Smart Information System

Personal Expenses Advisory System

By

Lew Wen Xiong

A REPORT SUBMITTED TO

University Tunku Abdul Rahman

in partial fulfilment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEM ENGINEERING

Faculty of Information and Communication Technology

(Kampar Campus)

January 2018
REPORT STATUS DECLARATION FORM

Title: SMART INFORMATION SYSTEM
PERSONAL EXPENSES ADVISORY SYSTEM

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_________________________
Supervisor’s name

Date: ____________________  Date: ____________________
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DECLARATION OF ORIGINALITY

I declare that this report entitled “Smart Information System - Personal Expenses Advisory System” is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : _______________________
Name : _______________________
ID No : _______________________
Date : _______________________

BIS (Hons) Information Systems Engineering
Faculty of Information and Communication Technology (Perak Campus), UTAR
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ABSTRACT

Budgeting, tracking expenses has been well known to most people and it is necessity to survive in this not so decent economic environment. Poor budgeting or not budgeting has come to a big issue and a major concern for most people, especially the younger generation. Recently, everyone can use their devices such as smartphones or tablets, which are more convenient, compared to a laptop to record their expenses and set budget. In this day and age, most people are trying to find other ways to get a more precise analysis without having to depend on experts consistently. For instance, using a smart device that has a built in budget analysis and advisory for personal expenses. This project title as “Personal Expenses Advisory System” will focuses on the poor budgeting performance issues. In this project, the input will be the user income, saving amount and budget amount and the output will be the expenses analysis and some expenses advices to help the user achieve their saving goal effectively. This system will be built around the concept of Business Intelligence (BI) technology, which means it will provide historical, current and predictive views or data to the user to support their decision making.
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CHAPTER 1 INTRODUCTION

1-1 Background Information

These days, many people have a problem with how to manage their money. The attraction of new technology, trendy goods and overpriced goods which made most people have the habit of overspending. Unfamiliar to money management is a serious problem, far an instance, there is a new issue among teenager with bankruptcy, due to the non-propel expenses and finances problem (Ferguson, 2012). In the statistic show, teenagers having a financial problem mainly is due to the use of credit card without control and self-discipline. The bankruptcy population fall under 25 years old is increasing (Smillie, 2004). Financial management lesson should be included in our education system, this can prevent teenagers to make mistake in the future.

In most if the countries, teachers may only conduct financial management classes for specific professional, and neglected it in other profession. There is about 83% of teens do not know how to manage their money (Tuggle, 2012). When teenagers are not educated with any financial knowledge, they are incapable to apply the tools and knowledge when needed. Eventually, these is the causes of why the rate of bankruptcy is increasing among teenagers.

In addition, not only teenagers need financial management skills or tools to make their life financially stable, worker, employer and even financial consultant need management tools to help them in managing and their personal income and expenses. They may want to keep track of their money flows and make a budget based on their analysis. This will be a convenient tool to help them to manage their money and easily come out with a budgeting plan.

Consequently, there is a need for expenses and budgeting management application for anyone to make good management of their money, especially for teenagers to start budgeting. This expenses application may include some advisory function to make budgeting easier and is a good start for beginner. The proposed system is to enhance current managing system, by including advisory and a more user friendly function to the user. Besides, time is very important for everyone, time-consuming budgeting tools are not popularly used by the user, and the user may find it not useful and hard to
interact with the application when there is too much entry of information is needed. Thus, the proposed application may reduce the steps of how others budgeting application works. The budgeting application must be able to handle the needs of the user and easy to use, this may benefit the user a lot on overcoming the budget problem and to keep the budget on the track. User can spend their money even more wisely and there is also some emergency fund available. With the expenses advisory system, the user can plan ahead and react well with emergency cases. Furthermore, user is able to understand their own spending habit.
1-2 Problem Statement and Motivation

Demand of the expenses management application is never going down, providing that people are still spending and using money. These application are necessary to store and manage their expenses and also for budgeting purpose.

Most of the existing applications are mainly in text form and user need to enter a lot of information in order to make the money flows to be very details, this will make user frustrated and give up easily, especially for beginners. Most of the user want their application to be as user friendly as possible. Furthermore, they do not want so many redundant information to be store and displayed.

Another issue with the current existing system is the lack of alternative input method. The user may want to input image as a record, as a memory, and do not need any other details. Therefore, make an application as simple as possible while did not need to give up any function as an expenses app is needed.

Furthermore, most of the existing expenses app are mainly in text form, while some provide some graph for the user about their expenses with a certain amount of price. It is frustrated when a user start budgeting, they need to spend money first. In this infographic world, a user can know everything about his expenditures with the aid of graph, they will know their spending behaviour and from there correct the bad spending behaviour and save more money.

Lastly, by doing budget solely is not recommended for beginners. This is because they do not have the financial knowledge to start the whole budgeting process. Therefore, if the expenses application can provide some guidance or some weekly digest for the user to learn and improve at which point they need to have some correction is highly recommended. Most of the user, especially younger generation are not tend to read books all the time because of the attraction these days. It is very hard to ask them to read a financial management book, while for adults, they will have little time to spend on books because of their works and families. So, it the application itself can provide guidance, it will benefit the user.
CHAPTER 1 INTRODUCTION

Motivation

i. The need of simple expenses tracker that can help the user to maintain budgeting practice.
ii. The need of data analysis system to track user spending behaviour.
iii. The need of advice for expenses and budget improvement.

Problem Statement

i. The inefficiency of achieving financial success due to lack of convenient planning execution and the lack of portability of desktop devices.
ii. The inefficiency of analysis system that can help the user to analyse their financial status.
iii. The lack of financial advisory service that can help the user in decision making.
CHAPTER 1 INTRODUCTION

1-3 Project Scope

This project aims to develop a Personal Expenses Advisory System on Android platform that is able to facilitate people in managing their expenses management performance. Essentially, this system is to be developed to bring expenses advisory functions into smart devices by using a combination of technologies which includes Android application development, database and business intelligence tools.

In addition, this system focuses on analysing user financial performance data and transforms the knowledge into preliminary plan that would use to assist the user in achieving the financial success.
CHAPTER 1 INTRODUCTION

1-4 Project Objectives

To build an Android application which includes features that able:

i. To provide a convenient one-stop financial bookkeeping application by allowing user to keep track their financial record, such as income and expenditure, anywhere and anytime in any portable Android devices based on Kaizen programming algorithm.

ii. To provide a personal financial calculator as useful analysis for income/expenses by using the cash basis of accounting. Also to show the results in various graph based on concept of infographics, subsequently helping user to understand their spending behaviour.

iii. To provide personal financial advisory services by comparing the user’s income and expense data from the database and alert the user together with useful advices when expenses exceeds the allocated budget.
CHAPTER 1 INTRODUCTION

1-5 Proposed Approach

In this mobile application project, there will be three modules that is highlighted according to the objective of this project. Those module are “Budgeting and Expenses Tracking”, “Graphical Analysis” and “Financial Advisory”. Each of the module is used to help the user to achieve their financial goals and have a better money management. A more details explanation about each module will be covered in Chapter 3.

Personal Expenses Advisory

Budgeting and Expenses Tracking
• set monthly or weekly budget
• track daily expenses

Graphical Analysis
• Daily, Weekly and Monthly Analysis
• Expenses based on categories

Financial Advisory
• Provide advises based on graphical analysis

Figure 1-5: System Module
CHAPTER 1 INTRODUCTION

1-6 System Overview

Figure 1-6: Flow Chart of Personal Expenses Advisory System
CHAPTER 1 INTRODUCTION

1.7 Report Organization

Chapter 1 discuss the problem statement and motivation, scope, objective, impact, significance and contribution, and background information of the project. In chapter 2, there will be some review and comparison of previous work. We also highlight and compare the proposed study with previous work. In chapter 3, we discuss about the system design of this project. This chapter also includes the top-down system diagrams and the explanation. In chapter 4, we discuss methodology used, describe how this project is developed and also how to perform implementation and testing of the application. In the last chapter, it is a conclusion to summarize the whole project.
2-1 Review of Advisory Systems

Advisory system is a system that provides aid and guidance to resolve the problem that is usually solved by human experts in that particular field (Beemer & Gregg, 2008). Advisory system will not provide the user with an exact answer to whatever question the user asks; this is because the advisory system is intended to support decision making in situations that are more amorphous. Knowledge from human experts had been transformed and coded into the advisory system, which is then used to perform an evaluation of alternative solutions to resolve problems.

2-2 Review of Infographics

Infographics are form from the words information and graphics, which means it is a graphical visual representations of information, data or knowledge. Infographics intended to show information to the user as fast as possible without sacrificing the clarity of the information. Infographics can improve cognition of the user by applying graphics to boost the user visual system to recognise patterns and trends. Infographics is mainly used to speedily communicate a message, to shorten the presentation of huge amounts of data, to get data patterns and relationships, and to observe variations in variables over the time. Infographics include bar graphs, pie charts, histograms, line charts, tree diagrams, mind maps, Gantt charts, and network diagrams, which are often found as the components of business intelligence software. As the quantity of data being cumulative in the system increases, infographics are used to aid users understand the important information contained in that data without going through all of it individually (Margaret, 2012).
2-3 Basis of Accounting

The basis of accounting refers to the methodology under which revenues and expenses are recognized in the financial statements of a business. When an organization refers to the basis of accounting that it uses, two primary methodologies are most likely to be mentioned:

Cash basis of accounting. Under this basis of accounting, a business recognizes revenue when cash is received, and expenses when bills are paid. This is the easiest approach to recording transactions, and is widely used by smaller businesses.

Accrual basis of accounting. Under this basis of accounting, a business recognizes revenue when earned and expenses when expenditures are consumed. This approach requires a greater knowledge of accounting, since accruals must be recorded at regular intervals. If a business wants to have its financial statements audited, it must use the accrual basis of accounting, since auditors will not pass judgment on financial statements prepared using any other basis of accounting.

A variation on these two approaches is the modified cash basis of accounting. This concept is most similar to the cash basis, except that longer-term assets are also recorded with accruals, so that fixed assets and loans will appear on the balance sheet. This concept better represents the financial condition of a business than does the cash basis of accounting.

The basis of accounting being used is typically listed as a disclosure in the footnotes that a business releases to outside parties as part of its financial statements. A change in the basis of accounting can be a major disclosure that would be of considerable interest to the users of financial statements, since this can have an immediate impact on the financial results and financial position of a business.

In this project, cash basis of accounting is used since the amount of cash flow for a personal budget is not as huge as a business organization and user will only bookkeeping when there is actual cash flows. For example, when a user receive money and spend money.
2-4 Review of Kaizen Programming Algorithm

Kaizen Programming is an evolutionally tool built on the concepts of the Kaizen methodology. Kaizen methodology is used to guide the continuous improvement process. Plan-Do-Check-Act is the principle practices by this methodology. The process starts from planning, executing and new action are taken based on the end results. These process will be repeated as a cycle until a mission or task is complete. As a result, every action can be evaluated based on how effective the action is in solving the problem. Which means, at each cycle, the user need more knowledge regarding to the problem and avoid bad actions to achieve better solution to the problem.

PLAN

In the beginning, set of randomly created solutions are used as the standard that may or will be improved in the next cycle.

DO

Idea or solution is transformed into physical action.

CHECK

Here, the Kaizen Programming will compare the important of current standard and new feature. The best solution will be used as the solution.

ACT

At here, action will be updated if standard had been changed.

Therefore, the whole Kaizen Programming Algorithm is simply the selection of the best solution and worse or bad ones will not be accepted.
CHAPTER 2 LITERATURE REVIEW

2-5 Review of Existing Expenses Management System

2-5-1 Goodbudget

![Goodbudget Screenshots](image)

Figure 2.5.1: Screen Shots of Goodbudget

Goodbudget is the virtual way to do the traditional budgeting method, where people once used the envelope system to divide their cash into several envelopes physically. All of the envelopes represent one category, for instance, bills, groceries etc. This app helps the user to allocate their finances into different categories through digital envelopes.

This application has all the basic features and tools to help the user to start a good budget. Before a user can start to track their expenses, they must first create a new household or account. The app will direct the user to setup their budget using several envelopes as categories. There are some pre-set envelopes, but users can always edit and add more envelopes according to their need. Users need to set their monthly income, then allocate the income to every envelope created. The system will check whether the allocated budget is more than the income. Besides this feature, users can also set saving goals, for example within one year, he needs to save up to RM1000. The system will have a saving envelopes created monthly and divide RM1000 into 12 months. The money will deduct from the monthly income.
CHAPTER 2 LITERATURE REVIEW

After setting up the budget, user can register an account and all the data will be securely protected. User can now track the expenses by key in the transaction daily and also view the graph report whenever they want. Besides, user can always edit their budget according to their new income or other changes.
2-5-2 Monefy

Figure 2-5-2: Screen Shots of Monefy

Monefy is one of the most simple budgets app you can get in the market. Everyone can get use to this app easily because of the use of graphical representation, but the interface need some time to get used to it due to the lack of tutorials. It was set up in a way that use can add in new transaction very quick and easily. Unlike others app, where the user need to setup a lot of things before the application can be use. There are other features include multi-currency support, built in calculator, passcode protection, data can be backup through Dropbox and widget.

When the user start the application, it will show the user a dashboard as shown in left side of figure 2-4-2. User just need to click on the “-” button to add expenses and “+” button to add income. While adding income or expenses, user need to add in categories as well and the data will be display immediately at the bar chart as shown. User can always scroll up to view the details of each categories as show in the right side.
of figure 2-4-2. Go through the setting of this application, user can setup a 4 number pass code for security and privacy concern and also backup the data to Dropbox for recovery use.

User can also track their money in different account by adding several account into the apps. But this features is not consider useful as the money in the bank will have slight changes due to interest and user need to always keep track on their bank account as well. It should be useful when the data is automatically sync between the app and bank account.
2-5-3 Money Manager Expense & Budget

Money Manager Expense & Budget is the budget app that have the most features between 3 of the application that had been reviewed. It is strange that it include the word “budget” in the name but it does not have a very good budget features. The only budget allocation is just income and do not have any other option where user can divide the money into several categories. It is basically an “expenses tracking” app rather than provide both the budgeting and expenses tracking function.

On the other hand, besides the lack of budgeting features, the app provide a wide range of different features in the application. It has several types of graphs that allows user to analyse their money based on income and expenses. It also can add in several account that can let the user to track their money in a more details ways and also allows user to take photo about a particular transaction for future reference. It also include some important features like passcode features and backup feature to Google Drive for recovery purpose.
2-6 Strength and Weaknesses of Existing System

In this section, strength and weaknesses of the reviewed application in previous section will be covered.

2-6-1 Goodbudget

Pro:

This application has the most complete budgeting features compared to another two application. It allows user to assign the money into several categories so that the user will not overspend or can monitor the money for that particular categories. User can also adjust their budget after one month based on their spending habit.

This application also comes with a web version, it is useful when phone is not available.

Cons:

Although it has a very good budgeting features, the user interface was poorly design. User can easily get confused when doing a transaction because of the lack of guidance. Besides, this application also lack of graphical representation and data analysis through graph or chart. User only can check their spending based on numbers. This is not effective as user might feel stress and stop budgeting because of too many text or numbers.
CHAPTER 2 LITERATURE REVIEW

2-6-2 Monefy

Pros:
This application provide the user the most simple and easiest way to track their expenses. Besides, the use of graphical representation is the best among three of the application reviewed. It gives user a quick glance about what is happening to their spending behaviour.

It also come with some backup features and security features – passcode, to make sure the user data is securely backup and protected.

It also come with variety of graphical data analysis where user can use it to plan for next month budget.

Cons:

The drawback about this application is lack of budgeting features compare to the one like “Goodbudget”. It does not have the features to allow user to allocate the money into different categories. This may create a bad practice because user do not budget the money based on their spending behaviour.
CHAPTER 2 LITERATURE REVIEW

2-6-3 Money Manager Expense & Budget

Pros:

This application is by far have the most features. It allows the user to do a lot of things with it. It allows user to customize the user interface with different colour and the ability to sync with web version.

User can store picture as memo for every expenses for future reference and backup everything in Google Drive for recovery in the future.

Cons:

The drawback of this application is the feature provided is too complicated. It is not user friendly at all. User tends to get confused because of the interface where most of the things are integrated in one page.

Besides, the input for transaction is complicated where user need to click and key in too many things for only one transaction, it has too many steps.
## 2-7 Comparison between Benchmark Reviews

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<th>Monefy</th>
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<tr>
<td>Plan-Do-Check-Act</td>
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<td>✓</td>
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Table 2-7-1: Comparison between Benchmark Reviews.
3-1 System Architecture

![System Architecture Diagram]

Figure 3-1: Personal Expenses Advisory System Architecture
CHAPTER 3 SYSTEM DESIGN

3-2 Functional Module

There are three main functional modules in the system, which includes budgeting and expenses tracking function, graphical analysis function, and advisory function.

Budgeting and expenses tracking function, user can set a monthly budget on their first successful login in the system or edit the budget through the budget page. User can set budget for each of the categories and also for saving. After set up the budget, user will be able to key in their expenses on daily basis. The app will record all the budgeting value and expenditure information into the database.

Graphical analysis function, user can view their expenditure information graphically through this function. The data in the database will be transformed into several types of charts for the user to have a quick glance, and based on the information, user can know where is most of their money spend. There are several types of graph functions included in this module where user can search based on categories, view daily, weekly or monthly expenditure and sort out the most money spend category.

Advisory function, user can view the recommended financial advice from this function. The system will get the latest data from the database and generate some useful advice for the user to improve the user’s money management.

There is also some other functional module included in the application which include profile function, login function and register function.
CHAPTER 3 SYSTEM DESIGN

3-3 Use Case Diagram

Figure 3-3: Personal Expenses Advisory Use Case Diagram
CHAPTER 3 SYSTEM DESIGN

3-4 Activity Diagram

Login Activity

Figure 3-4-1: User login activity diagram
CHAPTER 3 SYSTEM DESIGN

Manage Budget Activity

Figure 3-4-2: Manage budget activity diagram
CHAPTER 3 SYSTEM DESIGN

Expenses Tracking Activity (Transaction)

Figure 3-4-3: Expenses Tracking Activity Diagram
Analysis Activity (View transaction and etc. data in graph or chart)

Figure 3-4-4: Analysis Activity Diagram
CHAPTER 3 SYSTEM DESIGN

Advisory Activity

![Advisory Activity Diagram](image-url)

Figure 3-4-5: Advisory Activity Diagram
3-5 Database Design

In this project, the data will store as real time data in the database provided by firebase. Since firebase is a NoSQL database, all the data are not stored in table, instead all the data is store as a child in the JSON tree. Since NoSQL will not be exist if there is no data available, therefore in this report, SQL table will be used to represent the database design.

Entity Relationship Diagram (ERD)

![ERD Diagram]

Figure 3-5: ERD of Personal Expense Advisory
CHAPTER 3 SYSTEM DESIGN

Data Dictionary

User Table

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
<th>Data Type</th>
<th>Size</th>
<th>Primary Key</th>
<th>Foreign Key</th>
<th>Foreign Key Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>Unique identification for each user.</td>
<td>Integer</td>
<td>10</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>email</td>
<td>User email</td>
<td>Varchar</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>password</td>
<td>Account password</td>
<td>Varchar</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-5-1: Data dictionary for User table.

Budget Table

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
<th>Data Type</th>
<th>Size</th>
<th>Primary Key</th>
<th>Foreign Key</th>
<th>Foreign Key Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget ID</td>
<td>Unique identification for each budget.</td>
<td>Integer</td>
<td>10</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>User income</td>
<td>Double</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saving</td>
<td>User saving goal</td>
<td>Double</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposable Income</td>
<td>User money balance</td>
<td>Double</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User User ID</td>
<td>User ID</td>
<td>Integer</td>
<td>10</td>
<td>Yes</td>
<td>User</td>
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</table>

Table 3-5-2: Data dictionary for Budget table.
### Transaction Table

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
<th>Data Type</th>
<th>Size</th>
<th>Primary Key</th>
<th>Foreign Key</th>
<th>Foreign Key Reference</th>
</tr>
</thead>
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<td></td>
</tr>
<tr>
<td>Title</td>
<td>Transaction title</td>
<td>Varchar</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Transaction date</td>
<td>Date</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categories</td>
<td>Transaction categories</td>
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<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User ID</td>
<td>User ID</td>
<td>Integer</td>
<td>10</td>
<td>Yes</td>
<td>User</td>
<td></td>
</tr>
<tr>
<td>Budget ID</td>
<td>Budget ID</td>
<td>Integer</td>
<td>10</td>
<td>Yes</td>
<td>Budget</td>
<td></td>
</tr>
</tbody>
</table>

Table 3-5-3: Data dictionary for Transaction table.
CHAPTER 3 SYSTEM DESIGN

3-6 System Flow and System Functionality

3-6-1 Classes and Layout consist in this project

Figure 3-6-1: Screenshot of classes and xml file from Android Studio.
CHAPTER 3 SYSTEM DESIGN

3-6-2 Login and Register Module

This module allows the user to login into the system or to register as a new user. The authentication and security concern or validation will be processed by Firebase backend services. Therefore, by using Firebase, users can login to the system securely and the data will be protected as well.

Figure 3-6-2-1: Login and register activity.
Figure 3-6-2-2: Registered user account shown in Firebase.
CHAPTER 3 SYSTEM DESIGN

3-6-3 Budgeting and Expenses Tracking Module

The whole system will have 5 main fragment hosted by a **bottom navigation bar**, which include **income, budget, expenses, analysis** and advisory. Before a user can start budgeting, income is needed as well as monthly saving goal and fixed expenditure like rental, car loan or utilities. These information is needed to start a budgeting plan. Therefore, the first step after login is to setup and **disposable income**.

![Fig 3-6-3-1: Income Fragment.](image)

**INCOME**
+(salary, investment, comission)

**SAVING**
+(Saving)

**FIXED EXPENDITURE**
+(Rental, car, bills)

Disposable Income:
CHAPTER 3 SYSTEM DESIGN

After setting up the disposable income, the user can set budget to each category based on the disposable income. For the moment, the user can only set up the budget based on pre-set categories. User will be able to add in their desire category in future development. User just need to click on the list and an alert dialog will pop up for user to input budget.

Figure 3-6-3-2: Budget Fragment
CHAPTER 3 SYSTEM DESIGN

After the budget is set up, the user can now start to track their daily expenses in the Expense Fragment as shown below. A floating “+” sign is used to add transaction, and user can click on the thumbnail to view each transaction in the particular category in details. Below the thumbnail, it also shows the remaining budgeted balance of the category.

Figure 3-6-3-3: Expenses Fragment.
CHAPTER 3 SYSTEM DESIGN

3-6-4 Analysis Module

In this module, user will be able to see their overall expenses behaviour in chart or graph. This module had implement the concept of infographics which allow user to analyse the data in a short amount of time with a glance. User can view their total expenditure, monthly spending and more in graph analysis in this module.

Figure 3-6-4: Analysis Fragment.
CHAPTER 3 SYSTEM DESIGN

3-6-5 Advisory Module

In this module, the system will provide the user some useful suggestions in order to help the user in their decision making. The system will provide either daily or a weekly digest to the user by comparing their expenditure and income. Furthermore, it also has a tips section where users can learn more about budgeting through different sources.

![Dashboard](image)

Figure 3-6-5: Advisory Fragment.
CHAPTER 4 METHODOLOGY AND TOOLS

4-1 System Methodology

Throw-away prototyping is one of the Rapid Application Development (RAD) Model. This model is a software development methodology that uses minimal planning in favour of rapid prototyping, which means the system will be developed part by part. The small parts, called prototypes, we developed will be test and evaluate by the users or customers. Once the testing is ended, the prototypes will be throw away since the thrown away prototype cannot be considered as a final system, the deliverable. The objective for the throw-away prototyping is to validate the business requirements are flawless after the testing.

Figure 4-1: Throw-away Prototyping

The advantages of using throw-away prototyping is the problems can be easily detected to avoid it from happening once the product was released to the market. This model is cost effective also since problems are usually costly event, but when this is avoided, expenditures can be reduced. The whole project milestone will be decreased since early detection of issues will make the following phase smoother and faster. Lastly, the product released will suit the business requirement of the customers since the product is tested throughout the development process.

After evaluating and analysing the software process model, throwaway prototyping model will be the software development process model used throughout
CHAPTER 4 METHODOLOGY AND TOOLS

the whole project period. By using this model, the system can be separated into numerous task based on the objectives of this assignment which may lead to higher success rate and reduce complexity. Furthermore, it is essential to have a prototype, in this assignment, for the user to do testing and evaluation throughout the whole development process.
4-2 Tools Involved in Application Development

There are several tools are needed and required to develop the **Personal Expenses Advisory** Android application. The hardware used during development include as follow:

1. **Windows laptop:**

<table>
<thead>
<tr>
<th>Windows OS</th>
<th>Windows 10 Pro 64-bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Intel Core i5-5200U</td>
</tr>
<tr>
<td>GPU</td>
<td>NVIDIA GeForce 820M</td>
</tr>
<tr>
<td>RAM</td>
<td>8GB</td>
</tr>
<tr>
<td>ROM</td>
<td>240GB Solid State Drive (SSD)</td>
</tr>
</tbody>
</table>

2. **Android Smartphone**

<table>
<thead>
<tr>
<th>Model</th>
<th>Xiaomi Mi Note 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android Version</td>
<td>7.1.1 Nougat</td>
</tr>
<tr>
<td>Chipset</td>
<td>Qualcomm SDM660 Snapdragon 660 (Octa-Core)</td>
</tr>
<tr>
<td>GPU</td>
<td>Adreno 512</td>
</tr>
<tr>
<td>RAM</td>
<td>6GB</td>
</tr>
<tr>
<td>ROM</td>
<td>64GB</td>
</tr>
</tbody>
</table>

3. **Type-C USB cable**
CHAPTER 4 METHODOLOGY AND TOOLS

Beside the hardware mention above, the essential software involved in the development include:

- Android Studio
- Firebase
- Android Virtual Device (AVD)
- Android System Development Kit (SDK)
- Java Runtime Environment (JRE)
- Java Development Kit (JDK)

Programming language used:

- Java
- JSON
- NoSQL

*AVD is used for most of the code testing before the application is build and test in real smartphone.
CHAPTER 5 IMPLEMENTATION AND TESTING

5-1 System Testing

Several trails has been conducted to test the function of the system in order to make sure the system is working fine and it meets the objective of this project. This trail is conducted by the author and the output is observed and recorded as below. This test will not be focused on the coding and the application structures.

Manage Budget Module

<table>
<thead>
<tr>
<th>Feature</th>
<th>Input</th>
<th>Output</th>
<th>Expected Output</th>
<th>Abnormal (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter Income and Saving</td>
<td>Enter all fields</td>
<td>Data inserted in database</td>
<td>Data inserted in database</td>
<td>No</td>
</tr>
<tr>
<td>Enter Income and Saving</td>
<td>Enter some fields</td>
<td>Show Error</td>
<td>Show Error</td>
<td>No</td>
</tr>
<tr>
<td>Enter Income and Saving</td>
<td>Enter negative value</td>
<td>Show Error</td>
<td>Show Error</td>
<td>No</td>
</tr>
<tr>
<td>Enter Income and Saving</td>
<td>Empty all fields</td>
<td>Show Error</td>
<td>Show Error</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 5-1-1: Test result for Manage Budget Module

Transaction Module

<table>
<thead>
<tr>
<th>Feature</th>
<th>Input</th>
<th>Output</th>
<th>Expected Output</th>
<th>Abnormal (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter in all Edit Text</td>
<td>Enter all fields</td>
<td>Data inserted in database</td>
<td>Data inserted in database</td>
<td>No</td>
</tr>
<tr>
<td>Enter in all Edit Text</td>
<td>Enter some fields</td>
<td>Show Error</td>
<td>Show Error</td>
<td>No</td>
</tr>
<tr>
<td>Enter in all Edit Text</td>
<td>Enter negative value</td>
<td>Show Error</td>
<td>Show Error</td>
<td>No</td>
</tr>
<tr>
<td>Enter in all Edit Text</td>
<td>Empty all fields</td>
<td>Show Error</td>
<td>Show Error</td>
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</table>

Table 5-1-2: Test result for Transaction Module
## CHAPTER 5 IMPLEMENTATION AND TESTING

### Analyse Module

<table>
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<tr>
<th>Feature</th>
<th>Input</th>
<th>Output</th>
<th>Expected Output</th>
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<tbody>
<tr>
<td>Select chart type (Data in database)</td>
<td>Click on “Change Chart” and select chart type</td>
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<td>Chart shown</td>
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</tr>
<tr>
<td>Select chart type (Database Empty)</td>
<td>Click on “Change Chart” and select chart type</td>
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<td>No chart shown</td>
<td>No</td>
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Table 5-1-3: Test result for Analyse Module

### Advisory Module

<table>
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<th>Feature</th>
<th>Input</th>
<th>Output</th>
<th>Expected Output</th>
<th>Abnormal (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Daily Advice (No data)</td>
<td>Click on “daily advice”</td>
<td>Show “set budget”</td>
<td>Show “set budget”</td>
<td>No</td>
</tr>
<tr>
<td>Select Daily Advice (With data)</td>
<td>Click on “daily advice”</td>
<td>Show advice message</td>
<td>Show advice message</td>
<td>No</td>
</tr>
<tr>
<td>Select Weekly Advice (No data)</td>
<td>Click on “weekly advice”</td>
<td>Show “set budget”</td>
<td>Show “data for whole week is needed”</td>
<td>Yes</td>
</tr>
<tr>
<td>Select Weekly Advice (With data)</td>
<td>Click on “weekly advice”</td>
<td>Show advice message</td>
<td>Show advice message</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 5-1-4: Test result for Advisory Module
CHAPTER 6 CONCLUSION

6-1 Project Review, Discussions and Conclusions

This project is an android application that aims to increase the habit of budgeting among people. The focus of the project is to create an android application that will provide useful advice to the user in money management and at the same time help the user to reach or achieve their financial goals, like saving goals etc.

In this project, there are three main module that had been covered. First, it is to tackle the complexity of existing application but provide a simple budgeting and expenses tracking system with minimum input and less compact info. Second, it is to counter the problem where user do not know where is their money spend. The solution is to provide an automated system where all the data will be converted to graph to show the user as an infographics. This will immediately let the user know their spending behaviour. Lastly, it is to provide some guidance or advice to the user especially for beginners who want to start budgeting.

In conclusion, the final deliverable if the personal expenses advisory will guide and help everyone to start a financially discipline lifestyle and to help the user to save as much money as possible.

6-2 Novelties and Contributions

The main outcome of this project is to create an android application that can help the user to manage their money with a simple budgeting system, provided with an advisory. Especially for those who are new to budgeting, this application is aim to help them to cultivate a budgeting habit so that they can have a financially stable lifestyle. Some of the existing application are too complicated for beginners, this may make them to give up in budgeting quickly. Besides, this app also aims to reduce the time where user used to calculate everything manually when using the traditional method, for example, using a notebook.

The best part of this project is to provide advisory function to the user where the system will give some advice to hints the user and to help them in decision making.
CHAPTER 6 CONCLUSION

It is important to know that an advisory is to help the user in decision making but not to provide a solution.

6-3 Future Works

For the future development, the application should have some of the features discussed below. Firstly, to provide synchronization between bank account and the application. This is because a user cannot keep track of their money in details especially the one in the bank due to interest rate issue. User need to check their account with the bank to update manually in the application.

Secondly, it is to increase the security of the application. For now, user only have one layer of authentication before login to the system. If the features mentioned above is to be implemented, it was too dangerous to keep all the data without any highly encrypted protection. Therefore, increase the security is one of the important future works.

Lastly, I would like to include a feature to monitor the user bills and debt. With this features, the bills and debt of the user will automatically deducted from the budgeting amount so that the user will not overspent their money. There are some cases where the user may forget to include some bills into their budget. With this automated feature, user will not need to worry about that anymore.
REFERENCE

Visually. (n.d.). What is an Infographic? | Visually. [online]  
Available at: https://visual.ly/m/what-is-an-infographic/  
[Accessed 24 Nov. 2016].

Available at: http://www.webpagefx.com/what-is-an-infographic.html  
[Accessed 24 Nov. 2016].

Available at: http://www.androidauthority.com/waze-difficult-intersections-la-699111/  

Available at: https://www.wearable-technologies.com/2015/04/wearables-in-healthcare/  
[Accessed 28 Nov. 2016].

Available at: http://www.exforsys.com/career-center/project-management-lifecycle/throwaway-prototyping-model.html  
[Accessed 28 Nov. 2016].

Available at: https://www.tutorialspoint.com/sdlc/sdlc_waterfall_model.htm  
[Accessed 28 Nov. 2016].

PLAGIARISM CHECK RESULT
Smart Information System Personal Expenses Advisory System By LeWen Xiong

Smart Information System Personal Expenses Advisory System By LeWen Xiong
**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY**

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- **Publications:** _______ %
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- (i) Overall similarity index is 20% and below, and
- (ii) Matching of individual sources listed must be less than 3% each, and
- (iii) Matching texts in continuous block must not exceed 8 words

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

*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: __________________________

Date: __________________________

**Signature of Co-Supervisor**

Name: __________________________

Date: __________________________
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(Signature of Supervisor)
Date: