: Analysis on respondent's financial decision ability

Based on Figure 3.10, it shows that 70% respondents have ever experienced financial problems while 26.7% has never experienced any financial problems and 1 respondent has stated in others as overspending as the financial problem.
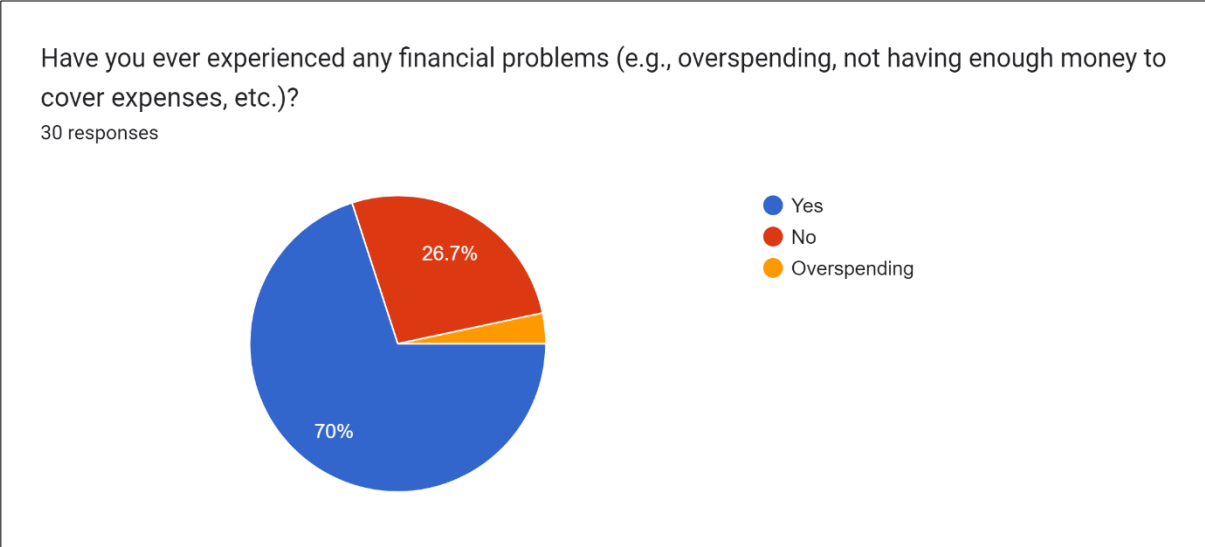
Figure 3.10: Analysis on respondent's experience on financial problem

Figure 3.11 shows the 53.3% of the respondents have never use mobile application to manage their expenses while 46.7% have.
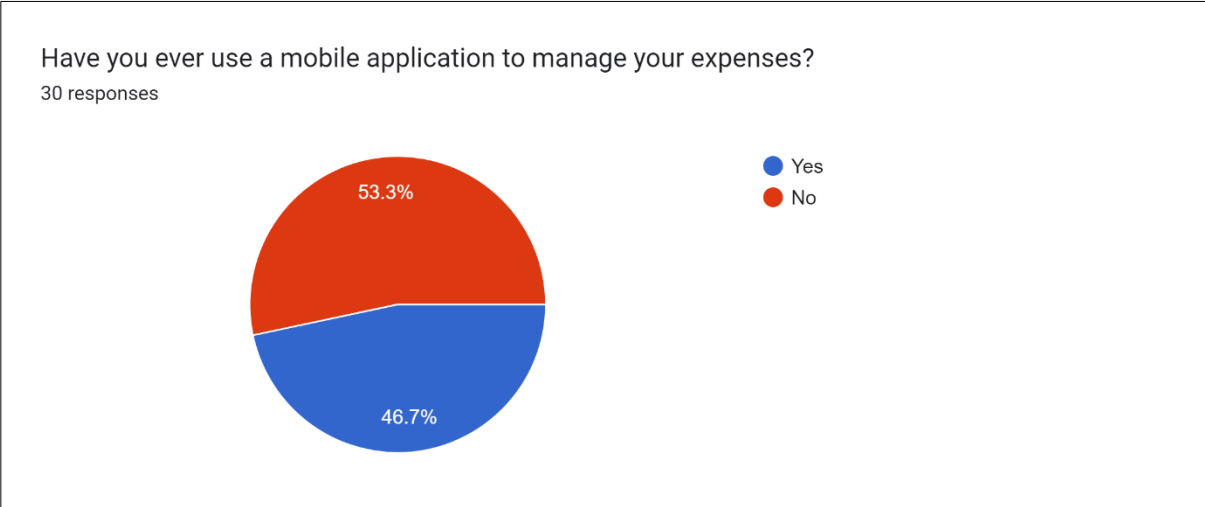
Figure 3.11: Analysis on respondent's experience on using mobile application to manage expense

Figure 3.12 shows analysis on the respondent's current method on managing expenses. The highest percentage which is 46.7% of the respondents does not record their expenses, 30% currently uses expense tracker mobile application, 16.7% write manually on a paper or notebook, 6.7% use default memo or note in their devices and only 1 respondent who uses expense tracker spreadsheet template in Excel to manage their expenses.
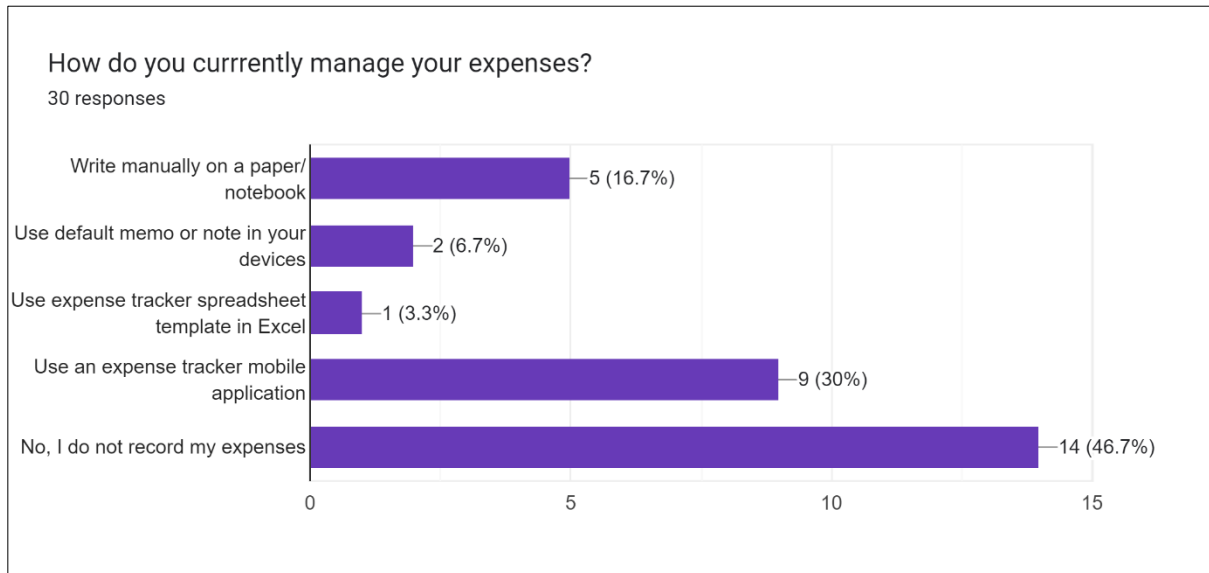
Figure 3.12: Analysis on respondent's current method on managing expenses

3.4.1.1.3 User Requirement

The following figures shows analysed result of the user requirement on the financial literacy mobile application.

In Figure 3.13, 63.3% of the respondents preferred on both graphical and textual report, 30% prefers graphical report while only 6.7% of the respondents prefers textual report.
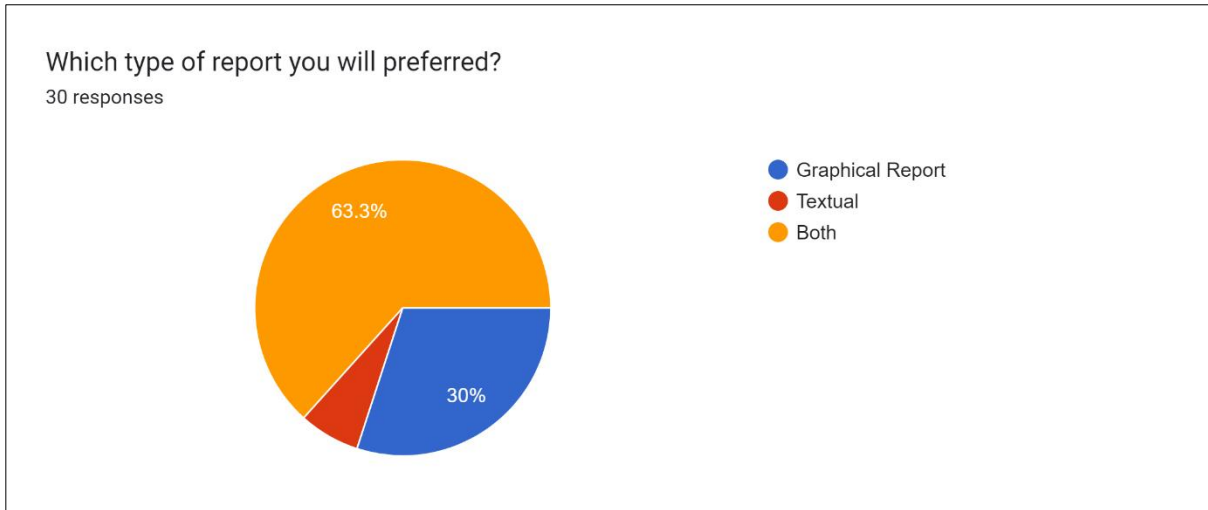
Figure 3.13: Analysis on respondents on report preferences

Based on Figure 3.14, the most expense categories that likely to be saved is food category that consists of 86.7% (26 respondents) , 80% (24 respondents) likely to save transportation, groceries and entertainment category, 63.3% (19 respondents) likely to save education and rent category,60% (18 respondents) likely to save bill category and only 3.3% (1 respondent) added on others category which is gift category.
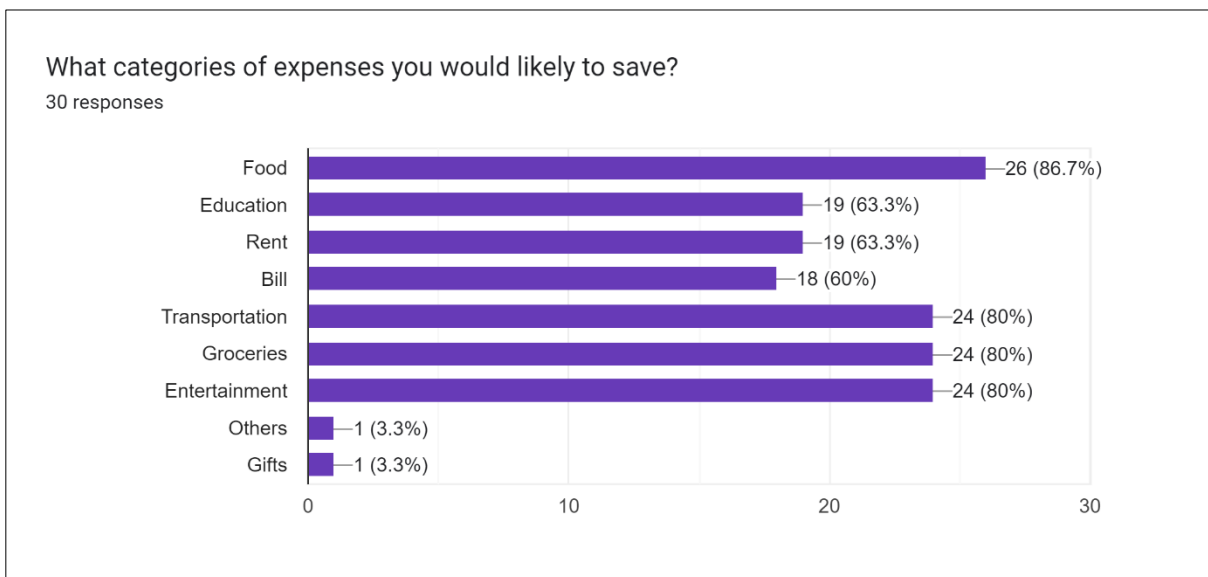
Figure 3.14: Analysis on respondents on expenses categories that they would likely to save

Based on Figure 3.15, the most income categories that likely respondents would save is pocket money from guardians which is 96.7% (29 respondents), 66.7% (20 respondents) would prefer loan category, 60% (18 respondents) likely to save salary, 56.7% (17 respondents) likely to save scholarship category and only 3.3% (1 respondents) likely to save on investments.

What categories of income you would likely to save?
30 responses

Category	Value
Salary	18 (60%)
Pocket money from guardians	29 (96.7%)
Scholarship	17 (56.7%)
Loan	20 (66.7%)
Investment	1 (3.3%)
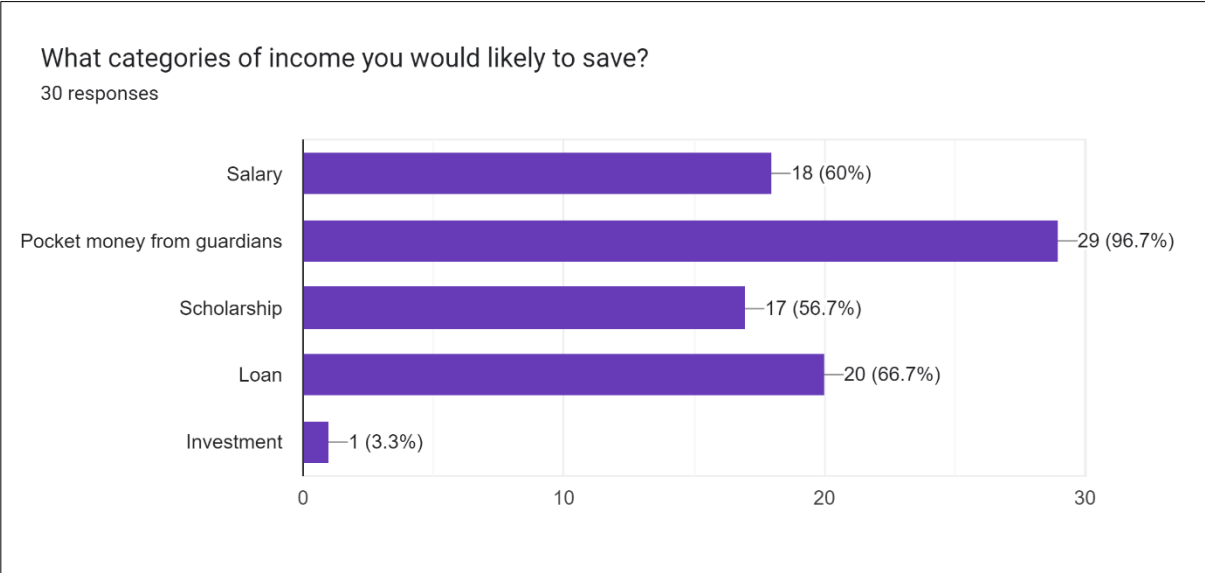
Figure 3.15: Analysis on respondents on income categories that they would likely to save

Figure 3.16 shows the analysis on respondents on likeliness on using this mobile application. The scale indicator is scale 5 being the totally agree and scale 1 being totally disagree. 66.7% (20 respondents) being the totally agreed, 26.7% (8 respondents) agreed and only 6.7% (2 respondents) is neutral while there are no respondent voted for totally disagree and disagree.
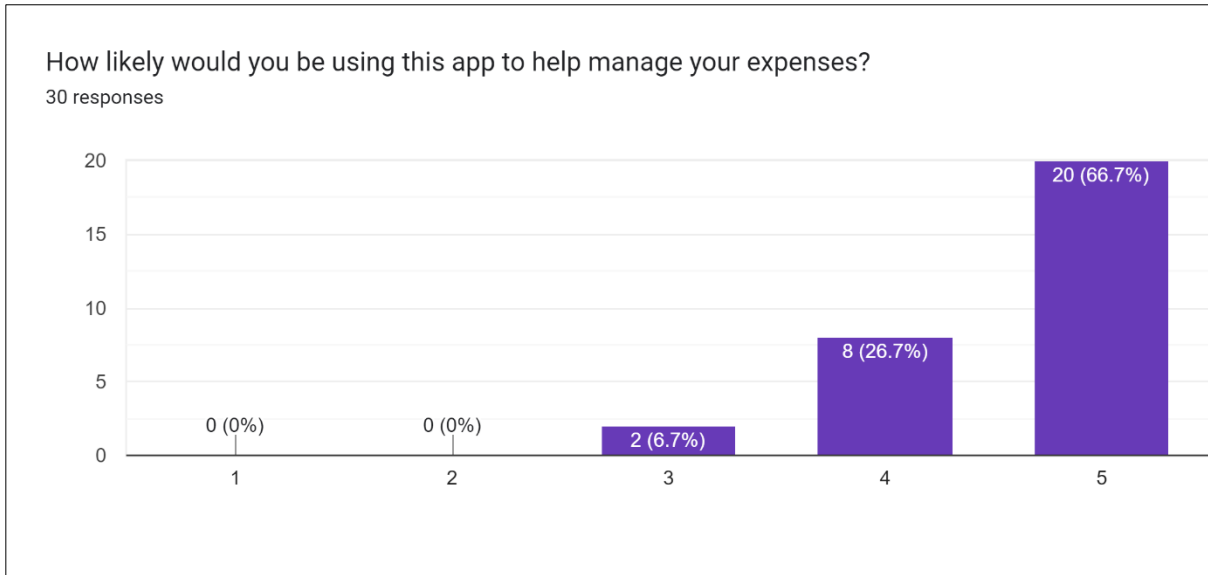
Figure 3.16: Analysis on respondents on likeliness on using this mobile application

Figure 3.17, 3.18 and 3.19 shows the analysis on respondents on willingness to learn more on managing expenses by using this mobile application, helpfulness on learning from this mobile application, and their agreement on increasement on teaching financial literacy skills overall respectively. All three figures show the majority voted agreed 96.7% (29 respondents) and 3.3% (1 respondent) voted on disagree.
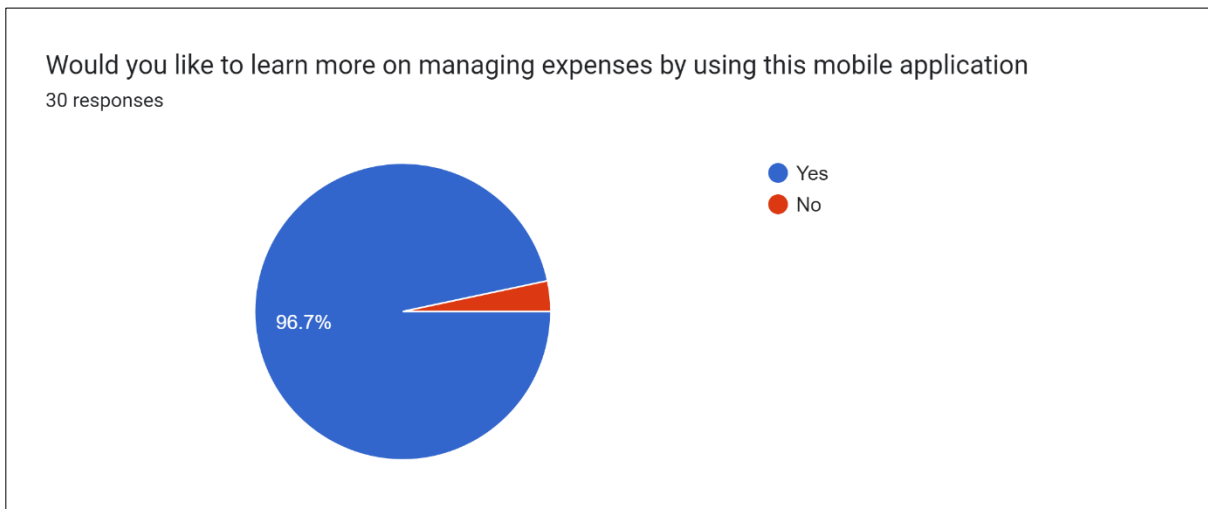
Figure 3.17: Analysis on respondents on willingness on learning from this mobile application
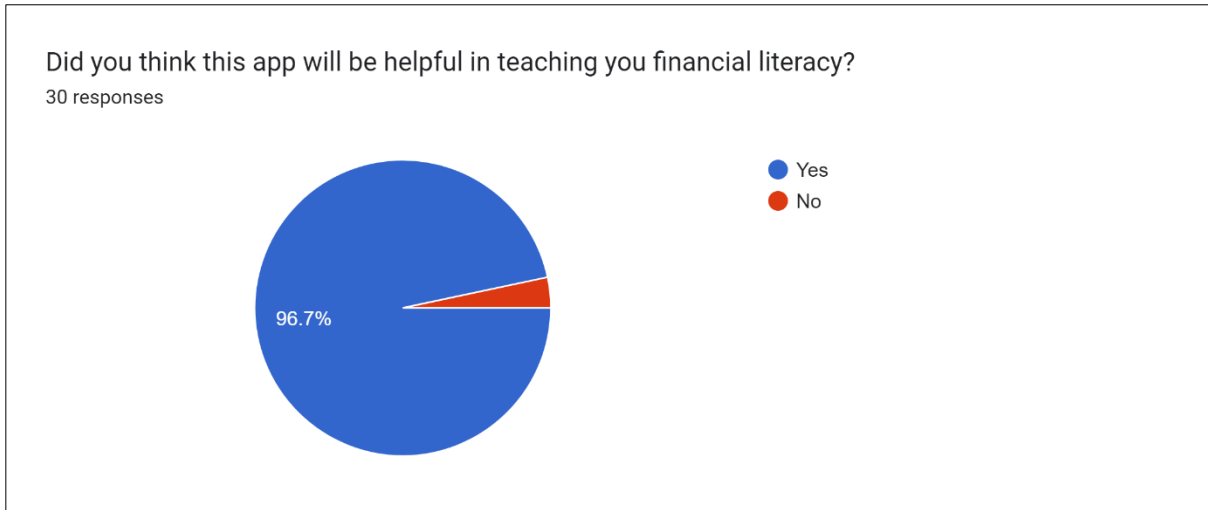
Figure 3.18 : Analysis on respondents on helpfulness on learning from this mobile application
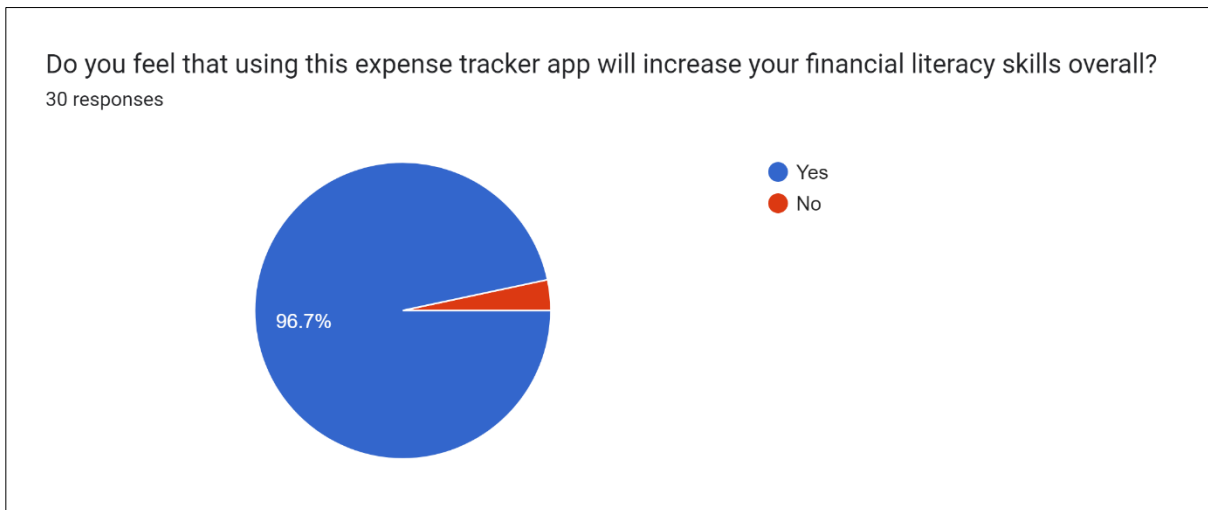
Figure 3.19 : Analysis on respondents on agreement on increasement on teaching financial literacy skills overall

Figure 3.20 shows the result whether they would you recommend this mobile application to others and their justifications. 28 respondents would recommend, 1 respondent does not recommend, and 1 respondent is not sure as they are not familiar with expense tracker mobile application features.

Yes because i never track my expenses before and it will be helpful
Yes because i have never track my expenses
Yes if it is convenient to use
Yes, this app provides clear statistics of one's financial conditions and net flows, it's helpful in finding what expenses can be reduced.
Yes because it will be a starting point for me and others to learn on managing money
Yes, it would be very beneficial in managing financial expenses.
Yes, so that we can save money more
Yes, money management is hard
Yes, will increase personal financial literacy skills
Yes because it helps people to track how much they spent
yes. it helps me to keep track on monthly expenses so that I can know whether I have overspend.
Yes because can track where my money is spent
Yes
Yes, because it will help us to gain more knowledge about financial
Yes , it is convenient
not sure, I not familiar with the features so far
Yes because it will be convenient by using app
Yes. Because i am using one myself and make me more financially organized
Yes if it truly helps me control my expenses and if it is free to use/cheap
Yes, because only with expense tracker we can know how much did we spent per month and in which categories we spent the most.
Yes, can improve the financial literacy skills together with friends or family members.
Yes because it helps to increase financial literacy to others and me
Yes because it helps to increase financial literacy
Yes. it helps me understand my financial situation
I will recommend if it can record my expenses well
Yes, because this app is so useful for our daily life.
Yes, because it is helping me well on tracking my daily expenses
No, because i dont familiar using this all so i will not recommend to other.
Yes, so that they can see what and how they spend their money and can manage them better
Yes, because it can be useful

Figure 3.20: Analysis on respondent's agreement on recommendation to others

3.4.2 Functional Requirements

This section will outline the functional requirements for the proposed mobile application. All of the functions are based on analysis of the data collected and the system must provide that are considered necessary by the end user ("Functional vs non functional requirements," 2020). Below listed are the functional requirements of the proposed mobile application:

1. The system should allow user to create their own accounts and log in.

2. The system should allow users to manually enter expenses into the mobile application including the amount, date, category, and note.

3. The system should allow users to view, edit and delete the expenses.

4. The system should allow users to search expenses.

5. The system should allow users to view the charts by period.

6. The system should allow users to view the videos.

7. The system should allow users to view the quiz results after finishing the quiz.

8. The system should allow users to receive notification on daily reminder to record expenses.

3.4.3 Non-functional Requirements

Non-functional requirements are the quality constraints that the system must meet in order to meet the project's objective ("Functional vs non functional requirements," 2020). Below listed are the non-functional requirements of the proposed mobile application:

1. When user save the add expense button, the expense should be added into the transaction records within 10 seconds.

2. From a usability perspective, the system shall use consistent design patterns such as familiar icons and buttons to help users with easier navigation.

3. The system shall provide a reliable result on displaying accurate process and data with minimal errors.

3.4.4 Hardware and Software Requirements

3.4.4.1 Hardware Requirements

The hardware requirement in the development phase are determined and showed in the following table. It shows the hardware requirements for the proposed project's development.

Hardware		Requirement	Description
Laptop	Processor (CPU)	Intel® Core ™ i5 and above	The specification that needed for laptop's processor is used to improve effectiveness in development of the proposed mobile application.
	Memory (RAM)	16 GB	The laptop has a storage up to 16GB RAM to ensure the performance of the mobile application during the development.
Mobile phone	Android Platform	Android Version 12.0 and above	Mobile phone that supports Android Version 12.0 and above will be used during development process for testing purpose.
	Processor (CPU)	1.6 GHz and above	It is used to support application and make sure it is working at faster rate.
	Internal Memory (RAM)	At least 1 GB	RAM is required at least 1 GB in mobile for installing APK and folders that will use in this application to avoid any frequent lagging issues or crashes and

			maintain a consistent performance overall.

<div align="center">Table 3.1: Hardware Requirements</div>

3.4.4.2 Software Requirements

      The software used for the development of the proposed project will be discussed and outlined in the following table.

Software	Description
Google Chrome	A web browser that is used to search information during development of proposed mobile application.
Android Studio	The development tool of the proposed mobile application will be using Android Studio. Android Studio is an integrated development environment (IDE) that enables you to develop Android operating system platform application ("What Does Android Studio Mean?," 2019). Android studio is easy to use and most importantly it includes debugging which allows to find and fix code errors to ease the process of debugging. It also includes an emulator for testing your app on a virtual device of troubleshooting.
Java and Kotlin	Since the IDE will be using Android Studio, the IDE supports both Java and Kotlin programming language. Both programming language were chosen as the programming language developing the proposed Android mobile application. By utilizing both languages within the same development environment, the compatibility brings numerous advantages.

	Seamless integration Java libraries into Kotlin projects will ensure smooth interoperability between the two languages (Makhija, 2023).
Firebase	Firebase is used as the proposed project's backend. Firebase is used for data storage as backend function for the proposed mobile application. It is a NoSQL database application that stores data and information in JSON-like document format. It is a popular option among developers because it combines several useful services into a single package and is simple to integrate with other Google services ("What is Google Firebase and how to use it for application development?," 2022).
Adobe XD	A tool in designing User Interfaces (UI) prototypes. Adobe XD is used to create prototypes to test the functionality of the overall mobile application. It enables testing and refining the logic prior to beginning the development phase, assure that the proposed product works as expected ("What is Adobe XD?," 2022).

Table 3.2: Software Requirements

3.5 Analysis and Design

In this subsection, analysis and design which used to define the overall system requirements will be explained and few diagrams were included to further describe in detail such as Context Diagram, Data Flow Diagram (DFD), Entity Relationship Diagram (ERD), Wireframes, and Flowchart Diagram.

3.5.1 Data Flow Diagram

Data Flow Diagram (DFD) refers to the information flow of a system or process. It also provides information about the inputs and outputs of each entity as well as the process itself. Data flow diagrams are widely used because they aid in visualising the significant steps and data involved in software-system processes ("What is DFD(Data flow diagram)?," 2022)

3.5.1.1 Context Diagram

A context diagram depicts the relationship between a system and external entities in the scope of interface design. A context diagram is intended to represent the high-level process of a Data Flow Diagram signifies the financial literacy mobile application for UNIMAS undergraduate students. In Figure 3.21, the process 0 indicates that the Financial Literacy Mobile Application for UNIMAS undergraduate students while user is the external entity. The data flow for the user and the mobile application is display detailed analysis chart, display videos, send notification on daily reminder, user login details, manage expenses, and manage quiz.
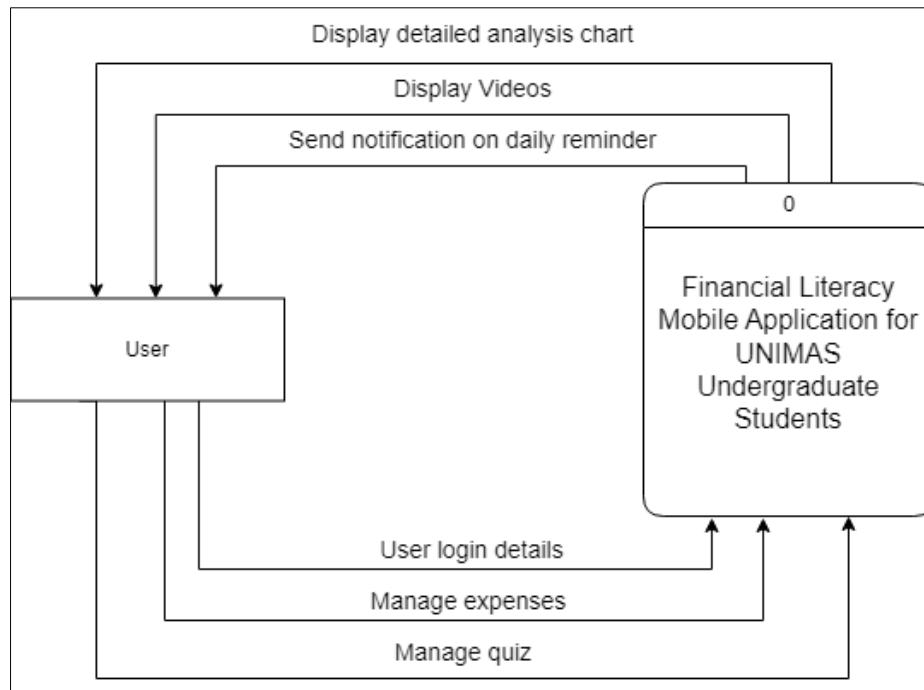
Figure 3.21: Context Diagram

3.5.1.2 Data Flow Diagram (DFD) Level 0

Figure 3.22 shows the main processes within the Financial Literacy Mobile Application for UNIMAS undergraduate students. There is one external entity involved which is the user. For Process 1.0, user is required to have enter the login details in order to login to application and verified with the data inside the "User Data" data store. After the verification, the user login verification status will be return back to the user. When user add new expense request, Process 2.0 will then allow user to add in new expense and the expense details will also be saved into the "Expense Data" data store. For process 3.0, when user enable the notification, the detail will then be verified inside the "Notification Data" data store. After the verification, the notification verification status will be return back to the user. In Process 4.0, users are allowed to request to manage quiz, it will access the "Quiz Data" and data store to get the quiz results. Lastly, in Process 5.0, the user able to display the video and video details from the data that is saved into "Video Data" data store.

43
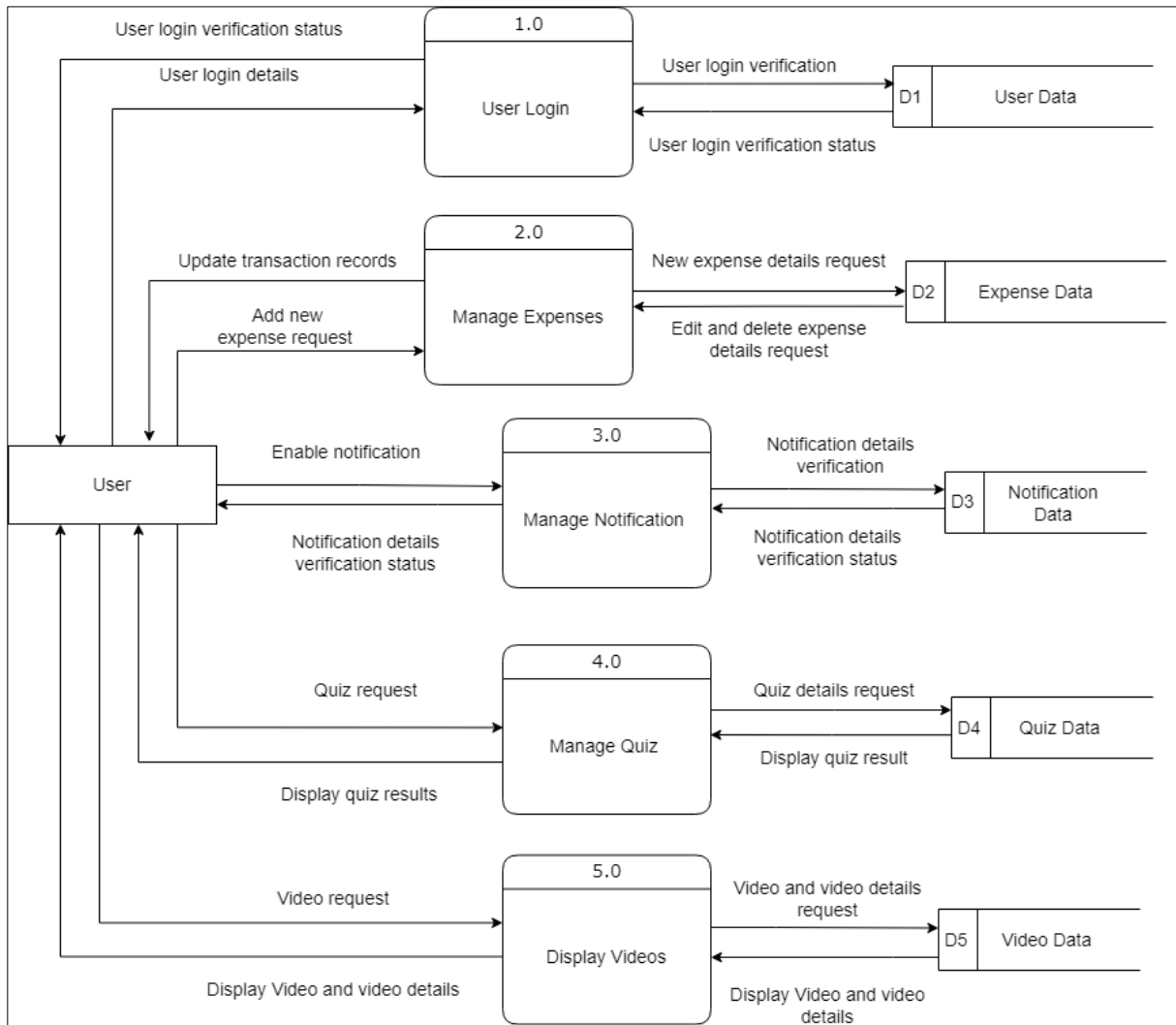
Figure 3.22: Level 0 Diagram

3.5.1.3 Data Flow Diagram (DFD) Level 1 For Process 1.0

Process 1.1 get user login details provided by the user in login page and send the process to 1.2 for user login verification. Process 1.2 will access the "User Data" data store to check the verification of the user and return user login verification status to the user to show the user login validity.

44
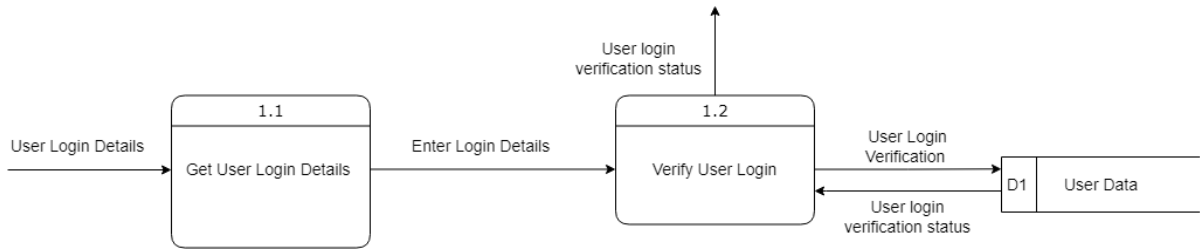
Figure 3.23: Level 1 Diagram for Process 1.0

3.5.1.4 Data Flow Diagram (DFD) Level 1 For Process 2.0

In process 2.1, user adds new expense request. Adding new expense request will go into Process 2.1. Then, to edit existing expense details, the request will be sent to process 2.2 and do searching expense by accessing "Expense Data" data store. The selected expense data will then go into Process 2.3 for updating details.
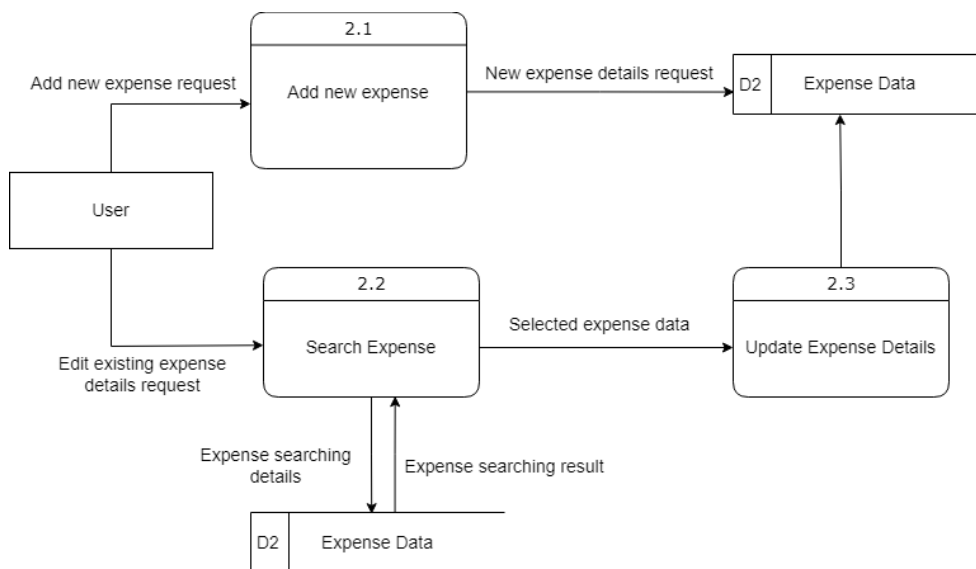
Figure 3.24: Level 1 Diagram for Process 2.0

3.5.1.5 Data Flow Diagram (DFD) Level 1 For Process 3.0

Process 3.1 get notification details provided enabling the notification and send the selected notification details to process 3.2 for notification details verification. Process 3.2 will access the "Notification Data" data store to check the notification verification details status and return notification verification status to the user to show the status to the user.
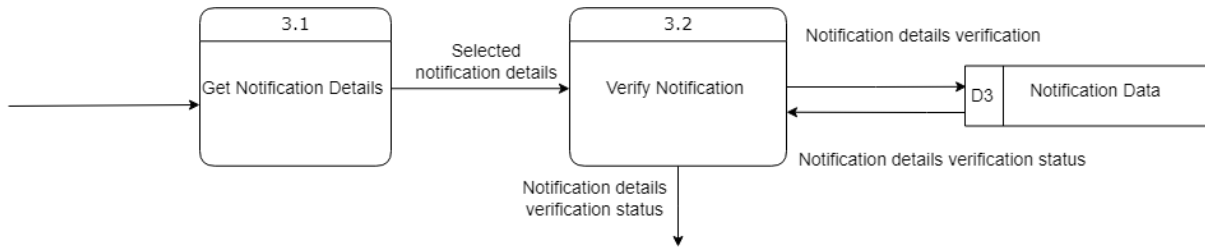
Figure 3.25: Level 1 Diagram for Process 3.0

3.5.1.6 Data Flow Diagram (DFD) Level 1 For Process 4.0

Process 4.1 allows user to select quiz answers and displays the quiz status back to user. In process 4.2, the correct quiz answers will be displayed the filtered correct quiz answers to the user.
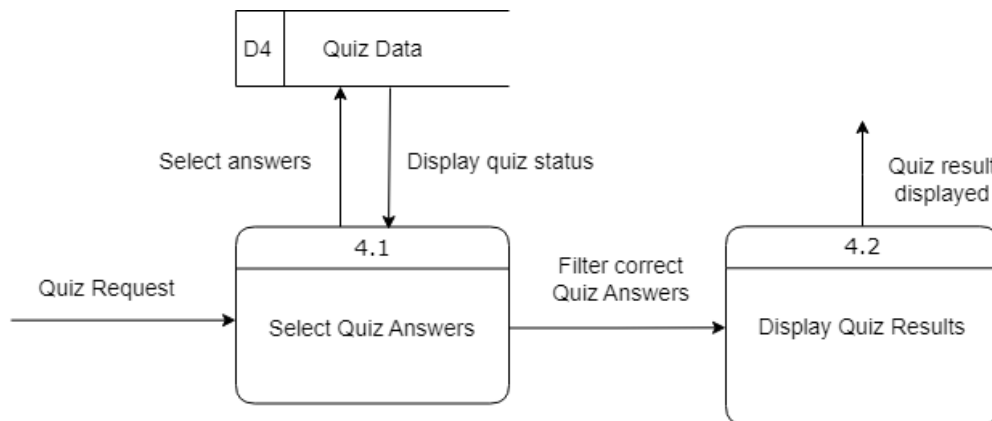
Figure 3.26: Level 1 Diagram for Process 4.0

3.5.1.7 Data Flow Diagram (DFD) Level 1 For Process 5.0

Process 5.1 allows user to select video type upon receiving video details request. In process 5.1, the selected video will be accessed through the "Video data" data store depending on which selected video. Then, process 5.2 will process by displaying the selected video and video details to the user.

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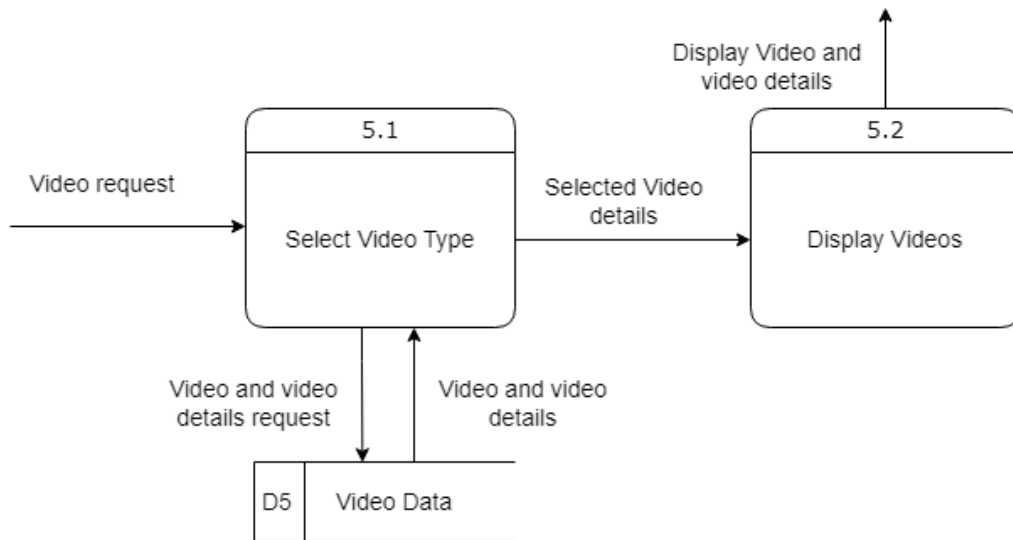
Figure 3.27: Level 1 Diagram for Process 5.0

3.5.2 Entity Relationship Diagram (ERD)

Figure 3.29 shows the Entity Relationship Diagram of the proposed mobile application. This diagram is used to show how the data inside the data store can be linked to each other. In the figure, it shows that there are total of 6 tables of data connecting to one another by their relationship in the database design of the proposed mobile application, which is the User Table, Expense Table, Chart Table, Notification Table ,Quiz Table, and Video Table.
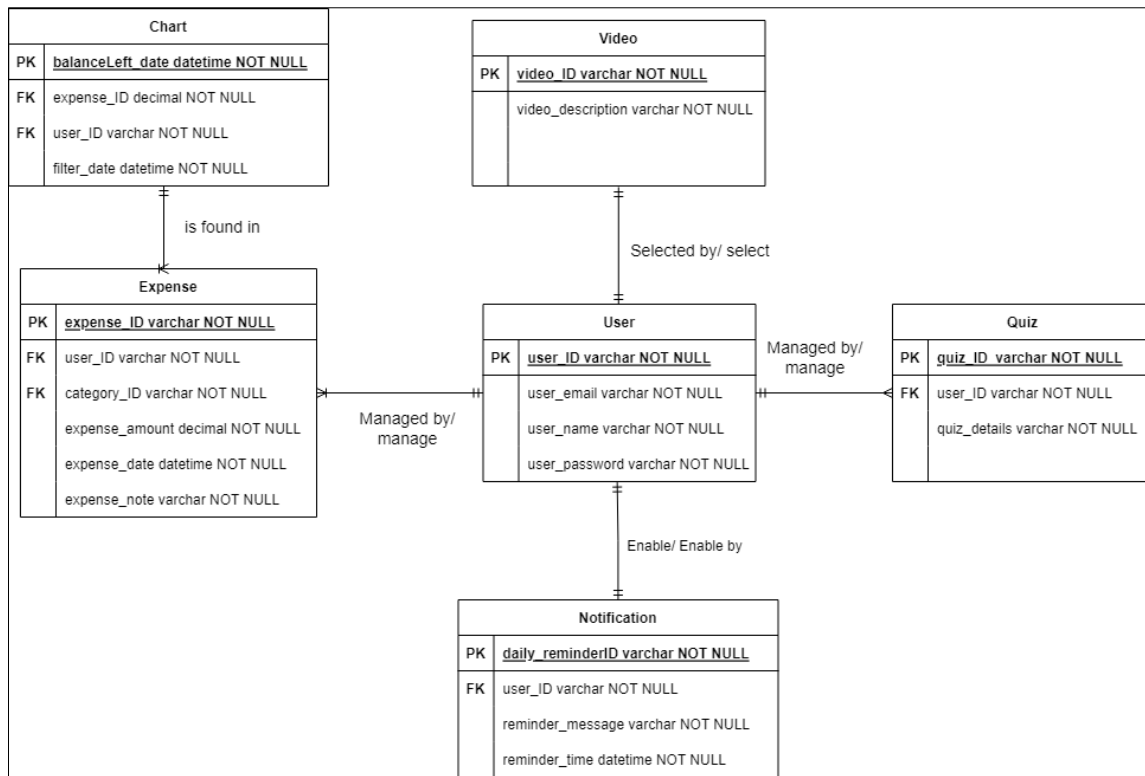
Figure 3.28: Entity Relationship Diagram

3.5.3 Data Dictionary

Data dictionary is a set of tables which describes the detailed database information. A data dictionary contains attribute, description, data type, length and constraints which are defined in the Table 3.3 to Table 3.8.

Attribute	Description	Data type	Length	Key
user_ID	User's ID	Varchar	50	Primary Key
user_email	User's email address	Varchar	50	
user_name	User's username	Varchar	20	
user_password	User's password	Varchar	25	

Table 3.3: Data Dictionary for User Table

Attribute	Description	Data type	Length	Key
expense_ID	Expense ID	Varchar	20	Primary Key
user_ID	User's ID	Varchar	50	Foreign Key
category_ID	Category_ID	Varchar	30	Foreign Key
expense_amount	Expense amount	decimal	8,0	
expense_date	Date of expense	datetime		
expense_note	Expense note	Varchar	30	

Table 3.4: Data Dictionary for Expense Table

Attribute	Description	Data type	Length	Key
balanceLeft_date	Date of total amount of balance left	datetime		Primary Key
expense_amount	Total amount of expense	decimal	8,0	Foreign Key
user_ID	User's ID	Varchar	50	Foreign Key
filter_date	Filter the date	datetime		

Table 3.5: Data Dictionary for Chart Table

Attribute	Description	Data type	Length	Key
daily_reminderID	Daily reminder ID	Varchar	30	Primary Key
user_ID	User's ID	Varchar	50	Foreign Key
reminder_message	Message of the daily reminder	Varchar	100	
reminder_time	Time of day to send the reminder	datetime		

Table 3.6: Data Dictionary for Notification Table

Attribute	Description	Data type	Length	Key
quiz_ID	Quiz ID	Varchar	30	Primary Key
user_ID	User's ID	Varchar	50	Foreign Key
quiz_details	Quiz details	Varchar	100	

Table 3.7: Data Dictionary for Quiz Table

Attribute	Description	Data type	Length	Key
video_ID	Video ID	Varchar	30	Primary Key
video_description	Description of the video	Varchar	200	

Table 3.8: Data Dictionary for Video Table

3.5.4 Wireframes

In this design phase, wireframes are used to produce visualization of the structure and the features of the mobile application. These wireframes will provide a clear development guide by defining the important features of the mobile application.

Figure 3.29 shows the user login page of the mobile application which required user to enter their email and password to login in order to proceed to the homepage. Besides, if there are user that have not registered yet, there is a "Register Here' link to let user register account.
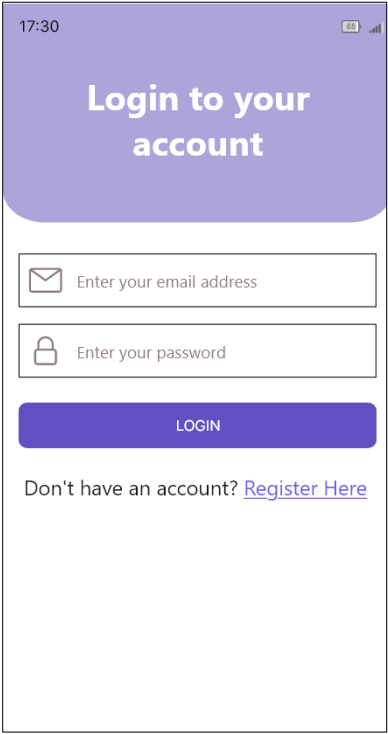
Figure 3.29: User Login Page

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Figure 3.30 is the user Register Account page where user need to create username, enter email address, and create password to proceed to register account and to the homepage.
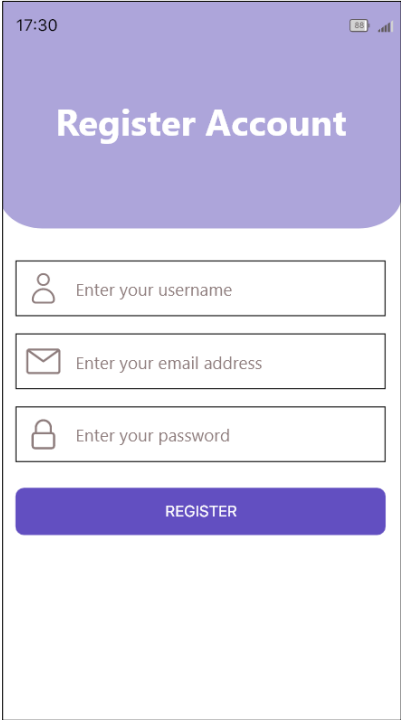
Figure 3.30: User Register Account Page

Figure 3.31 shows the homepage of the mobile application. Once the user has successfully logged in or registered their account successfully, user will be able to view the homepage that display the overview of the total balance amount left, the total of expenses, and the recent records with view all button to view all of the records. The records of expense can be modified and delete once the user click the record. This page also consists of quick access navigation to other pages such as charts page, add expense page, categories page and settings page.
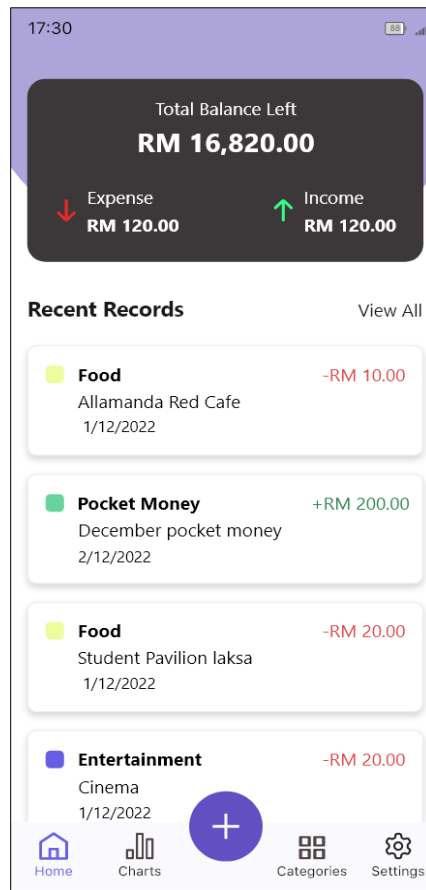
Figure 3.31: Homepage

Figure 3.32 shows all of the records of transactions. The user is able to search the records by using the search function. User can view the expenses by monthly. The user is also able to manage the expenses once click the record.
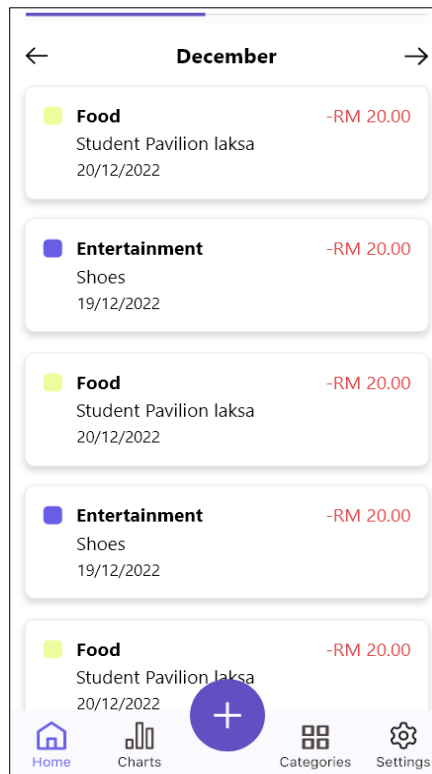
Figure 3.32: Transaction Records page

Figure 3.33 is the edit and delete expense page which allows user to edit and delete the expense details of the selected record. User can update existing details of the record by their date, amount, category and note by clicking the "SAVE CHANGES" button after editing. Then, a pop out message stated "Changes saved successful" will prompted as show in Figure 3.34. To delete the record, user can click on the "DELETE EXPENSE" button. Once the user has successfully deleted, the mobile application will show a successful page pop out message as shown in Figure 3.35 to show that the record has been deleted.
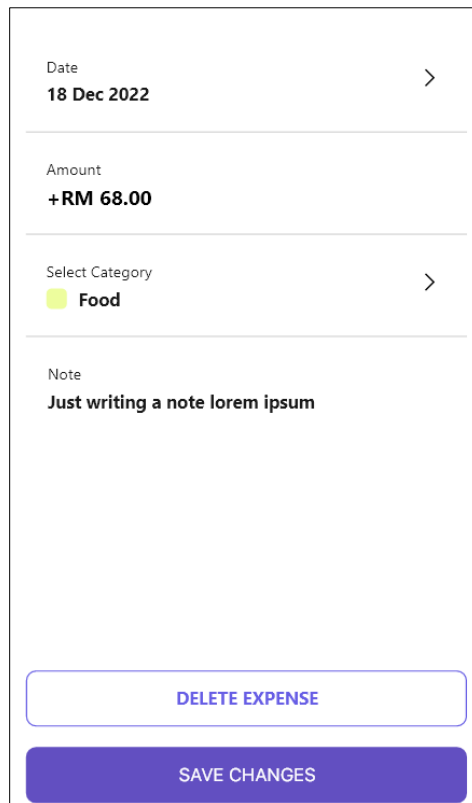
Figure 3.33: Edit and delete expense page
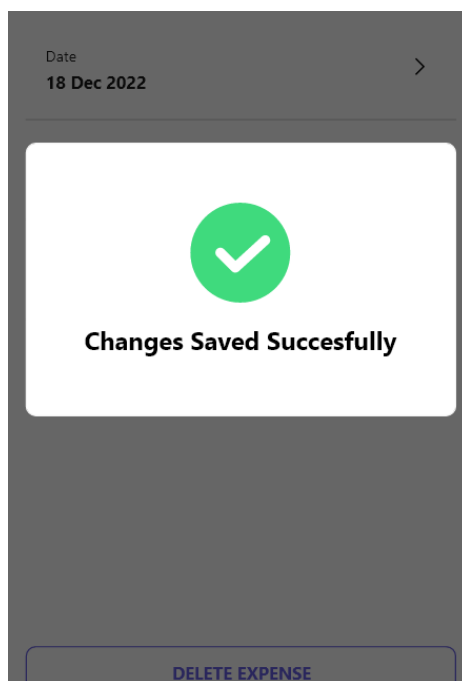
Figure 3.34: Changes saved successful prompt pop out page
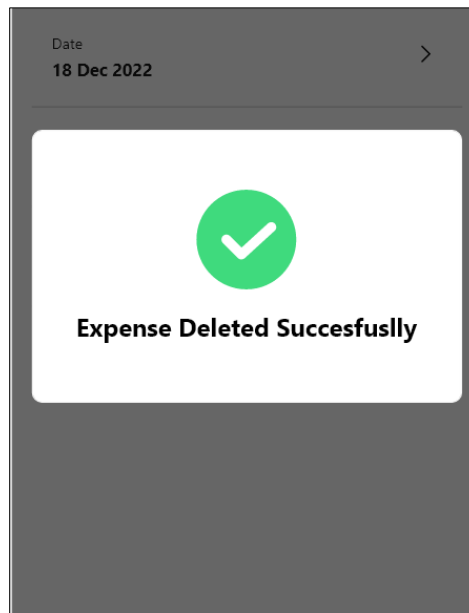
Figure 3.35: Record deleted successful pop out page

The "+" button on the homepage as shown in Figure 3.36 will redirect user to the add expense page in Figure 3.37. Users are able to edit the default date, select expense and enter the amount, select category, and enter note. Then, user click the "Add Expense" button to add expense. It will prompt a successful pop out page with "Expense added successful" message as shown in Figure 3.38.
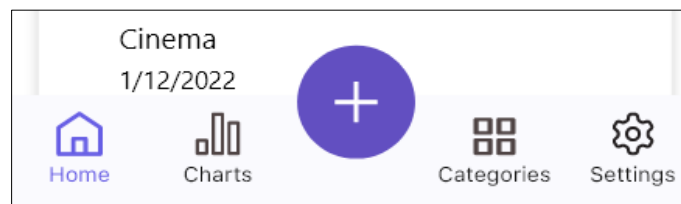
Figure 3.36: + button on homepage
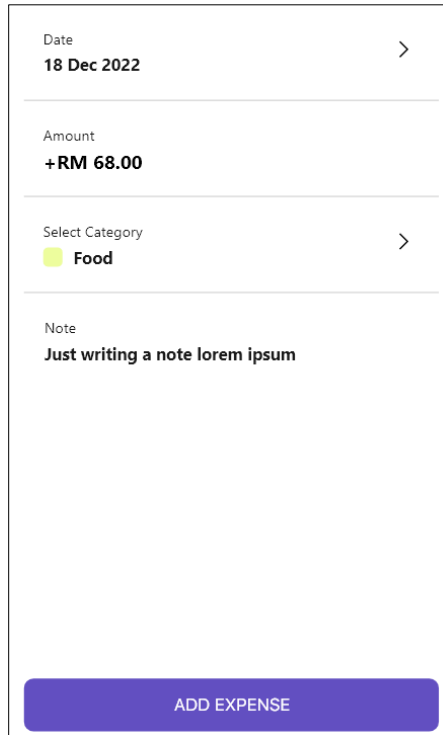
Figure 3.37: Add expense page
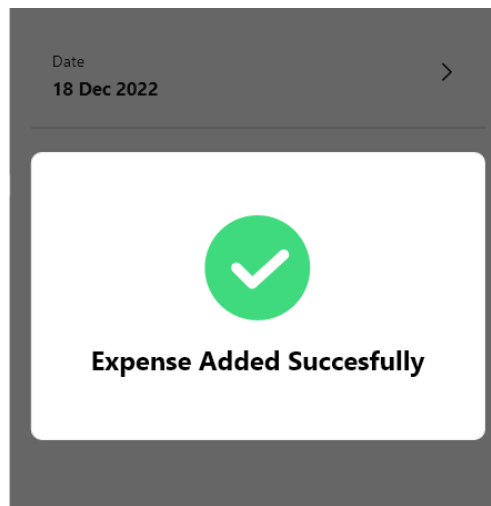
Figure 3.38: Expense added successful pop out page

The Charts page is shown in Figure 3.39. Users are able to view monthly report on expense accordingly. Users are also able to download the report. Once user click the "Download

Report" button, it will proceed to prompt "Report Downloaded Successfully" message to indicate that the report has been downloaded successfully as shown in Figure 3.40.
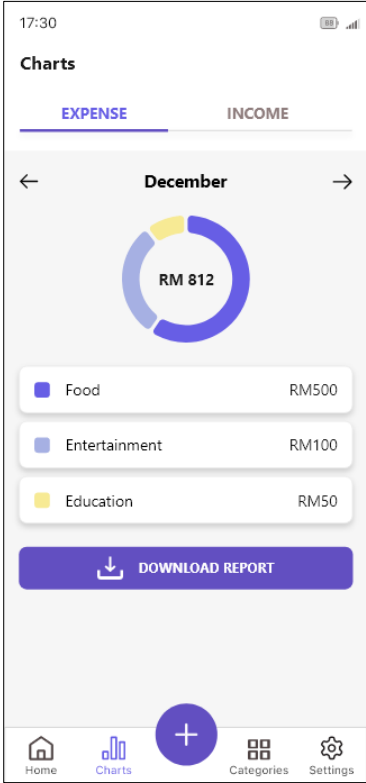
Figure 3.39: Charts page
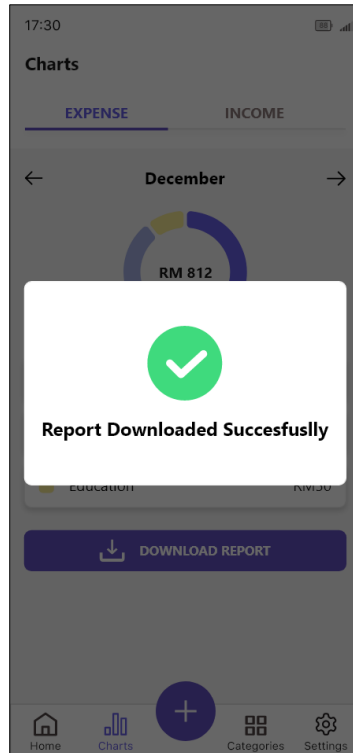
Figure 3.40: Report downloaded successful pop out page

Figure 3.41 is the Settings page. Users are able to manage their user profile, manage notification, view on developer's information and also logout button to logout from the mobile application.
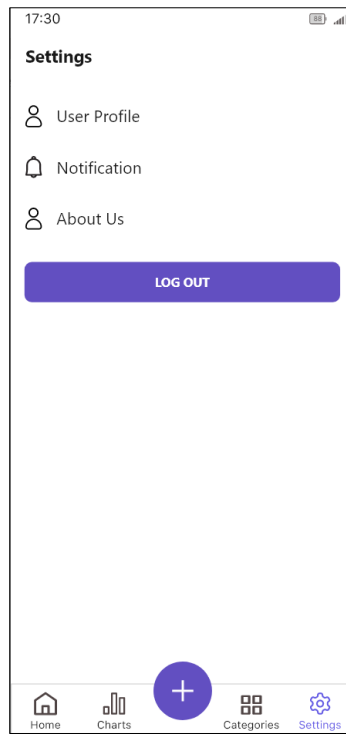
Figure 3.41: Settings page

Figure 3.42 is the Notification page where users are able to manage the reminders in this page. Users are able to turn on and off the reminder by toggle button to remind the user to record their expenses daily. The reminder time can be updated as shown in Figure 3.43, the time selection can be updated when user click "OK" button.
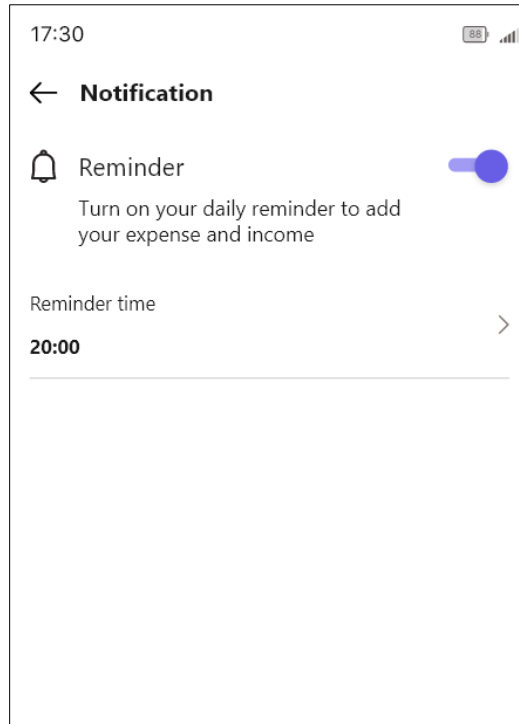
Figure 3.42: Notification page
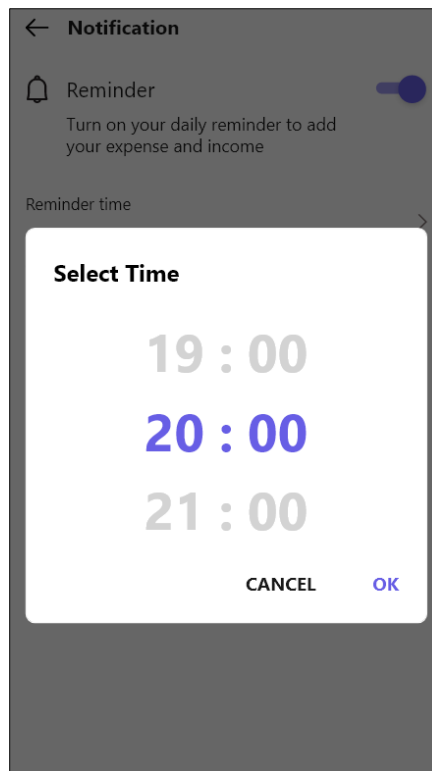
Figure 3.43: Reminder time selection page

3.5.5 Navigation Flow and Controls

Figure 3.44 is the flowchart diagram of the proposed mobile application. Flowchart is used to provide visualization and documentation of the processes of the overall flow of the workflow. It helps to identify lack of efficiencies in a process for improvement.

The first step in the navigation flow would be opening the mobile application. Then, the login page will be displayed to allow existing users to login to their account with username and password. For the new users, there is a sign-up button on the login page that direct user to the sign-up page for user registration to enter their registration details.

Once the user had logged in successfully, the user will be able to view the homepage view the total amount of expenses by monthly, add expense function, preview of recent transaction records and quick access navigation to other pages. To manage transaction records, users are able to click into the transaction record to view more transactions, they are able to delete, edit and search records of expenses. On the home page, users are able to switch tab to navigate to the chart page for detailed analysis.

Furthermore, there is a quick access navigation bar in the homepage that navigate user to other pages which is homepage quiz, video, and settings. In the settings page, users are able to view about the mobile application project details, notification reminder and logout.

Overall, the proposed mobile application will have a clear navigation flow, with simple to use.
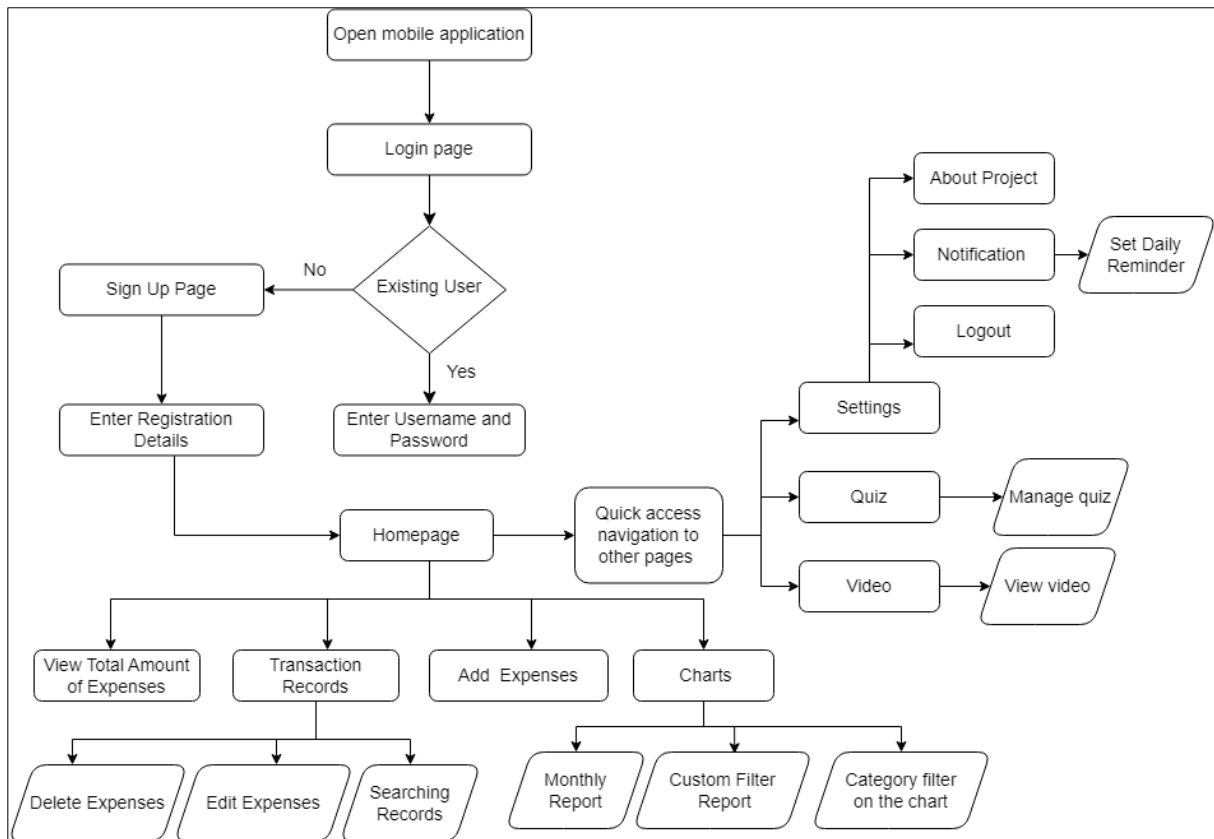
Figure 3.44: Flowchart Diagram

3.6 Testing Design

Testing phase is one of the most crucial phases in the achieving this proposed project's objective which is the usability of the mobile application. It helps to ensure that all function is worked as expected before it deployed to the public and minimal to no bugs. The testing phase of the proposed project is essential in achieving the objective of the project, which is to ensure the usability of the mobile application. The purpose of testing is to verify that the application functions as intended and that any bugs or issues are identified and addressed before deployment. This helps to ensure that the application is of high quality and ready for deployment with minimal to no bugs. In the testing design, functional testing and usability testing will be conducted to ensure developed proposed mobile application will be tested and ready for deployment.

Functional testing will be used for developer to test while usability testing will be for user testing. Functional testing will be used to test the application's features and functionality, while usability testing will be used to evaluate the user experience and ease of use of the application.

Functional testing is typically carried out by developers and is designed to ensure that the application behaves as expected, and that all features are functioning correctly. The functional testing will include testing the application's individual components and integrated tests to ensure that the application behaves as expected when different components are combined.

Usability testing, on the other hand, is focused on evaluating the user experience and ease of use of the application. The usability testing will be conducted with actual users to gather feedback on the application's user interface, navigation, and overall user experience. The usability testing will help to identify any issues or problems with the application that may not have been identified during functional testing, and that could negatively impact the user's experience.

Overall, the testing design for this proposed project includes functional testing and usability testing to ensure that the developed mobile application is ready for deployment. Both types of testing are necessary to ensure that the application functions correctly and to achieve proposed project's objective.

3.7 Summary

In conclusion, chapter 3 discussed in detail for the methodology that consists of the requirements, analysis and design and also testing design. The methodology is discussed in detail on the tools and technique used in each phase of the methodology. The proposed work where the description of functionality of the mobile application were discussed in detail. In the requirement phase, user requirement was collected using questionnaire survey that is created by using Google Form. The questionnaire is distributed to 3 of each faculty of UNIMAS undergraduate students that adds up to 30 respondents to collect all the required data for the proposed mobile application. In addition, the functional requirement, non-functional requirement, software, and hardware requirement were discussed to determine that the requirements were met before the development of the proposed mobile application. Next is the analysis and design where several diagrams and table were used such as Data Flow Diagram, Entity Relationship Diagram, Data Dictionary, Wireframes and Flowchart Diagram. The testing design were briefly discussed where functional testing and usability testing will be used for the testing phase of the proposed mobile application.

CHAPTER 4 : IMPLEMENTATION

4.1 Introduction

In the previous chapter, the collected requirement analysis and system design will be implemented for proposed mobile application. The implementation phase outlines the process of transforming the requirement analysis and system design into a fully functional mobile application. This chapter covers the installation and configuration of the tools used in the development process and the implementation of the modules in the mobile application will be describe in this chapter.

4.2 Installation and Configuration of Software/Tools Used

The tools that needed to be installed and configured in the implementation of the financial literacy mobile application are Android Studio and Firebase. The function of Android Studio is used for implementation of the mobile application and Firebase is used to manage the databases of the mobile application. Both functions will be described in detail in the section below.

4.2.1 Android Studio

Android Studio is the official Integrated Development Environment (IDE) for developing mobile applications for Android. It consists of an extensive range of tools and features for designing, coding, and testing Android applications efficiently (Android Studio, n.d.). Java, Kotlin and XML are the development languages used in Android Studio for the mobile application. The function of Android Studio includes developing applications for all Android devices, provides layout editor to design user interfaces, having an easy and feature-rich emulator readily virtually for testing and debugging applications. As shown in Figure 4.1,

users can download the Android Studio installer from the official website at https://developer.android.com/studio. Once the user has downloaded the installer, the user can run the downloaded installer file and complete the installation process by following the instructions provided such as choosing the installation location. To complete the installation, the user needs to configure Android Studio. By following the instructions in the Android Studio welcome screen, the user can complete the Android SDK setup and the installation is completed.
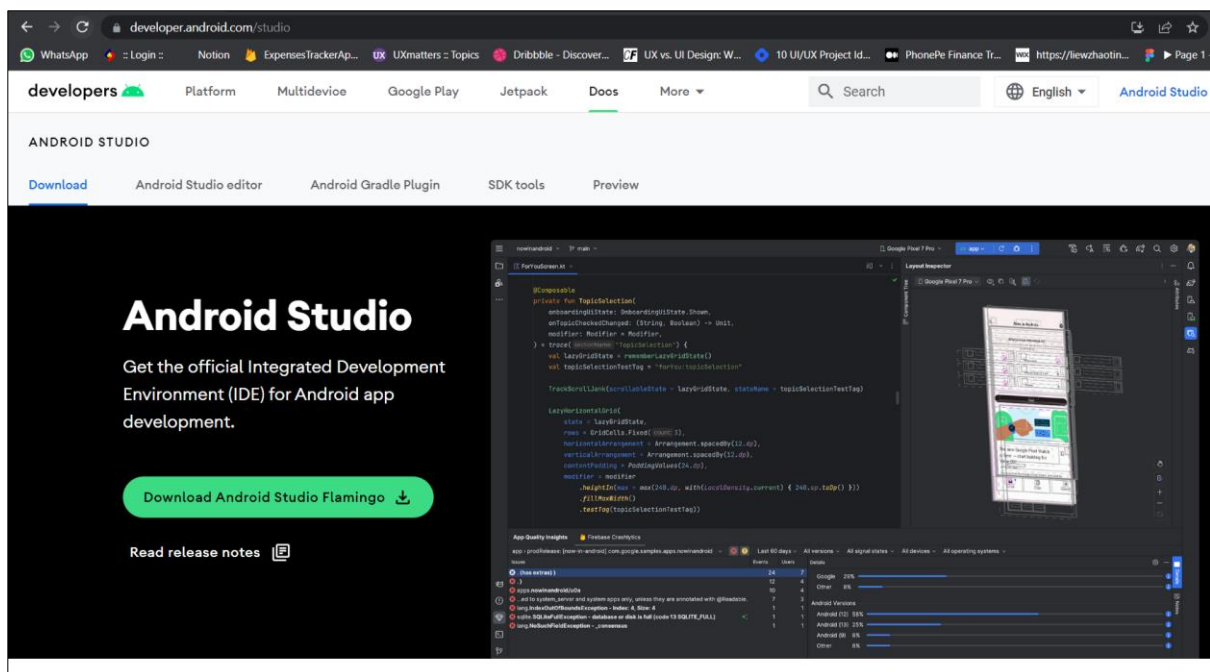
Figure 4.1:Android Studio Official Website

4.2.2 Firebase

Firebase is an extensive platform for developing and managing mobile applications offered by Google (Google, n.d.). The mobile application uses Firebase to provide services such as database management, user authentication and analytics that eases the mobile application development. To manage the Firebase project, Google account is required to sign into Firebase. Once signed in, the services provided to be used in the mobile application such as Firebase

Realtime Database, cloud-messaging and other services that are provided with instructions to be enabled. Then, to integrate Firebase with the mobile application, registration of the mobile application is needed by creating the package name of the mobile application. Then, google-services.json configuration file is downloaded and moved to the directory in the Android Studio project. In this project, Realtime firebase is used as the data storage in the mobile application. The data is stored on the cloud and sync with real time. Figure 4.2 shows the real-time database stored in Real-Time Database in Firebase for the expenses.
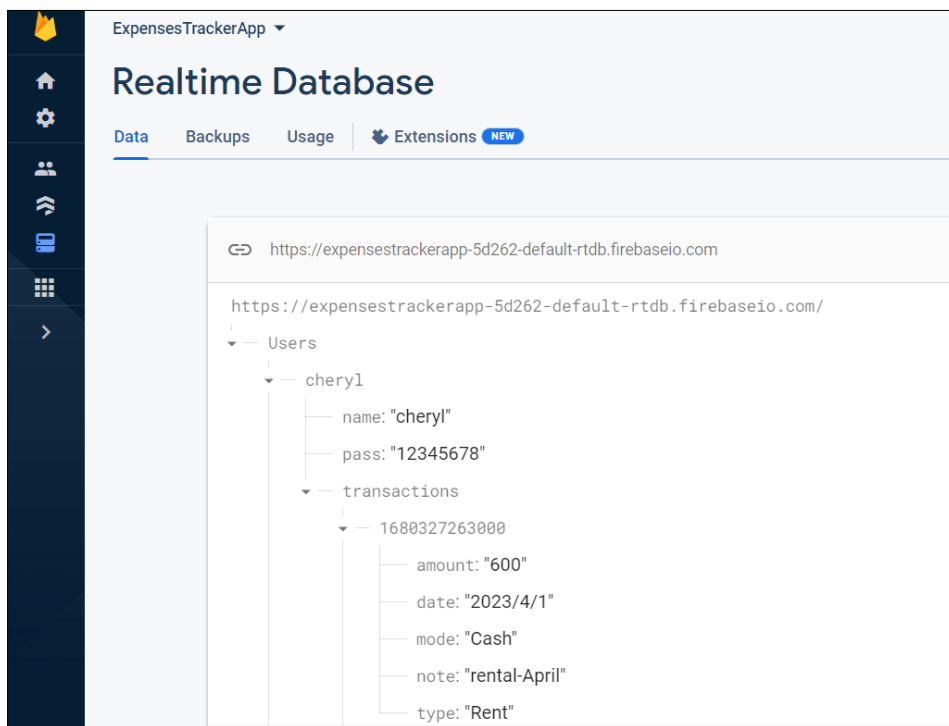
Figure 4.2: Real-Time Database in Firebase

4.3 Implementation of Module

This section will be describing the implementation of the modules of the mobile application. In this project, the mobile application consists of only one type of user, which is

UNIMAS undergraduate students. Hence, in the following the sub section below of 4.3.1 will be the description on the implementation on the user side.

4.3.1 User (UNIMAS Undergraduate Students)

The user of the mobile application is UNIMAS undergraduate students. The functions of the mobile application will be described in the modules below.

4.3.1.1 Login

Once the user launches the application in the emulator, the first screen that user will see is the splash screen of the mobile application which allows user to choose login or sign up as shown in Figure 4.3. Figure 4.4 shows the login page of the financial literacy mobile application for UNIMAS undergraduate students. After that, users are required to enter their username and password to proceed to the mobile application.

Upon successful validation, the login process will verify the entered credentials to the database of the user to allow access to the mobile application. If the credentials are valid, the mobile application will direct the user to the homepage. If the credentials are invalid, an error message is shown accordingly based on the wrong credentials such as Figure 4.5 and Figure 4.6 that shows the errors that will display when user leaves the username and password field empty and also user enter the wrong credentials accordingly.
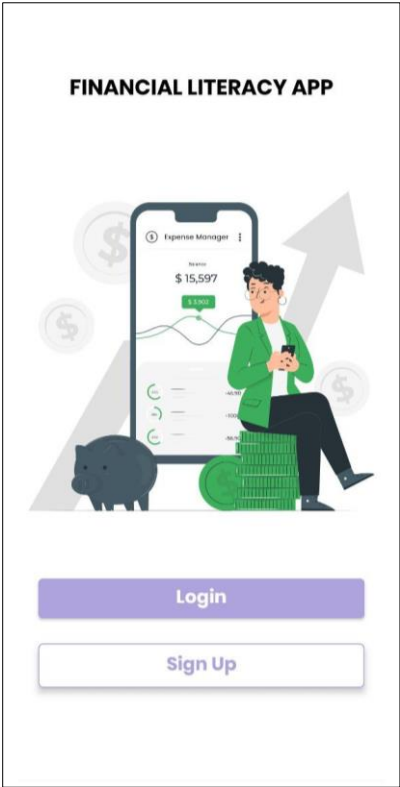
Figure 4.3: Splash screen
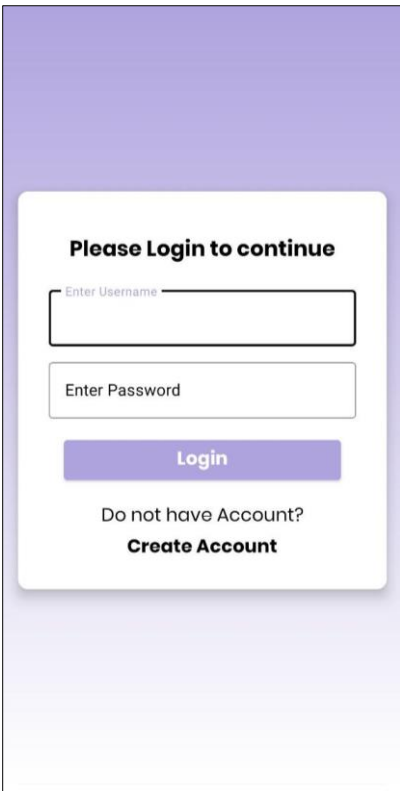
Figure 4.4: Login page
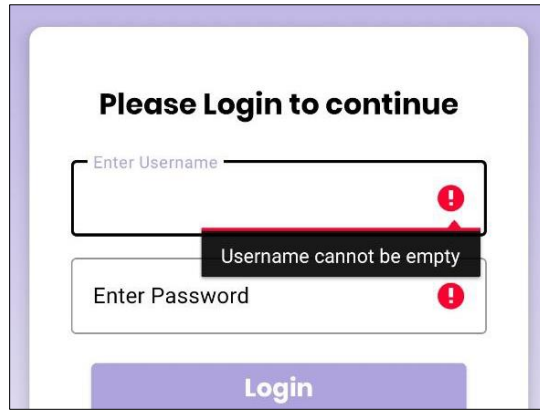
Figure 4.5: Empty fields error message
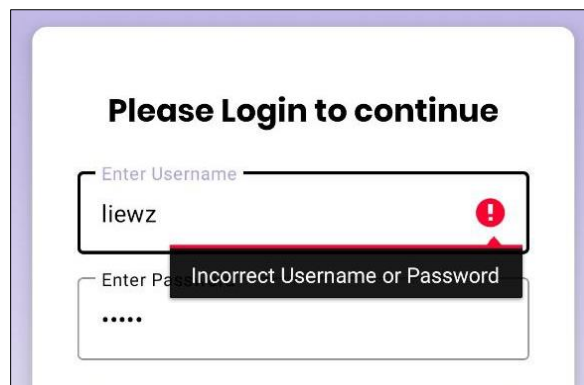
Figure 4.6: Wrong credentials error message

4.3.1.2 Sign Up

In the sign-up module, the user signs up for a new account within the mobile application on the sign-up page as shown in Figure 4.7. The users are able to access the sign-up page from the splash screen page "Sign Up" button or from the login page "Create Account" text button. User are also able to click the "Login" text button to navigate to the login page.

On the register page, users are prompted to enter the details including the username, password and confirm password. The registration process validates the entered details to ensure accuracy and completeness. The username must be unique, and the existing users will not have the same username in the database to prevent security concerns. If the user enters the existing

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username found in the database, the mobile application will display an error message "Username already taken" as shown in Figure 4.8. If the password entered by the user must be the same as confirm password. Otherwise, the error message "Password Mismatch" will show in Figure 4.9.
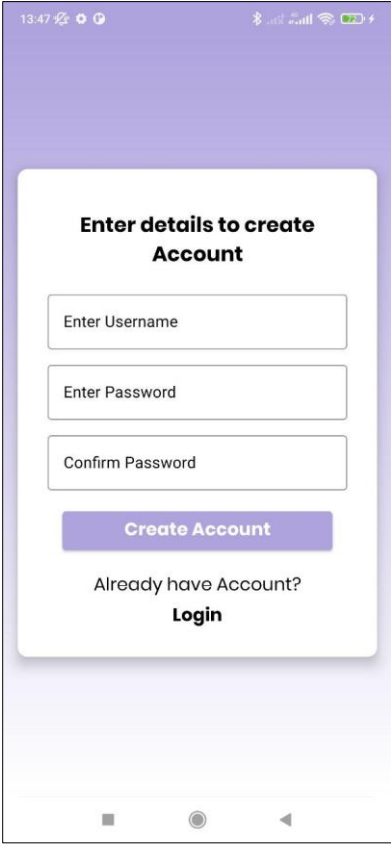
Figure 4.7: Register page
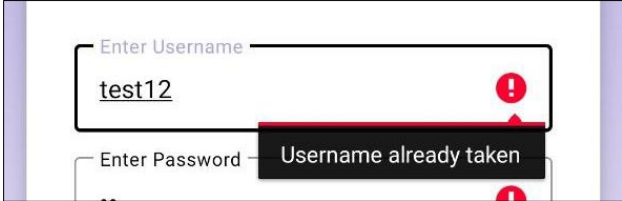
Figure 4.8: Error message on existing username
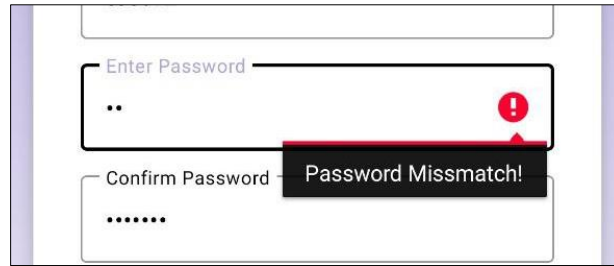
Figure 4.9: Error message on password mismatch

4.3.1.3 Homepage

Once the user has successfully logged in or registered their account successfully, user will be able to view the homepage that displays by default that is in "Records" switch tab which shows the total amount of expenses by monthly, the preview of the transaction records, add expenses floating button. Once the user clicks on the next tab, which is the Detailed Analysis tab, the user will navigate to the chart page. Moreover, there is a quick access bottom navigation that consists of the default by homepage, quiz page, videos page and settings page. Figure 4.10 shows the user interface of the homepage where these details are in the mobile application.
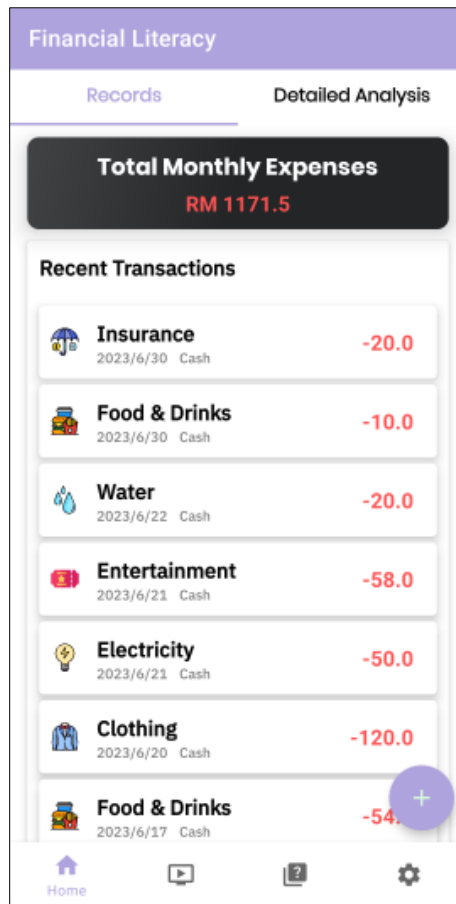
Figure 4.10: Homepage

4.3.1.4 Add Expenses

User are able to access the add expenses function by clicking the "+" floating button on the homepage. This function allows the user to add their expense detail by entering the expense amount, note, select expense category, payment type and date of transaction.

In Figure 4.11, the user interface shows the input fields where the user can enter the expense details. Once the user successfully added an expense, the latest expense will be displayed in the transaction records and a successful toast message displaying "Transaction saved" to the user as shown in Figure 4.12. If the user leaves the amount of expense field blank, an error reminder message will be displayed as shown in Figure 4.13 as other fields are pre-filled with default values chosen by the mobile application if the user did not fill in the input or

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select any other field. Figure 4.14 shows the reminder toast message "Please add transaction to show here" displaying to the user when there is no data in the transaction data as only the expense amount is required user to enter. All of the expenses in the transaction records are synced with the data in Firebase Real-time database as shown in Figure 4.15.
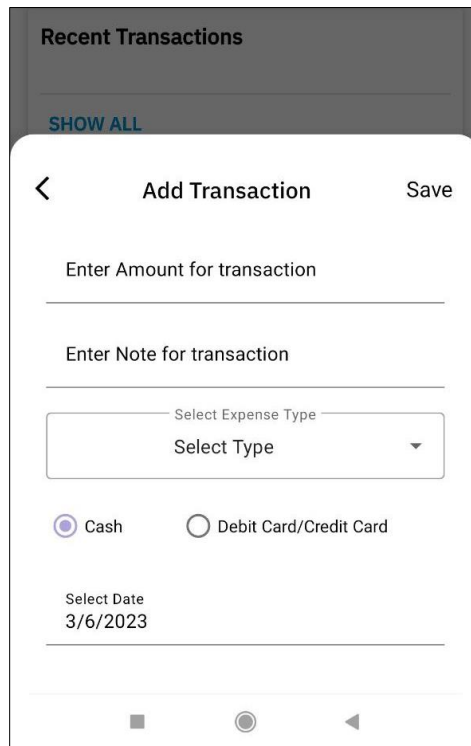
Figure 4.11: Add expense page
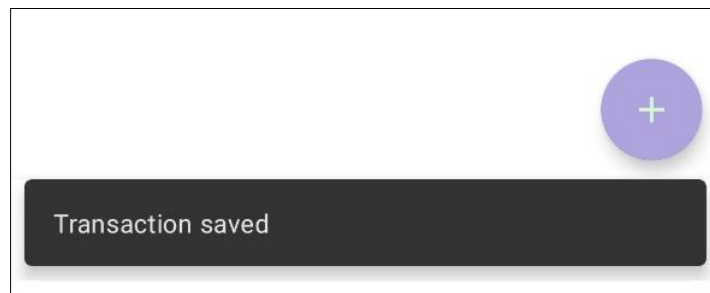
Figure 4.12: Successful toast message after adding an expense
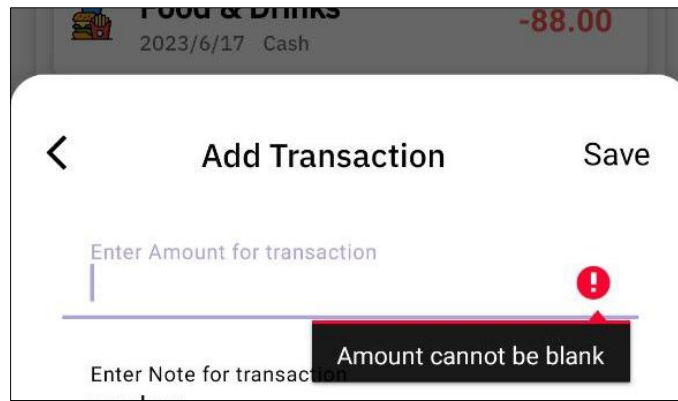
Figure 4.13: Error message on empty field
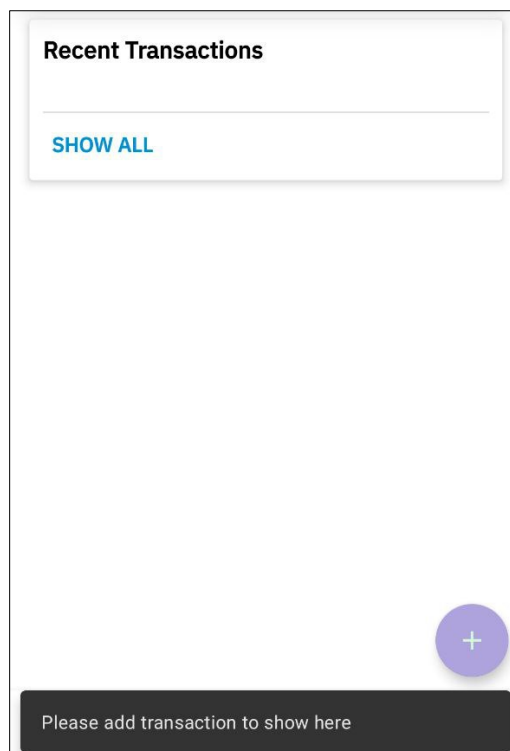
Figure 4.14: Reminder to add transaction toast message
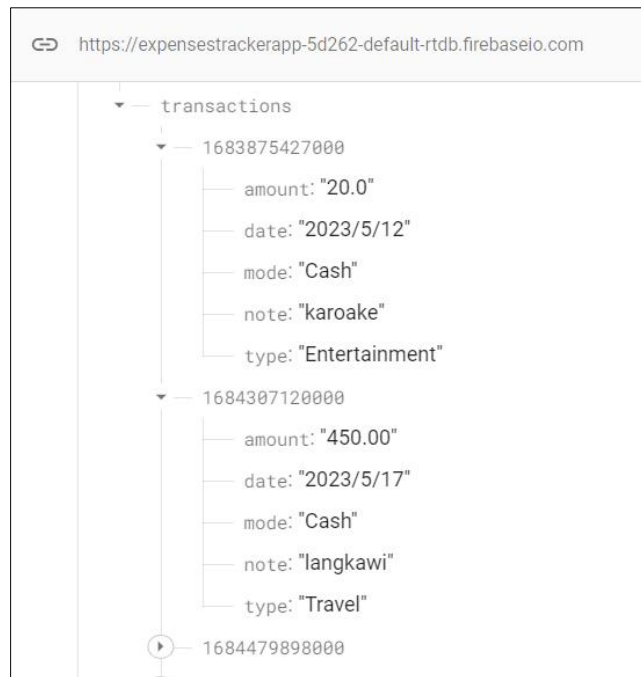
Figure 4.15: Transaction real time database

4.3.1.5 Transaction Records

Figure 4.16 shows the preview of the transaction records displayed on the Homepage where only a maximum of 7 recent transactions will be shown to the user. Once the user clicks the "SHOW ALL" text button, the user can view all of their transaction records to search, view, and modify their transaction such as edit and delete as shown in Figure 4.17.

The most recent transactions are displayed first, followed by the older ones. User are able to search their transaction with the search bar. User can delete their transaction directly by swiping the selected transaction to the left and the transaction will be deleted from the records as shown in Figure 4.18. Upon successful of deleting transaction, there will be a successful toast message displaying "Transaction Removed" to the user as shown in Figure 4.19.

For updating the transaction details, users can swipe the selected record to the right to update the transactions as shown in Figure 4.20 and a successful toast message displaying

"Transaction Updated" will be shown to the user as shown in Figure 4.21. The latest modification will be shown on the homepage successfully.
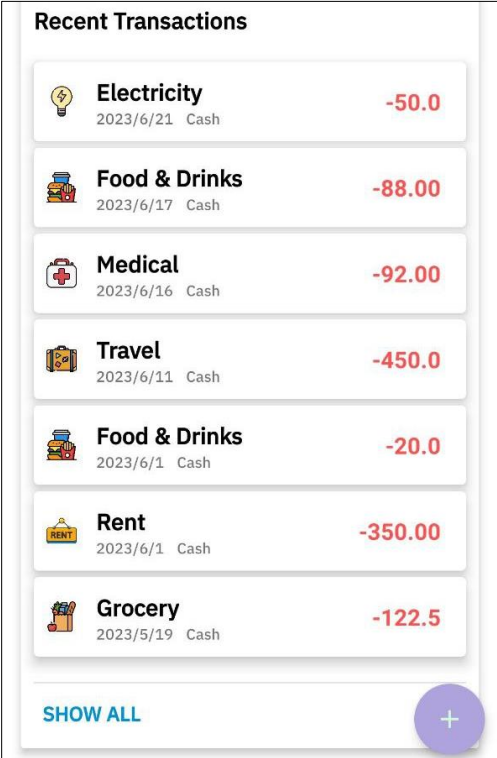
Figure 4.16: Preview of transaction records in homepage

Figure 4.17: Transaction Records page

Figure 4.18: Delete Transaction
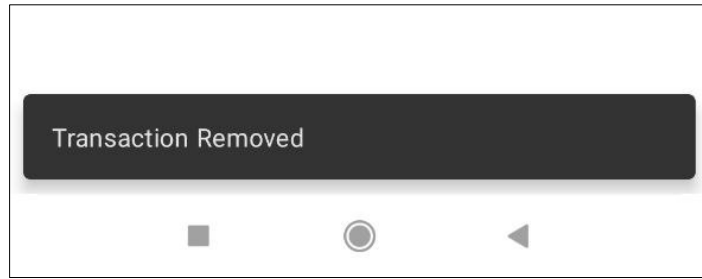
Figure 4.19: Delete Transaction successful toast message
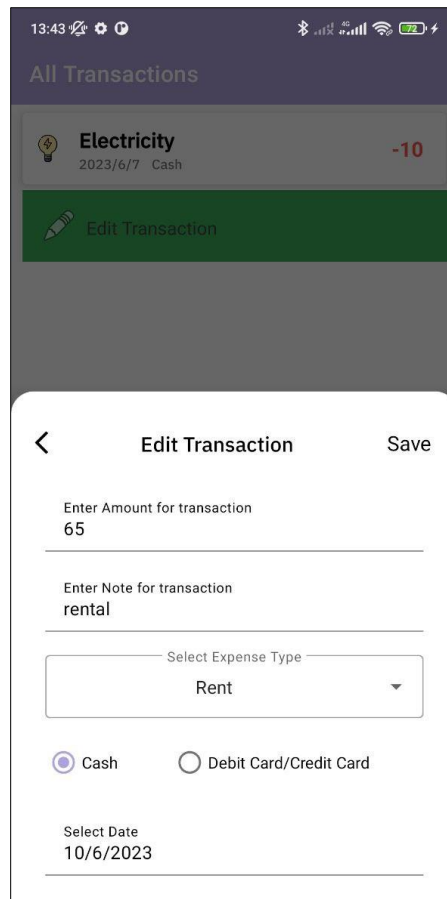
Figure 4.20: Edit Expense
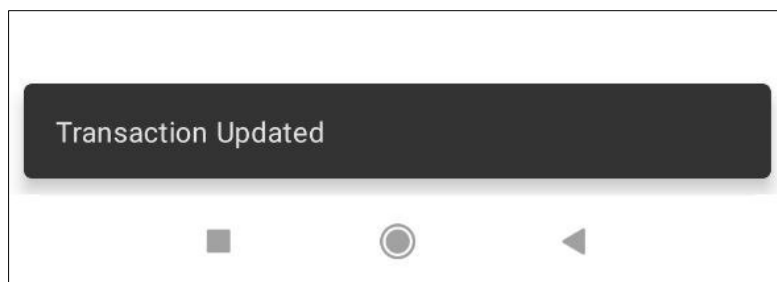
Figure 4.21: Edit Transaction successful toast message

4.3.1.6 Chart

Figure 4.22 shows the chart page where users are able to access when they click on the Detailed Analysis tab on the homepage. In Figure 4.22, the "Food & Drinks" category had been selected. Therefore, the total of the selected categories will be shown in the middle of the pie chart and all of the records for that category will be displayed below the pie chart. User are able view the legends below the chart to provide a clear representation of the categories.

This page consists of a pie chart that provides an overview of the expense which can be viewed monthly, and custom filter as shown in Figure 4.23. With the custom filter, users have the ability to select a specific date range to view the corresponding expenses on the chart.
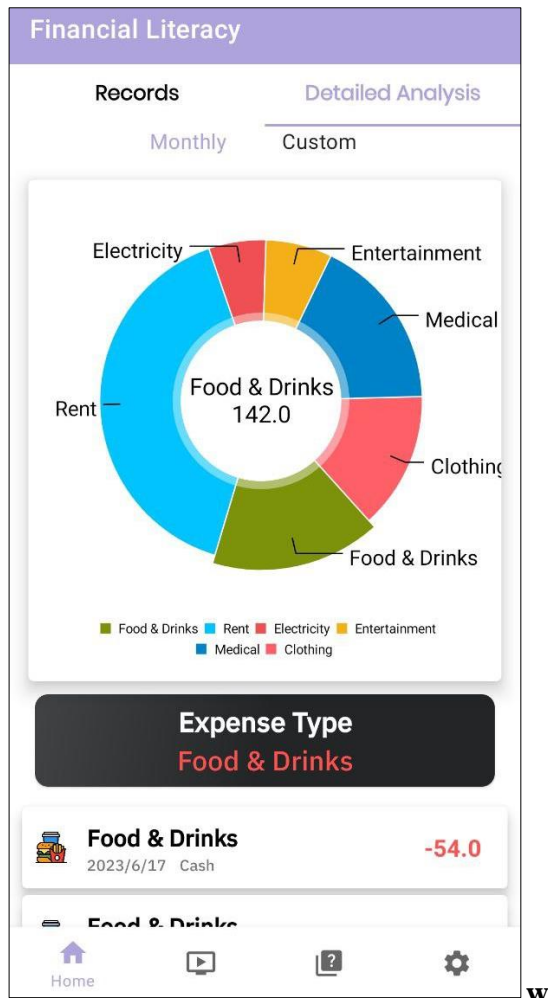
Figure 4.22: Chart Page
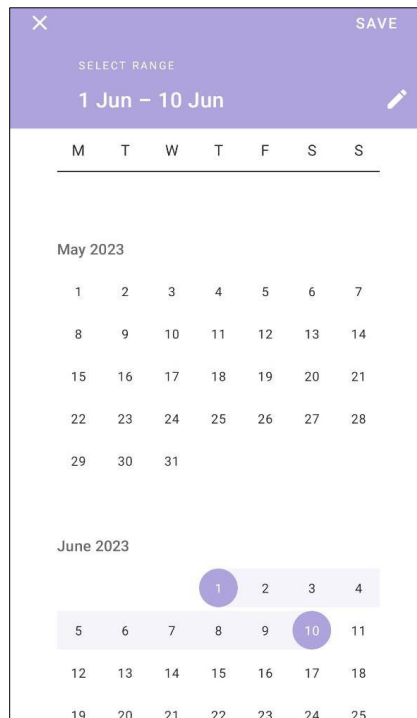
Figure 4.23: Custom Date Filter

4.3.1.7 Video

User can access the video page by clicking on the video icon on the quick access bottom navigation bar on the homepage. Once the user clicks on the play button on the video, users are able to view the video in the mobile application itself as shown in Figure 4.24. The topics of the videos that included to teach user financial literacy are the basics of financial literacy, budgeting basics, emergency funds, money management, financial goal settings, savings and investing, investing basics, taxes, tips on paying student loan (PTPTN), personal finance tips and avoiding financial scams. All of the videos are bite-sized which are within 3 to 10 minutes long which simplifies the learning, saving time and keeps the user engaged in the learning process.

Figure 4.24: Video page

4.3.1.8 Quiz

Users are able to navigate to the quiz page through the bottom navigation in homepage. Once the users are on the quiz page, the users are able to view the questions directly and answer by selecting one radio button as shown in Figure 4.25. Figure 4.26 illustrates the quiz when user answered correctly while Figure 4.27 shows the user interface where the quiz is answered incorrectly. Then, the total result correct answers will show after the user has completed answering all of the questions as shown in Figure 4.28. Then, the user can click the "FINISH" button to go back to the homepage.
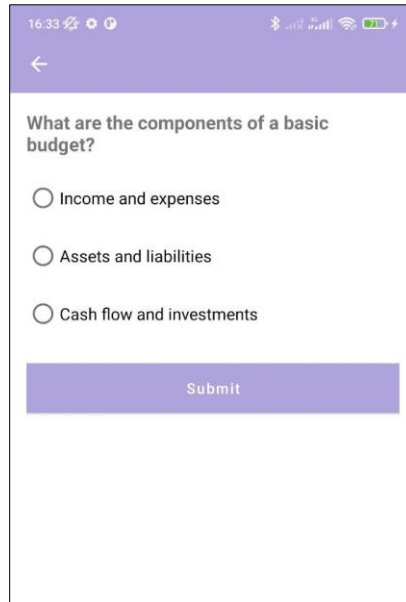
Figure 4.25: Quiz page
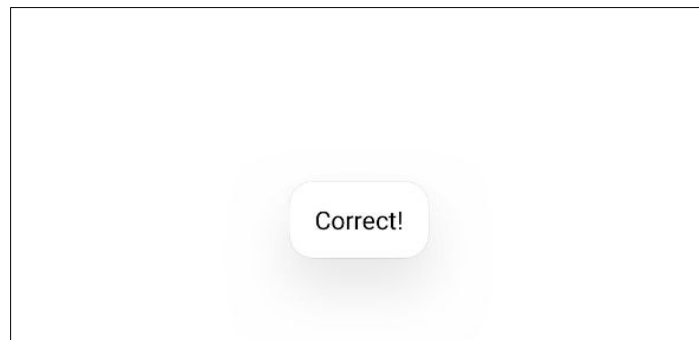
Figure 4.26: Quiz answered correctly
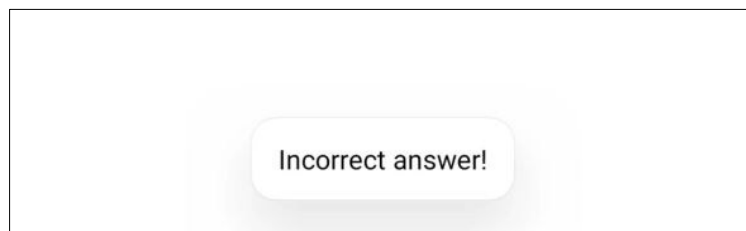
Figure 4.27: Quiz answered incorrectly
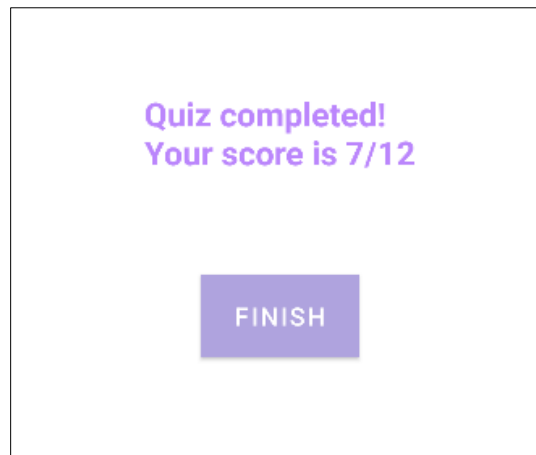
Figure 4.28: Quiz total result

4.3.1.9 Settings

Figure 4.28 shows the settings page of the mobile application that can be accessed through the bottom navigation of the mobile application.

Once the user clicks on the "About Project", user will navigate to the about project page as shown in Figure 4.29 that includes the overview of the mobile application project details, link to contact through my email address and also link to the Instagram account of UNIMAS Official. Next, Figure 4.30 shows the notification settings for daily reminder for user to add their expenses. User are able to toggle to turn on or off the notification. User need to scroll to their preference time for the notification and click "Save" button to save the notification setting. Figure 4.31 shows the daily reminder notification in the device notification.
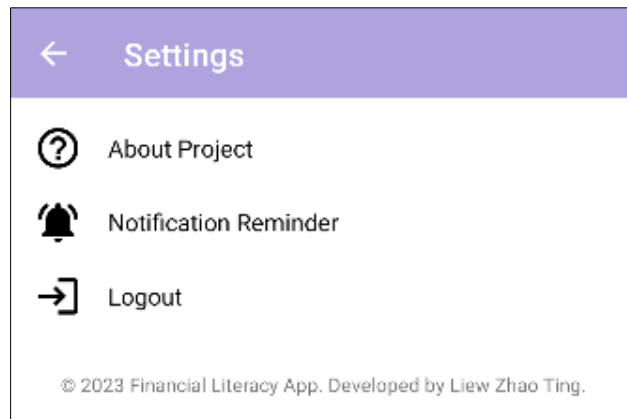
Figure 4.29: Settings page
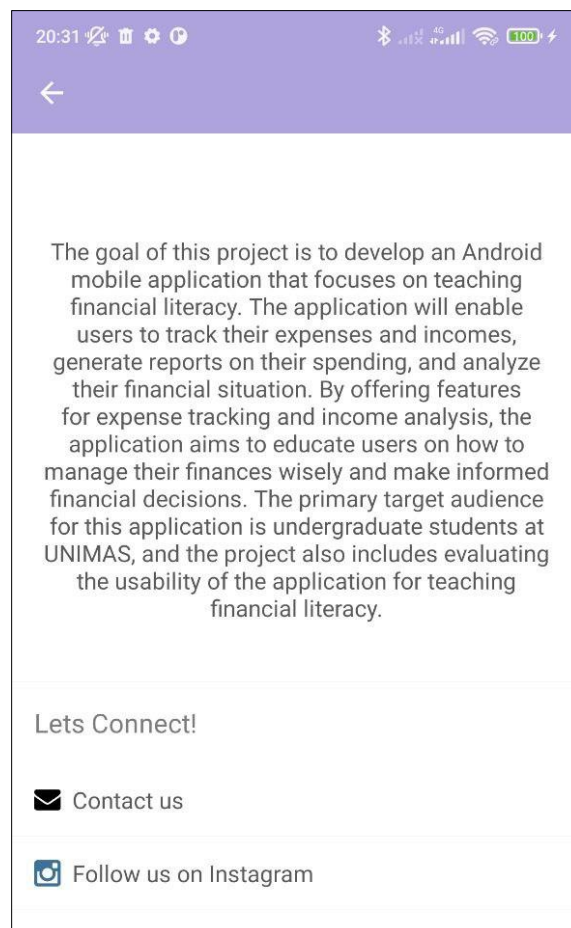
Figure 4.30: About project page
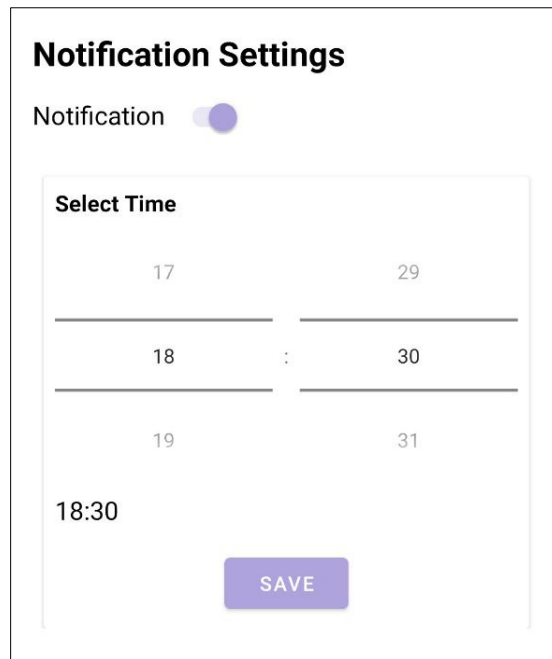
Figure 4.31: Notification Settings
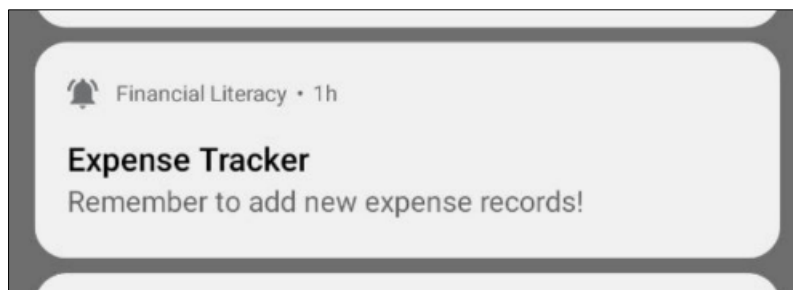
Figure 4.32: Daily reminder notification

4.4 Summary

This chapter discussed the implementation of the financial literacy mobile application for UNIMAS undergraduate students. The development tools that are used to develop the mobile application include Android Studio and Firebase. Furthermore, the implementation of the user interfaces of the mobile application has provided to teach financial literacy and usability of the mobile application. The functions of the modules of the mobile application have been described through the features and functionalities with the screenshots.

CHAPTER 5 : TESTING

5.1 Introduction

In this chapter, the mobile application testing phase is conducted after the implementation phase in order to ensure sure that the functionalities comply with the project's requirements and objectives. The testing phase is divided into two parts which are functional testing and non-functional testing. Functional testing consists of two type of testing that are used which is the unit testing. For non-functional testing, usability testing is used to carried out.

5.2 Unit Testing

Unit testing is one type of software testing that concentrates on particular components or unit of a software system (GeeksforGeeks, 2023). The main objective of unit testing is to ensure that each unit of software works as intended and meets the requirements. Hence, each unit of the mobile application will be examined with a test case, which is a set of conditions used to verify whether the requirements are met, or the mobile application functions as intended.

Test Case ID: 1			Test Designed By: Liew Zhao Ting			
Test Priority (Low/Medium/High): High			Test Designed Date: 22/6/2023			
Module Name: Login			Test Executed By: Liew Zhao Ting			
Test Title: User login into their account			Text Executed Date: 22/6/2023			
Description: Test on user login function						
Prerequisite:						
i. User has successfully landed on the "Login" page.						
ii. User has a registered account.						
Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	User login with empty username and password	1. User clicked "Login" to navigate to login page. 2. User leaves the username and password fields empty. 3. User clicks on the "Login" button.	Invalid login message that displays "Username cannot be empty" and "Password cannot be empty" to the user.	Invalid login message displayed "Username cannot be empty" and "Password cannot be empty" to the user.	Pass	User has registered account in the database.
2	User login with only username entered	1. User clicked "Login" to navigate to login page. 2. User enters the username and leaves password fields empty.	Invalid login message that displays "Password cannot be empty" to the user.	Invalid login message displayed "Password cannot be empty" to the user.	Pass	

		3. User clicks on the "Login" button.				
3	User login with only password entered	1. User clicked "Login" to navigate to login page. 2. User leaves username empty and enters the password. 3. User clicks on the "Login" button.	Invalid login message that displays "Username cannot be empty" to the user.	Invalid login message displayed "Username cannot be empty" to the user.	Pass	
4	User login with invalid username or password	1. User clicked "Login" to navigate to login page. 2. User enters the invalid username or password. 3. User clicks on the "Login" button.	Invalid login message that displays "Incorrect Username or Password" to the user.	Invalid login message displays "Incorrect Username or Password" to the user.	Pass	
5	User login with valid username and password	1. User clicked "Login" to navigate to login page. 2. User enters the valid username or password. 3. User clicks on the "Login" button.	User should be logged into the mobile application and should be redirect to the Homepage.	User is logged into the mobile application and is redirected to the Homepage.	Pass	

Table 5.1: Test case for user login

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Test Case ID: 2	Test Designed By: Liew Zhao Ting
Test Priority (Low/Medium/High): High	Test Designed Date: 23/6/2023
Module Name: Add Expenses	Test Executed By: Liew Zhao Ting
Test Title: User add expenses	Text Executed Date: 23/6/2023
Description: Test on user add expenses	

Prerequisite:

i. User has successfully landed on the Home page.

ii. User has login to the mobile application.

Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	Users leaves the add expense form with empty fields	1. User clicked "+" to navigate to the pop-up add expense prompt. 2. User leaves the amount, note, category, payment method and date fields empty. 3. User clicks on the "Save" text button.	Error message that displays "Amount cannot be blank" prompt for the user to enter their expense amount.	Error message displayed "Amount cannot be blank" prompt for the user to enter their expense amount.	Pass	Only the expense amount is required user to enter as other fields are pre-filled with default values chosen by the app if user did not fill or select the field.

2	Users enter the expense amount only	1. User clicked "+" to navigate to the pop-up add expense prompt. 2. User enters the expense amount and other fields such as note, category, payment method and date empty. 3. User clicks on the "Save" text button.	Expense will be successfully added into the transaction records with the record will be pre-filled with "Others" category, cash payment method and also the current date.	Expense is successfully added into the transaction records with the record will be pre-filled with "Others" category, cash payment method and also the current date.	Pass	
3	User has not added any expenses yet or no transaction data in the records.	1. User is at the Homepage or click "SHOW ALL" to the transaction records page.	A reminder toast will be displaying the message "Please add transaction to show here" to the user.	A reminder toast displaying the message "Please add transaction to show here" to the user.	Pass	No data in the transaction records.

Table 5.2: Test case for add expenses

Test Case ID: 3			Test Designed By: Liew Zhao Ting			
Test Priority (Low/Medium/High): High			Test Designed Date: 23/6/2023			
Module Name: Transaction Records			Test Executed By: Liew Zhao Ting			
Test Title: User manage transaction records.			Text Executed Date: 23/6/2023			
Description: Test on functionality of manage transaction records such as search, edit and delete transactions.						

Prerequisite:

i. User has successfully navigated to the Transaction Records page.

Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	User search with empty value	1. User click "SHOW ALL" in homepage to navigate to transaction records page 2. User click on the search bar.	The results should be displayed the same which is the listing of all existing records.	The results are displayed the same which is the listing of all existing records.	Pass	All existing records is shown by default in the records.
2	User search for records that does not match or exists in the database	1. User click "SHOW ALL" in homepage to navigate to transaction records page	There will be no search results displayed according to the existing records.	There are no search results displayed according to the existing records.	Pass	Only the results will be show from the existing records in the database.

		2. User enter non-existing or not matching keyword of the category in the search bar.				
3	User reset the search value by removing the current searched value	1. User click "SHOW ALL" in homepage to navigate to transaction records page 2. User remove or empty the existing input in the search bar.	The search result should be reset back to default listing which is listing all of the existing records.	The search result is reset back to default listing which is listing all of the existing records.	Pass	All existing records is shown by default in the records.
4	User search for records that is match or existed in the database	1. User click "SHOW ALL" in homepage to navigate to transaction records page 2. User enter existing category in the search bar.	The search results will be displayed successfully according to the search value.	The search results are displayed successfully according to the search value.	Pass	
5	User edits the transaction details by removing the current expense amount	1. User click "SHOW ALL" in homepage to navigate to transaction records page 2. User selects one record to edit by swiping to the right. 3. User remove the existing amount of the expense in the form and click "SAVE".	The error reminder message will display "Amount Cannot Be Blank" to the user.	The error reminder message displayed "Amount Cannot Be Blank" to the user.	Pass	Only the expense amount is required user to enter as other fields are pre-filled with default values chosen by the app if user

| 6 | User edits the transaction details with valid inputs | 1. User click "SHOW ALL" in homepage to navigate to transaction records page
2. User selects one record to edit by swiping to the right.
3. User enters any in the amount of the expense field and click "SAVE". | The selected transaction will be successfully updated in the list and a successful toast message will be displaying "Transaction Updated" to the user. | The selected transaction is successfully updated in the list and a successful toast message is displayed "Transaction Updated" to the user. | Pass | did not fill or select the field. |
| 7 | User deletes transaction | 1. User click "SHOW ALL" in homepage to navigate to transaction records page
2. User selects one record to edit by swiping to the left. | The selected transaction will be successfully deleted in the list and a successful toast message will be displaying "Transaction Removed" to the user. | The selected transaction is successfully deleted in the list and a successful toast message will be displaying "Transaction Removed" to the user. | Pass | - |

Table 5.3: Test case for manage transaction records

Test Case ID: 4			**Test Designed By:** Liew Zhao Ting			
Test Priority (Low/Medium/High): High			**Test Designed Date:** 23/6/2023			
Module Name: Chart			**Test Executed By:** Liew Zhao Ting			
Test Title: User manage the chart.			**Text Executed Date:** 23/6/2023			
Description: Test on functionality of the chart page.						
Prerequisite: i. User has successfully navigated to the Chart page.						
Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	User views the chart by monthly	1. User clicks the "Detailed Analysis" tab in homepage to navigate to charts page. 2. User clicks the "Monthly" filter.	The pie chart will show the overview by monthly result successfully.	The pie chart showed the overview by monthly result successfully.	Pass	There must be at least one or more data in the transaction records.
2	User views the chart by custom filters	1. User clicks the "Detailed Analysis" tab in homepage to navigate to charts page. 2. User clicks the "Custom" filter.	The pie chart result will display the selected custom date and the expenses detail successfully.	The pie chart result displayed the selected custom date and the expenses detail successfully.	Pass	

		3. User select the preference start date and end date. 4. Then, click "SAVE".				
3	User views the chart with no data in the records	1. User clicks the "Detailed Analysis" tab in homepage to navigate to charts page.	The message "No data found" will be displayed to the user successfully.	The message "No data found" is displayed to the user successfully.	Pass	No data is in the transaction records.
4	User views the chart by Category	1. User clicks the "Detailed Analysis" tab in homepage to navigate to charts page. 2. User clicks on any selected category in the pie chart section.	1.The pie chart will display the selected category total expenses in the middle of the chart. 2. The records for the selected category will be displayed successfully below the pie chart.	1.The pie chart is displayed the selected category total expenses in the middle of the chart. 2. The record for the selected category is displayed successfully below the pie chart.	Pass	There must be at least one or more data in the transaction records.

Table 5.4: Test case for chart page

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	Test Case ID: 5			Test Designed By: Liew Zhao Ting			
	Test Priority (Low/Medium/High): Medium			Test Designed Date: 24/6/2023			
	Module Name: Video			Test Executed By: Liew Zhao Ting			
	Test Title: User views video			Text Executed Date: 24/6/2023			
	Description: Test on functionality of the video page.						

Prerequisite:

i. User has successfully navigated to the Video page.

Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	User views the video in the app default layout (portrait)	1. User clicks the video icon at the bottom navigation in homepage to video page. 2. User clicks on the YouTube play button to view the video.	The selected video will be displaying in-app successfully.	The selected video is displayed in-app successfully.	Pass	-
2	User views the video in the app default layout (landscape)	1. User clicks the video icon at the bottom navigation in homepage to video page. 2. User clicks on the YouTube play button to view the video.	The selected video will be displaying in-app as a full screen landscape mode.	The selected video is displayed in-app as a full screen landscape mode.	Pass	-

		3. User click on the "zoom full screen" icon to view as landscape mode				

Table 5.5: Test case for video page

Test Case ID: 6	Test Designed By: Liew Zhao Ting
Test Priority (Low/Medium/High): High	Test Designed Date: 24/6/2023
Module Name: Quiz	Test Executed By: Liew Zhao Ting
Test Title: User manage quiz	Text Executed Date: 24/6/2023
Description: Test on functionality of the quiz page.	

Prerequisite:
i. User has successfully navigated to the Quiz page.

Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	User answers the quiz session.	1. User clicks the quiz icon at the bottom navigation in homepage to quiz page. 2. User selects answer by clicking the radio button.	1. User will get to answer 12 questions in total and the quiz results will be displaying the total results correct from the quiz.	User answered 12 questions in total and the quiz results displayed the total results correct from the quiz.	Pass	-

		3. Clicks "submit" button to submit the answers.				
2	User finished the quiz session	1. User at quiz result page that shows the total correct answers. 2. Click on the "Finish" button.	User will be navigated back to homepage.	User is navigated back to homepage.	Pass	-

Table 5.6: Test case for quiz page

Test Case ID: 7			Test Designed By: Liew Zhao Ting			
Test Priority (Low/Medium/High): Medium			Test Designed Date: 24/6/2023			
Module Name: Settings			Test Executed By: Liew Zhao Ting			
Test Title: User manage settings.			Text Executed Date: 24/6/2023			
Description: Test on functionality of the settings page.						
Prerequisite:						
i. User has successfully navigated to the Settings page.						
Test Case ID	Test Case	Test Case Description	Expected Result	Actual Result	Pass/ Fail	Remarks
1	Users manage the About Project Page	1.User click on the "About Project" on the settings page to navigate to the about project page. 2. User click on the "Contact us" or and "Follow us on Instagram"	1. User will be able to view the project details successfully. 2. User able to click on the "Contact us" and will navigate to contact to my email and click "Follow us on Instagram" and will navigate to UNIMAS Official Instagram account.	1. User able to view the project details successfully. 2. User clicked on the "Contact us" and navigated to contact to my email and clicked "Follow us on Instagram" and navigated to UNIMAS Official Instagram account.	Pass	-

2	Users manage notification on Notification Reminder page	1.User click on the "Notification Reminder" on the settings page to navigate to the notification reminder page. 2. User turn the toggle on and scroll to the preferred timing of the notification. 3. User click "Save" button to save the notification.	The notification will display in the mobile's notification page displaying the message "Remember to add new expense record!" successfully to the user.	The notification is displayed in the mobile's notification page displaying the message "Remember to add new expense record!" successfully to the user.	Pass	-
3	User logout from the application	1.User click on the "Logout" on the settings page.	Users will navigate back to the login page successfully.	Users navigated back to the login page successfully.	Pass	-

Table 5.7: Test case for settings page

5.3 Usability Testing

Usability testing is a technique for evaluating the ease of use of the mobile application design through the observation of the actual users as they are trying to complete tasks on it. It is usually carried out frequently from early development to final deployment of the mobile application (Interaction Design Foundation, n.d.).

There are a total of 30 respondents on the usability testing and the results are collected and analysed as shown in the figures below. This testing aims to collect user's feedback on their satisfaction in terms of usability in the mobile application for the user. The linear scale 5 indicates the most agreed to the statement while scale 1 indicate being the least agreed to the statement.

Figure 5.1 shows the test result on the how frequent the user would like to use this mobile application. Overall result has positive feedback where 90% of the users most agree with the statement and 10% agree with the statement.
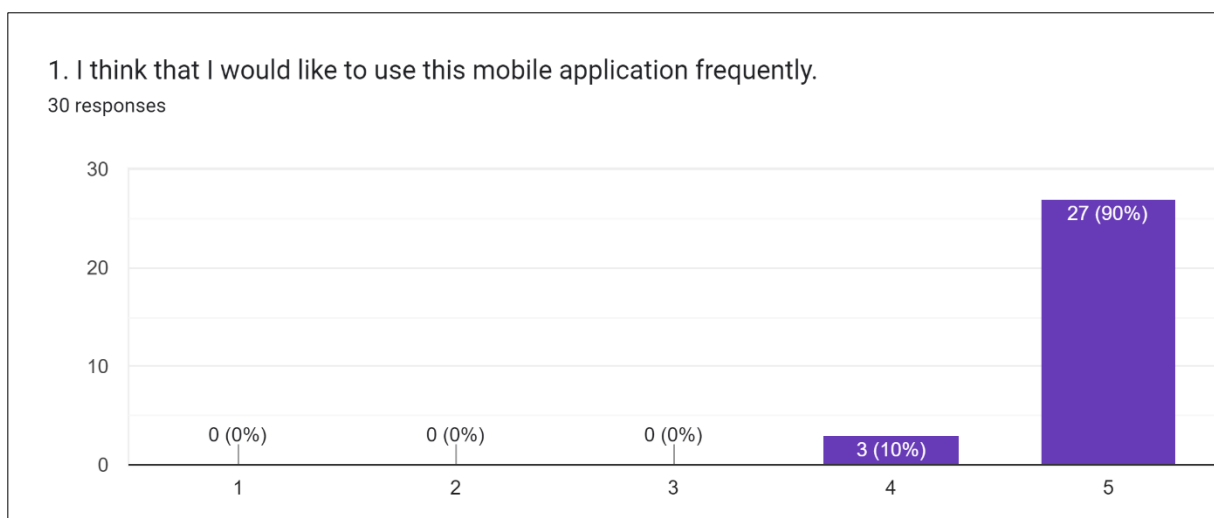
Figure 5.1: Test result on the how frequently they would like to use this mobile application

Figure 5.2 shows the analysis result on the user's perception of the mobile application, indicating that they found it unnecessarily complex. 76.7% most disagree and 23.3% disagree with the statement that the mobile application is unnecessarily complex.
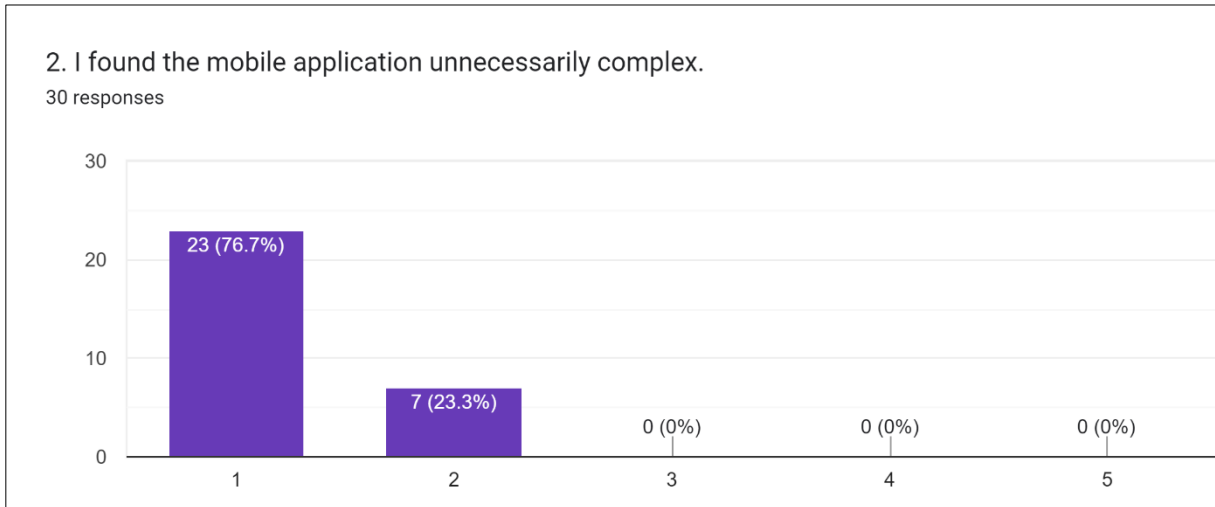
Figure 5.2: Test result on respondent's perception of the mobile application that they found it unnecessarily complex

Figure 5.3 shows the analysis result indicating that users found the mobile application easy to use. 76.7% most agree and 23.3% agree with the statement that the mobile application is easy to use.

Figure 5.3: Test result on users found the mobile application easy to use

Figure 5.4 shows the analysis result indicating that the user thinks that they would need the support of a technical person to be able to use this mobile application. There are 22 respondents that most disagree, 7 respondents disagree and 1 respondent is neutral about the statement.
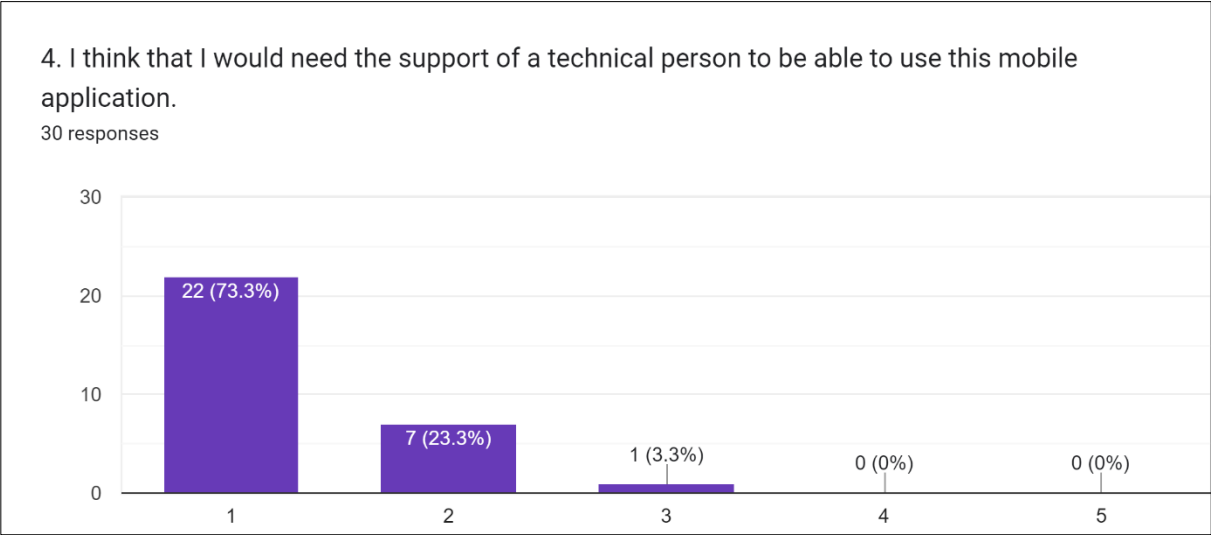
Figure 5.4: Test result on users would need the support of a technical person to be able to use this mobile application

Figure 5.5 shows the analysis result indicating that the user found the various functions in this mobile application to be well integrated. 25 respondents most agree, and 5 respondents is also agreeing that the various functions in this mobile application to be well integrated.
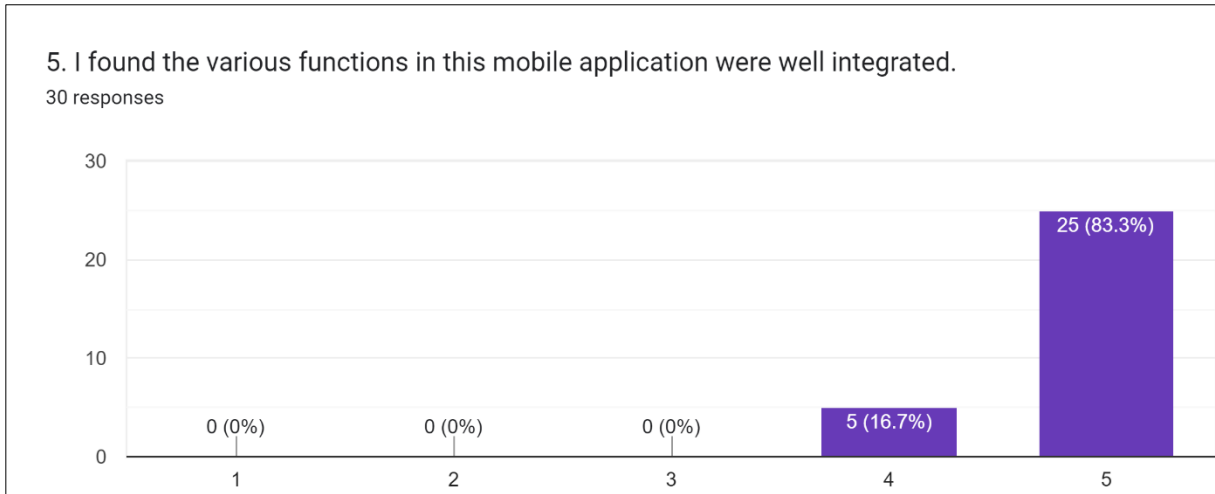
Figure 5.5: Test result on users found the various functions in this mobile application to be well integrated

Figure 5.6 shows the analysis result indicating that the user perceived too much inconsistency in this mobile application. 23 respondents most disagree, 6 respondents disagree and 1 respondent neutral to the thought on there was too much inconsistency in the mobile application.
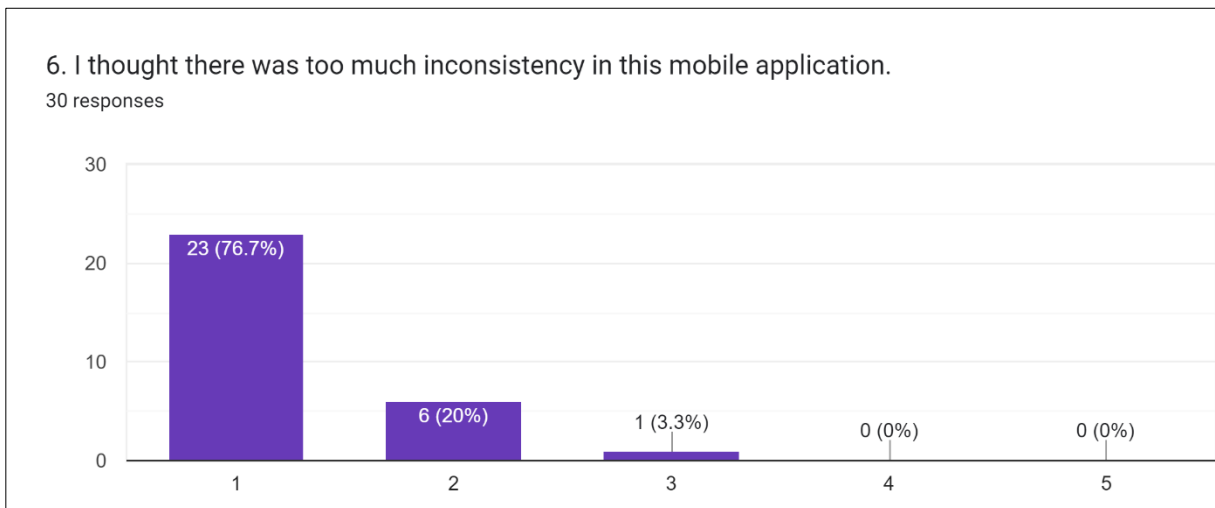
Figure 5.6: Test result on users found the mobile application too much inconsistency

Figure 5.7 shows the analysis result indicating that the user imagined that most people would learn to use this mobile application very quickly. 24 respondents and 6 respondents most agree and agree that they would learn to use this mobile application very quickly accordingly.
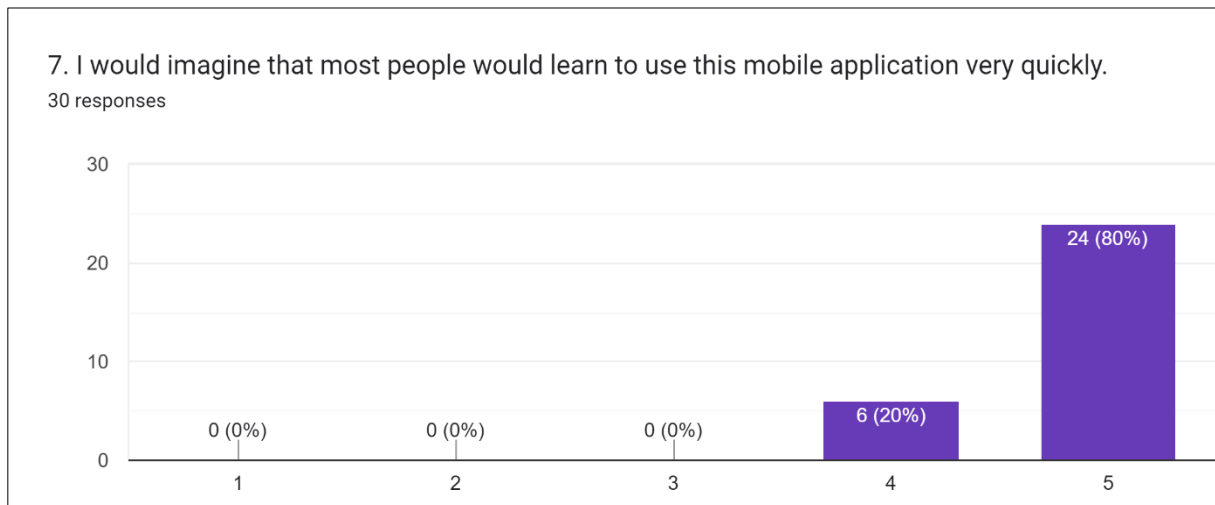
Figure 5.7: Test result on users would learn to use this mobile application very quickly

Figure 5.8 shows the analysis result indicating that the user found the mobile application to be very cumbersome to use. 22 respondents and 7 respondents most disagree and disagree that the mobile application is very cumbersome to use while 1 respondent found it neutral.
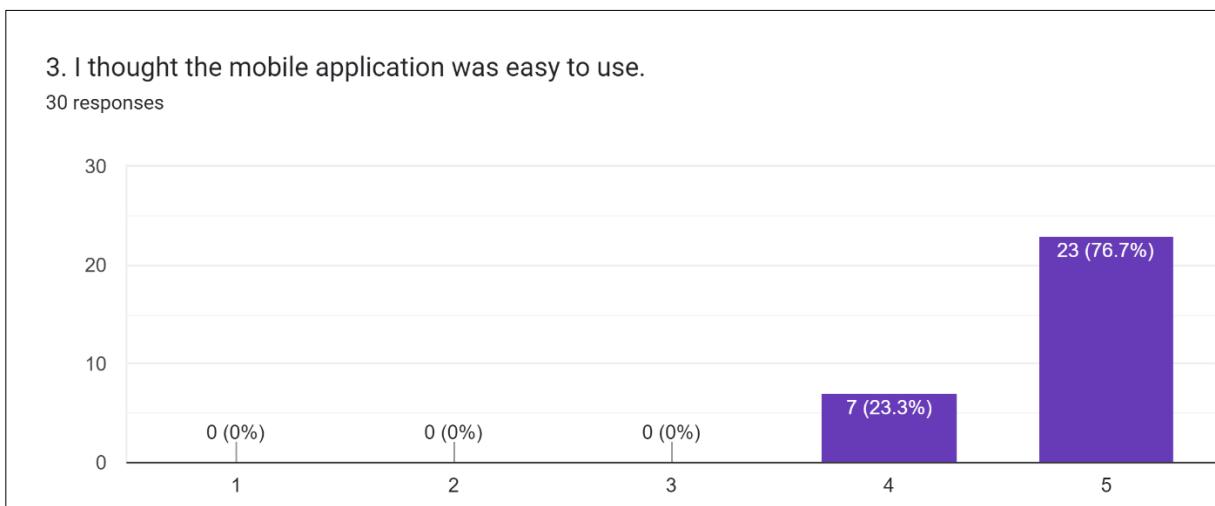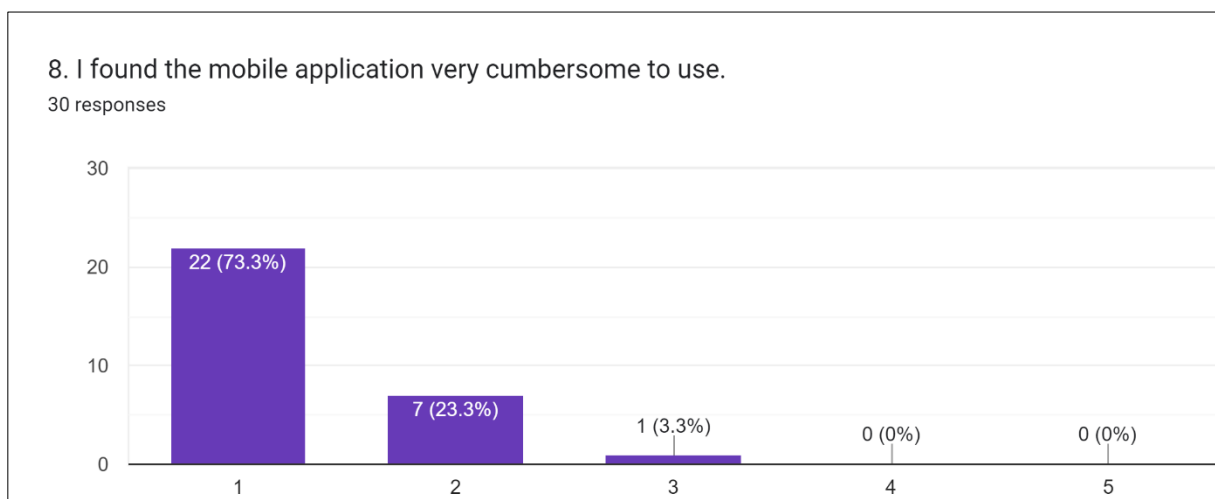

Figure 5.8: Test result on users found the mobile application to be very cumbersome to use

Figure 5.9 shows the analysis result indicating that the user felt very confident using the mobile application. 23 respondents and 7 respondents most agreed and agreed that they felt confident using the mobile application.
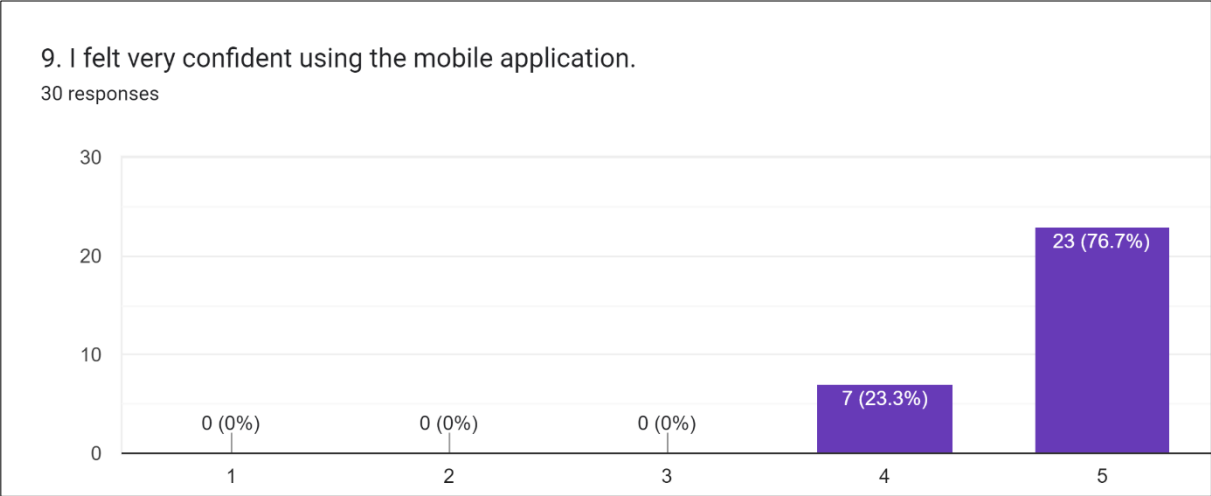
Figure 5.9: Test result on users felt very confident using the mobile application

Figure 5.10 shows the analysis result indicating that the user felt the need to learn a lot of things before being able to use this mobile application effectively. 17 respondents most disagree, 11 respondents disagree while 2 respondents are neutral about, they felt the need to learn a lot of things before being able to use this mobile application effectively.
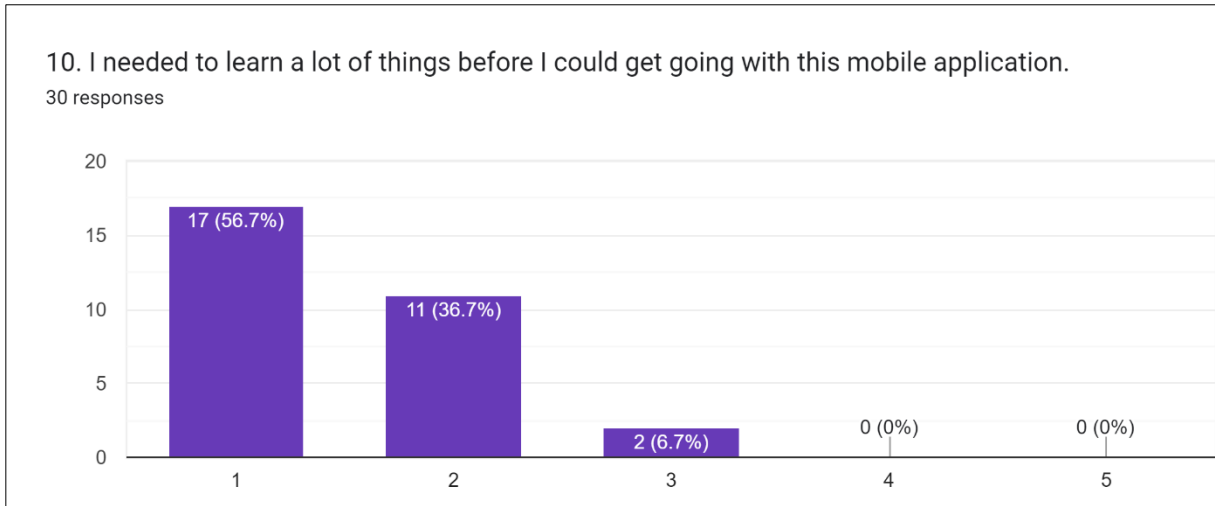
Figure 5.10: Test result on users felt the need to learn a lot of things before being able to use this mobile application effectively.

Figure 5.11 shows the result of the overall content usefulness in the mobile application from the user. 90% and 10% most useful and useful according to the content usefulness in the mobile application.
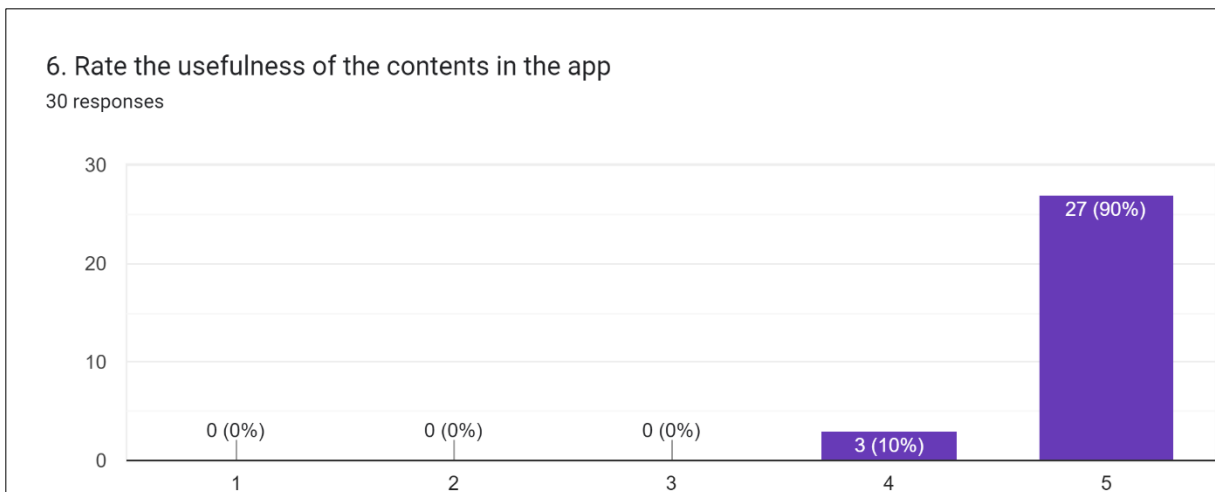
Figure 5.11: Test result on the content useful of the mobile application

Figure 5.12 shows the analysis result of overall content satisfaction in the mobile application from the user. 25 respondents most satisfied and 5 respondents satisfied with the overall content.
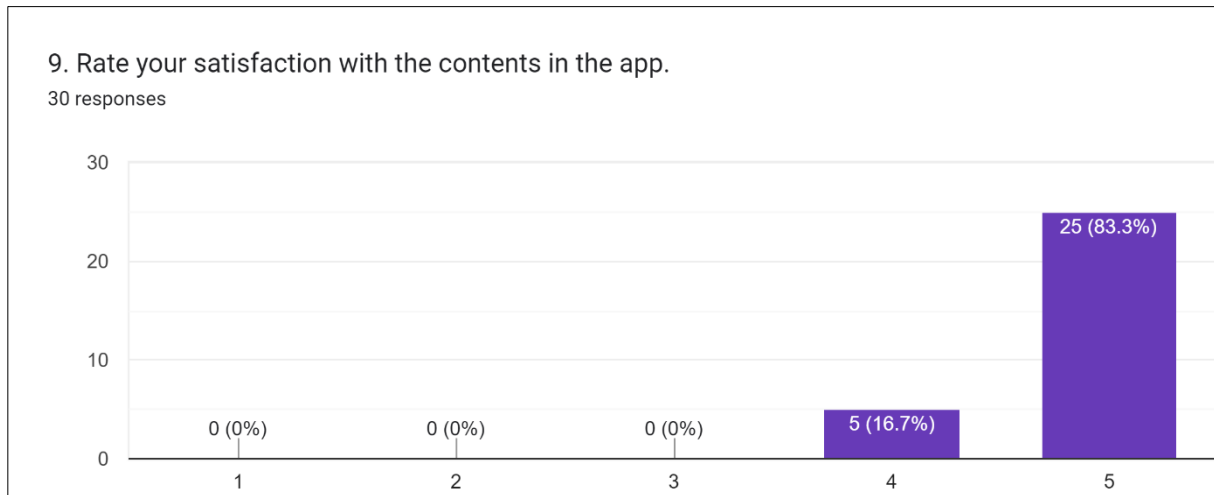
Figure 5.12: Test result on the content satisfaction of the mobile application

Figure 5.13 shows the user feedbacks on the content improvement of the mobile application. The user feedbacks on how the contents can be improved are adding dark mode, display daily expenses, implementing auto-scanning receipts feature, implementing Artificial Intelligence (AI) chatbot and other content improvement that could be considered to enhance in the future.
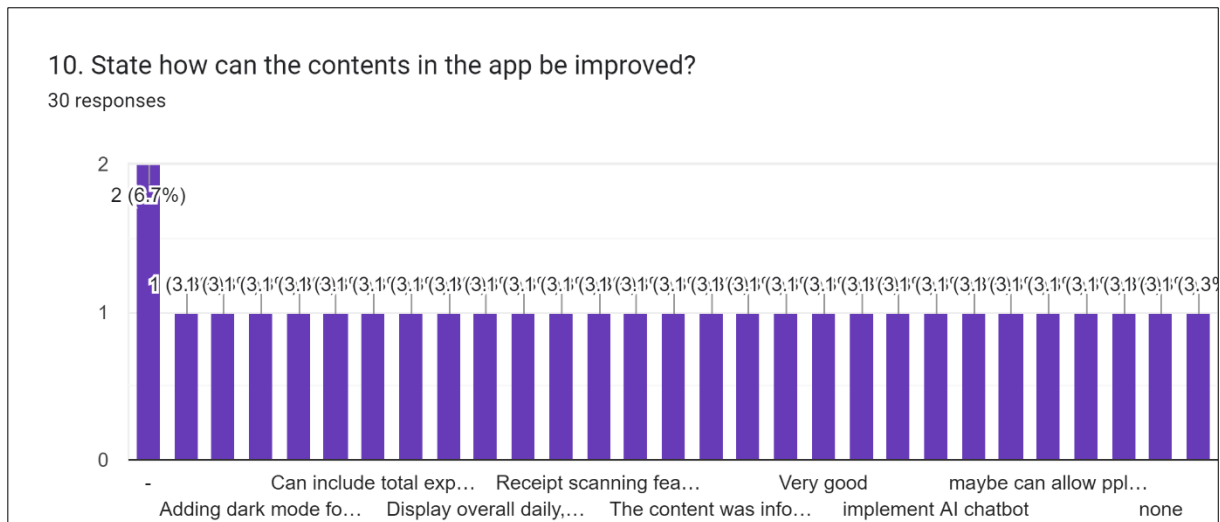
Figure 5.13: User feedbacks on the content improvement of the mobile application

5.4 Findings and Discussion

The findings and discussion have been divided into two testing which is the unit testing and usability testing. These tests were conducted to assess different aspects of the mobile application's functionality and usability.

Hence, the analysis from the mobile's application for the unit testing helps to determine the effectiveness and accuracy of individual components or units within the mobile application. It helps to identify any bugs, errors, or inconsistencies that may exist in the code or functionality of the application to ensure that the functionalities work as intended and meet the requirements.

On the other hand, the usability testing has evaluated the overall user experience, ease of use, and user satisfaction with the mobile application. This testing involved gathering feedback on the application's navigation, layout, user interface, and user experience. The findings from this testing provided valuable insights into areas that users found the mobile application is easy to use as well as learnability, consistency, and others. The analysis of the testing results indicate that the mobile application has a good level of usability, as they found

the mobile application to be user-friendly, but there are opportunities for refinement and enhancement to provide an even better user experience.

As a conclusion from the findings and discussion from both testing, it is crucial that the functionality and usability of the mobile application to ensure to meet with the requirements of the user and the objectives of the project.

5.5 Summary

In conclusion, this chapter describes in detail the testing that was carried out following the completion of the implementation of the financial literacy mobile application for UNIMAS undergraduate students. During the testing phase, functional and non-functional testing were performed to verify that the mobile application met the objectives and fulfilled the requirements. Functional testing consists of unit testing, while non-functional testing includes usability testing.

CHAPTER 6 : CONCLUSION AND FUTURE WORKS

6.1 Introduction

In this final chapter, it discusses the overall accomplishment of the proposed mobile application as well as some possible future work to further enhance the financial literacy mobile application for UNIMAS undergraduate students. The objective achievement will be explained in the section below. Nonetheless, the limitations and the future works of the project will be outlined will be described in detail for future enhancements.

6.2 Objectives Achievement

The financial literacy mobile application was designed and developed specifically for UNIMAS undergraduate students. The mobile application includes features to educate students on managing their finances efficiently and making wise financial decisions based on their spending patterns. Usability testing had been carried out and gathered feedback from users to improve the app's user content and overall experience.

6.3 Limitations and Future Works

The proposed mobile application has some weaknesses due to the limited development time and new programming language. The limitations of the proposed the mobile application is that is limited to Android users only. Hence, non- Android users are unable to use the mobile application. Another limitation is that the mobile application has no multilingual support for user to choose their preferred language. From the user feedback, there is a suggestion on adding auto-scanning receipt feature to add expenses.

Future enhancements to the financial literacy mobile application for UNIMAS undergraduate students are possible. The platform limitation of the mobile application can be

altered to operate on a different platform for future enhancement to reach wider audience by using developing the mobile application with cross-platform frameworks such as Flutter, React Native and Xamarin. Next is by adding the multilingual support in the mobile application. Last but not least, the auto-scanning feature could be added in the future to enhance the add expense feature experience.

6.4 Conclusion

Financial literacy mobile application designed and developed for UNIMAS undergraduate students to teach financial literacy. The mobile application has been developed based on the requirements in previous chapters. Last but not least, the objectives outline has been achieved. The limitations and future works are also summarised in this chapter.

APPENDICES

APPENDIX A

Final Year Project: Financial Literacy Mobile Application For UNIMAS Undergraduate Students

Hi ! My name is Liew Zhao Ting (70190) from Faculty Of Computer Science And Information Technology (FCSIT) in Universiti Malaysia Sarawak (UNIMAS). The Final Year Project (FYP) that I worked on is to develop and design a good usability mobile application that teaches financial literacy with bite-sized videos, quizzes and manage expenses tools. It teaches user to manage their finances by analyzing the financial reports. It helps user to track their spending, analyze expenses to make wise finance decisions.

Below is the instruction to download the mobile application in order to test:
Step 1: Download the app-debug.apk into your mobile device in this folder
https://drive.google.com/drive/folders/17RBA4LhYHMKPklh45vnhtEbQe_s5iyvr?usp=sharing

Step2: Before you click "Install", make sure that you go to settings->unknown sources for the security permission in order to proceed to the installation.
Step 3: After installation, you can run and use the mobile application.

The questionnaire consists of 3 section:
Section 1: User Demography
Section 2: User Testing on Usability
Section 3: User Testing on Content Usefulness

All information and data gathered from this questionnaire will be kept confidential and strictly used for academic purposes only.
Your participations and cooperation are appreciated and your feedback are precious.
If you have any inquiries, please do not hesitate to contact me at:
70190@siswa.unimas.my
Thank you very much!

Section 1: User Demography

This section consists questions that will collect your personal information. Kindly answer all the questions.

Are you currently an undergraduate student in UNIMAS? *

○ Yes

○ No

Which faculty you are studying in UNIMAS? *

○ Faculty Of Computer Science And Information Technology

○ Faculty Of Cognitive Sciences And Human Development

○ Faculty Of Economics And Business

○ Faculty Of Engineering

○ Faculty Of Applied And Creative Arts

○ Faculty Of Medicine And Health Sciences

○ Faculty Of Resource Science And Technology

○ Faculty Of Social Sciences & Humanities

○ Faculty Of Built Environment

○ Faculty Of Language And Communication

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Section 2: User Testing on Usability

This section to observe how users interaction with the application and gather feedback on its usability.
There are a total of 10 questions in this section.

Kindly answer all the questions.

1. I think that I would like to use this mobile application frequently. *

	1	2	3	4	5	
Strongly disagree	O	O	O	O	O	Strongly agree

2. I found the mobile application unnecessarily complex. *

	1	2	3	4	5	
Strongly disagree	O	O	O	O	O	Strongly agree

3. I thought the mobile application was easy to use. *

	1	2	3	4	5	
Strongly disagree	O	O	O	O	O	Strongly agree

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4. I think that I would need the support of a technical person to be able to use this * **mobile application.**

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

5. I found the various functions in this mobile application were well integrated. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

6. I thought there was too much inconsistency in this mobile application. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

7. I would imagine that most people would learn to use this mobile application * **very quickly.**

	1	2	3	4	5

Strongly disagree   ○   ○   ○   ○   ○   Strongly agree

8. I found the mobile application very cumbersome to use. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

9. I felt very confident using the mobile application. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

10. I needed to learn a lot of things before I could get going with this mobile   *
application.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Back   Next   Clear form

6. Rate the usefulness of the contents in the app *

	1	2	3	4	5	
Not at all useful	○	○	○	○	○	Extremely useful

7. Rate the quality of the contents in the app. *

	1	2	3	4	5	
Poor	○	○	○	○	○	Excellent

8. Rate the relevance of the contents in the app. *

	1	2	3	4	5	
Not at all relevant	○	○	○	○	○	Extremely relevant

9. Rate your satisfaction with the contents in the app. *

	1	2	3	4	5	
Not at all relevant	○	○	○	○	○	Extremely relevant

10. State how can the contents in the app be improved? *

Your answer

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