PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA

By

Lim Xin Jie

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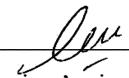

(Supervisor's signature)

Address:

107, Lorong Wira Indah 13,

Taman Wira Indah,

08000 Sungai Petani, Kedah.

Ku Chin Soon

Supervisor's name

Date: 9/15/2023

Date: 15/09/2023

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TUNKU ABDUL RAHMAN

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ABSTRACT

This project is a design and development project on retirement advisory tools for Malaysia citizen. It involves methodology, concept, and design of a financial decision-making tool with the focus on retirement planning financial areas. This personal retirement advisory tool will be developed as a mobile application due to more efficient and available for offline using. The development project will use some calculation and algorithms to calculate and estimate the amount of money needed for user's retirement life. The factors such as inflection, lifestyle, insurance, saving and other more that play an important role on effecting future money flow will be consider in the calculation. A suitable recommendation will be given to the user as reference on their financial planning according to the studies of users' data and research. The recommendation provided hope to help user having a better plan and understanding on money flow during retirement and have planning as soon as possible once they step in work field.

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LIST OF ABBREVIATIONS

EPF	Employees Provident Fund
PRS	Private Retirement Scheme
GUI	Graphic User Interface
MyPF	My Personal Finances

CHAPTER 1

Introduction

1.1 Project Inspiration

In this chapter, we will discuss about the aim and direction of the project which is about retirement decision making advisory tools. In current society structure, we have been given the opportunity as a workforce in society to stop working and live a retirement life after a long working time. According to the most recent population estimation report obtained from the Department of Statistics Malaysia's official portal, the population aged 60 and above is expected to account for 11.1% (3.6 million) of Malaysia's total population (32.7 million) in 2022. The estimated average retirement age is around 60 years old like the minimum retirement age set by the government of Malaysia [8] and the estimated average life expectancy in Malaysia is 73.4 years old [1]. However, Malaysia had many issues with retirement planning because most citizens were unaware of how important it was to maintain a similar and consistent lifestyle during retirement and relied solely on the Employees Provident Fund (EPF) and Private Retirement Scheme (PRS) that offer by government Malaysia.

1.2 Problem Statement and Motivation

Most of the retirement advisory tool for Malaysians not as establish compared to the foreign country retirement advisory system as it only provides limited calculation and work as part of the financial planner. According to google result when searching for retirement advisory tool Malaysia or retirement planning tool Malaysia, the search result in first page mostly is providing retirement calculator with some personalisation or recommendation of calculation tool [46][47]. According to table 2.1.3**, many local retirement advisory tools didn't provide risk calculation, scoring and retirement activities planning for their user**. Risk calculation is important to ensure the estimation range of money flow show for the user to avoid wrong decision making due to unpredicted factor and risk included medical fees, hobbies and other big expenses

that might happen in future. Scoring function can help user to determine their planning situation and can done a better decision making by the guideline of scoring while retirement activities planning allow user to have more planning other than retirement basic living need, for example travelling, retirement villages living and other activities that can be done during retirement. Hence, these functions should be included in retirement advisory tool.

Besides that, **the variables involved and official statistic use in the retirement calculation are not familiar to novice users.** For example, the rate of inflation in Malaysia averages is 3% increase per year. The average rate of inflation data provided by the Ministry of Statistics Malaysia will be constant for everyone estimating the amount of retirement savings needed with the condition of still living in Malaysia during their retirement life. According to World Bank research, only 36% of Malaysian individuals were financially literate and 13% of Malaysian respondents ranked their personal levels of financial literacy as extremely low [42]. This show the important of having explanation and standard amount of some financial term in the system to helps users reduce key-in change and control the data fill-in, which is logical to store in the user's account. Besides that, by including some financial knowledge, user able to increase the user's financial literacy level at the same time when planning for retirement.

1.3 Project Objectives

The first project objective is to design a local retirement planning and advisory tools that involve scoring, risk calculation and retirement activities planning and can be customised according to user needs. In Malaysia, existing apps cannot provide incredibly detailed, customised retirement plans compared to apps abroad. Therefore, our plan needs to have more variables that need to be filled in by users. **To developing a local retirement advisory tool that provided functionality like scoring, risk calculation and retirement activities planning** for planning other than system set to improve current existing local system and user can have more specific planning on the retirement planning.

At the same time, sufficient explanation of data basics is needed to help users enter accurate information. Second objective of this retirement advisory tools is to **develop a retirement advisory tool that provide variables from research and financial literacy knowledge or information** to enhance their financial literacy. According to World Bank research, only 36% of Malaysian individuals were financially literate and 13% of Malaysian respondents ranked their personal levels of financial literacy as extremely low [42]. Hence, this project will also provide some financial literature knowledge in the retirement advisory tools to raise their awareness about saving for the future, especially retirement.

1.4 Project Scope

This project focuses mainly on developing a retirement advisory tool. This application will be developed using Android Studio and Firebase. Android Studio is for Android mobile development for whole project including the graphic user interface (GUI) and activities carried out on the application. Firebase will be used to save the important data of users online and for backup purposes.

This project will include two parts of retirement planning analysis which will focus on analysis using estimated future value of each account including expenses and assets while another will analysis based on the average value of retirement planning contributed by other users. All the analysis will be generated after several data collected from user using **Planning module**. In this module user will be required to input all personal data according to three categories which is basic personal information, retirement planned asset information, retirement planned monthly expenses and other retirement plan that allow additional planning that not listed on system. In this module, user with different employment status will be allowed with different input limit to cope with their needs.

Next, the result calculation needs to be displayed to acknowledge user about how much should they keep according to their situation and based on their current planned asset situation how much they will have in future. The amount that user need to prepare for future will including the amount of fault tolerate using risk calculation designed according to income level and variables required. Comparation between two

amounts will be used to having some advisory about the amount their need to improve. In **Calculation module**, the estimated money flow also will be show using graph for user use on ensuring the increasement according to their planning.

Other than Calculation module, **Analysis module** will focus on comparing the current retirement planning with other user that also using the application and by separating the current retirement planning variable into ten level and define which level that they are. This can help user to identify which variable or planning that they can have improvement when comparing to others.

There will be testing or a **demo** for retirement planning element that provided constants dividend or income for the user and how it affects their retirement savings. Same working on the planning module to collect the demo data or directly modify from their current data for data collection using for demo module and choosing for show the result as draft. The data will be pass to calculation module and show all related analysis and calculation on future value needs and asset for their retirement planning.

Due to the understand of targeted user in financial knowledge not so high, the term that is used inside that system can be viewed with explanation and information to ensure the user is able to understand what the system requires and how it works on financial planning. A **financial literacy block** module will be used to view some financial knowledge about retirement saving and what is working theory used behind the system. Some link and block will work on guiding user to complete the retirement planning process.

1.5 Project Impact and Contributions

This project brings benefits to the user from many life stages. As all of us have the chance to live until retirement life and it is better to have your own financial planning to ensure a comfortable life in future especially retirement life. When we are still young, we might not so aware of saving for retirement just because we think that things it is too far from us.

As written in the project scope, this project provides a different module for different life stages of users from student to elderly. This project helps the student on building

their images about retirement planning. By some related financial literacy, they can be aware of the importance of financial management for their future life. At the same time, the user that wants to start their retirement planning can use the application to help identify their saving target, record their saving, plan their retirement life or even have a draft on constant investment on the application. Factors such as lifestyle, inflection, health costs, accommodation costs or even family members also need to be considered. This project will provide some recommendations to help the user improve their financial situation during retirement. Based on their current savings situation, the elderly can have an estimated expense and extra income needed to reach their ideal retirement life.

1.6 Report Organization

We will discuss this project in detail in the next chapter. Chapter 2 describes annuity calculation principles, calculation variables or circumstances, and websites that provide related applications. Chapter 3 presented the system requirements, blueprints, architecture diagrams, use case diagrams, and the timeline for this project in this chapter. Then, Chapter 4 showed the preparatory work for developing this project application, a retirement advice tool. In addition, Chapter 5 reports on the completion of all work on this project.

CHAPTER 2

Literature Reviews

2.1 Previous Work on Retirement Advisory Tool

2.1.1 Personal Capital's Retirement Planner

Personal Capital's Retirement Planner is a part of the financial system owned by an online wealth management company named Personal Capital. It provides a wide range of financial services, including investment management, budget management, and more. This application also offers many calculators for free to the public, but it targets only American users. Retirement is one of the options provided in the calculator tools [3].

The first simple calculator offered by Personal Capital required the user's current age and target retirement age, annual savings, retirement target, annual spending, risk tolerance and lastly the user's annual social security amount. Other than showing a simple draught of the calculation, the tools allow users to login and customize their retirement planning calculations by using their financial management planner on the main page and including information about assets and liabilities. (Refer figure2.1.1)

In the section for the retirement planner, the tools allow the user to set a target for how much they plan to use during retirement. The percentages of usage on retirement targeted savings that are required to be filled in at the beginning of the tool's use will allow the user to have a general idea of how much money they can plan to save to cover their anticipated retirement expenses. On the retirement planning expenses section, it is flexible to include and increment the value by year on that plan and if any family members are also involved. This helps the user calculate any consent factor that might affect the plan.

On the other hand, income events during retirement are also included as they are a factor that affects retirement planning. The user may include some events, such as property renting, property sales, investment income and others, to help increase retirement savings. This helps the user control their target money flows by not putting too much burden on retirement saving [4].

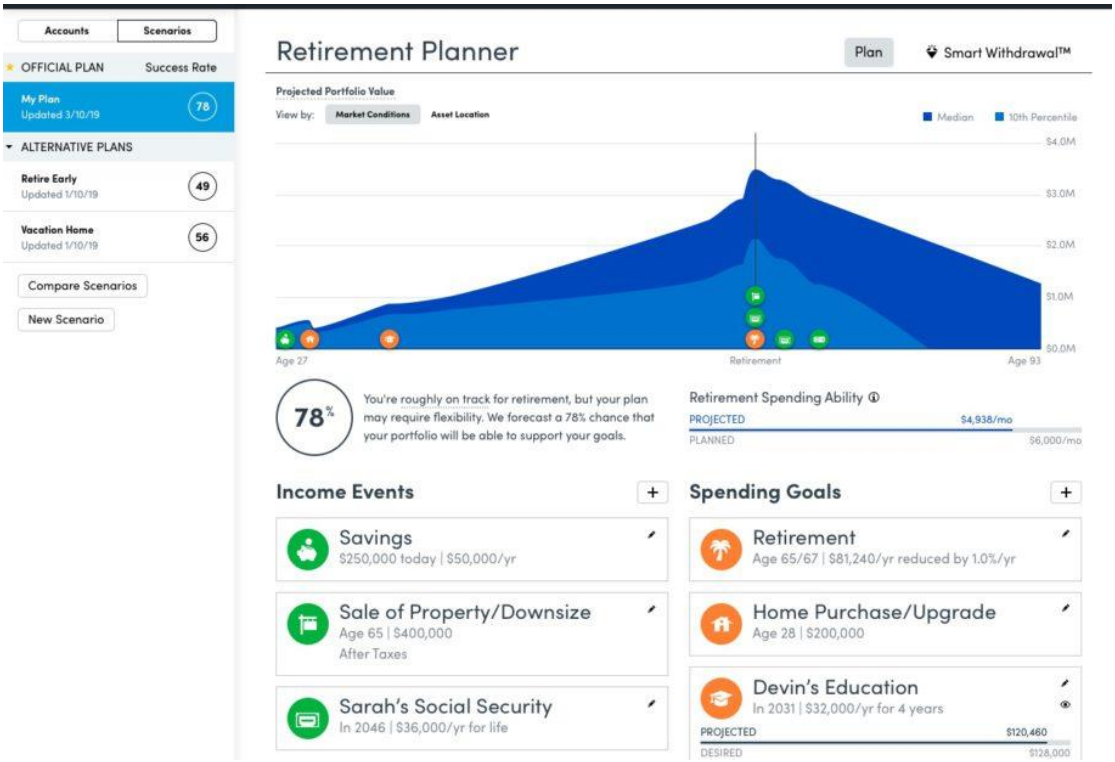


Figure 2.1.1 Interface of Retirement Planner section for Personal Capital Application [44]

This tool provides a clear statistical analysis of previous event effects and money flow as show in figure 2.1.1. The statistics provided by Personal Capital's Retirement Planner also include 10 percentage points of increment to cover market risk that might happen anytime anywhere. Therefore, assumption data was included to avoid significant differences between the actual and simulated data [5].

2.1.2 Betterment Application

Betterment Retirement Planning is part of Betterment Financial Management and Investment Platform that only provides services for Americans. It provided many other modules on future money flow and suggested their user choose suitable financial investment products that are suitable to their financial situation.

For the retirement module, Betterment provides many selections for the user to start their account. For the user that still does not have any idea, they will provide a questionary for users to identify the user's financial situation and encourage them to start their portfolio. Betterment will allow the user to set their targeted value to have

flexible planning however the system will round off the value as projected spending value as the main target.

As a program that provides financial services like traditional 401k, Roth 401k and others. They provide the user with a chart description of data and have their prediction on the market flow that is stated with outcome range and the range when poor market outcome occurs as shown in figure 2.1.2. The overall risk rates with different timeframes will also show with the scoring calculated by the robo-advisor. Besides that, external investment also can be included by the user to have better planning to reach their target goal.

On the other hand, Betterment provides an option for adding family members into their retirement planning by setting an overall retirement target for the user and his family members together. Betterment allows the investment or fund taken by that family member in the calculation of estimating future money to reach the ideal life during retirement.

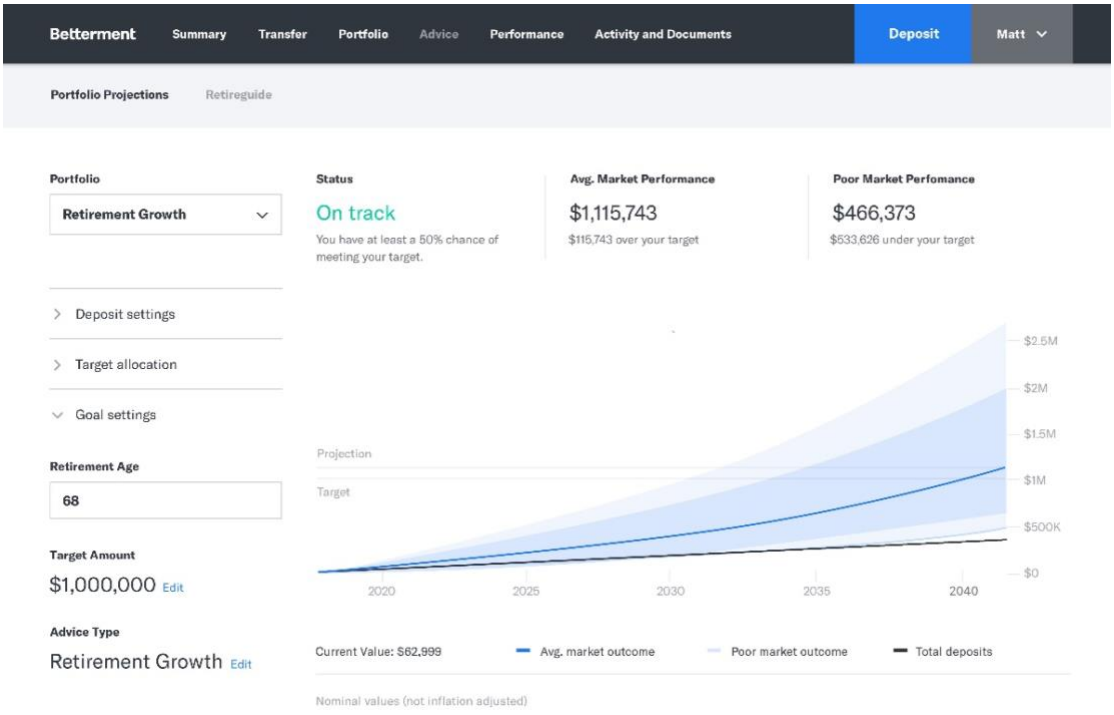


Figure 2.1.2 Interface of Betterment Application in retirement growth statistics part [19]

In conclude, Betterment is an outstanding financial investment application. It provided many possible and good investment suggestion for the user and having good predicting system to let user understand more about their investment. This program more focus on investment compared to planning. As it set the target of activities with own setting timeframe, for example if the user plan to saving for his planning on travel to Europe country during retirement will be separate from retirement saving planning if the user doesn't set the amount together. The retirement planning involve is only focus on living after retiring from work and not include accident activities that need a big amount of money during retirement.

2.1.3 Fidelity Retirement Score Tool

Fidelity is an investment platform that provided many investments program for their user. It owns by Fidelity Investment which was a stockbroker that found in the year 1946 in the United States. Fidelity Retirement Score Tool is the tool provided for the user to help them identify their investment and financial situation if they continue their current situation until retirement life (Refer figure 2.1.3.1).

Scoring will be given according to their input about current age, annual income, current savings, expected retirement lifestyle and investment style. The system also will estimate how much you can have during retirement every month and how much you should have to enough support your retirement life.

The system also provided a section for users to change their retirement age, monthly savings on retirement, retirement lifestyle and investment style. According to the changes, users can know what can be done to enhance retirement planning. The scoring will change and the range of the score had stated with what current financial situation.

This is only a calculation tool with rough retirement planning that is designed according to the study. It had a better study as it used some research-based statistics involved in the calculation and make the users enter less data compared to other similar calculators, however the unstated attributes involved might not be suitable for every user and cause inaccuracy advice given to the user. Besides that, this investment company have other two platform that provides only investment related detail. (Refer figure 2.1.3.2) This platform only provides detail on the investment amount and the money flow of the account according to their daily investment.

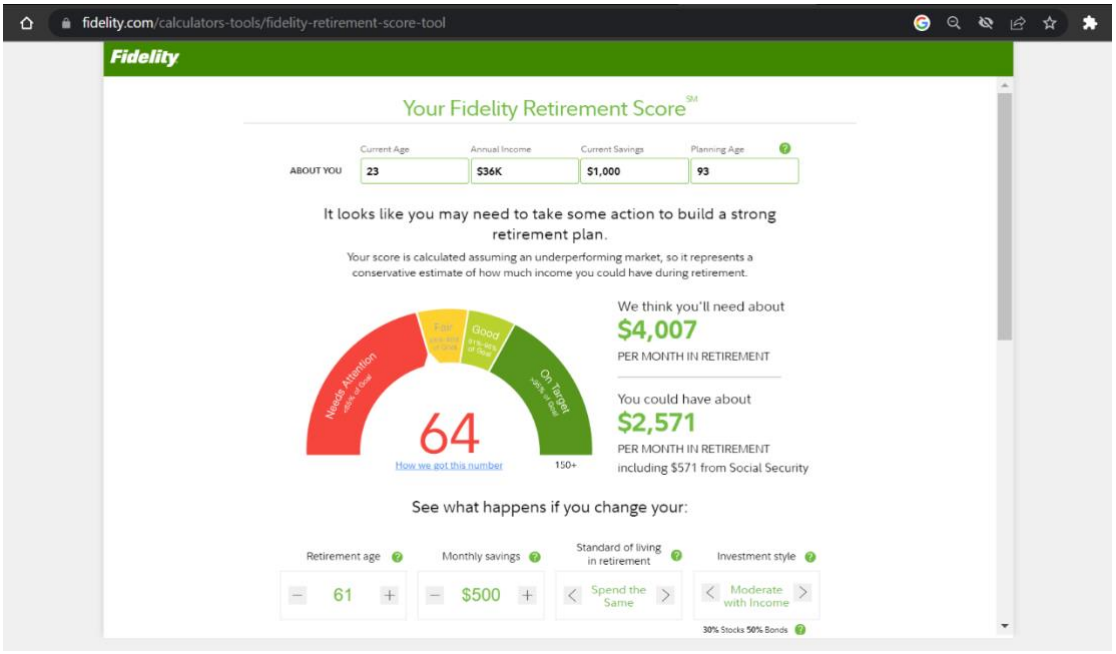


Figure 2.1.3.1 Interface of Fidelity Retirement Score Tool

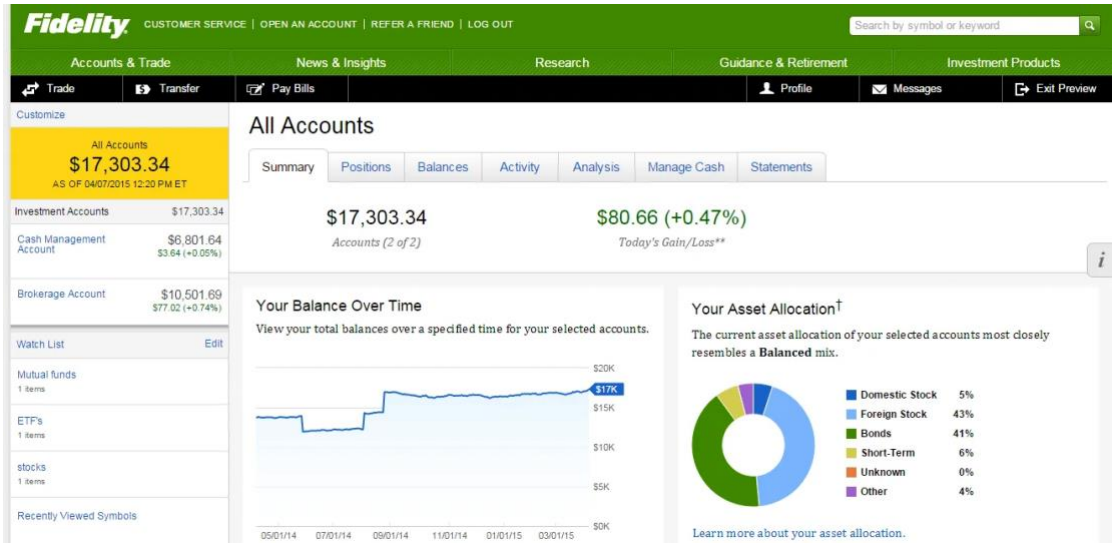


Figure 2.1.3.2 Interface of Fedility Investment [45]

2.1.4 NewRetirement Retirement Planner

NewRetirement is an online financial planning tool that offer free calculators and fees service support according to user need. NewRetirement provided a simple retirement calculator on their official website. This calculator required user to enter personal condition like age, relationship, monthly income, monthly expenses, monthly saving, social security savings and other related condition. (Refer figure2.1.4) Four graphs will be shown about how the flow of money you need and how much you will have if current situation remains the same for future and the ratio or amount of savings, home equity and unfunded in future. This help user to identify their financial situation and encourage user to move on for complete retirement financial planning.

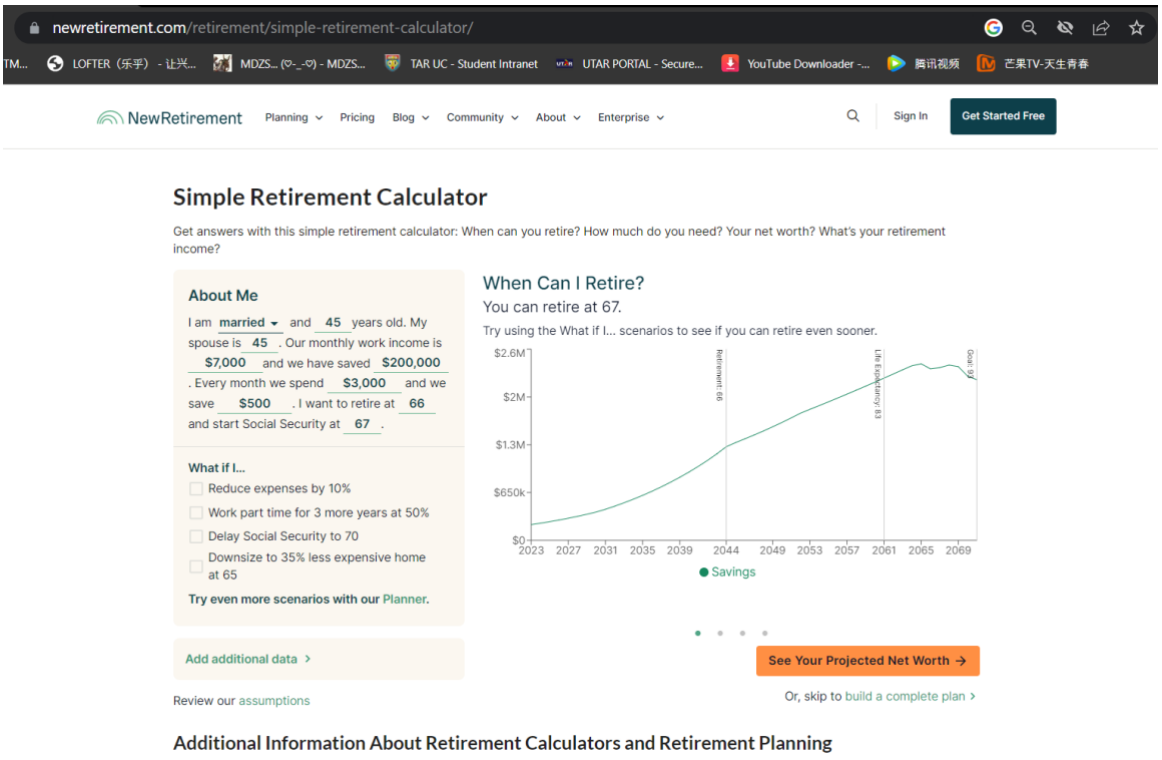


Figure 2.1.4.1 Interface of Simple Retirement Calculator

When login in into NewRetirement website with google or sign-up using email and password, two option let user to choose on quick setup and comprehensive setup. Both setups required user to answer and fill in detail from 8 expect which is path, profile, income, savings, pension, home and real estate, and expenses. After entering all the information, the system will pass the detail to profile and generate a scoring result about chance of success, the completion progress, net worth and ratio of income vs expenses. On the side bar, all aspect data entered can be more specific in the profile to have a

more detail estimation and suggestion on how to have a better plan on retirement planning.

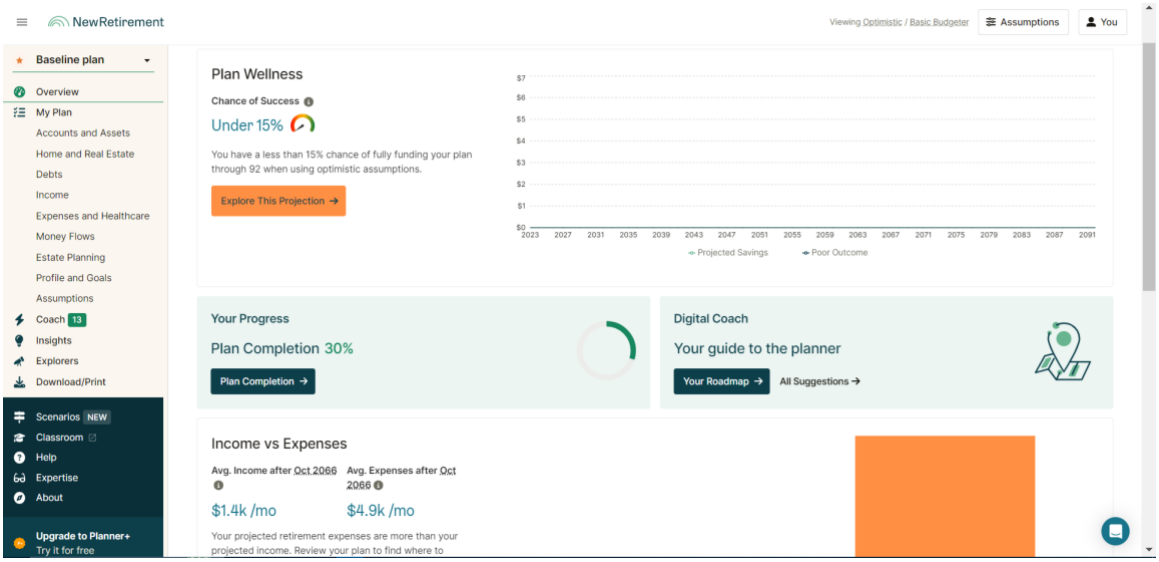


Figure 2.1.4.2 Interface of NewRetirement Application Retirement Planning

NewRetirement Application had a complete and in deep detail on retirement planning compared to other application. It had a lot of functionality the help user to have a concept on how the situation of financial if they change or remain their current lifestyle and financial opinion as shown in figure 2.1.4.2. Besides that, NewRetirement provided plenty of information related to financial for their user to encourage their had better idea or planning for their future. However, it need user need more in deep retirement planning need to upgrade their using and constantly as they provided very draft assumptions on the beginning.

2.1.5 Ringgit Plus's Retirement Goal Calculator

Ringgit Plus's Retirement Goal Calculator is a tool provided by the RinggitPlus.com website. RinggitPlus.com is a financial comparison website in Malaysia that works on helping Malaysians with their financial decisions. The main service provided is financial consultation and advisory or recommendation on financial products [7].

This website provided a form to be filled out by the user about the information and the form was separated into 3 steps. To begin, the system uses the current age to determine the period for planning. To continue, the amounts of monthly living expenses and yearly

expenses during retirement must be estimated to calculate the total expenses for each year of retirement. Optional big expenses like charity and family inheritance are also included as financial determining factors for their customers. Then, a result of the estimated amount needed for retirement will be shown and the user will be able to select for further calculation on how much is needed according to their current situation.

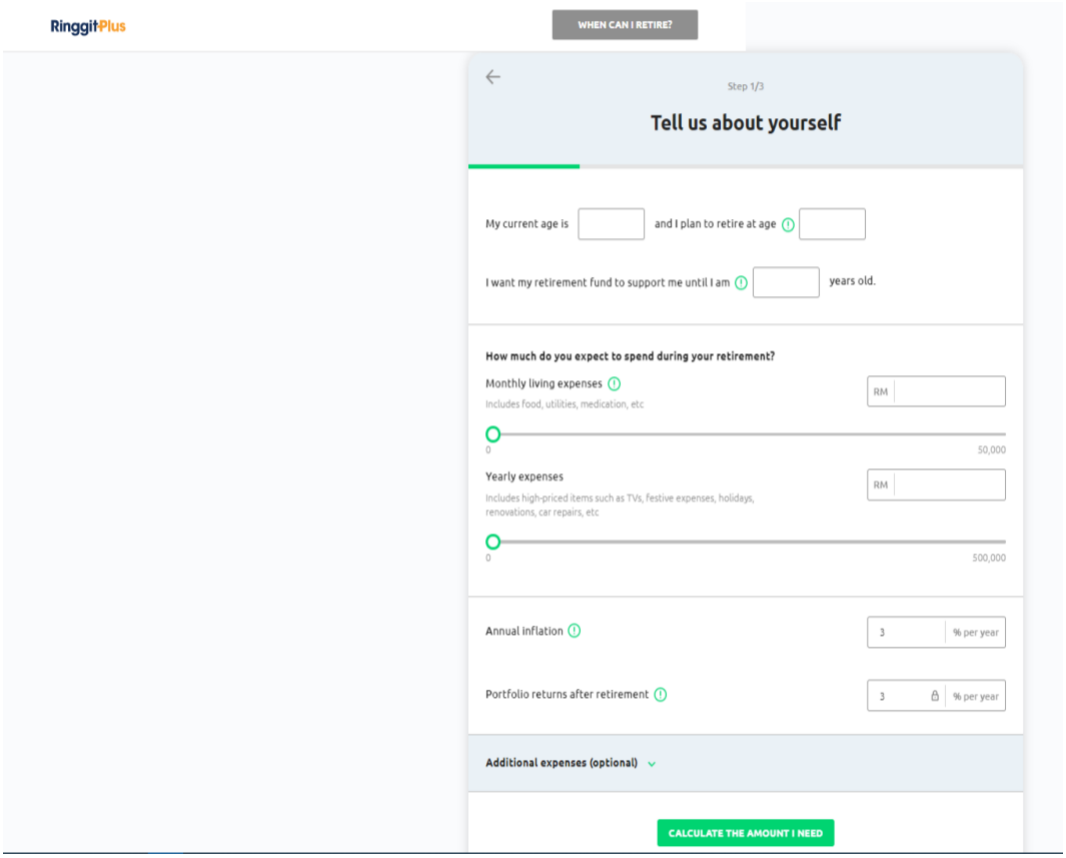


Figure 2.1.5 Interface of Step 1 on Ringgit Plus's Retirement Goal Calculator

Cash saving, investment, property status during retirement, gross monthly salary, endowment plans and EPF/PRS are the factors that are considered when counting money saved for retirement. In all the required elements, the inflection rate and moving rate were included to provide a more accurate calculation of the money required. Finally, your current financial situation will determine when you can reach your goal. On the result page, some financial product and planning reading is provided to encourage user consultation for their services [6].

This tool does not provide the rough estimate data that comes from research about the amount to be filled in by the user, the section only provides data on the inflection and increment of risk calculation. Majority of the data fields provided are based on the

fundamental elements in which Malaysian citizens are involved. However, the tools are still not enough to customise more detailed retirement planning based on income, spending and target planning.

2.1.6 Imoney Retirement calculator

Imoney Malaysia is a financial comparison aggregator than provide the public about information of financial products in Malaysia to improve Malaysian's financial literacy and encourage the development of financial markets. Imoney Retirement Calculator is a tool provided by Imoney Malaysia to estimating the amount of money to be keep for retirement beside EPF. This tool required user to enter only their monthly income and retirement age. The system will take 2/3 of current monthly income as the retirement monthly spending with defined as same lifestyle as now to predict future need amount or target and calculate how much should user keep other than EPF that should be keep by public. This calculation includes inflation calculations of 3% and life expectancy of 80 years old.

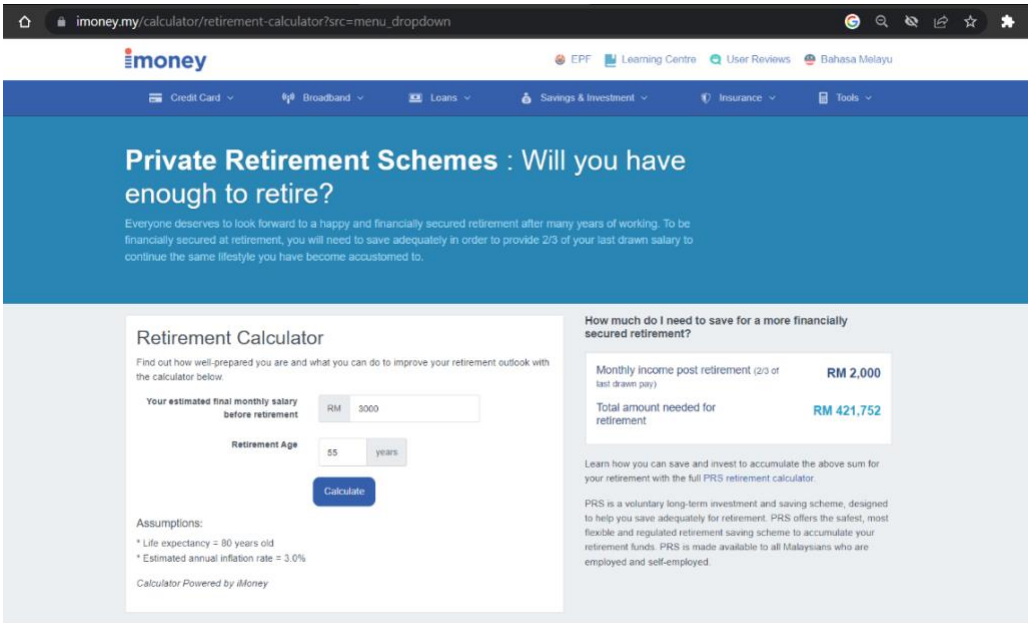


Figure 2.1.6 Interface of Imoney Retirement Calculator.

This calculator needs less user input to the system so it easier to use compared to all systems reviewed above. The calculation does not provide flexible variable for the user to change according to their situation and the retirement amount need just include daily expenses and not include any emergency or incident expenses that may happen in the

future during retirement life. This platform just provided the value to user in purpose on encouraging user to involved in PRS projects as listed under the calculator.

2.1.7 Sunlife Retirement

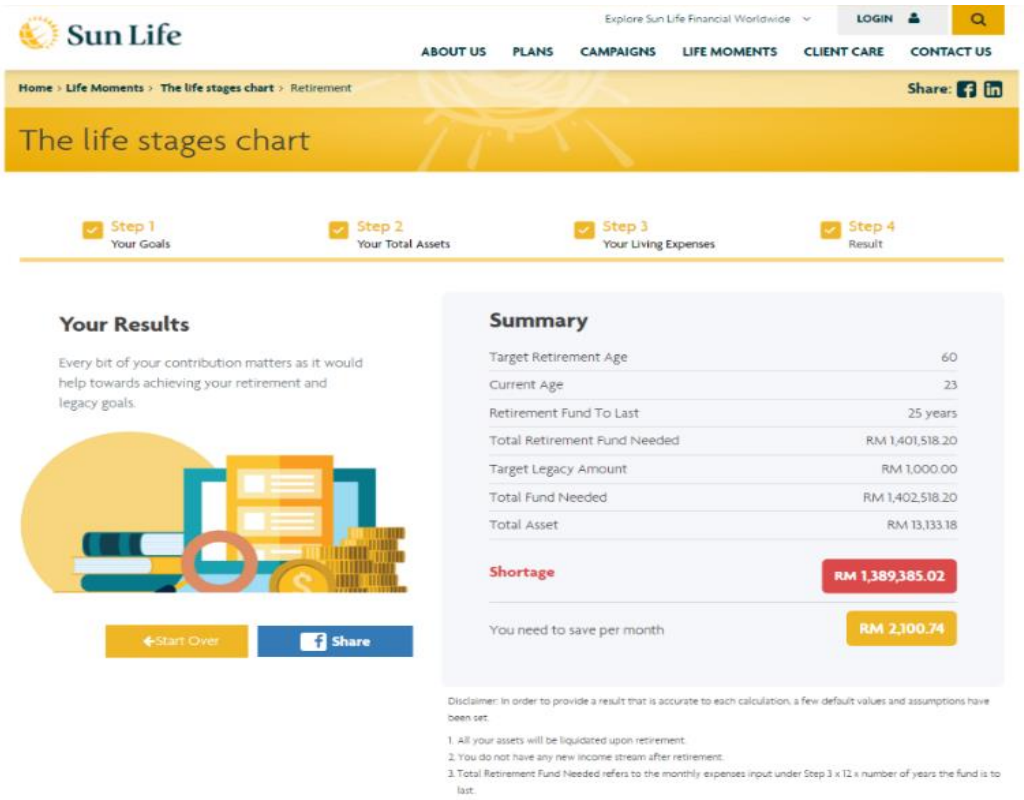


Figure 2.1.7 Interface of Sunlife Malaysia's Retirement and Legacy Calculator

Sunlife Malaysia is an insurance company that offer various type of insurance and takaful product for the public. This company was a joint venture by Khazanah Nasional Berhad and Sun Life Assurance Company. In official website of Sunlife Malaysia, it provided a retirement and legacy calculator for their users.

Firstly, the user is required to input their current age, retirement age, saving for how many years and amount to keep for family member to identify the roughly planning timeframe. Then, enter current asset user had in the type of fixed deposit, EPF, Fund and Shares, properties and other variable assets with the annual growth rate of the assets inputted. Next, user will need to enter monthly living expenses during retirement life in various categories like housing, transportation, living expenses, others and variable like entertainment, dining, utilities, takaful, insurance, child, maintenance, loan payment,

transportation, and other more related expenses. At last, it will show result on how much fund needed compare the total asset count in future (Refer figure 2.1.7). The shortage of amount will be show with amount need to save per month from now.

The calculator provides more flexibility for user on define what might need to be spend during retirement life. However, user cannot change the default value of variable involve like inflation rate of this calculation set is 2.1%. This calculation suitable for simple estimation of the value needed to save and below the result stated the monthly expenses is count by amount input times 3 times 12 times number of year need to be saving while assets will be count according to the rate input by user.

saving while assets will be count according to the rate input by user.

2.1.8 My Personal Finances Retirement Calculator (MyPF)

My Personal Finances is a financial education and services platform that provided licensed financial planners, tools and solutions to the public. MyPF Retirement Calculator is one of the tools provided on its website. This calculator required user age, retirement age, life expectancy age, monthly expenses, current fund, monthly investment and return rate with the inflation rate for its calculation as shown in figure 2.1.8.1 below. This system provided a default set value on investment rate and inflation rate a rough demo also show on the website as a guide for the public on using the calculator. When moving to the blank input boxes, some of it provided some explanation on what to fill in for the calculation.

MyPF Retirement Calculator having their result in capital liquidation and capital preservation as shown in figure2.1.8.2. For capital liquidation, your assets during retirement will covering all your retirement need and this is riskier compared to capital preservation where retirement savings will cover all the retirement need without the calculation of interest rate that may happen during saving period. The calculator result including post-retirement expenses then fund required, fund available, fund surplus and roughly including investment that need to cover shortfall. User can change their planning according to their own preference.

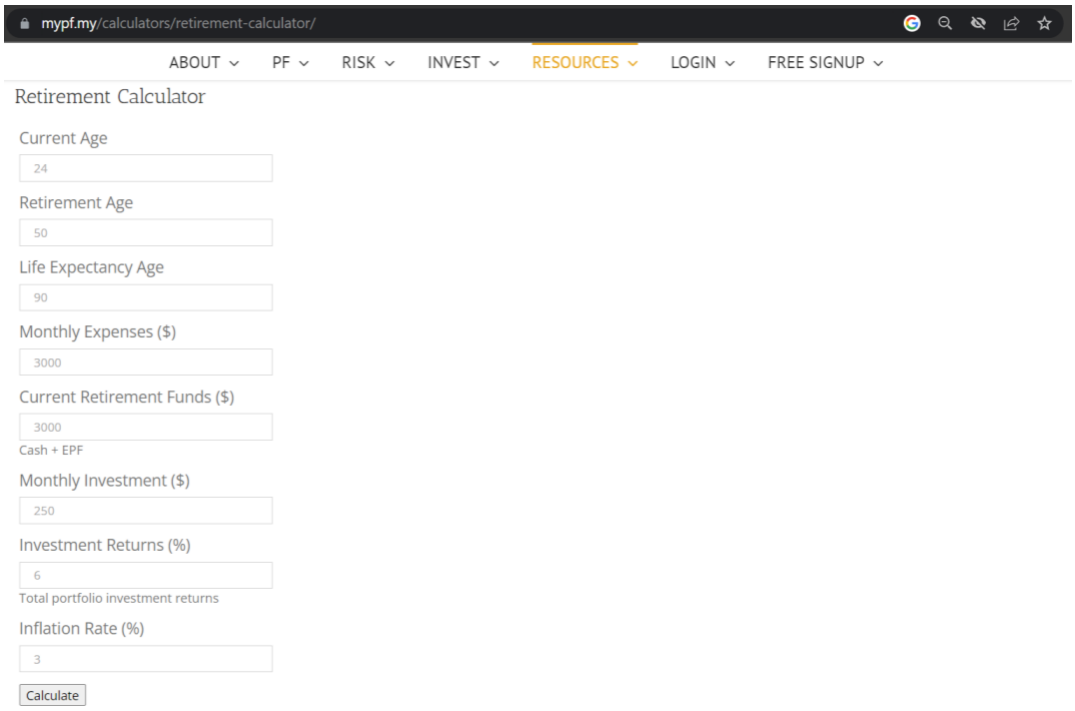


Figure 2.1.8.1 Part of the MyPF Retirement Calculator that required user enter detail**.**

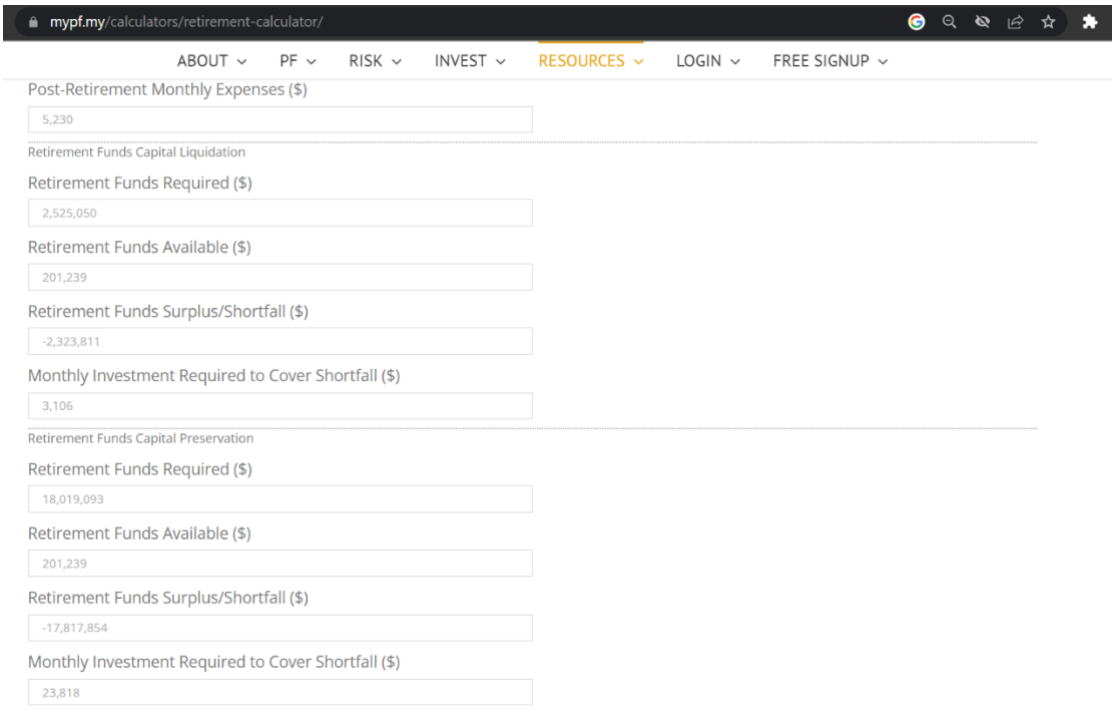


Figure 2.1.8.2 Part of the MyPF Retirement Calculator result that divided to capital liquidation and capital preservation.

MyPF Retirement calculator had a clear guidance and included risk calculation to ensure user get know their financial situation more specifically. This calculator didn't include too complicated and detail retirement planning for their user only a rough calculation that divided to two capital type is different from other work. The capital separate calculation also had better reduce the risk of saving not enough to maintain life during retirement.

2.1.9 Overall Related Application and Tool Online

Application Name	Type	Financial product advisor	Questionaries	Risk calculation	Retirement Activities Planning	Including scoring	Local / Oversea
Personal Capital's Retirement Planner	Part of financial Planner	Yes	Yes	Yes	Yes	Yes	Oversea
Betterment Application	Part of financial Planner	Yes	Yes	Yes	Yes, divided from retirement planning	By grade	Oversea
Fidelity Retirement Score Tool	Calculator	Yes, another application	No	N/A	Only lifestyles	Yes	Oversea
NewRetirement Retirement Planner	Retirement Planner and Advisory, Simple Calculator	Yes	Yes	Yes	Yes	Yes	Oversea
Ringgit Plus's Retirement Goal Calculator	Calculator	Yes, work with other company	No	N/A	Yes, not specific	No	Local
Imoney Retirement calculator	Calculator	Yes, work with other company	No	No	No	No	Local
Sunlife Retirement	Part of financial Planner	Yes	Yes	No	Only variable	No	Local
My Personal Finances Retirement Calculator	Calculator	Yes	No	Yes, capital liquidation and capital preservation	No	No	Local

Table 2.1.3 Information of related retirement tool online

After review for many online tools about retirement planning, most of it work as part of a financial planning tool or only a tool to encourage user join their company provided financial product. (Refer Table 2.1.3) Only few examples like New Retirement planning written in the work review is the advisory tool that only work on retirement planning. For Malaysia most of the article and tool provided is only with simple calculation and part of financial planner. This will be one of the problem statements of this project.

Most of the system that have more complete need on user input with let user start with a questionary to guild user on pre-retirement planning or investment risk identification. (Refer Table 2.1.3) Risk calculation is included in most of the calculation, activities during retirement also included in some of the retirement saving. Only some of the retirement planning having score calculation on their planning and almost all the retirement planning provided compare retirement saving amount and retirement need to evaluate user planning situation.

In conclude, most of the application oversea provided complete retirement planning compared to most of the local application and not only concentrate on need but also include advanced activities that can be done during retirement. (Refer Table 2.1.3) Questionaries, scoring, financial situation comparison is the aspect that mostly exist other than the application main functionality like estimating retirement saving need, manage retirement saving and give recommendation that can be taken for enhance retirement planning.

2.2 Calculation and Methodology

2.2.1 Principles involve in Calculation

Retirement planning is a planning on financial and decision making to prepare for living during retirement life. While retirement phase can be divided into four phases where first phase is pre-retirement phase, second is early-retirement phase, next is middle retirement stages and later year. Where pre-retirement phase will be about 10 years before start retirement. People will start care about their retirement planning and saving and start to keep a big amount of money or put in high return of investment to ensure there still income source after retirement. They also start planning which year and when they want to take their pension and what to do when they stop working. Early retirement

phase, most of retires will enjoy their life as plan by holiday and enjoy freedom of life. Middle retirement phase will bring retire back to reality and consent of how to save and spend on the money that they currently have and find new investment with current money. Later year will be after five years of retirement start to settle down all planning and enjoy life.[53]

When talking about formulas for retirement saving calculation, most of them will think of 4% rule introduced in financial planning literature and in a short time it become a common use principle adopted by many organisations and calculated by financial firms and advisory. This principle state that 4% of the total retirement saving will be every month withdrawn during retirement life. It also means that when we keep enough money for retirement is the time when we save enough to let us withdraw in the same amount that we set for 25 years [41]. Another rule is 80% rule which recommends saving enough money to cover 80% of one's pre-retirement income. This rule put an assumption on lower expenses during retirement because they no longer have work related expenses [40]. However, these two rules did not prove efficient of the invented idea. Besides that, less control variables will be one of the obstacles to retirement financial planning. 4% rule and 80% rule that saving for 25 years with constant value did not concern about the things that may happen that are out of control, for example, medical fees, inflation, new hobbies, new life planning and other emergency issues that causing expenses that out of planning.

Regular contribution is another principle involved in the calculation. This led to constant and long-life retirement saving and easily help to estimate the money growth and easier to help the user to reach their target. This can be shown in EPF savings which a constant percentage will be given as the standard for all their member to keep a constant value of money according to their effort and law in Malaysia. Besides that, PRS and other investments also will be considered by requiring the user to include their constant interest and contributions. Next, we will concern about taxes which will need to pay by all citizen that lives in Malaysia. Apart from EPF which is related to retirement investment and savings, investment in some stocks and other related investment products will lead to taxation problems. This will be considered when estimating the monthly income that gets from the investment activities.

After reviewing many similar programs above, they had the similarity of having inflation adjustment and risk prediction. As the market and economic situation change every day, the selling price of items and services will change from time to time. This is where inflation that happening and affecting our daily expenses. In Malaysia, the official average inflation rate is 3.8%. Therefore, in prediction the expenses will be counted including the inflation every year to ensure the estimation is closer to a real number in the future. The risk part can be seen in Betterment Application and Personal Capital's Retirement Tools. Both programs reviewed above included risk prediction on the return of investment account. This helps users to have a rough image of the money flow for the account and be able to have flexible planning on their money flow.

2.2.2 Term involved in Calculations

Decile Group		Income Share (%)	Median Household Income (RM)	Mean Household Income (RM)	Income Threshold (RM)
T20	T2	30.7	19,781	24,293	More than 15,039
	T1	16.1	12,586	12,720	10,960 - 15,039
M40	M4	12.3	9,695	9,730	8,700 - 10,959
	M3	9.9	7,828	7,841	7,110 - 8,699
	M2	8.2	6,471	6,477	5,880 - 7,099
	M1	6.8	5,336	5,346	4,850 - 5,879
B40	B4	5.6	4,387	4,395	3,970 - 4,849
	B3	4.5	3,556	3,561	3,170 - 3,969
	B2	3.5	2,786	2,803	2,500 - 3,169
	B1	2.4	1,929	1,849	Less than 2,500

Figure 2.2.2.1 Table of income grouping in Malaysia.[34]

First, Income which is how much money we can get every month. This term is important to know we are from which income categories and how is our lifestyle. According to Figure 2.2.2.1, Malaysia government divided Malaysians into 3 categories according to their monthly income where B40 is the group of population that had monthly households less than RM4,850 and currently covers 40%（2.91 million）people living in Malaysia. While M40 is a middle-income group that also forms 40% of total citizens that had income around RM 4,851 to RM10,970. Lastly, 20% of the population in Malaysia had an income of more than RM10,971 labelled as T20. Every category can be separated into another four categories to form a more targeted population. According to BNM (Bank Negara Malaysia), individuals need to have an

income of at least RM2,700 to live a comfortable lifestyle. If a couple without a child is estimated to need about RM4,500 and those with two children will need at least RM6,500 to cover most of the expenses of all family members. This means that M40 and above will be the target of all the population to have a comfortable life.

Then, the year of retirement and current age need to be known to identify how much time left for the user to save money for their retirement life and identify the EPF rate that might change according to the user age. According to Malaysia's official law, stated that minimum retirement age of worker in Malaysia is 60 years old. The employers can force their employees to retire before 60 will commits a crime however the employees still can choose to have their retirement life earlier due to the life planning. For life expectancy, the estimated average life expectancy in Malaysia is 73.4 years old while the highest life expectancy of country is 85.29 years old. The statistics from Satista.com stated that female in Malaysia spending 2.1 times of working life compared to retirement life and 2.2 times for male in Malaysia. Therefore, the user retirement age can be set as 60 years old and saving until 80 years old if the user does not have any different planning.

Next, when take about retirement we will think about EPF calculation which might be the main depending on income when come to retirement life as Malaysians and some non-Malaysian that works in the private sector Malaysia. They mostly had their EPF account due to protection of law settled by Malaysia government. According to, EPF required contribution for 8% to 11% from their basic salary plus bonus income to keep in their EPF account while their employer also need to provide another 13% to 12% of their employee's basic salary plus bonus to keep in employee's account. The rate of EPF contribution is depending on the basic salary of the employees, decision making of the employees and changing year by year according to government policies. The calculation of monthly amount contribute for EPF is monthly basic salary plus bonus then times the rate of contribution. The calculation of employees and employers will be count separately and add as the total saving into EPF every month. While according to [52], the interest rate of EPF change from year to year and the average interest rate is 6.115 for Conventional savings. This value can be use as the increasing value to estimate future amount in EPF account. On the other hand, Syariah savings is another type of EPF account which offer by KWSP Malaysia which the average return of 5.57%.

These accounts carry out its investment according to Islamic Law and away from maysir (gambling), gharar (uncertainty in contracts) and riba (interest).

Other than EPF, Private Retirement Schema that control by Private Pension Administrator also under consider on the retirement planning. According to information provided on the official website of PPA, there are 8 insurances and investment company in Malaysia which is AHAM Capital Asset Management, AIA Pension and Asset Management Sdn Bhd, AmFund Management, Hong Leong Asset Management Bhd, Kenanga Investors Bhd, Manulife Investment Management, Principle Asset Management Berhad, Public Mutual Berhad and RHB Asset Management Sdn Bhd. Every Company provided many different funds like conservation fund, moderate fund, growth fund, equity fund and other more to fix with different people requirement. The rate of return will be not consistent and different according to different company and organizations.

Besides investment of EPF and PRS, user might also involve in other related stock and fund return. The are many stocks and fund in market include blue-chip stocks, small-cap stocks, growth stocks, value stocks, ETFs, and mutual funds. [30] Predicting stock or fund value in the future can be done with two main formulas which is future value formula with different investment type. For single investment contribution formula of FV = PV x (1 + r)^n, where FV refer to the future value, PV refer to the present value, r is the interest rate, and n is the number of compounding periods while for series regular investment formula is FV = Pmt x (((1 + r)^n - 1) / r), where FV is the future value, Pmt is the regular payment, r is the interest rate, and n is the number of payments. [31][32] These two formulae will only be used by the investment that had regular and constant return or income in same quarter of time.

Besides investment, income during retirement also be one of the variables that should be consider in the calculation. In Malaysia, we don’t have the law on limiting people above retirement age continue contribute the work force in our social. According to many articles online stated that continue working after retirement age is still very common in Malaysia because factor like financial consideration, personal fulfilment and social interaction especially most of them didn’t have a good plan on retirement life. This income can be considered on postretirement planning to ensure enough money for their spending during retirement or to kill time. [24][25][26]

Besides that, renting assets also can be one of the income sources that could be had during retirement life. As owning a home is a sense of security and stability with a constant living space, the home that not staying by the user can be renting out as a passive income for user for every time include retirement life. However, real estate such as car, house will need user maintain it with lot of fees even during retirement life. Therefore, renting income will be consider in income calculation and assets maintenance will be consider as expenses during retirement. Rent Increase Method can divide into three type percentage increase, fixed dollar increases and market rent analysis. Percentage increase type had formula of Future Rent = Present Rent x (1 + Annual Rent Increase) ^ Time Period to count total amount of renting income. The user might use their renting income or change according to their decision.[29]

Other than renting, planning on selling of the current assets also would be include according to user need, user. The formula that can be used to predict the future price for investment will be Future Value Method which FV = PV x (1 + r) ^ n, where FV refer to the future value, PV refer to the present value, refer to the annual interest rate, and n refer to the number of years the money is invested [27]. Other than Future Value Method, Home Appreciation Method also can be use with formula of A = P x (1 + R/100) ^n, where A is the future value of the home, P is the current value of the home, R is the annual percentage rate of appreciation, n is the number of years after the purchase [28]. Other related income like subsidy also can be include as an optional selection for user according to their personal financial situation.

Then, we move on to expenses that need to know to estimate the retirement needs. First is current monthly expenses need with the categories of housing, transportation, food, healthcare, personal and household expenses, debt payment and other more [33]. All these expense total will need to estimate expenses amount during retirement. According to a survey by the Employee Benefit Research Institute, 56% of retirees say their retirement expenses are more than they expected that might lead to inflation on the market [35]. By adding the inflation rate of expenses amount year by year to the total amount, we get to know the amount that the user roughly needs every month to continue their life. Besides that, there might be yearly expected expenses which include the bill that need to paid yearly and some annually expenses can also affect the estimation of future expenses need.

Besides normal living expenses, saving for health and wealth also need to be consider. According to a report by the Malaysian Insurance Institute in 2019, only about 33% of Malaysian taking some form of insurance for their health care [36]. This might bring financial problem to user during retirement life. Therefore, saving for them that doesn't have any healthcare insurance is important to ensure they can continue their life easily during retirement. On the other hand, expenses on family member also can be consider on retirement saving as part of the retire people still need to support their family member living cost, buying an asset for others and especially children education cost when they are retiring. This can bring some problem for those still not had enough money for lifestyle maintaining. Therefore, this factor could be an elective option for user to include in their retirement saving. A 2014 survey of Malaysians revealed that about 40% of the participants planned to give their children an inheritance, while the remaining 40% were unsure [38]. This study show that part of Malaysian will take consideration on leaving some money for their heirs. Other than inheritance, travel, hobbies, education and social activities also can be consider as activities that retirees mean to carry out during their retirement [39].

2.2.3 Calculation method

After reviewing many works online, calculating the amount of money required for retirement often entails taking into consideration several variables, including present age, desired retirement age, life expectancy, the anticipated rate of return on assets, inflation, and anticipated retirement expenses. The calculation is calculating how much money will be required for retirement and then figuring out how much must be saved annually to reach that objective. Although there are several retirement calculators available online that employ different formulas and suppositions, the fundamental formula combines calculations of present value, future value, annuity value, and compound interest. The general formula is saving target – current saving amount = amount needed to save for other than current saving.

To get saving future value of the regular contribution annuity formula will be used. The formula is Future Value = regular contribution X [(1+interest rate) ^ number of period -1] / interest rate [48]. While a lump sum investment general formula is using future value calculation formula where future value = Present value X (1 + interest rate) ^ number of years. Other than this formula there is also another formula that uses Monte

Carlo simulation to get the value of potential investment return by simulating different market conditions using data mining technique with the formula of A = (PMT * ((1 - (1 + r)^(-n)) / r)) + (PV * (1 + r)^n) + (S * FVIF), where A = Retirement savings needed, PMT = Annual contribution amount, r = Expected annual rate of return on investments, n = Number of years until retirement, PV = Present value of current retirement savings, S = Annual retirement income needed and FVIF = Future value interest factor that calculated using a Monte Carlo simulation [49].

On the other hand, for expenses inflation rate need to be considered by applying the formula Projected Future Expenses = Current Expenses x (1 + Inflation Rate) ^ Number of Years. The current expenses involved must be in annually hence multiple 12 will be needed if the user provided in monthly amount. The formula is converted from the future value formula [27].

For determine the scoring of retirement planning, many ways like finding net worth, saving rate and debt to financial situation scoring. Net worth required user to provide their asset and liabilities amount by dividing asset with liabilities. The net worth works as a parameter to help user on determine their saving strategy. For Saving rate, it uses to determine the saving ratio to help user find balance between their saving amount and present use amount to avoid too miserable trying on saving behaviours [50]. For financial situation scoring is evolution of formula of balance sheet which is Financial Situation Score = (Income + Total Assets) / (Expenses + Total Debts) [51]. The formula work on finding the ratio of asset and liabilities to know if current estimated saving situation can cover estimated expenses in the future during retirement.

2.2.3 Calculation and Methodology finding outcome

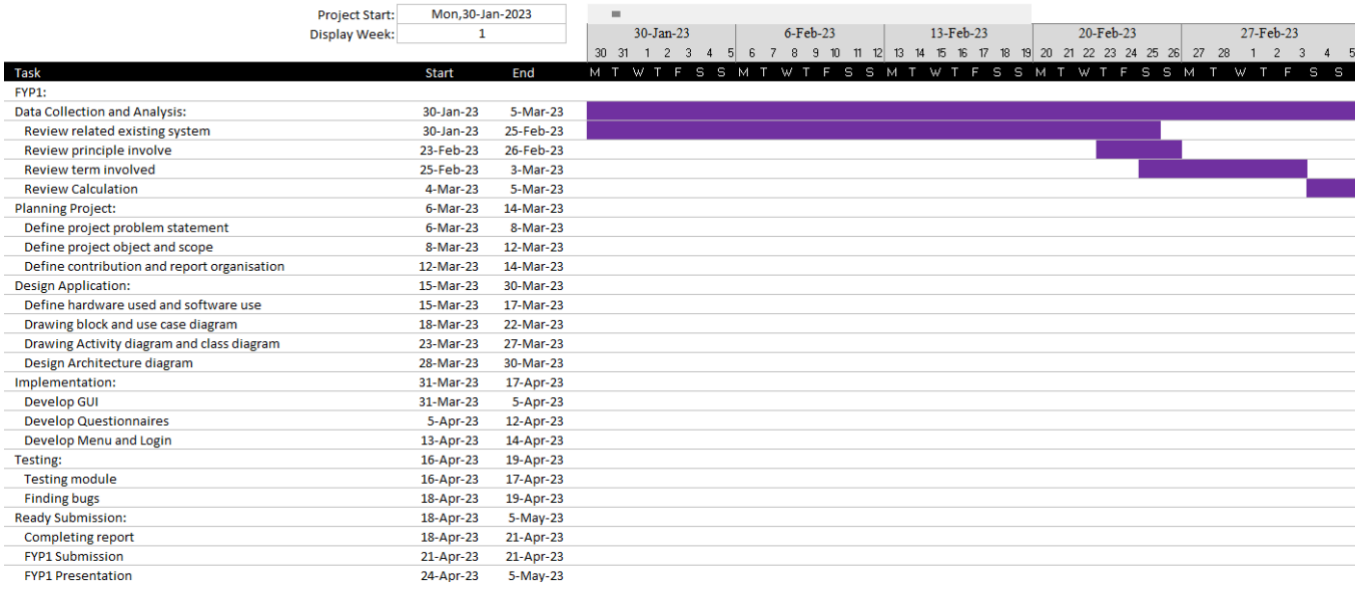
Many calculations found above in literature review however not all calculation discover can be use in retirement advisory tool. Firstly, the project needs to identify user saving period and saving supporting period by minus retirement age with current age and minus expected living age with retirement age. Next, EPF calculation which affects by user income and user age or citizen status. Income value will be need from user to identify predict EPF saving amount in future and saving progress that effected by income including available amount for saving by compare with expense. Current monthly expenses will be another variable that needed to get amount need during retirement. Besides that, investment that might take by user can be included as a money

source for their retirement planning there also some formula like future value calculation can be used to predict their future value as a reference in saving amount. Next, some other more detail like fixed deposit saving, wealth insurance, health insurance and working during retirement also can be considered as retirement money source. While for spending target will including some yearly expenses, extra planning like buying asset, hobbies support savings, travel saving also can be considered. By calculating all expected amount of asset and target need and minus between these variables, we can know how much still need to reach target or how much to reach a better financial planning. Lastly, financial situation scoring able to use for identify user retirement financial planning situation and work as a advisory parameter for user to enhance their retirement planning.

CHAPTER 3

Proposed Method/Approach

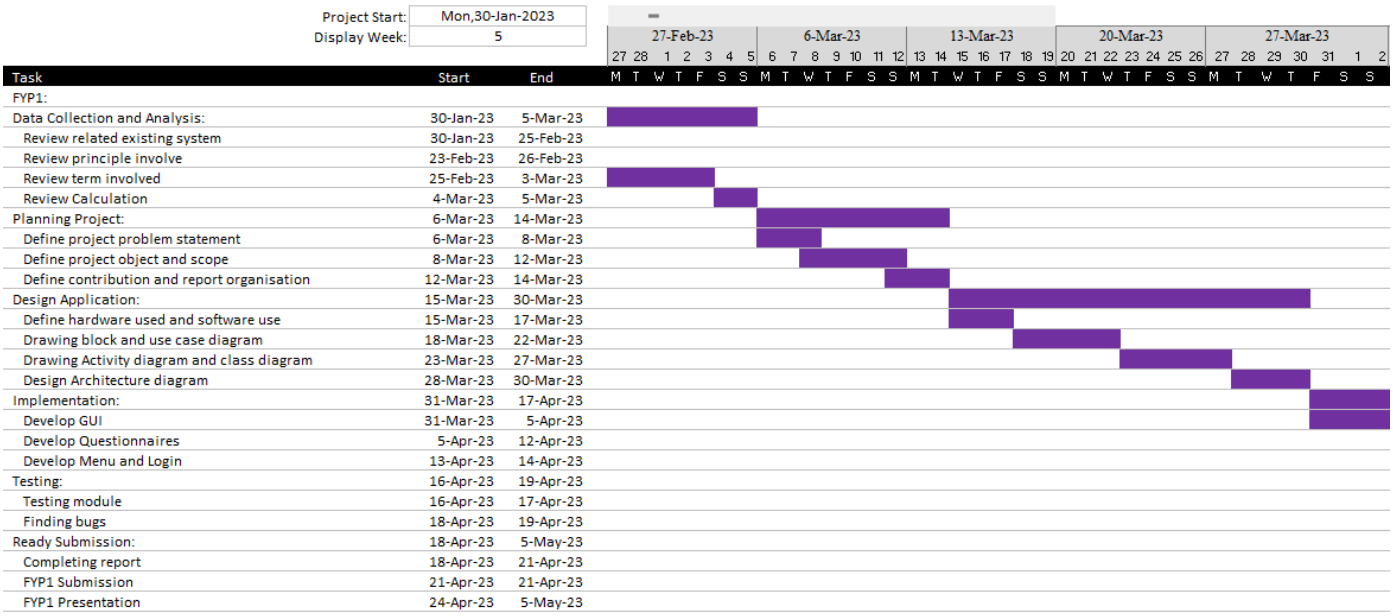
3.1 Project Methodology



Project Start:	Mon,30-Jan-2023
Display Week:	1

Task	Start	End
FYP1:		
Data Collection and Analysis:	30-Jan-23	5-Mar-23
Review related existing system	30-Jan-23	25-Feb-23
Review principle involve	23-Feb-23	26-Feb-23
Review term involved	25-Feb-23	3-Mar-23
Review Calculation	4-Mar-23	5-Mar-23
Planning Project:	6-Mar-23	14-Mar-23
Define project problem statement	6-Mar-23	8-Mar-23
Define project object and scope	8-Mar-23	12-Mar-23
Define contribution and report organisation	12-Mar-23	14-Mar-23
Design Application:	15-Mar-23	30-Mar-23
Define hardware used and software use	15-Mar-23	17-Mar-23
Drawing block and use case diagram	18-Mar-23	22-Mar-23
Drawing Activity diagram and class diagram	23-Mar-23	27-Mar-23
Design Architecture diagram	28-Mar-23	30-Mar-23
Implementation:	31-Mar-23	17-Apr-23
Develop GUI	31-Mar-23	5-Apr-23
Develop Questionnaires	5-Apr-23	12-Apr-23
Develop Menu and Login	13-Apr-23	14-Apr-23
Testing:	16-Apr-23	19-Apr-23
Testing module	16-Apr-23	17-Apr-23
Finding bugs	18-Apr-23	19-Apr-23
Ready Submission:	18-Apr-23	5-May-23
Completing report	18-Apr-23	21-Apr-23
FYP1 Submission	21-Apr-23	21-Apr-23
FYP1 Presentation	24-Apr-23	5-May-23

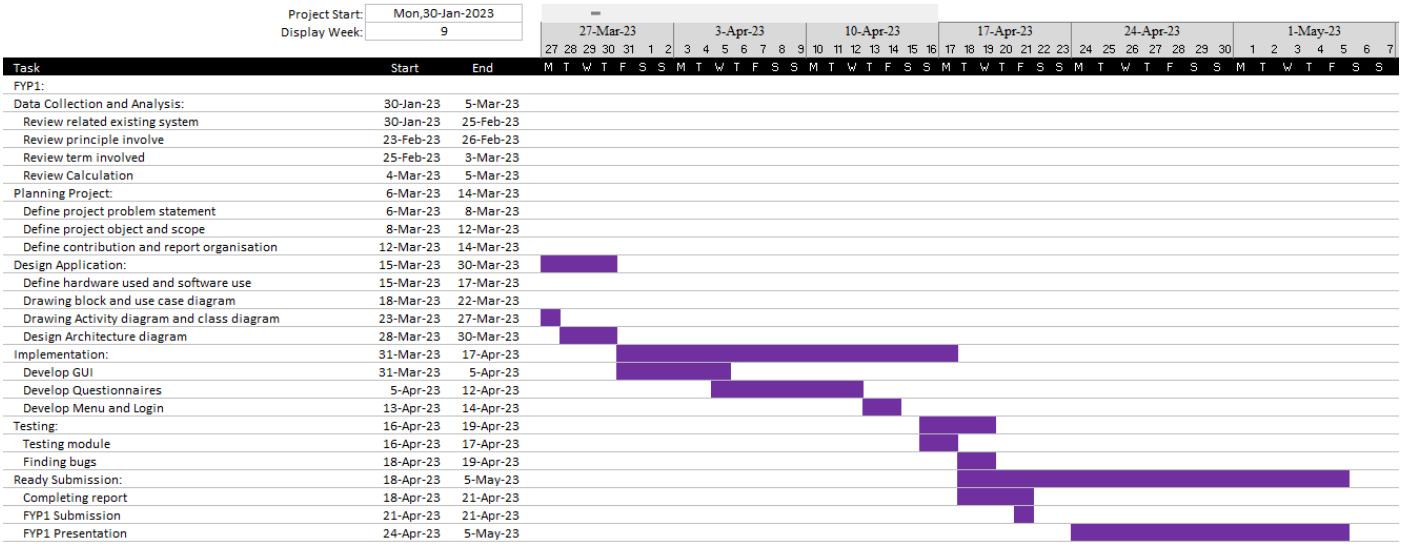
Figure 3.4.1 First 5 weeks of the project timeline table.



Project Start:	Mon,30-Jan-2023
Display Week:	5

Task	Start	End
FYP1:		
Data Collection and Analysis:	30-Jan-23	5-Mar-23
Review related existing system	30-Jan-23	25-Feb-23
Review principle involve	23-Feb-23	26-Feb-23
Review term involved	25-Feb-23	3-Mar-23
Review Calculation	4-Mar-23	5-Mar-23
Planning Project:	6-Mar-23	14-Mar-23
Define project problem statement	6-Mar-23	8-Mar-23
Define project object and scope	8-Mar-23	12-Mar-23
Define contribution and report organisation	12-Mar-23	14-Mar-23
Design Application:	15-Mar-23	30-Mar-23
Define hardware used and software use	15-Mar-23	17-Mar-23
Drawing block and use case diagram	18-Mar-23	22-Mar-23
Drawing Activity diagram and class diagram	23-Mar-23	27-Mar-23
Design Architecture diagram	28-Mar-23	30-Mar-23
Implementation:	31-Mar-23	17-Apr-23
Develop GUI	31-Mar-23	5-Apr-23
Develop Questionnaires	5-Apr-23	12-Apr-23
Develop Menu and Login	13-Apr-23	14-Apr-23
Testing:	16-Apr-23	19-Apr-23
Testing module	16-Apr-23	17-Apr-23
Finding bugs	18-Apr-23	19-Apr-23
Ready Submission:	18-Apr-23	5-May-23
Completing report	18-Apr-23	21-Apr-23
FYP1 Submission	21-Apr-23	21-Apr-23
FYP1 Presentation	24-Apr-23	5-May-23

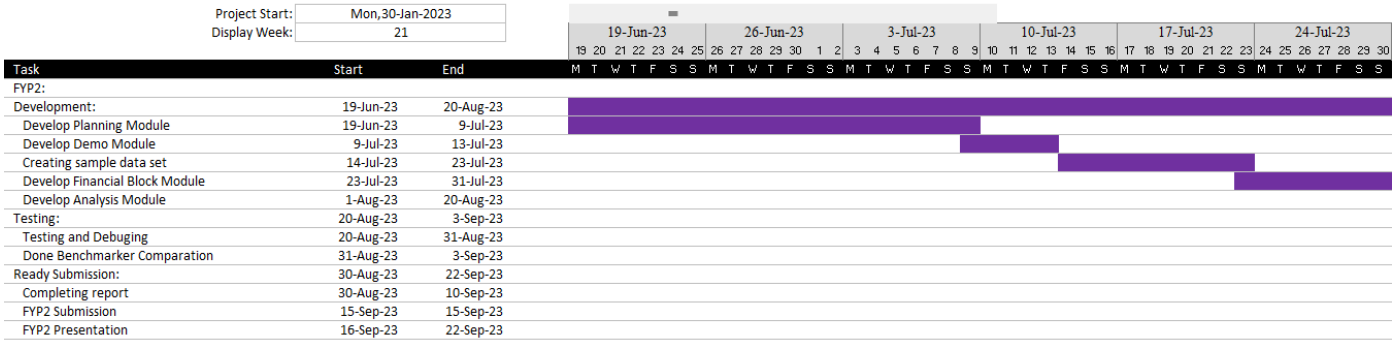
Figure 3.4.2 Week 5 to week 9 of the project timeline table in final year project 1.



Project Start: Mon,30-Jan-2023
Display Week: 9

Task	Start	End
FYP1:		
Data Collection and Analysis:	30-Jan-23	5-Mar-23
Review related existing system	30-Jan-23	25-Feb-23
Review principle involve	23-Feb-23	26-Feb-23
Review term involved	25-Feb-23	3-Mar-23
Review Calculation	4-Mar-23	5-Mar-23
Planning Project:	6-Mar-23	14-Mar-23
Define project problem statement	6-Mar-23	8-Mar-23
Define project object and scope	8-Mar-23	12-Mar-23
Define contribution and report organisation	12-Mar-23	14-Mar-23
Design Application:	15-Mar-23	30-Mar-23
Define hardware used and software use	15-Mar-23	17-Mar-23
Drawing block and use case diagram	18-Mar-23	22-Mar-23
Drawing Activity diagram and class diagram	23-Mar-23	27-Mar-23
Design Architecture diagram	28-Mar-23	30-Mar-23
Implementation:	31-Mar-23	17-Apr-23
Develop GUI	31-Mar-23	5-Apr-23
Develop Questionnaires	5-Apr-23	12-Apr-23
Develop Menu and Login	13-Apr-23	14-Apr-23
Testing:	16-Apr-23	19-Apr-23
Testing module	16-Apr-23	17-Apr-23
Finding bugs	18-Apr-23	19-Apr-23
Ready Submission:	18-Apr-23	5-May-23
Completing report	18-Apr-23	21-Apr-23
FYP1 Submission	21-Apr-23	21-Apr-23
FYP1 Presentation	24-Apr-23	5-May-23

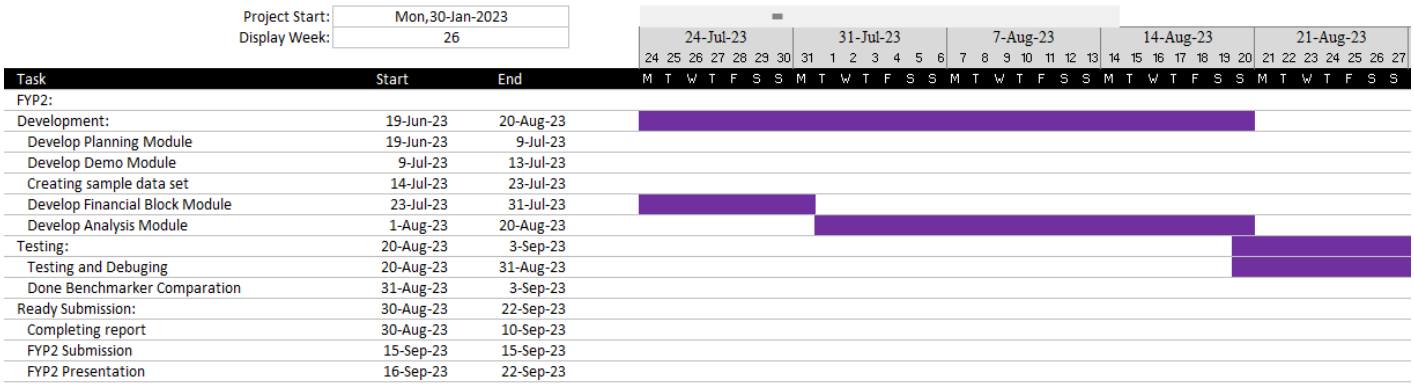
Figure 3.4.3 Week 9 to week 14 of the project timeline table of final year project 1.



Project Start: Mon,30-Jan-2023
Display Week: 21

Task	Start	End
FYP2:		
Development:	19-Jun-23	20-Aug-23
Develop Planning Module	19-Jun-23	9-Jul-23
Develop Demo Module	9-Jul-23	13-Jul-23
Creating sample data set	14-Jul-23	23-Jul-23
Develop Financial Block Module	23-Jul-23	31-Jul-23
Develop Analysis Module	1-Aug-23	20-Aug-23
Testing:	20-Aug-23	3-Sep-23
Testing and Debuging	20-Aug-23	31-Aug-23
Done Benchmarker Comparation	31-Aug-23	3-Sep-23
Ready Submission:	30-Aug-23	22-Sep-23
Completing report	30-Aug-23	10-Sep-23
FYP2 Submission	15-Sep-23	15-Sep-23
FYP2 Presentation	16-Sep-23	22-Sep-23

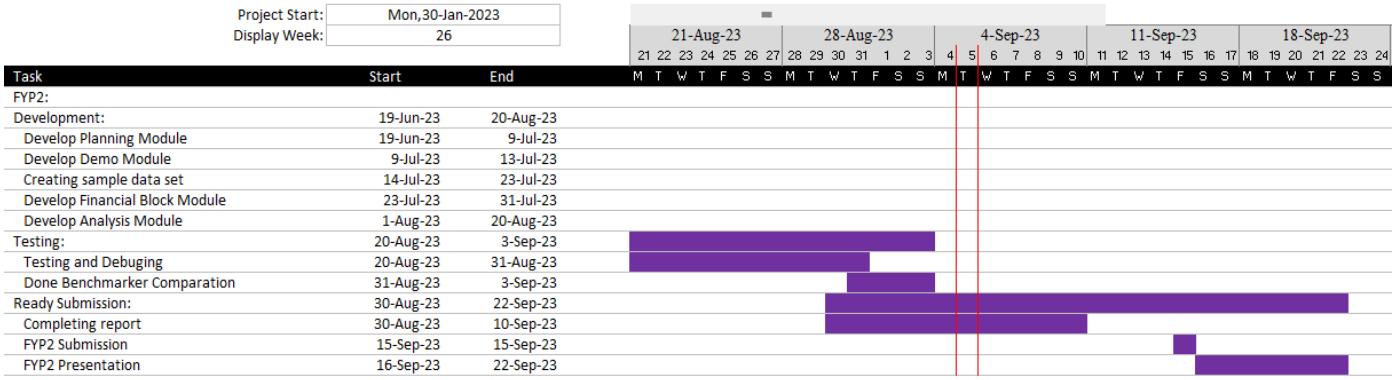
Figure 3.4.4 First 6 weeks of the project timeline table of final year project 2.



Project Start: Mon,30-Jan-2023
Display Week: 26

Task	Start	End
FYP2:		
Development:	19-Jun-23	20-Aug-23
Develop Planning Module	19-Jun-23	9-Jul-23
Develop Demo Module	9-Jul-23	13-Jul-23
Creating sample data set	14-Jul-23	23-Jul-23
Develop Financial Block Module	23-Jul-23	31-Jul-23
Develop Analysis Module	1-Aug-23	20-Aug-23
Testing:	20-Aug-23	3-Sep-23
Testing and Debuging	20-Aug-23	31-Aug-23
Done Benchmarker Comparation	31-Aug-23	3-Sep-23
Ready Submission:	30-Aug-23	22-Sep-23
Completing report	30-Aug-23	10-Sep-23
FYP2 Submission	15-Sep-23	15-Sep-23
FYP2 Presentation	16-Sep-23	22-Sep-23

Figure 3.4.5 Week 6 to week 10 of the project timeline table of final year project 2.



Project Start:	Mon,30-Jan-2023
Display Week:	26

Task	Start	End
FYP2:		
Development:	19-Jun-23	20-Aug-23
Develop Planning Module	19-Jun-23	9-Jul-23
Develop Demo Module	9-Jul-23	13-Jul-23
Creating sample data set	14-Jul-23	23-Jul-23
Develop Financial Block Module	23-Jul-23	31-Jul-23
Develop Analysis Module	1-Aug-23	20-Aug-23
Testing:	20-Aug-23	3-Sep-23
Testing and Debuging	20-Aug-23	31-Aug-23
Done Benchmarker Comparation	31-Aug-23	3-Sep-23
Ready Submission:	30-Aug-23	22-Sep-23
Completing report	30-Aug-23	10-Sep-23
FYP2 Submission	15-Sep-23	15-Sep-23
FYP2 Presentation	16-Sep-23	22-Sep-23

Figure 3.4.6 Week 10 to week 14 of the project timeline table of final year project 2.

This project will use waterfall models' architecture to complete this project. This project will be separated into five stages which include analysis or data gathering, planning, design, implementation and testing. First stage of the project is data gathering and analysis that starts with deciding the title which had done during the proposal writing course. Then to know what range to be done in this project, the pre-development or researching stage will involve doing some data collection from related work including applications, websites and much information related also been reviewed then written in the report about what ideas get from the reviewed work. In figure 3.4.3 shows that around 5 weeks is used to find data for the literature review of this project. After concluding all reviews, data will be analysed by identifying the points that can be used or help to gain new ideas for this project. This projected spending about one week to complete problem and solution identification. The design stage will start by defining the flow of the application from login to system recommendation for the user. The design stage was used from week 6 to week 9 according to figure 3.4.3.

Then, the development of the project will start on develop some prototypes of the project and end with testing once the project's prototype is done. This project prototype and report will be fully complete and submitted in week 12 and the time after will focus on preparing documents for presentation that work as the last section in this project for this semester.

For the part done in project two will focus on developing system and testing. During project two the development will focus on completing the development as the system planned at the beginning of the project and having some minority modification to

improve the proposed idea in early stage. The development of planning module required more time than other for GUI design and data management when undergoing data collection. Demo module also designed using same module to operate. While to cope with the understanding needs of what correct input into the system, financial literacy block is implemented after completing the planning and demo module development. The calculation module and analysis module will be implemented at last to perform data to user.

Lastly, testing of the module will be done manually to solve all the possible error meet by user. On the same time, the functionality of risk calculation, scoring will be included to confirm the solution proposed able to use in the system develop. After done all the testing and development. A report will be done and prepare for information and explanation on idea of this project.

3.2 Design for Retirement Advisory Tool

3.2.1 Module access by all user

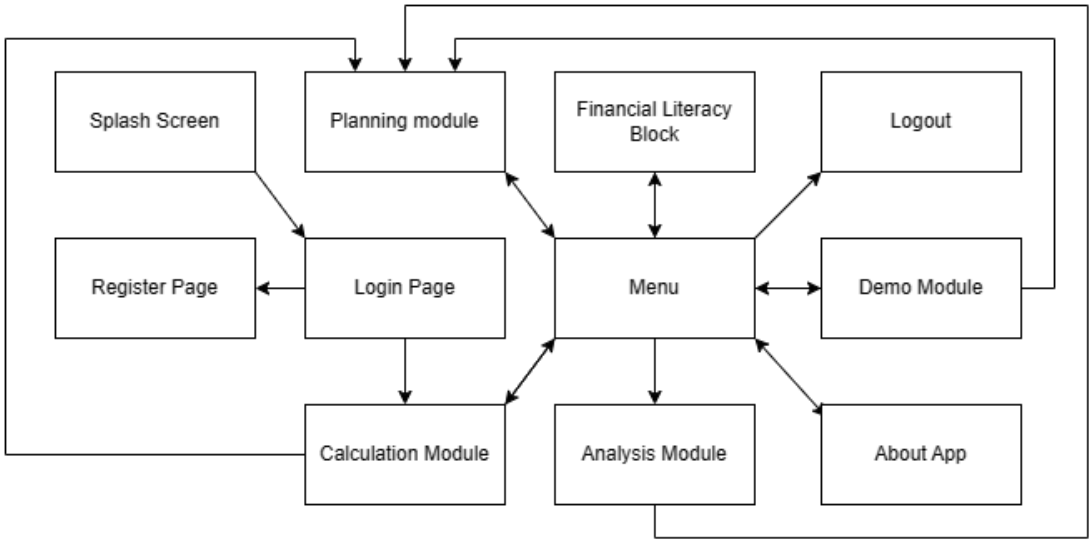


Figure 3.2.1 Block diagram for the system.

According to block diagram above in figure 3.2.1 show the module that able to be access by all user who using the retirement advisory tool. When the user first goes in, they will saw a splash screen that show the application logo and know about the application main function which help user on their retirement planned. Then, the login page will show to allow user login to the own account. The account is used to save their data for future review and use. If the user hasn't registered their account in this application, they can click on register button at login page to register their account in register page.

For the user that already login when first using the application will directly go to calculation module which display all the previous entered data which saved in database with it result on calculation. If the user wants to know more, they need to scroll up the menu from left side of the application and choose the module that they want to access. The module that user can access using the slide menu include calculation module, analysis module, planning module, demo module, about app and financial literacy block.

Planning module is the module that required user data. If the user didn't have data in database, the view in calculation module, analysis module, demo module will lead the

user to planning module for data input. After done the input all modules will show all data processed in each module.

3.2.2 Functionality of Retirement Advisory Tool

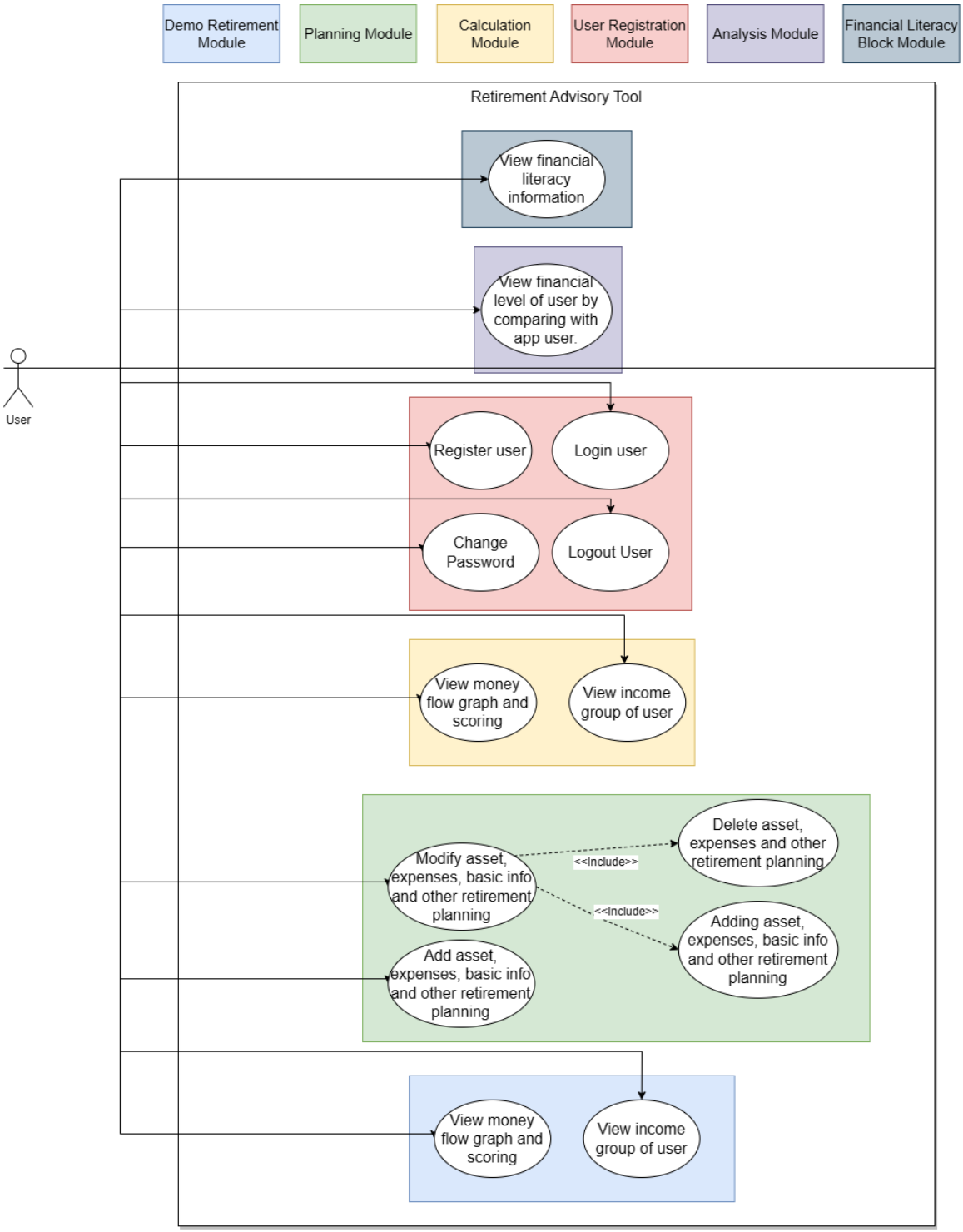


Figure 3.2.2 System functionality of retirement advisory tool in each module.

In figure 3.2.2, Users able to login and register themselves into the system. This login function is to let user information on retirement planning or advisory can be secure and keep for future use. Register function will let the user that didn't have account to register a new one in this system. Forget password function allow user to reset their password when they forget their account password. Logout also allow to let user switch data as their need.

For financial literacy block which also call guideline module, user can view financial information in literacy block module. User able read information according to retirement planning and other financial literacy though link embedded to enhance the financial literacy knowledge level.

Besides that, user to add their basic information data, planned assets data, planned expenses during retirement and other retirement planning data which allow user to have planning other than system set. User also able to modify what data that they already added into database for generate different result according to current planning change.

For Calculation module, the user able to know their retirement planning scoring or can said as percentages of the value they saved if continues with current planning. The user also able to view all the statistics of estimated assets value, estimated future needs amount and all the graph with the label of money flow with the year. The module shows the money flow of each available variable of assets and expenses to allow user to have a clear understanding of each money flow estimated on each section of their planning.

Next, Demo analysis module will show the same as the calculation module but the data will not be saved into database and only exist until user close the application from the device. For analysis module will show the analysis result after comparing with another same variable in database. User able to view and the average value of variable currently and compare with current amount in personal profile value. User also able to react with the graph to know what level of their personal planning.

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3.2.3 System process of retirement advisory tool

3.2.3.1 Process for user module

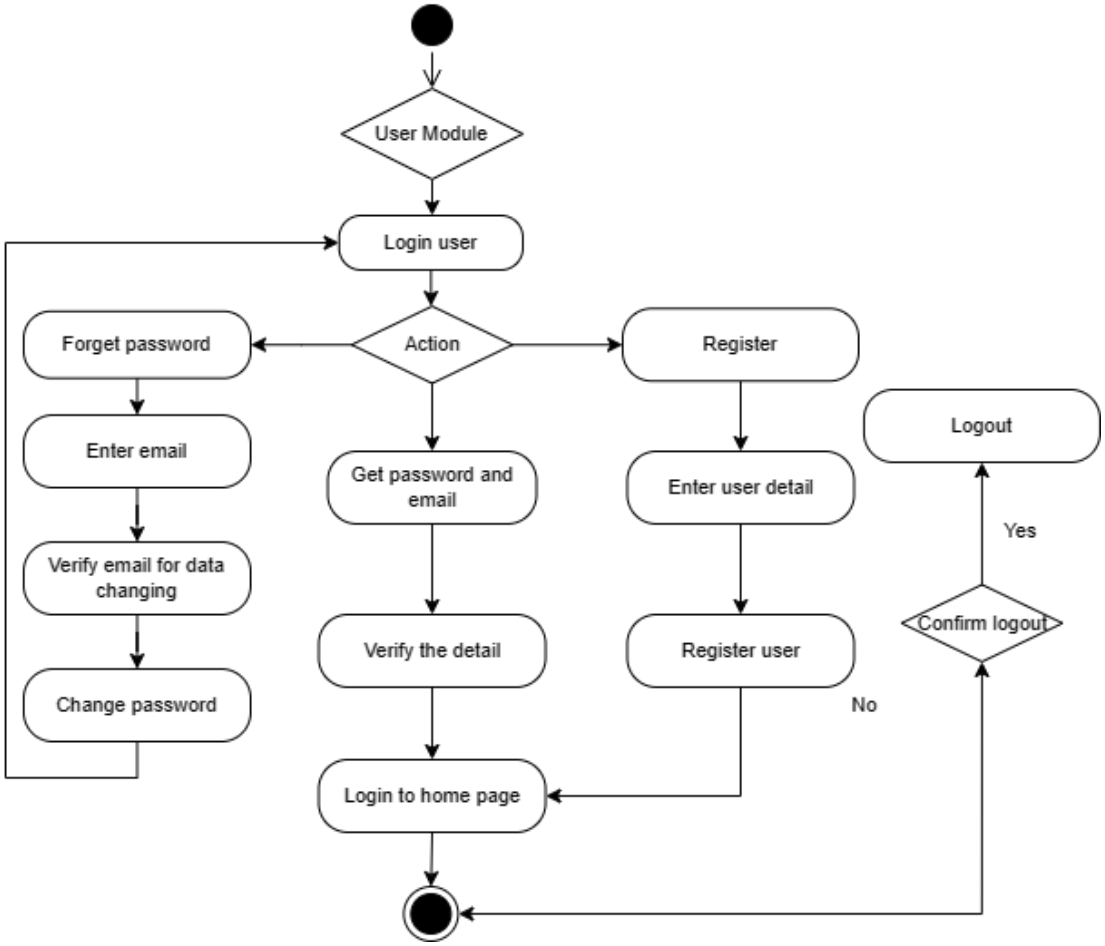


Figure 3.2.3.1 Flow of process in user modules.

User module including four major functions which is register user, login user, reset password and logout as shown in figure 3.2.3.1. User module is the first module access by user as user will first see the login page once access into the application. In login page user will need to enter their username and password for verification and end their login if successful. Other than login, the user able to choose if they want to reset password using forget password function or register user for the user who haven't setup any account for using the application. For reset password, user will request to enter their email and carry out reset action according to firebase instruction. For register user, user will enter their detail according to requirement and click register to create their account. While logout will be the last function for whole application to make the user logout after get user confirmation on the action.

3.2.3.2 Process for Analysis module

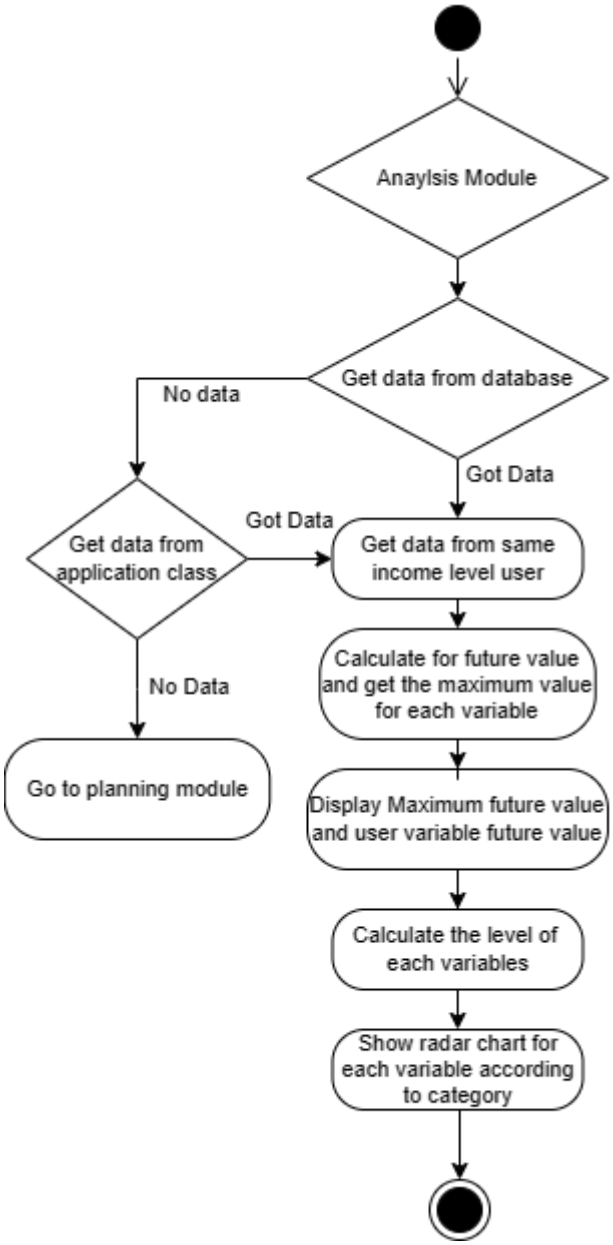


Figure 3.2.3.2 Flow of process in analysis modules.

In analysis module, the module will get the user data from database or application class of current user data. Then, the module will access to database again to get user data from user that in same income categories according to user input. The data get will be used to find the maximum value of the future value according to each variable type. Then, the real time, future value generated will be used to compare with user current data and define which level of user current future value in each variable type. The data will be display in radar chart to show to the user as references for their future planning.

3.2.3.3 Process for Calculation module

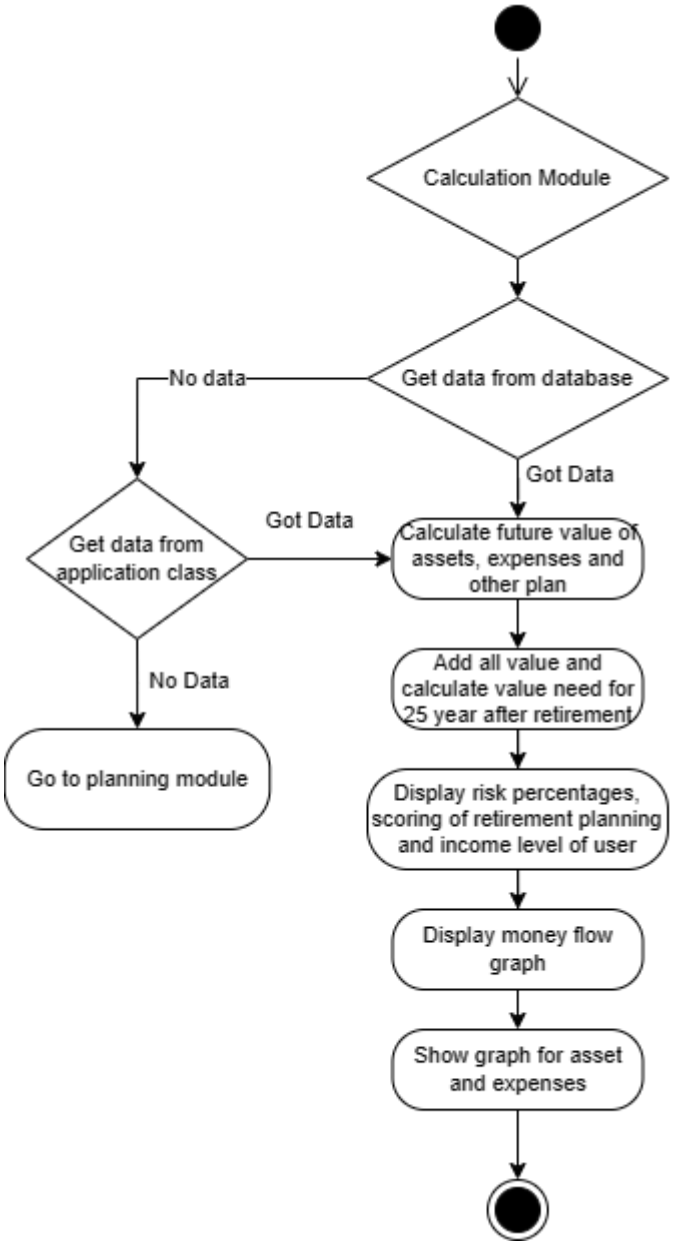


Figure 3.2.3.3 Flow of process in calculation modules.

In calculation module, the module will get the user data from database or application class of current user data. Then calculate future value of assets, expenses and other plan according to user provided data. Then calculate the value need for 25 years after retirement. After done all calculation, display the risk parentages, scoring of retirement planning, income level of user with all money flow chart for assets and expenses.

3.2.3.4 Process for Demo module

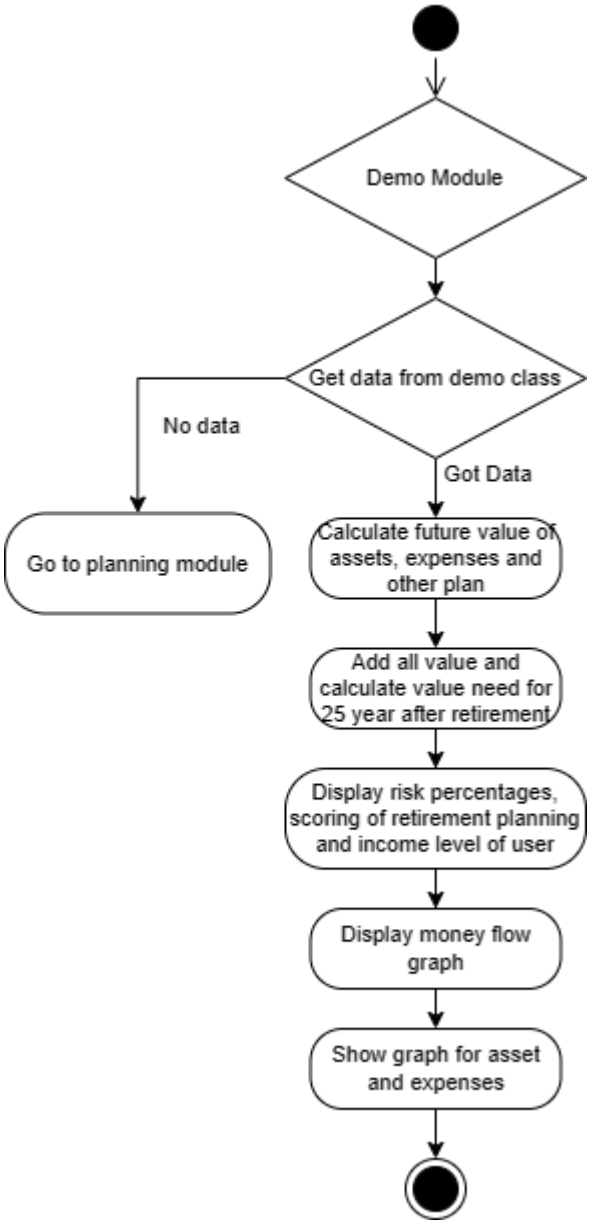


Figure 3.2.3.4 Flow of process in demo modules.

In figure 3.2.3.4 show the process carry out in demo process. The module will also get data from class before starting the calculation. Then calculate the future value and need for 25 retirement life. After done all calculation, display the risk parentages, scoring of retirement planning, income level of user with all money flow chart for assets and expenses. This module is similar as calculation module but using data for demonstration and not save into the database.

3.2.3.5 Process for Planning module

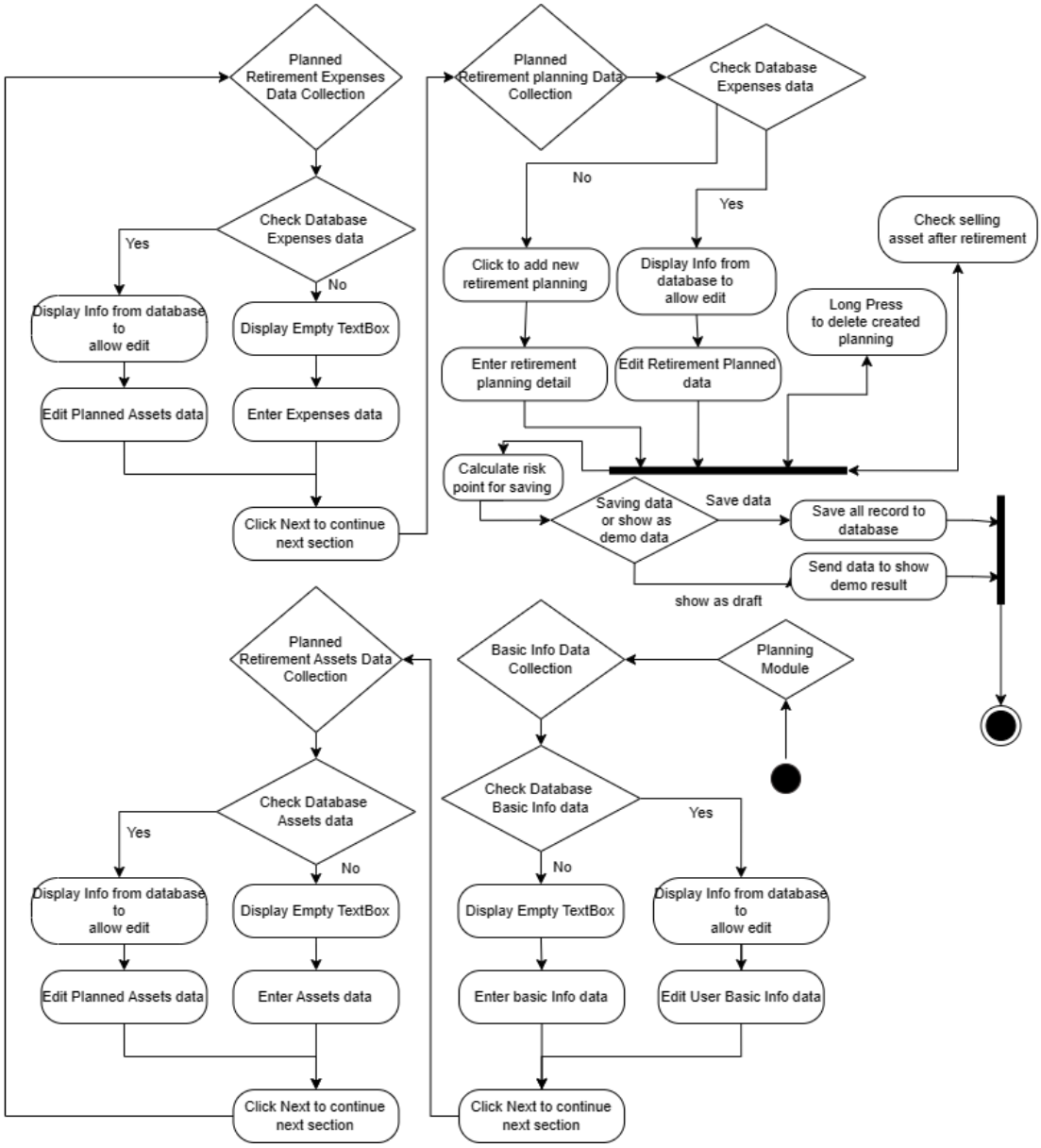


Figure 3.2.3.5 Flow of process in planning modules.

In planning module, the input data will be separate to for part which is user basic information, planned retirement assets, expenses during retirement and planned retirement planning activities. All section will involve many input data. If there was data in the database then all data will be show for user else the input box will show empty and required user input. For other retirement planning section, the input will be optional and user can delete the section by click on delete button. There also one selection that allow user to define if they want to include housing in their calculation.

3.2.3.6 Process for financial literacy block \ Guideline module

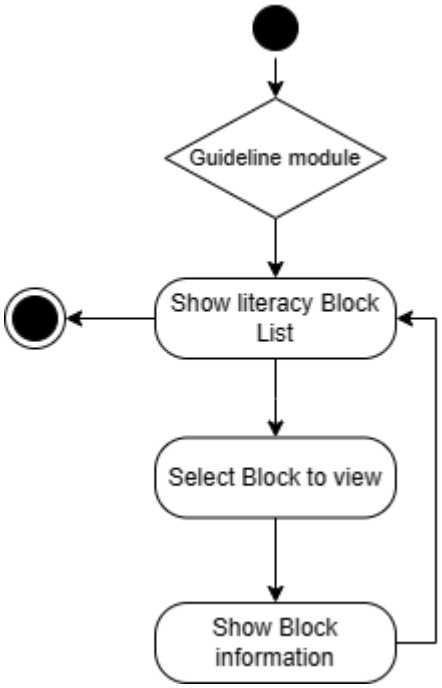


Figure 3.2.3.6 Flow of process in financial literacy block modules.

Based on figure 3.2.3.6, financial literacy block module will show literacy block in list. This financial literacy block is set manually in the system. User able click to view the data inside about the financial literacy information provided by the system to help user on financial decision making. Then user can click on OK button to return to the list after finish reading information in the literacy block. The module will end id user choose to exit form viewing literacy block list.

3.2.3.7 Process for overall system

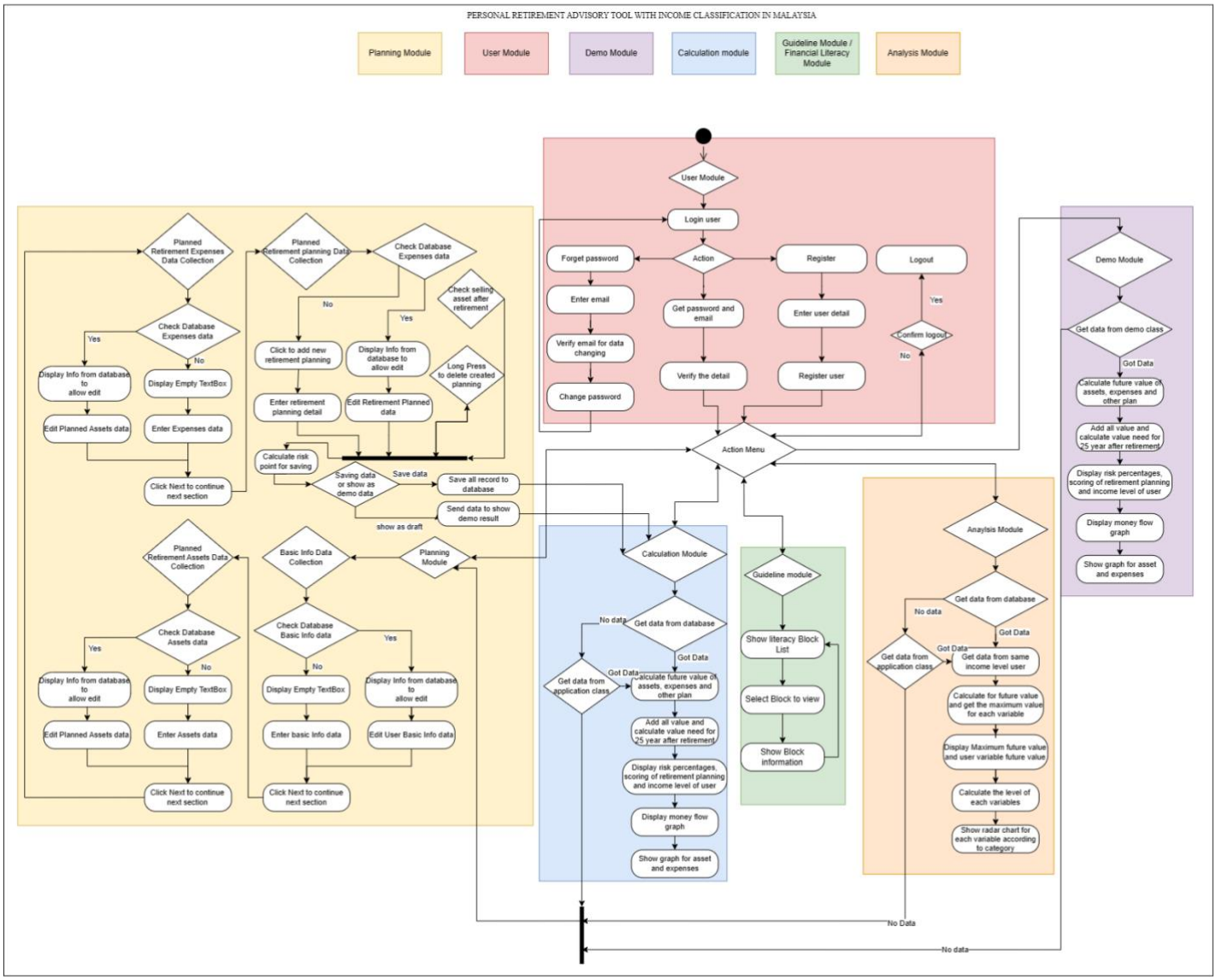


Figure 3.2.3.7 Flow of overall process taken by user in the system.

In figure 3.2.3.6, all the module discussed above will be combine with another menu that allow user to move from one module to another. The first module that will be view by user was questionnaire module as a guideline for user to start their retirement planning after answered the question, system able to identify which module should be able for user to access. While in figure 3.3.3.5 show all the module that available for user and all can be use by user in worker life stages on planning or having an advisory.

3.2.4 Calculation Involve

Table 3.2.4.0 Calculation that involve in retirement advisory tool.

Name	Equation	Explanation
EPF calculation for employer	Monthly income (Round off 20) × contribution rate = EPF employer contribution (round off)	Calculation of EPF contribution amount of employer to employee's account
EPF calculation for employee	Monthly income (Round off 20) × contribution rate = EPF employee contribution (round off)	Calculation of EPF contribution amount of employee to its own account
Asset Appreciation Method	A = P x (1 + R/100) ^n, where A is the future value of the home, P is the current value of the home, R is the annual percentage rate of appreciation, n is the number of years after the purchase	Calculation for asset in appreciation mode.
Asset Depreciation Method	D = P x (1 - R/100) ^n, where D is the future value of the home, P is the current value of the home, R is the annual percentage rate of depreciation, n is the number of years after the purchase	Calculation for asset like houses in depreciation mode.
Future value	FV = PV x (1 + r) ^n, where FV is the future value, PV is the present value, r is the interest rate, and n is the number of compounding periods	Calculation of all other expenses, asset, income that increase regularly per year.
Financial Situation Score	Financial Situation Score = (Income + Total Assets) / (Expenses + Total Debts)	Calculation to determine financial situation of user.

Calculation stated in table 3.2.4 will be use in the retirement advisory tool. EPF calculation for employer and employee will be used to calculated user EPF contribution amount. Asset Appreciation method can be used to calculate asset that can increase value in future like houses and jewelry while depreciation method can be used on asset like car and if user need conservative calculation. Future value can be use for estimating

all variable future value. This help to predict the value of needs and value of saving during retirement. Lastly, financial situation scoring will work on evaluating user retirement planning and the system can use the result to provide suitable suggestion about user retirement planning.

Risk Calculations

For risk calculations use in this project is according to user selection criteria which as listed in list below.

Table 3.2.4.1 Risk Calculations table listing of risk point value.

Content	Risk Point Value
Basic information	
Age (Max 3)	Age < 60 = 1, Age > 70 = 3, 60 > Age > 70 = 2
Status (Max 3)	Single = 3, Married = 2, Other = 1
Employee Status (Max 3)	Employed, Business Owner = 3, No Employed, Retired = 2, Homemaker, Student = 1,
Status (Max 3)	Selangor, Penang, Johor = 1, Terengganu, Negeri Sembilan, Malacca, Sabah, Sarawak = 2, Pahang, Perak, Perlis, Kelantan, Kedah =3
Income (Max 6)	income < RM4,850 = 2, RM4,850 < income < RM 10,960 = 4, income > RM10,960 = 5
Assets (Max 8)	
EPF Account (Max 2)	If future value of EPF Account Value > RM2400,000 = 2, else = 1
Saving / Fixed Deposit (Max 2)	2

Unit Trust / Share (Max 2)	2
Housing / Properties (Max 2)	2
Future Expenses (Max 21)	
Medical Expenses (Max 3)	if got = 1 , else = 3
Accommodation (Max 3)	if got = 1 , else = 3
Housing Maintenance (Max 3)	if got = 1 , else = 3
Vehicle Expenses (Max 3)	if got = 1 , else = 3
Vehicle Maintenance (Max 3)	if got = 1 , else = 3
Living Expenses (Max 3)	if got = 1 , else = 3
Entertainment (Max 3)	if got = 1 , else = 3
Other retirement planning	
Other planning activities (Max 3)	If plan type is expenses = 1, If plan type is extra income = 3

Table 3.2.4.1 above show all the risk point design in the calculation after calculating the total of risk points and all maximum existed point. The formula below will be used to get the percentages of overall risk points. Below shows the example of calculation if user input content as below.

Table 3.2.4.2 Sample Risk Calculations table listing of risk point value.

	Content	**Risk Point**	**Total Risk Point**
Age (Max 3)	Age < 60	1	3
Status (Max 3)	Married	2	3
Employee Status (Max 3)	Employed	3	3
Status (Max 3)	Terengganu	2	3
Income (Max 6)	RM 4,000	2	6
Assets (Max 8)			
EPF Account (Max 2)	Future value of EPF Account	1	2

	Value < RM2400,000		
Saving / Fixed Deposit (Max 2)	RM2000	1	2
Unit Trust / Share (Max 2)	RM0	0	2
Housing / Properties (Max 2)	RM0	0	2
Future Expenses (Max 21)			
Medical Expenses (Max 3)	RM0	3	3
Accommodation (Max 3)	RM0	3	3
Housing Maintenance (Max 3)	RM0	3	3
Vehicle Expenses (Max 3)	RM0	3	3
Vehicle Maintenance (Max 3)	RM200	1	3
Living Expenses (Max 3)	RM1000	1	3
Entertainment (Max 3)	RM100	1	3
Other retirement planning			
Other planning activities (Max 3)	No other planning	0	0
		27	47

After getting the value 27/47 which equal to 0.5744. The maximum percentages of risk set default as 10% of the expenses. Therefore, a calculation using formula below is use when calculating estimated future expenses.

Total risk involves = risk percentage* 10%

= 0.5744*10/100

= 0.05744

If monthly expenses are RM1500, period of time until retirement is 24 years, inflation rate is 4%

Total future expenses = (expenses * 12)* (1 +((risk rate + inflation rate)/100)) ^ period

= (1500*12)*((1+(0.05744+0.06)/100)^24

= 18,000 * 1.307338

= RM23.531.08

Analysis Module

In analysis module, system will get data of user about their assets and expenses. Then calculate their future value until retirement start. The future value of user will be add together to find the average value and the maximum value among the future value. The value of average and maximum value will be used to compare with current user data future value. The result of comparison will be shown in ten level using radar chart as a guideline for user on what they should improve according to current retirement planning.

Sample Calculation:

If the average future value is RM5,000, maximum future value is RM 120,000, current user value is RM3,000

Range value of each level = (Maximum value – Average value) / 5

= (RM120,000 – RM5,000) / 5

= RM7,000 / 5

= RM1,400

Level of user =User future value / range of each level

= RM3,000 / RM1,400

= 2.142

= 2 (Round off)

3.3 System Requirement

3.3.1 Hardware

The hardware that will be mainly involved in this project will be a laptop computer for development and an Android mobile device for testing and future demonstration. The development required a computer for coding purposes, including designing the GUI that makes using the application easier. On the other hand, mobile devices will need to be tested for the availability of function, logic, flow, and other aspects of the application developed to ensure the smoothness and compatibility of the application.

Table 3.3.1.1 Specifications of laptop

Description	**Specifications**
Model	Asus A456U series
Processor	Intel(R) Core (TM) i7-8565U
Operating System	Windows 10 Home Single Language
Graphic	Intel® UHD Graphics 620
Memory	8GB LPDDR3RAM
Storage	512GB SSD

Table 3.3.1.2 Specifications of Android Mobile Device

Description	**Specifications**
Model	Honor 50
Processor	Qualcomm Snapdragon 778G
Operating System	Android 12 – Magic UI 6.0
Screen Size	2340 X 1080
Memory	8.0GB + 2.0GB
Storage	180.85GB

3.3.2 Software

Android Studio will be the main development application for this project and Firebase will be used as the support database. Android Studio serves as the official integrated development environment, allowing users to create android-based mobile applications in Java or Kotlin, depending on their preference for mobile development [10]. Because Kotlin has a smaller community and library than Java, Java will primarily use for this project. Besides that, Android Studio also provides many frameworks that help to design mobile view. This speed up project development with the public template, and it's compatible with Android Studio. In this project, I used Android Studio Giraffe that released on 2022.3.1 which had better assistant on coding suggestions and able to open project from previous versions help me to follow up the progress from previous development.

Firebase is a mobile or web application development platform which launched by google in 2011. It provides many tools and services to help user on simple application development. Due to the range of this project is small and required a real-time online database to support analysis. Firebase is chosen to use in this project even it was not relational database.

3.4 Information Gathering

Data collection of this project involved six categories which is basic information, assets, expenses, other planning, optional settings and guideline data.

Table 3.4.1 List of data collection and its description

Data Collected	**Description**
Basic Information	
Birthday	The birthday date of user to know user current age
Retirement Age	The planned retirement age of user to know the time available for user to saving.
Marital Status	The marital status of user to know the risk of the retirement planning.
State of Residence	The state of residence during retirement to know if the risk of inflation will be high or low.
Employment Status	Current employment status to know user current situation for risk of saving.
Monthly Income	Monthly income help to classify user according to income level in Malaysia and define user planning risk.
Retirement planned assets	
EPF Account Amount	EPF account amount to predict future value of account.
Saving Account Amount	Saving account amount to predict future value of account.
Saving Account Interest Rate	Saving account interest to predict future value of account.
Unit Trust Amount	Unit Trust amount to predict future value of account.

Unit Trust Increasing Amount	Unit Trust increasing amount to know if the constant increasing amount exits for calculation.
Unit Trust Interest Rate	Unit Trust Interest rate to predict future value of account.
Housing/ Properties Amount	The housing or properties amount help to predict value of housing value.
Housing/ Properties Interest Rate	The housing interest rate to predict future value of the properties if with constant increasement.
Retirement planned expenses	
Medical Expenses/ Medical Insurance	Backup saving for medical expenses during retirement to prevent not enough money for medical services.
Accommodation/ Housing Loan / Rental	Accommodation expenses during retirement for user that doesn't have a constant place to settle down or need to rent for place to live.
Housing Maintenance Expenses	Housing maintenance expenses during retirement as a backup money for user to enhance their living qualities on accommodation.
Vehicle/ Transportation/ Car Loan	Vehicle expenses for user that not having their own vehicle to travel around.
Vehicle Maintenance Expenses	Vehicle maintenance expenses for user to backup for the fees and petrol expenses when using vehicle.
Living Expenses	Living expenses on food and other fees that need to be included for living.
Entertainment Expenses	If the user needs to set a backup budget for other relaxing activities in monthly period during retirement.

Inflation Rate	The inflation rate use to find the future value for each expenses planned.
Other planning Name	Other planning that does not define by use can be named by user.
Other planning Amount	Other planning amount to predict future value of the planning.
Other planning Type	Other planning type to define if the plan is a need or a asset for retirement life.
Other planning Period	Other planning period to know if the planning is monthly or for yearly
Other planning Increasing Rate / Interest Rate	Other planning increasing rate to predict future value of the planning.
Retirement planning optional setting	
Properties Selling Option	To define if the properties will be included into the retirement planning calculation
EPF Withdrawal Option	To define what type of withdrawal will cause some change on amount able to use for retirement.
Retirement planning guideline data	
Guideline Content	The content to be displayed to guide user on data to be enter.
Guideline Link	The link that helps to improve user understanding to the content needed and some functionality.

CHAPTER 4

Design of Proposed System

4.1 Graphical User Interface Design

4.1.1 Splash screen

Figure 4.1.1.1 Splash page of this project app with logo and name of app.

The splash screen is show when begin the app in a device. User will view the splash screen to get know about the purpose and theme of the application, as well as to provide a welcoming and engaging user experience. Then, the system will jump to the starting module of the app.

4.1.2 Login module

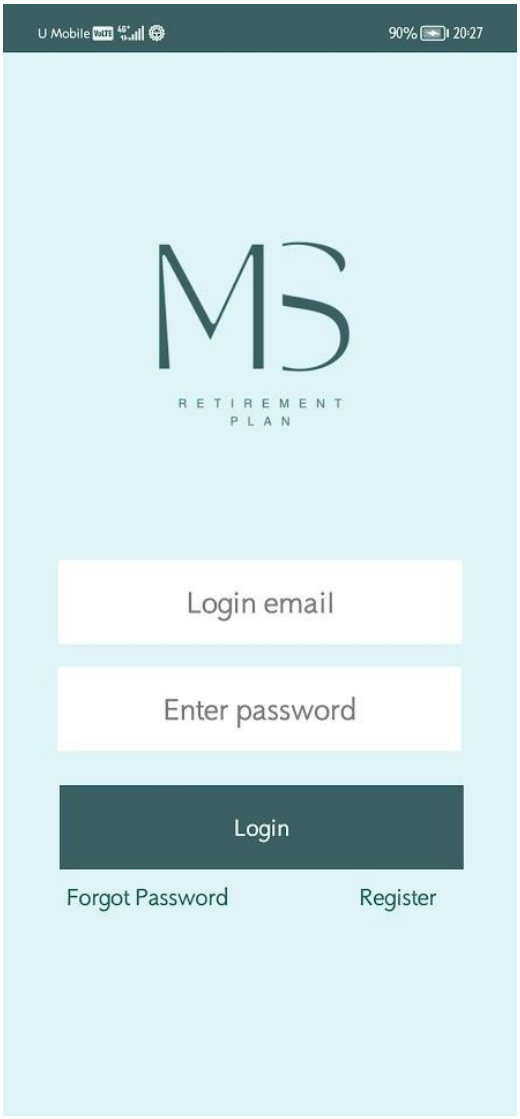


Figure 4.1.2.1 Login page of the app for user.

Currently, user will direct to login after beginning the app due to incomplete of another module. Login page will require user to enter login name with is the email and password. The system will identify the email and password provided and click on login button to continue to next activity. Firebase is connected and used for login authentication. system will check with firebase data when login into the application. If user haven't registers as user, they will click on register to continue their activity at register page. Besides that, forgot password also a page that allow user to reset their password.

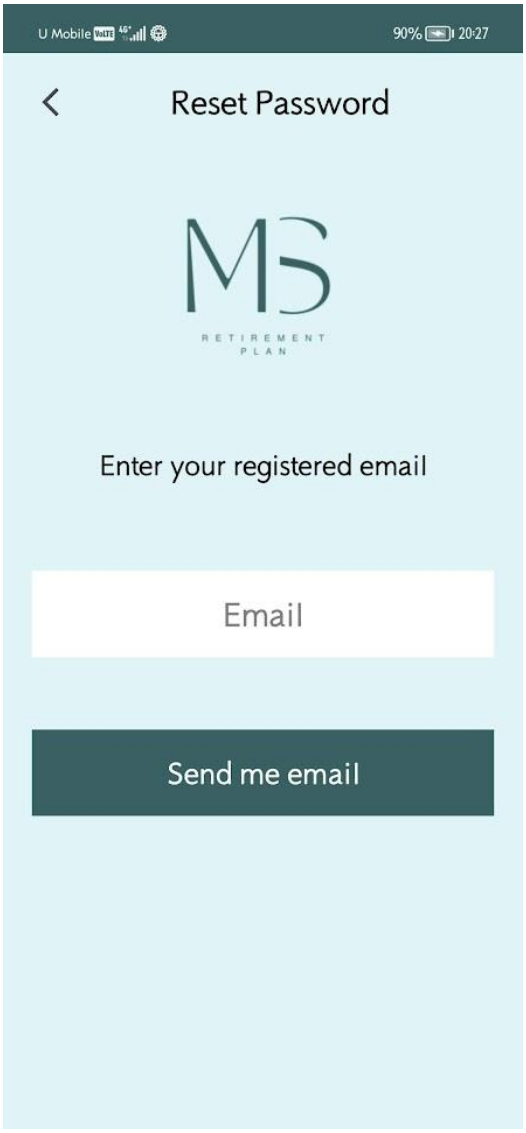


Figure 4.1.2.2 Forget password layout of retirement advisory tool.

Reset password layout as show in figure 4.1.2.2 will require user to enter the registered email to the edit text bar and press send rest email to allow user press on button ‘send me email’. After pressing the button, user need to check their email to get reset password link and the link will lead user to enter their new password after confirm user will jump to next activity.

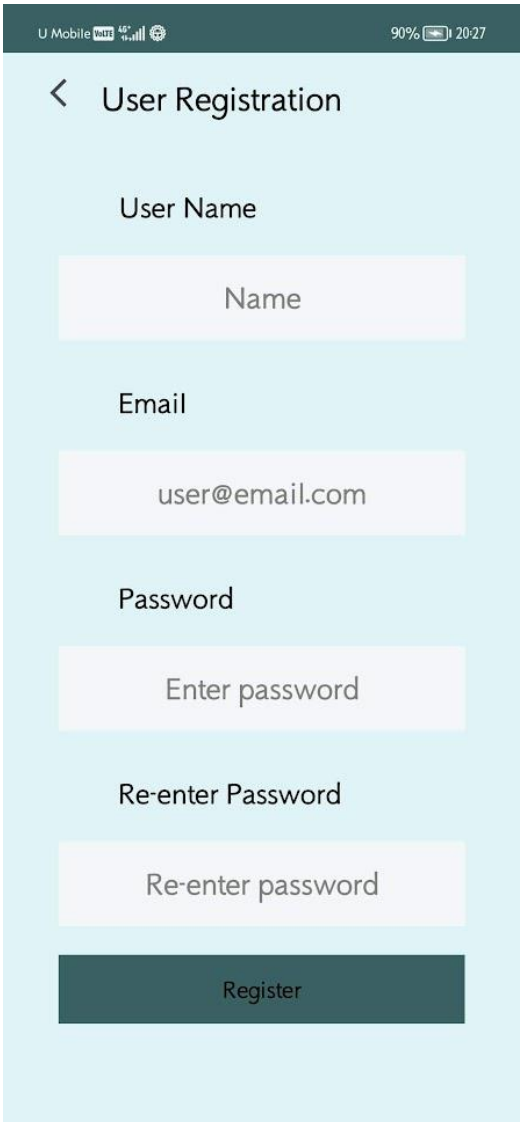


Figure 4.1.2.3 Registration layout of retirement advisory tool.

For registration page, system will ask user to enter their name, email and login password for two times. The username will be collected for app internal use while email is collected for changing account password and other important notification to allow app contact user through email. The system will verify the password is similar at both column if yes, the data will be recorded in the database.

4.1.3 Sidebar menu

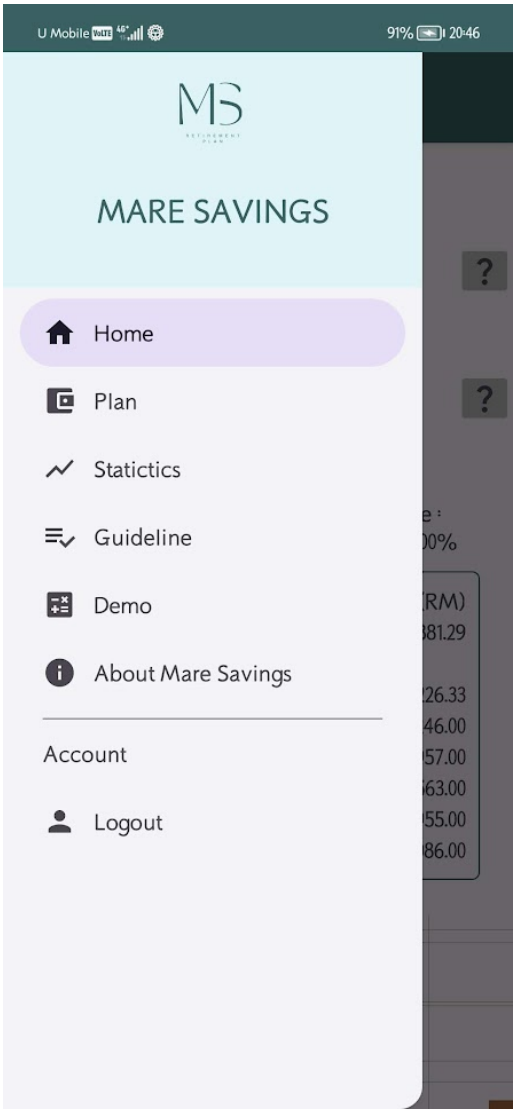


Figure 4.1.3.1 Sidebar menu created that able to use when changing from one module to another.

Sidebar show in figure 4.1.3.1 will be included in most of the main layout in this retirement advisory tool. This sidebar menu will use as navigation bar to change from one module to another. The top header will show the logo of the application then is the application name but planned that it will be set to username and will be complete in future. Then, the white part will show the list of modules that can be access using the sidebar. Currently, the sidebar still can't be use as most of the module haven't complete development.

4.1.4 Planning Module

Figure 4.1.4.1 User Basic Information in Planning Module.

Based on figure 4.1.4.1 show the basic information required user to fill in including birthday, retirement age, status, sate of residence and employment status. Birthday textbox will require user to enter their date by selecting from calendar prompted out. Other input will be spinner and ambo box that already provided answer for user to choose. After click on next will continue input at planned retirement assets.

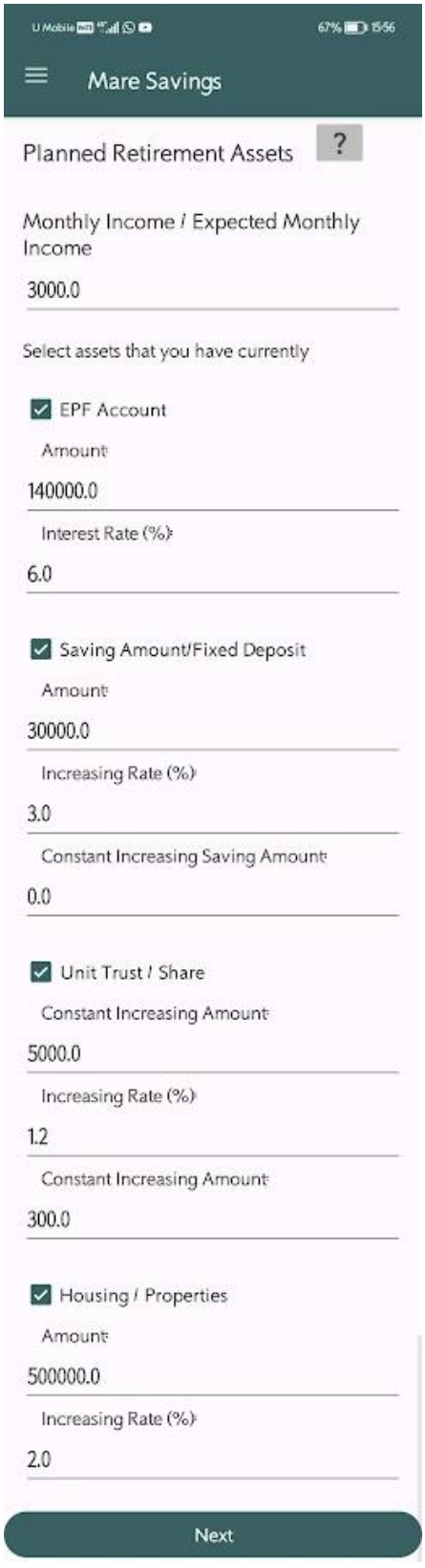


Figure 4.1.4.2 Planned Retirement Assets in Planning Module.

For planned retirement assets, user will need to enter their monthly income or expected income for user that haven't start their employment. The income is needed for analysis,

calculate for risk calculation and EPF future value calculation. Other than income, EPF amount, saving amount, unit trust amount and properties amount all with its interest rate. For unit trust and saving , there will be additional variable which is increasing amount for constant cash in. After click on next will continue input at planned retirement expenses.

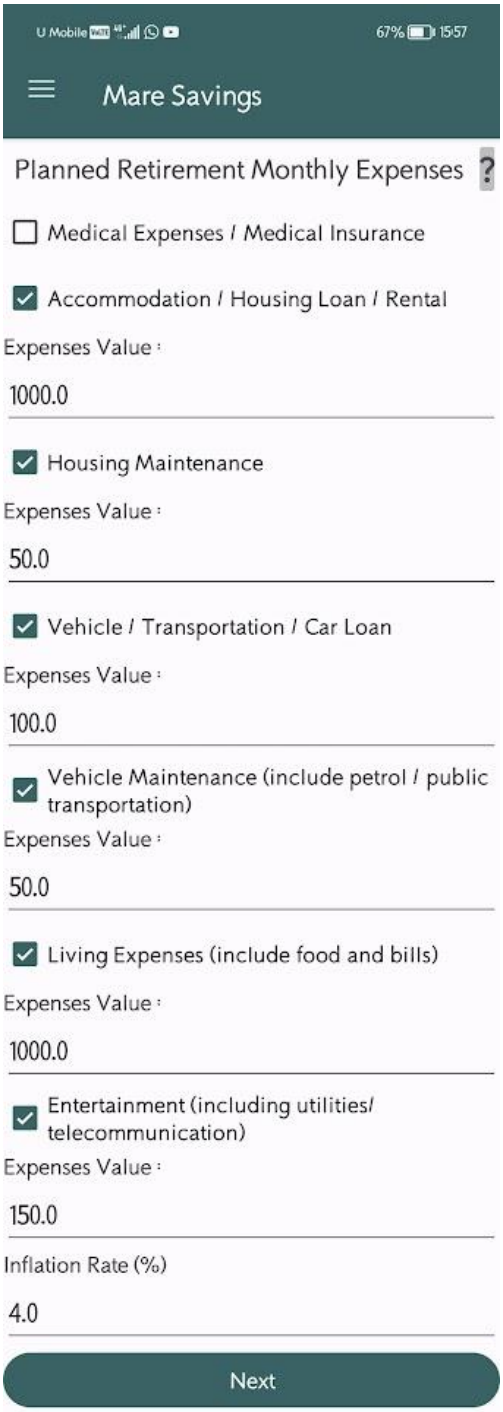


Figure 4.1.4.3 Planned Retirement Expenses in Planning Module.

For planned retirement expenses in planning module, the user is required to enter their planned monthly expenses during retirement including medical expenses, housing or accommodation expenses, housing maintenance expenses, transportation expenses, vehicle maintenance expenses, living expenses and entertainment expenses. All the expenses section exist with check box, only the checkbox that checked will be count as a expenses that user want to include it their planning. Lastly, inflation also need user to be confirm as it will set 4% as default. When click 'Next' button, system will check data for validation and if empty input will prompt warning message to ask if user want to continue for other retirement planning input section or entering new expenses in this page.

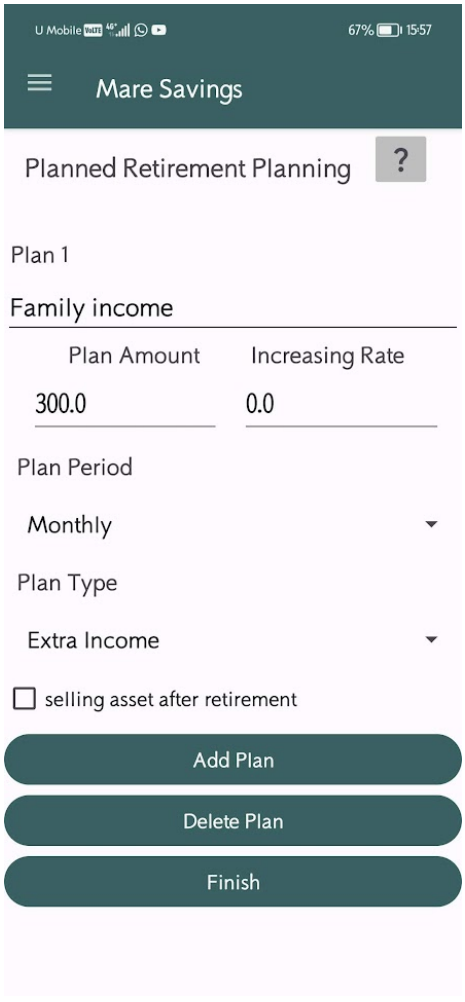


Figure 4.1.4.4 Planned Retirement Planning / activities in Planning Module.

Planned Retirement Planning is the section that required user to input their retirement planning that they haven't enter in previous section. That work as the additional input section for user. The variable exists for user input including plan name, plan amount,

increasing rate, plan type and plan period. The plan input box will exist if the user click on the ‘Add Plan’ else user can also choose to ‘Delete plan’ if don’t want to include any plan for their planning. For check box of ‘selling assets after retirement’ will include housing and properties in assets section to retirement planning calculation. After finish all click on “finish”, a dialog will display as shown in figure 4.1.4.5.

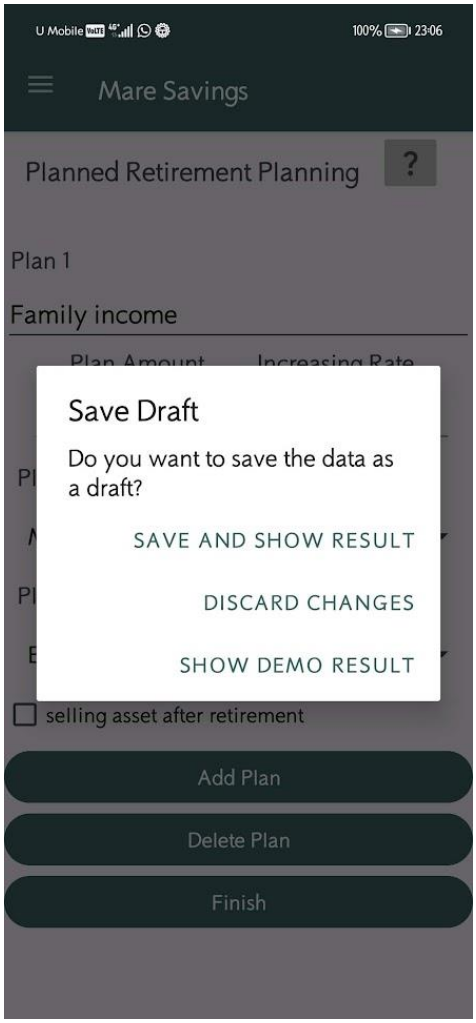


Figure 4.1.4.5 Dialog that required user to choose on how data save in Planning Module.

Figure 4.1.4.5 shown the dialog prompt after user click on ‘finish’. The dialog prompt to ask if user want to save the data as demo or as formal data for further analysis.

4.1.5 Calculation Module

Figure 4.1.5.1 and figure 4.1.5.2 Result shown in part of Calculation Module.

Figure 4.1.5.1 and figure 4.1.5.2 show the result show on the first page of calculation module when contain many sections including current income level, assets percentage and risk percentages. The question mark images will show a guidance on what value show for what purpose. The table show the result of future value need after some calculation. The needs value show in first year, 5 years, 10 years, 15 years, 20 years

and 25 years. The Bar chart below show a comparison between all the value shown in table. Below the bar chart will be the value user will get every month if user withdrawal constantly. After the value will be the line graph that show the total asset and expenses flow.

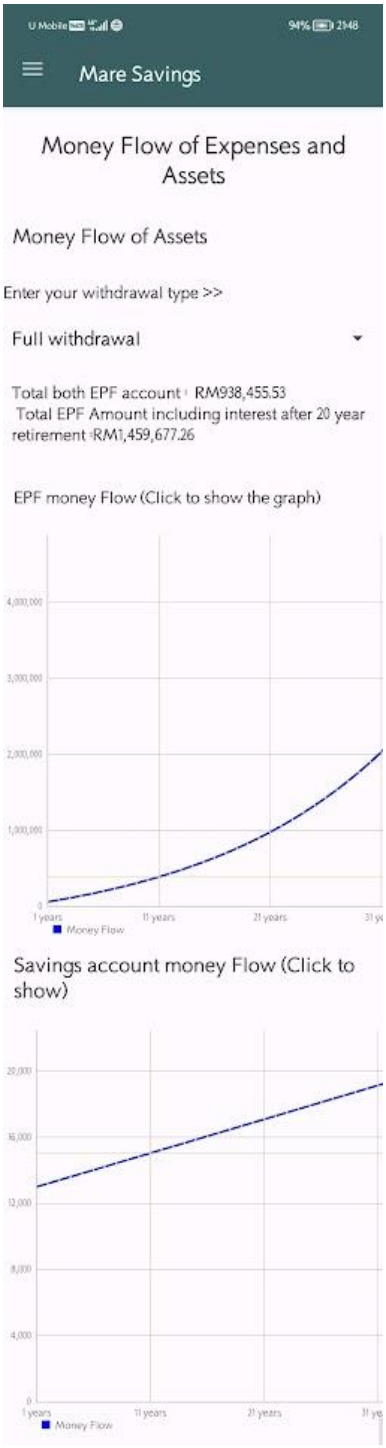


Figure 4.1.5.3 and figure 4.1.5.4 Line chart and layout of money flow of Asset and expenses in Calculation Module.

Figure 4.1.5.3 and figure 4.1.5.4 show another part of calculation module. The top will let user to choose which type of EPF withdrawal the user planned. The changing of the withdrawal type will change the amount get after retirement in the first fragment of the module. While all the line charts below will show all the user enter variable money flow including all assets and expenses involved.

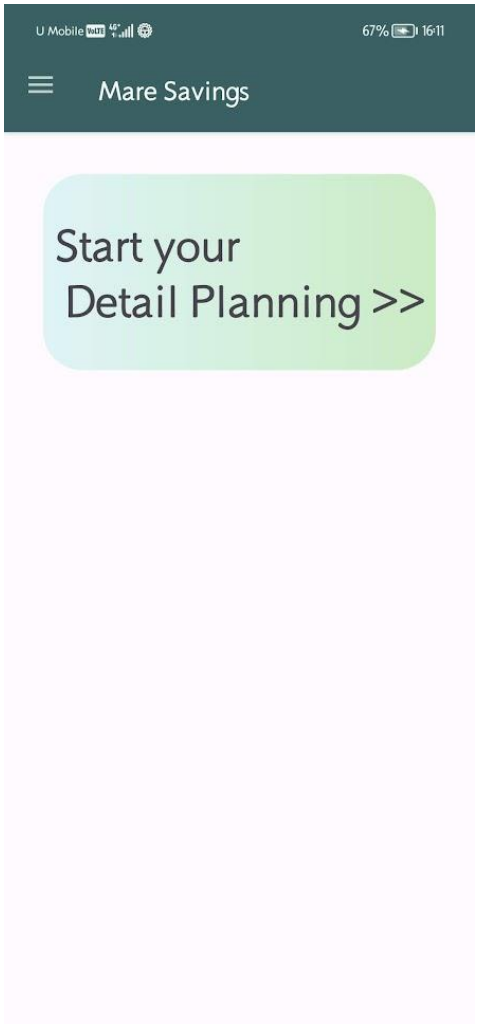


Figure 4.1.5.5 View shown when no data available in Calculation Module.

If the user hasn't inserted any data for calculation. The layout of calculation module will show as figure 4.1.5.5. Users allow to click on the block to start their planning on planning module.

4.1.6 Demo Module

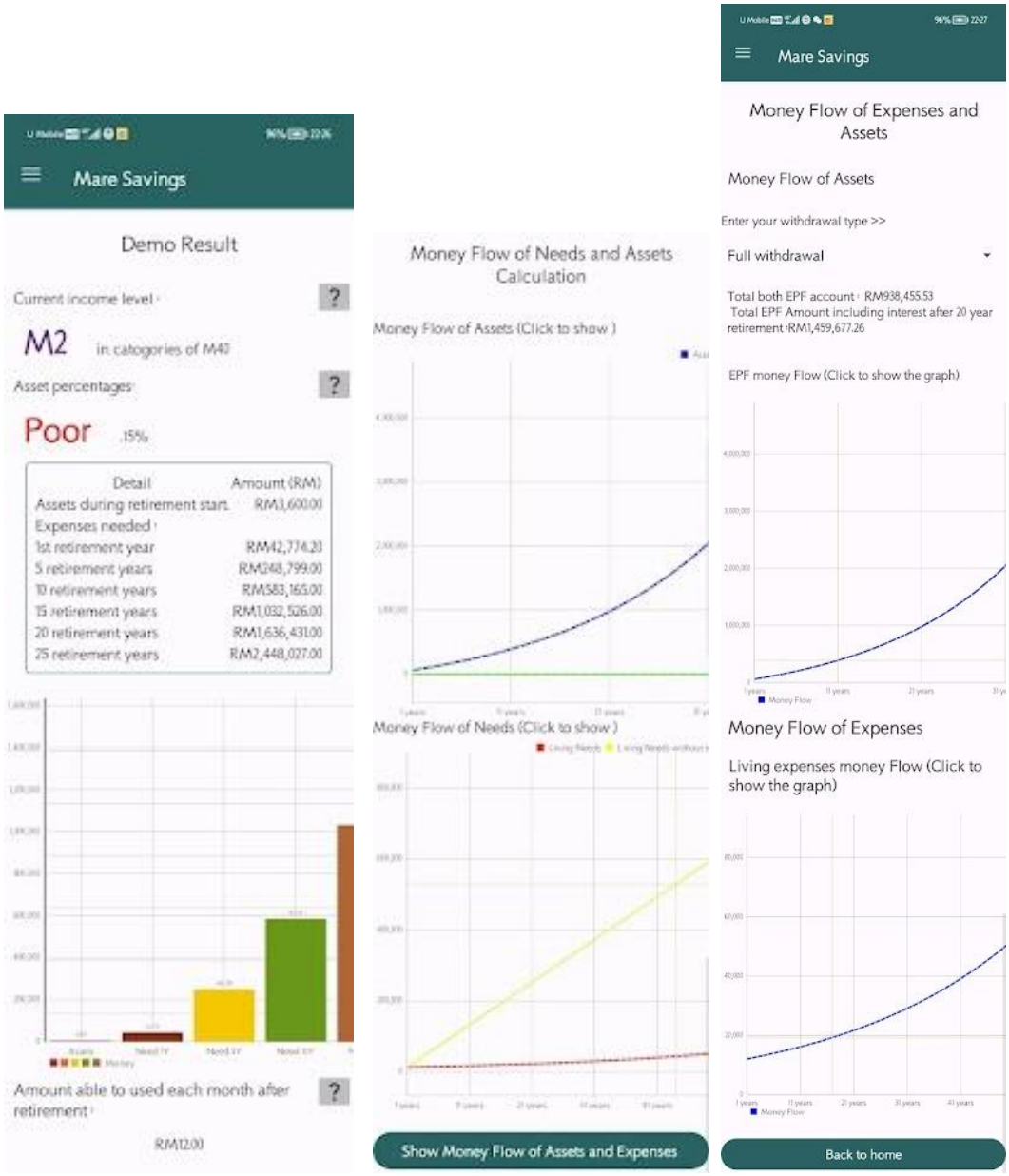


Figure 4.1.6.1, figure 4.1.6.2 and figure 4.1.6.3 chart and layout of Demo Module.

In demo module, majority of the layout is same as the calculation module only the data use for the calculation will be different. The data use will show keep as temporary data and will missing after stop application running.

4.1.7 Analysis Module

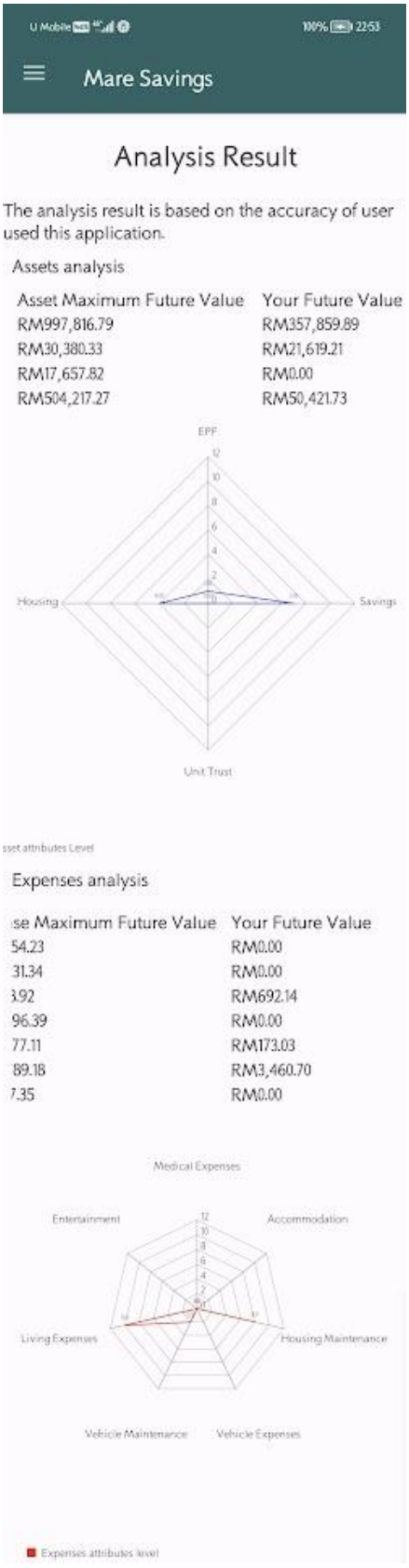


Figure 4.1.7.1 and figure 4.1.7.2 Radar chart and data shown in Analysis Module.

In analysis module, the assets analysis will show a table that show all the maximum value get from user that categories in same user income group and the future value between user will be find and level according to the range of user in database. The level of user planned variable will be divided into ten level and the user able to know the radar charts represented what data by clicking on the need in the radar charts. Same as the expenses analysis that have same chart as assets.

4.1.8 Guideline/ Financial Literacy Module

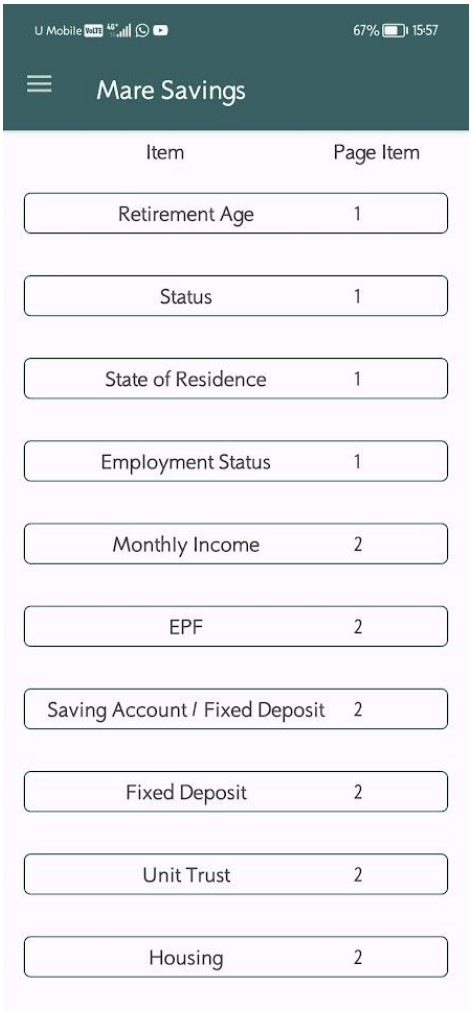


Figure 4.1.8.1 View shown layout of guideline list in the guideline or financial literacy block module.

The guideline list shown the guideline available for user to help them on input their data or variable to the system. The correct data enter will help the user to get a usable estimation result and analysis data for user to enhance their retirement planning. Page item is shown where the page of the guideline will be get and the item shown the guideline title or name.

Figure 4.1.8.2 View shown when no data available in Calculation Module.

The dialog box above shows the layout of guideline page including the content to tell and the link for user to view for more detail information about the content needed and further knowledge.

4.1.9 About App

Figure 4.1.9.1 About App layout that show the information of this application and the contact of the creator of the application.

The about app is shown the aim of creating the application and the contact of the application for user further information. User able to get contact to the creator using the contact in the about app page.

4.1.10 Logout Dialog

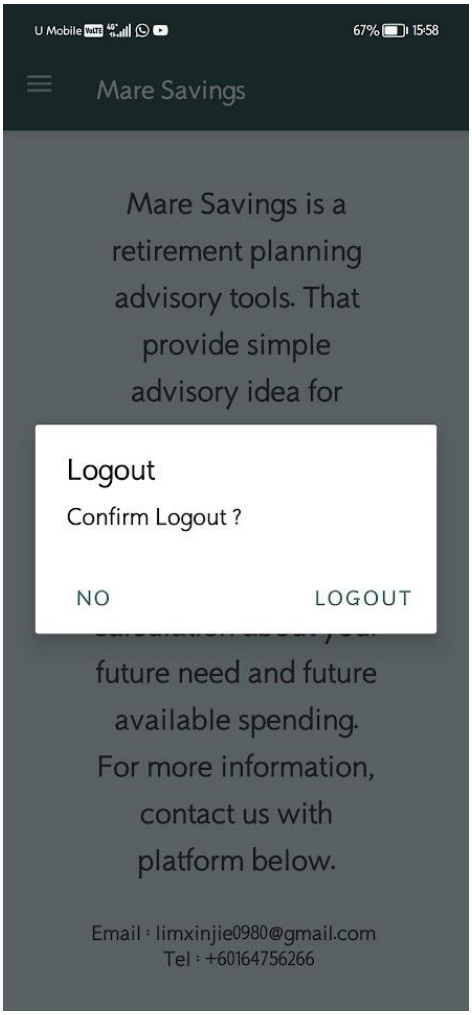


Figure 4.1.10.1 Dialog that ask user to confirm their logout action.

The dialog show when user click on logout section in sliding menu. If the user click 'Logout' the data in app will be clear and the user will be jump to login page for further action. If the user chooses 'No', they will back to calculation module layout that work as the first home page.

4.2 Data storage design

User		
userID	Integer	The primary key of the USER table is automatically generated by the system. It represents the unique ID of the user.
name	String	The user register name.
password	String	User's password for login.
email	Integer	User's email for verification

Table 4.2.1 User table in data storage.

Table 4.2.1 show the USER table in data storage. Based on the table 3.4.1, UserID will be the primary key that generated by system and work as unique ID to identify each user in the database. UserName and userPassword that store in string store for user to identify user identity for further activity and data saving in database. Email of user also store for user password reset and user contact.

BasicInfo		
basicID	Integer	The primary key of the BasicInfo table is automatically generated by the system. As recognition of data owner.
birthday	Date	The table records are for pre retirements planning or undergoing retirement planning.
employeeStatus	String	The status of employment of user
income	double	The amount of user constant income
inflationRate	double	The inflation rate defines by user
retirementAge	Integer	The retirement agedefine by user
riskPoint	float	The risk point calculates by system
savedTime	Date	The time user input of save this record
state	String	The state where user stay currently
status	String	The marital status of user

Table 4.2.2 Basic Info table in data storage.

Table 4.2.2 show BasicInfo table in data storage. BasicInfo table use to store basic information and some setting value for calculation. The user ID is use as key value to

know the detail saved own by which user. The information keep will be one for all user under child of user ID. The birthday date saved is used to identify user current age and period of saving available by retirement age (retirementAge). Employment status (employeeStatus), marital status (status), will be additional data use for identifying user risk and group range for future analysis. Risk point (riskPoint) is calculate using formula stated in calculation section to help estimated a fault tolerance resulting of future vale and needs. Income is use to keep current constant income user to estimated EPF account future value.

Others		
planID	String	The primary key of the Others table is automatically generated by the system. As recognition of data owner.
planName	string	The other planning name as identification of the plan
planAmount	double	The other planning amount
planPeriod	String	The other planning duration using for calculation
planType	String	The other planning type which might be income or expenses during retirement
planRate	double	The other planning rate with to know the increasing rate

Table 4.2.3 Others table in data storage.

Table 4.2.3 show Others table in data storage. Others is table that record other retirement planning activities which not included in the asset and expenses section selection. The variable included in the table is plan name (planName), plan amount (planAmount), plan period (planPeriod), plan type (planType) and plan rate (planRate). This table contains will be led by user ID as the key of the access to the user data and the table item is store under list which mean where was a child of num under the user key to lead all data user enter for other retirement planning activities.

Assets		
assetsID	String	The primary key of the Assets table is automatically generated by the system. It represents the unique ID of the assets.
assetName	String	The asset name set by system for saving
assetAmount	double	The asset amount record from user input
assetRate	double	The interest rate of the asset from user input
assetInc	double	The asset constant increasing value per year from user input

Table 4.2.4 Assets table in data storage.

Table 4.2.4 show Assets table in data storage. Assets table is use to record planned retirement asset where user will save or invest the money as their source of money during retirement. The assets class contain assets name (assetName), asset amount (assetAmount), asset interest rate (assetRate) and asset increasing amount (assetInc). The structure of the table will be header by user ID work as the key and number starting from zero to three use to separate the assets enter by user.

Expenses		
User ID	String	The key of the user table is automatically generated by the system. As recognition of data owner.
expenseName	String	The expense name given by user
expenseAmount	double	The expense amount input by user
increasePeriod	String	The expense period divide by system

Table 4.2.5 Expenses table in data storage.

Table 4.2.5 show Expenses table in data storage. The purpose of an expenses table is to show which record table variable is a money decreasing record. The main key for this table is expenses name, which serves as a name for verify type of expenses. User-assigned amount and system-defined classify expenses type.

Guideline		
gId	String	The guideline page ID use to identify detail display page.
gContent	String	The literacy title to acknowledge user
gLink	String	The literacy detail that can be view by user
gTitle	String	The literacy adding date

Table 4.2.6 Guideline table in data storage.

Table 4.2.6 show Guideline table in data storage. Guideline table is used to keep financial literacy block detail or guideline data. gId is used to identify which page the guideline detail display in the system. gTitle, gContent and gLink will use for data display to guide user on filling data and system using. gTitle is storing title of the literacy block. gContent is storing the literacy information for user to view. gLink is used to store link that able to view by user for more information. The guideline is assigned under number key to differential each guideline keep.

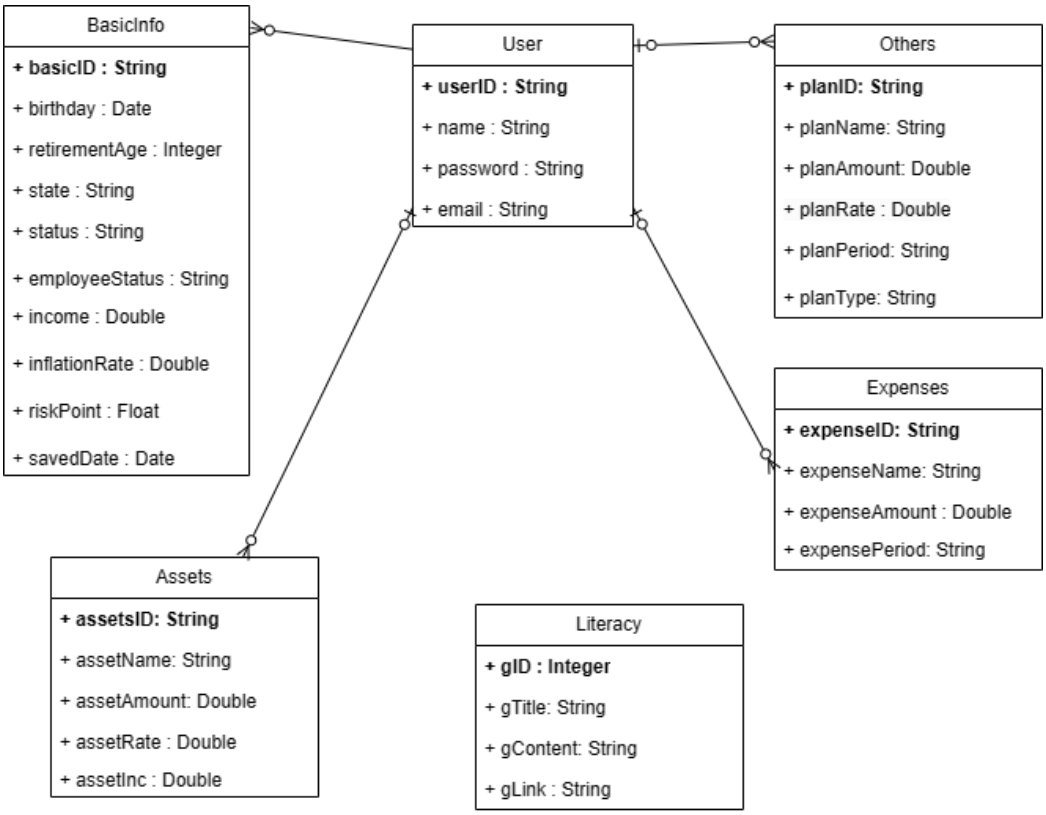


Figure 4.2.7 Overall class diagram for database classes design.

4.3 System Architecture

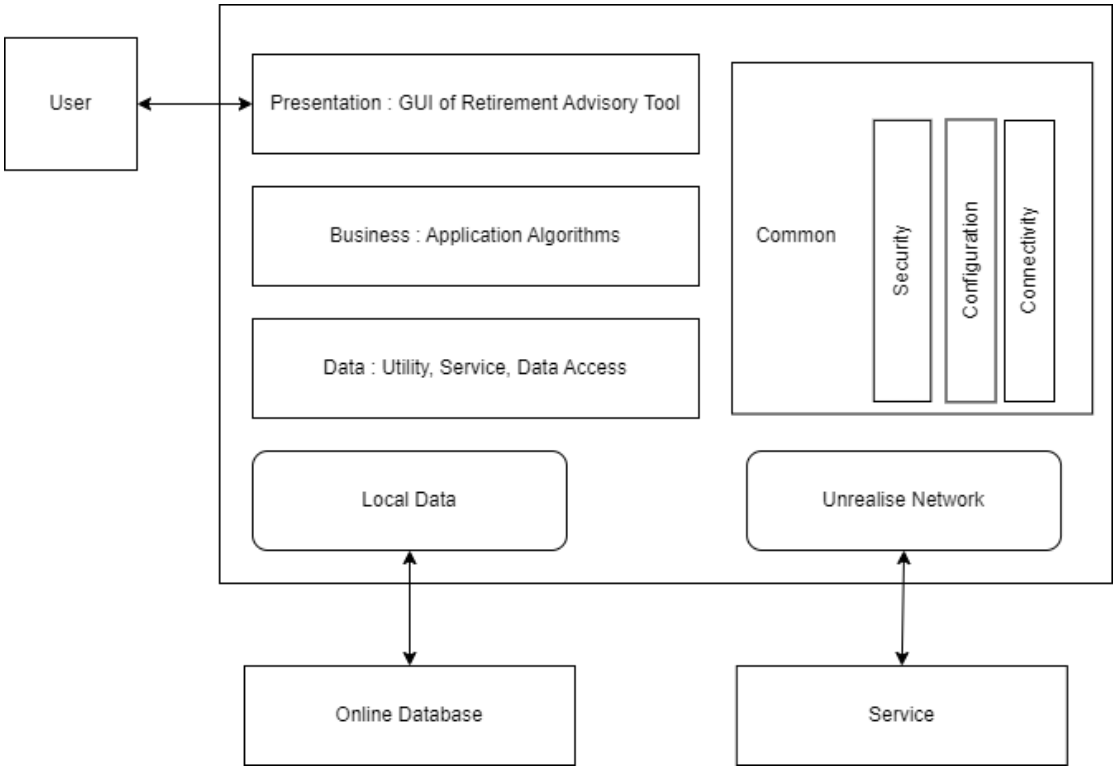


Figure 4.3.1 System architecture of retirement advisory tool.

This project will use mobile app architecture that consists of data, business, presentation, common, local data, online database, service and network. Users will directly react to the presentation layer which works as the graphic user interface. The business layer will carry out the algorithms set like calculation and estimation. The data layer will work on retrieving data from local and online databases. The data layer also reacts with the operation system and involves a common layer controlling the access on the network sync function and device offer services. This architecture contains elements of the Model-View-Controller architecture pattern suitable for this project as it also needs data to support the system that can sync it online as a backup and locally keep it for local use at the same time. The data user reacts with must be reprocessed before meeting with the user to enhance the user experience and easy to use. Mobile development had limited resources compared to computers therefore mobile app architecture specifically designed for mobile applications will be the most suitable for this project that works in an Android environment.

CHAPTER 5

System Testing

5.1 System Verification Plan

The verification plan can be separated into two parts, calculation module and analysis module followed by benchmark comparison as functionality verification. The first testing plan focuses on testing the calculation module where the user needs to enter their retirement planning details in the planning module and system will provide scoring and calculation results according to their planning. The evaluation can be done by ensuring the risk calculation in the module where they will show their result which includes inflation and the module that includes both the inflation and risk calculation result.

Then, for the scoring, the user will be given a score according to the data entered for retirement planning. An advisory and conclusion should be given according to the scoring. The system should state the calculation formula or way to make the score better. These two functions will be the way to prove the advice that was given to the user for the decision-making process on retirement planning.

For the financial literacy block, users can access and enhance their knowledge using the system. Reducing user input in some common variables like inflation rate and EPF rate also helps to improve the user experience with acknowledgement to the user which increases their image of the current financial situation in retirement planning. This module verifies by checking access to all related terms used in the calculation that might be hard to understand by the user. At the same time, the block should provide an explanation of the terms, formulas and data existing in the calculation and estimation.

Additionally, there will be a comparison of calculations that do not include income level for their retirement planning tools and the advisory tool in our project. A comparison of variables offers and defines a constant value for the variables that exist in both systems. By inputting the same variables in two different systems, compare the results between two systems with the same input variables and try to discuss the results

between the systems. This testing can show if the inclusion of income level and the designed risk calculation cause a difference in the result given to the user.

Table 5.1.1 Risk Calculations testing variables list.

	Content	**Risk Point**	**Total Risk Point**
Retirement Age (Max 3)	65	2	3
Status (Max 3)	Single	3	3
Employee Status (Max 3)	Employed	3	3
Status (Max 3)	Selangor	1	3
Income (Max 6)	RM7000	4	6
Assets (Max 8)			
EPF Account (Max 2)	RM1000 Future value = RM1,885,161	1	2
Saving / Fixed Deposit (Max 2)	RM2000	2	2
Unit Trust / Share (Max 2)	RM0	0	2
Housing / Properties (Max 2)	RM50000	2	2
Future Expenses (Max 21)			
Medical Expenses (Max 3)	RM0	3	3
Accommodation (Max 3)	RM0	3	3
Housing Maintenance (Max 3)	RM200	1	3
Vehicle Expenses (Max 3)	RM0	3	3
Vehicle Maintenance (Max 3)	RM50	1	3
Living Expenses (Max 3)	RM1000	1	3
Entertainment (Max 3)	RM100	1	3
Other retirement planning			
Other planning activities (Max 3)	No other planning	0	0
		31	47

Calculation of finding risk rate:

Risk rate = risk percentages *10%

= 0.65957 * 0.1

= 0.065957

= 6.5957%

= 6.60% (Round off)

Scoring calculation

Scoring = future value of assets / needs for 25 years after retirement

= RM897,103.09 /RM 3,397,102.48

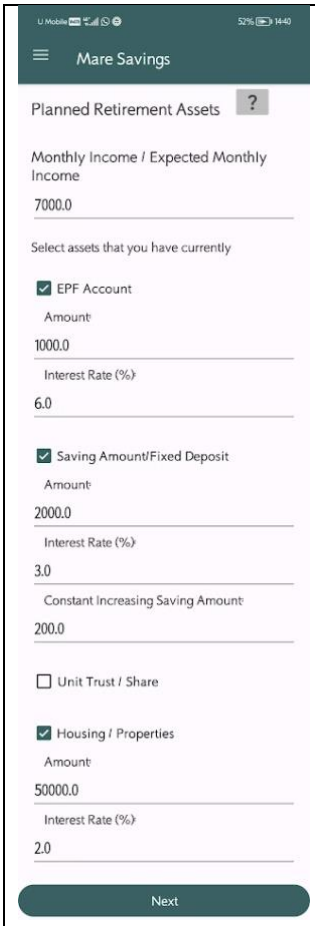
= 0.26407 *100

= 26.41% (Round off)

5.2 System Testing Result

Table 5.2.1 Table of prove and description for functionality and calculation.

<table>
<tr><th>Snapshot</th><th>Description</th></tr>
<tr><td colspan="2">Risk Calculation and Scoring Calculation</td></tr>
<tr><td> 
</td><td>Input data for user basic information.
<table>
<tr><td>Retirement Age (Max 3)</td><td>65</td></tr>
<tr><td>Status (Max 3)</td><td>Single</td></tr>
<tr><td>Employee Status (Max 3)</td><td>Employed</td></tr>
<tr><td>Status (Max 3)</td><td>Selangor</td></tr>
<tr><td>Income (Max 6)</td><td>RM7000</td></tr>
</table></td></tr>
</table>

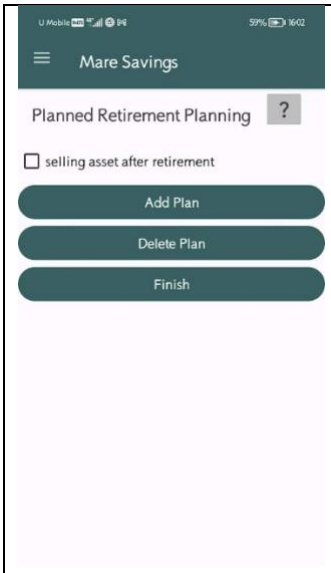
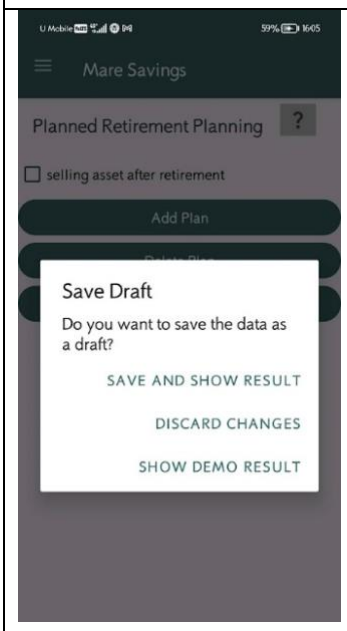
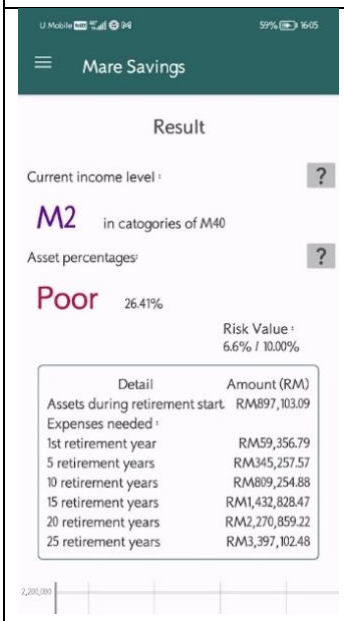


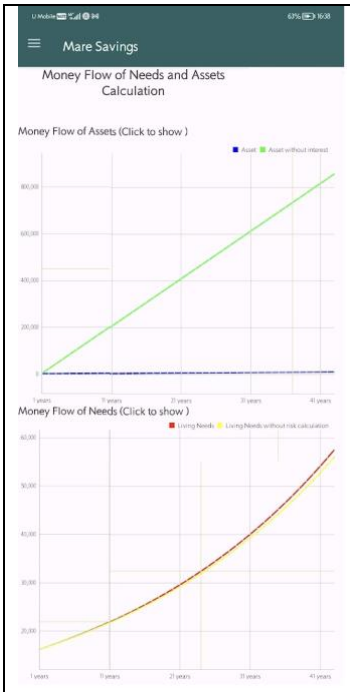
Input data for planned retirement assets.

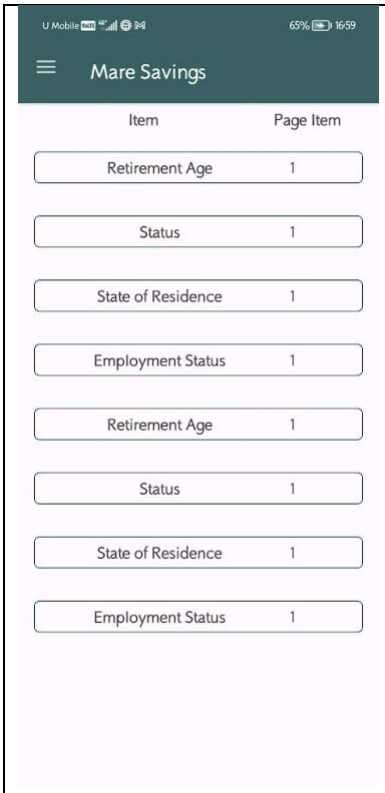
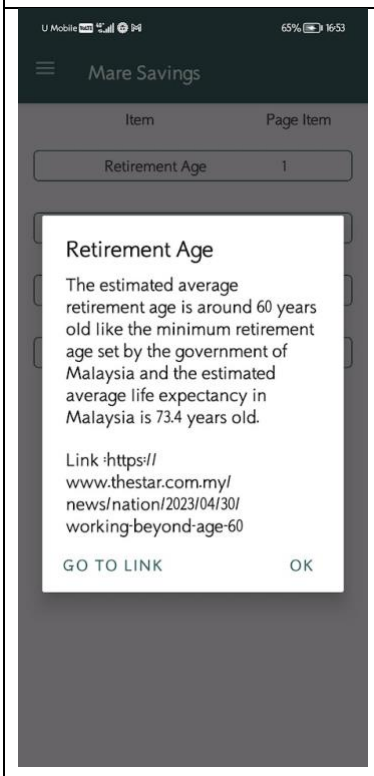
EPF Account (Max 2)	RM1000 Future value = RM1,885,161
Saving / Fixed Deposit (Max 2)	RM2,000
Unit Trust / Share (Max 2)	RM0
Housing / Properties (Max 2)	RM50,000

Input data for planned retirement expenses.

Medical Expenses (Max 3)	RM0
Accommodation (Max 3)	RM0
Housing Maintenance (Max 3)	RM200
Vehicle Expenses (Max 3)	RM0
Vehicle Maintenance (Max 3)	RM50
Living Expenses (Max 3)	RM1,000
Entertainment (Max 3)	RM100

	Skip planned retirement planning section as not data need to enter for this part. Click on 'Finish' button to save the input entered.
	A dialog will prompt after input. Click on 'Save and show result' to save data to database and prompt to result page.
	The result page shows the data of Income level separation and asset percentages as the scoring for user reference. The risk of user retirement planning also shown above the table of result amount. The user is M2 in categories of M40 of income level Malaysia and scoring for 26.41% for its asset percentages. Risk calculate will be 6.6% over 10%

	The two-line charts show the different if the assets calculation not including interest while the money flow of needs show the needs value of user increasing by year under the influence of inflation and the calculation of risk for fault tolerance. The yellow show the data with only inflation calculation and the red one with inflation and risk calculation.
Guideline Display	
	In planning module find the question mark logo in the layout for click to lead to guideline block.

	The layout shows the layout of listed financial literacy block. Click on 'Retirement Age 1' block to view the content inside.
	After clicking the block of retirement Age. It will show the content the guide user about the retirement age and a link provided for more information. Click on the 'Go To Link' to show the link content.

	This shows the content after click on 'Go To Link' in dialog block. The link will lead user to browser with the URL shown in the dialog box.

Table 5.2.1 shows the proof of calculation and functionality provided by the system in this project. The calculation of risk based on user input and scoring can be clearly seen as shown in the figure in Table. The calculation is fully the same as the result calculated manually and it works as designed.

Benchmark Testing

Input data as below in two tool which is sample tool from internet without risk calculations and current system in this project.

Table 5.2.2 Table of sample content to be input into two tools for comparison.

Variable	**Content**
Retirement Age	60
Current Age	23
Saving last till (years)	25
EPF account amount	RM1000
EPF monthly contribution	Income = RM5,000, contribution = RM1,200
Monthly expenses during retirement	RM1,000
Yearly expenses during retirement	RM200

The application used for comparison is OCBC Retirement planner that offer by OCBC Bank online [54].

Table 5.2.3 Table of snapshot with description for benchmark testing using OCBC Bank.

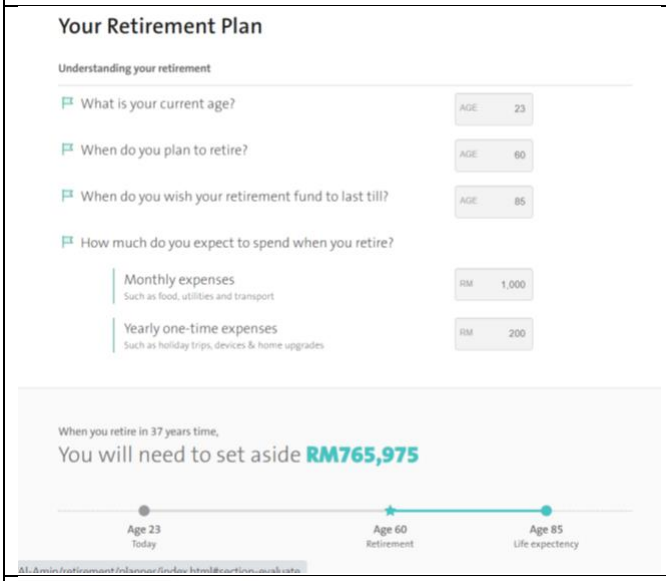
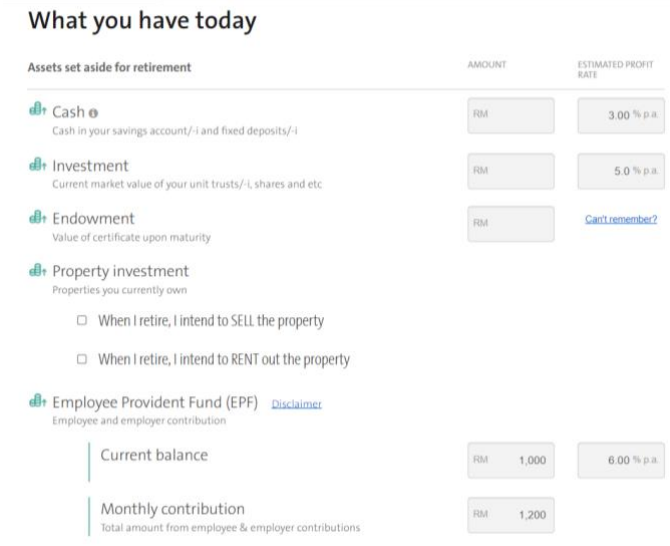
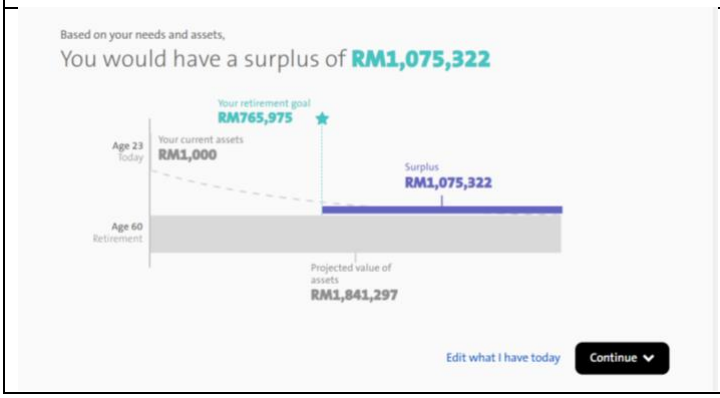
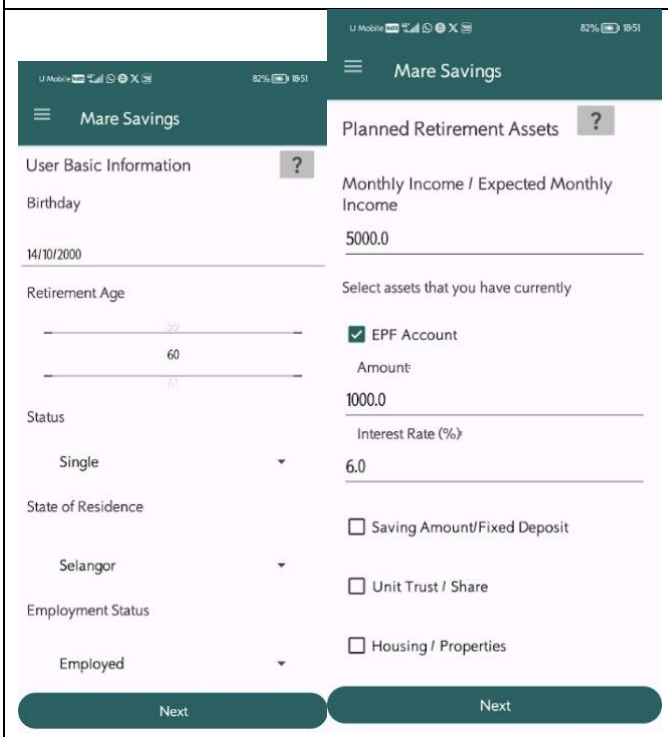
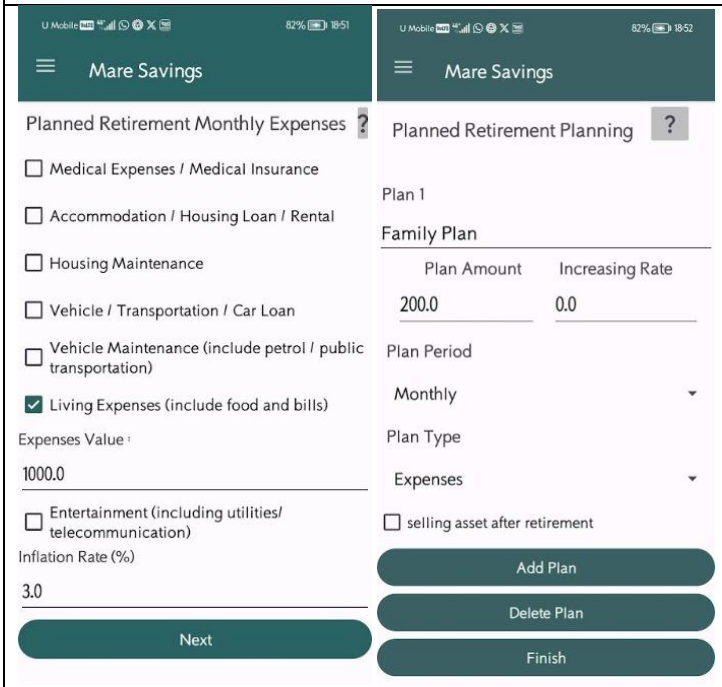
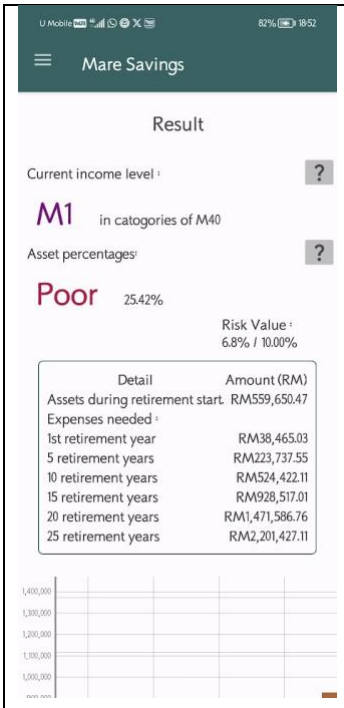
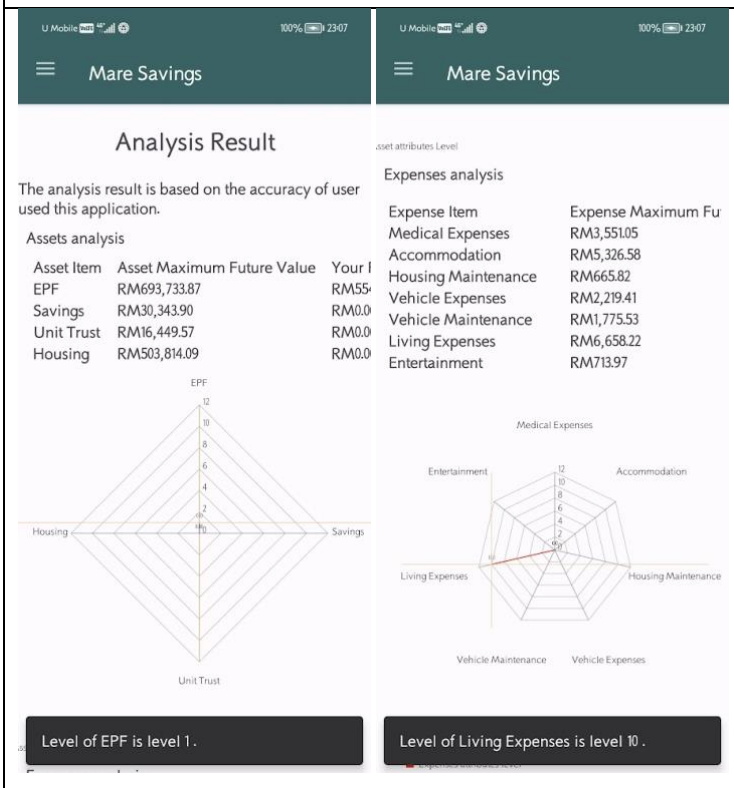
Snapshot	Description
	Input current age as 23 years old, retirement age as 60 years old, retirement find last until 85 years old which also 25 years after retirement. The monthly expenses saved as RM1,000 and RM200 as yearly expenses during retirement.
	For current assets prepared for retirement is EPF account will current value of RM1,000 and 6% interest with RM1,200 monthly contribution by assume that monthly income is RM5,000.
	The chart shows the user will have RM765,975 when start retirement and need RM1,841,297 to maintain retirement life.

Table 5.2.4 Table of snapshot with description for benchmark testing using project application.

Snapshot	Description
	Input data as variable above where retirement age as 60 years old, birthday that is currently 23 years old. Other set as default. For retirement assets, income as RM5,000 which will contribute RM1,200 for EPF account per month, EPF account current amount with RM1,000 and 6% interest rate.
	For expenses, living expenses represent the overall show RM1,000 per month needed during retirement. On the other hand, extra yearly plan at planned retirement planning with the amount of RM200 is set and saved.

	The result show the user in income level of M1 in categories of M40. The asset percentages is 25.42% which will have RM559,650.47 when starting retirement life. However, according to calculation of retirement needs user will need RM38,465.03 for first years of retirement and need RM 2,201,427.11 for 25 years after retirement.
	The EPF account future value show high level in the accuracy of all user in this application While the living expenses future value not including risk show low in this app.

The results above show that the result provided by OCBC Bank will be less than using the current application. As the OCBC Bank retirement planner provided their calculation does not involve a risk calculation, and they provided the result of that round off value for their users to easily see and remember as a whole number. While for

application in this project, we provided a more detailed result value for user and the result amount will be much larger than the one without as the risk will cause the amount to need to be increased to become more fault tolerance. On the other hand, the higher needed value also secures that the lower value result as the more the user saves the more the user can cope with money challenges during their retirement life. Next, this project also provides a comparison value to define user level based on their assets and expenses. However, due to the limitation of the amount in a real time database, it is difficult to give a suitable and advisory value to the user. Therefore, users can only use the analysis module as a reference and not fully put their trust in the result.

Conclusion

According to the results obtained from the testing, the calculation module included risk calculation and scoring for the user to view and understand more about their retirement planning. On the other hand, the guideline also provided users with guidance on how to fill in all the input that needs to be completed in the planning module.

For benchmark testing, risk calculation is shown as an additional variable that helps users have more fault tolerance when they have over-budget spending during retirement. Besides that, the analysis advisory will need much more accuracy and usable data for analysis to build up a better advisory function for the user. Therefore, the analysis module can only be used as a rough reference for users to find ways to enhance their planning by following the flow of another user.

In conclusion, there is still a lot that needs to be improved for this project. Lack of a dataset for retirement planning among Malaysians will be one of the challenges to completing a local customized retirement advisory tool with high usability. Important retirement planning also needs to be one of the reasons behind this situation as the majority of Malaysians depend only on EPF for their retirement money sources.

CHAPTER 6

Discussion

6.1 System Limitation

The first limitation of this retirement advisory tool is poor data representation. The user might find that the graph display is difficult to understand as the value of overall result will have a bit different with the total result. As a direct formula calculation of future value and indirect calculation might cause minor different of result representation. On the other hand, a lot of explanations will cause user to feel uncomfortable with too much word to be read when using the application. Therefore, a design that help user to have better understanding will be important to ensure user entered data according to system requirement.

Other than above, lack of value changing on current assets provided less convenience as user need to enter again their new amount of the assets input even there was a constant and predictable value change. Due to limit on time, this project system didn't include this functions to improve user experience.

Besides that, there also limitation on analysis module which needs a lot of real time data that show good retirement planning to be as guidance for user. As in analysis module user need to compare their retirement planning with other and find their level of the variable among the user in this project 's system. If the system has a more accuracy and realistic data, user can get more better advisory on increasing which variables amount or decrease which variables amount to have a better retirement planning.

6.2 Future Enhancement

This project mainly focuses on localise current retirement planning advisory tool. However, due to time limited there still a lot of limitation in this project, further enhancement can be made based on the GUI and data display method. By having an easy and understandable layout can help user to get data from the application as fast as

possible. This help can help attract user attention and get them to know more in deep on one of this project problem statement which is to increase the financial literacy level among Malaysians. Due to the multiracial and different financial literacy level among Malaysians, application that provided multilanguage will be more suitable to local use. Providing a multilanguage application seem to be a better solution to make majority user feel more user friendly to the application and can better understand compared to one language that might not too familiar by some user.

Other enhance that can be done in future in including saving flow of user into the system. User will only need to be confirm their assets amount after their first input. System can have auto sum on the current value based on the data saving time to predict if the value currently is same as the one predicted previously. This can help to improve user experiences and encourage the user to be a permanent user for the advisory tools to ensure their retirement planning following the flow as planned.

6.3 Discussion on objective achievement and challenges

This project holds the objective of including risk calculation, scoring and advance variable which is retirement planning activities in the project system. Besides the three functionality and feature, system also need to provide the guideline module that using resource online to improve user understanding in the variables to be input. As shown in table 5.2.1, the functionality that planned to include is developed. The objective is completely fulfilled . However, there still a lot of improvements need to be added to current system to improve the functionality that proposed. Especially, the design of the designed functionality.

The challenges that meet in this project include the design of the calculation and the way to represent the result data. As most users now prefer fast food reading, they will not spend their time reading a large number of words as a result of an application. Therefore, a short, easy-to-understand layout will be the main challenge for this project. Due to time constraints, the financial knowledge needed to design this retirement calculation might not be as complete as other retirement advisory tools on the market. However, the calculation features will be enough to allow a user to customize their own retirement planning.

CHAPTER 7

Conclusion

Retirement is a must going life stage after stop from working and start enjoying living. However, money source will be very important to maintain our life therefore retirement planning is needed to make sure the money we had saving is enough for our life spending when retirement. To ensure we have a better planning on retirement planning, an advisory tool or advisor is needed as reference to help us make decision on our financial planning. In Malaysia, there still limited functionality on retirement advisory tool provided. As comparison made in literature review above, most of the tool provided didn't complete with risk calculation, scoring and retirement activities planning that allow user to have more specific and custom planning. Besides that, majority of Malaysia citizen are not financially literate and can't understand too professional word or terminology.

A complex functionality like scoring, risk calculation with retirement activity planning system will be needed and user friendly to not well financially literate user will be the aim of this project. By including development of lacking function and financial literacy block can help on solving the problem of current system existing for Malaysia user. Malaysia users need different variable and have different investment product that support retirement life like 401K for American but retirement insurance for Malaysian. These variables and calculation were review as stated above. Finally, all the development is done with some limitation due to limited time for this project. On behave of the functionality is fulfil real life needs still in discussion due to lack of data with real statistics. The still many need to improve and hope there will be a chance to continue this project.

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APPENDIX

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Year 3 Trimester 2	**Study week no.: 2**
Student Name & ID: LIM XIN JIE 21ACB00214	
Supervisor: DR KU CHIN SOON	
Project Title: PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Done develop layout of user basic information and planned retirement assets section in planning module.

2. WORK TO BE DONE

Continue develop other part of planning module and connect develop saving data to database.

3. PROBLEMS ENCOUNTERED

Development done in project I not suitable to be continue in project II. Need to redevelop.

4. SELF EVALUATION OF THE PROGRESS

Need to speed up and have a better management for development time.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Year 3 Trimester 2	**Study week no.: 4**
Student Name & ID: LIM XIN JIE 21ACB00214	
Supervisor: DR KU CHIN SOON	
Project Title: PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Done develop layout of planned retirement expenses and other retirement planning section in planning module.

2. WORK TO BE DONE

Continue data setting on the planning module and start developing home fragment with contain calculation module.

3. PROBLEMS ENCOUNTERED

Learning to retrieve data from firebase and setting data spending more time than expected.

4. SELF EVALUATION OF THE PROGRESS

Need to improve time management and need to learning knowledge of firebase.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Year 3 Trimester 2	**Study week no.: 6**
Student Name & ID: LIM XIN JIE 21ACB00214	
Supervisor: DR KU CHIN SOON	
Project Title: PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Done development of planning module and some working on calculation module.

2. WORK TO BE DONE

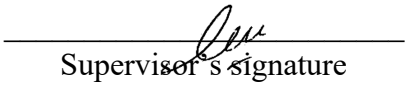
Continue development on calculation module and completing risk calculation of the system.

3. PROBLEMS ENCOUNTERED

Adjusting a better solution and design on risk calculation and retirement planning variable future value.

4. SELF EVALUATION OF THE PROGRESS

Need a better planning and design before start development of calculation.



Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Year 3 Trimester 2	**Study week no.: 8**
Student Name & ID: LIM XIN JIE 21ACB00214	
Supervisor: DR KU CHIN SOON	
Project Title: PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Done development of calculation module, about app, logout function, and demo module.

2. WORK TO BE DONE

Continue development of analysis module layout and data displaying. Changing layout display to improve user experience.

3. PROBLEMS ENCOUNTERED

Layout design is hard to be understand by user, need more improvement.

4. SELF EVALUATION OF THE PROGRESS

Need to fast up development and start some part in final report.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Year 3 Trimester 2	**Study week no.: 10**
Student Name & ID: LIM XIN JIE 21ACB00214	
Supervisor: DR KU CHIN SOON	
Project Title: PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Done majority of development start some done testing and fix bug task.

2. WORK TO BE DONE

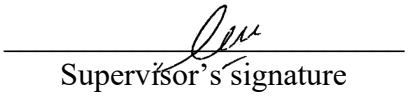
Continue testing and fix bug task. Update chapter 4 in report to current design.

3. PROBLEMS ENCOUNTERED

Majority of system design for chapter 4 need to change in this project report.

4. SELF EVALUATION OF THE PROGRESS

Need a better management on time.



Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Year 3 Trimester 2	**Study week no.: 12**
Student Name & ID: LIM XIN JIE 21ACB00214	
Supervisor: DR KU CHIN SOON	
Project Title: PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Complete majority of report

2. WORK TO BE DONE

Continue work on report and complete whole project.

3. PROBLEMS ENCOUNTERED

Hard to find system that can be use as benchmark for verification.

4. SELF EVALUATION OF THE PROGRESS

Need a better management on time.

Supervisor's signature

Student's signature

POSTER

UTAR
UNIVERSITI TUNKU ABDUL RAHMAN

PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA

PROJECT DEVELOPER : LIM XIN JIE
SUPERVISOR: DR KU CHIN SOON

INTRODUCTION

Develop retirement decision-making advisory tools to address the lack of awareness and understanding of retirement planning among Malaysians.

METHODS USE

- Divide decision making to asset, expenses and extra retirement planning.
- Using calculation on predicting future value of needs and assets value.
- Include explanation for most financial term.

DICUSSION

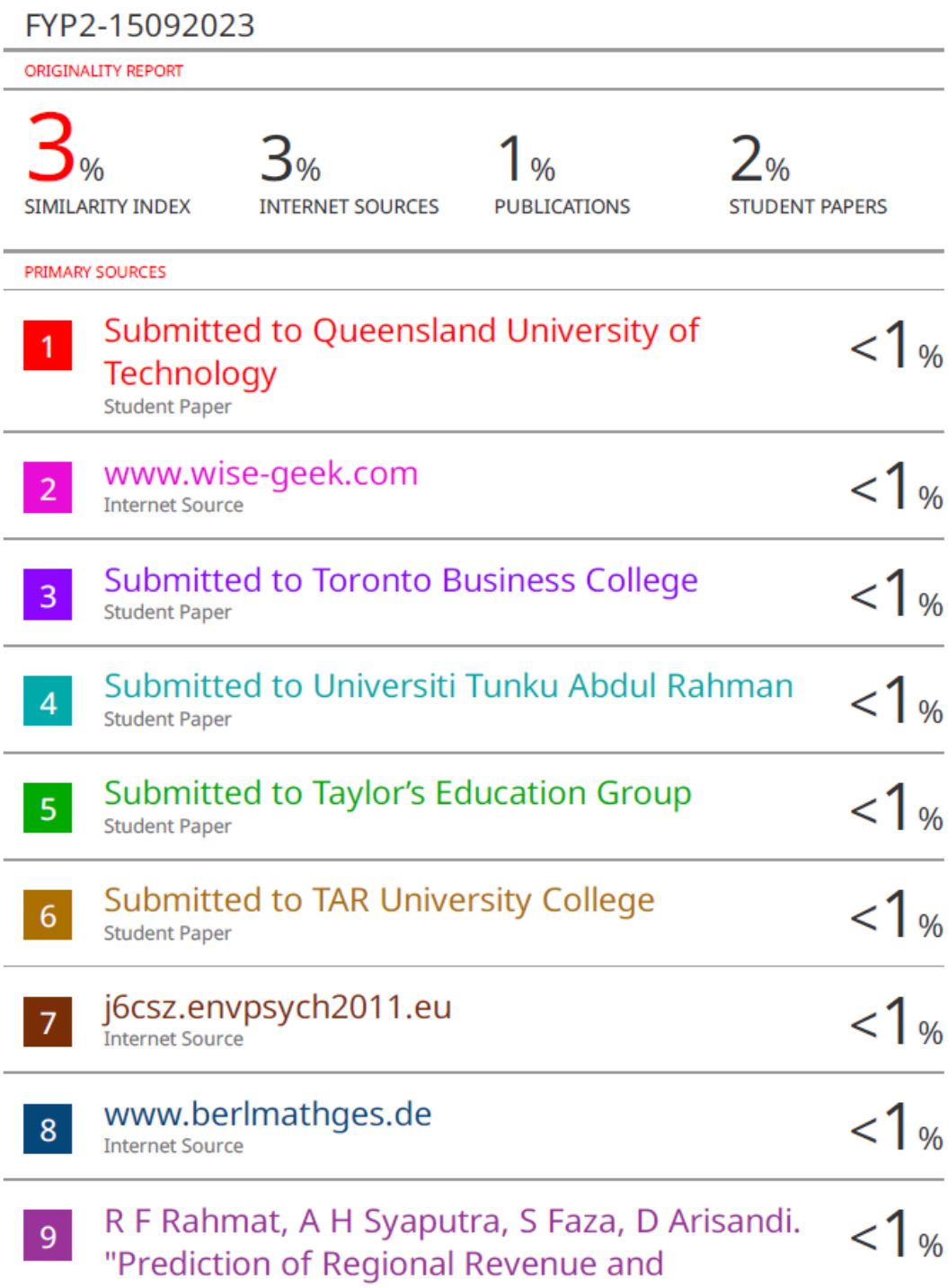
The design and calculation of retirement planning is important and will cause different to user according to input. Due to the differences in financial management methods and consumption concepts. The result provided by advisory tools still meet many challenges .

CONCLUSION

Retirement advisory tool can help user to make desicion making by predicting future value with mathematic calculation.

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY
BACHELOR INFORMATION SYSTEMS (HONOURS) INFORMATION SYSTEMS ENGINEERING

PLAGIARISM CHECK RESULT



FYP2-15092023

ORIGINALITY REPORT

3%	3%	1%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Queensland University of Technology Student Paper	<1%
2	www.wise-geek.com Internet Source	<1%
3	Submitted to Toronto Business College Student Paper	<1%
4	Submitted to Universiti Tunku Abdul Rahman Student Paper	<1%
5	Submitted to Taylor's Education Group Student Paper	<1%
6	Submitted to TAR University College Student Paper	<1%
7	j6csz.envpsych2011.eu Internet Source	<1%
8	www.berlmathges.de Internet Source	<1%
9	R F Rahmat, A H Syaputra, S Faza, D Arisandi. "Prediction of Regional Revenue and	<1%

PLAGIARISM CHECK RESULT

Universiti Tunku Abdul Rahman			
Form Title: Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	LIM XIN JIE
ID Number(s)	21ACB00214
Programme / Course	BACHELOR INFORMATION SYSTEMS (HONOURS) INFORMATION SYSTEMS ENGINEERING
Title of Final Year Project	PERSONAL RETIREMENT ADVISORY TOOL WITH INCOME CLASSIFICATION IN MALAYSIA

Similarity	**Supervisor's Comments (Compulsory if parameters of originality exceed the limits approved by UTAR)**
Overall similarity index: 3 % **Similarity by source** Internet Sources: 3 % Publications: 1 % Student Papers: 2 %	
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Parameters of originality required, and limits approved by UTAR are as Follows:

(i) Overall similarity index is 20% and below, and

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Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.

Note: Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: Ku Chin Soon

Date: 15/09/2023

Signature of Co-Supervisor

Name: _____

Date: _____

Bachelor of Information Systems (Honours) Information Systems Engineering
Faculty of Information and Communication Technology (Kampar Campus), UTAR

FYP 2 CHECKLIST

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	21ACB00214
Student Name	LIM XIN JIE
Supervisor Name	DR KU CHIN SOON

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
	Front Plastic Cover (for hardcopy)
√	Title Page
√	Signed Report Status Declaration Form
√	Signed FYP Thesis Submission Form
√	Signed form of the Declaration of Originality
√	Acknowledgement
√	Abstract
√	Table of Contents
√	List of Figures (if applicable)
√	List of Tables (if applicable)
	List of Symbols (if applicable)
√	List of Abbreviations (if applicable)
√	Chapters / Content
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I, the author, have checked and confirmed all the items listed in the table are included in my report.

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