



MINISTRY OF EDUCATION AND TRAINING

# FPT UNIVERSITY

## Capstone Project Document

---

### Reasonable Spending Suggestion

Group 1	
<b>Group member</b>	Nguyen Phan Anh – Team Leader – SE60780 Tran Do Phong – Team Member - SE60732 Nguyen Van Hon – Team Member - 60390 (Dropped out) Phan Vo Lan Phuong – Team Member – 60479 (Dropped out)
<b>Supervisor</b>	Mr. Kieu Trong Khanh
<b>Ext. Supervisor</b>	N/A
<b>Capstone Project code</b>	RSSuggestion

-Ho Chi Minh City, 05/2014-



### **3. Software System Attribute**

#### **3.1 Usability**

##### **3.1.1 Graphic User Interface**

- All the texts, labels and should be written in Vietnamese.

##### **3.1.2 Usability**

- Admin should need less than one week of training to be productive with the system.
- Member can use the system easily without training.

##### **3.1.3 Installation**

- The website is easy to deploy on server if following each step in installation guide.
- The mobile app is easy to install by running file .APK.

#### **3.2 Reliability**

- The suggestion should be reasonable to saving money and keep balance user's finance.

#### **3.3 Availability**

- In case mobile cannot connect to Internet, user still can input income and expense.

#### **3.4 Security**

- Privacy: Each role of user has a specific permission to interact with system.
- System always checks authorization and authentication before doing anything.

#### **3.5 Maintainability**

- The system is divided into separated modules.
- The code is easy to maintain and upgrade.

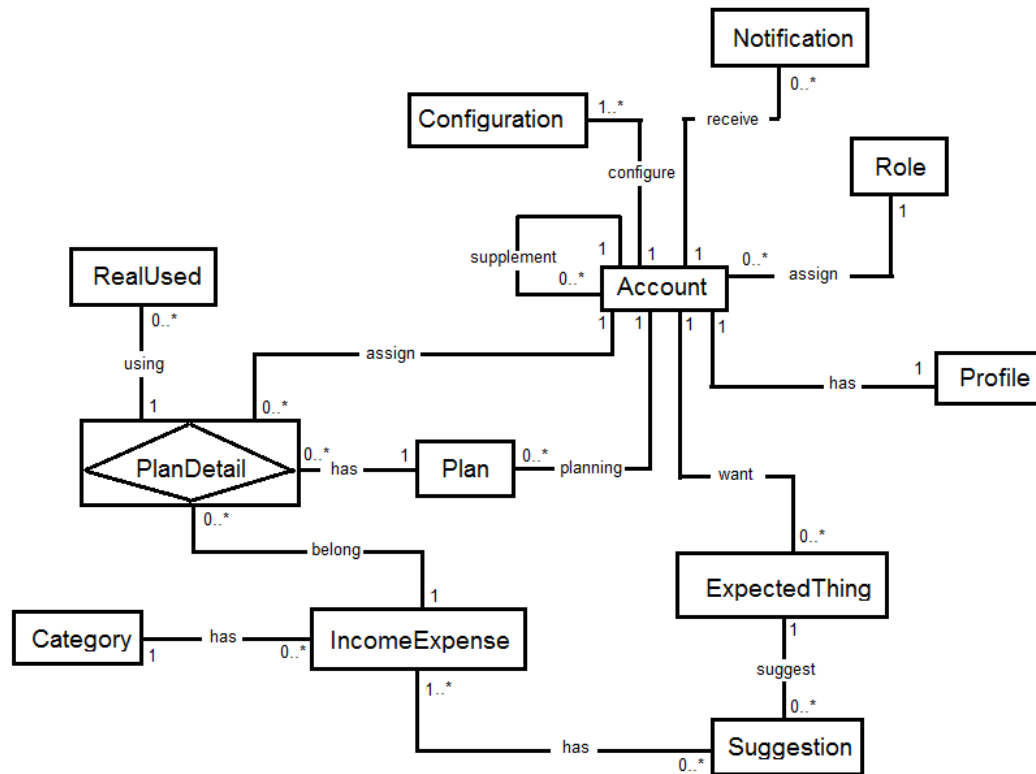
#### **3.6 Portability**

- N/A

#### **3.7 Performance**

- The speed of suggestion algorithm is less than 2 seconds.

### **4. Conceptual Diagram**



**Figure 1 Conceptual diagram**

### Data Dictionary

Entity name	Description
Account	Describe all users in the system. Each user has only one account
Profile	Describe profile of all users in the system. Each user has only one profile
Role	Describe all roles in the system
Notification	Describe all notifications of users
Configuration	Describe all configurations of users
Plan	Describe all income and expense plan of users
PlanDetail	Describe details of each plan
RealUsed	Describe all income, expense in real life
Expected Thing	Describe all products that users want to buy
Suggestion	Describe all suggestions of users
Income/Expense	Describe all income and expense name in the system
Category	Describe all category of income and expense in the system

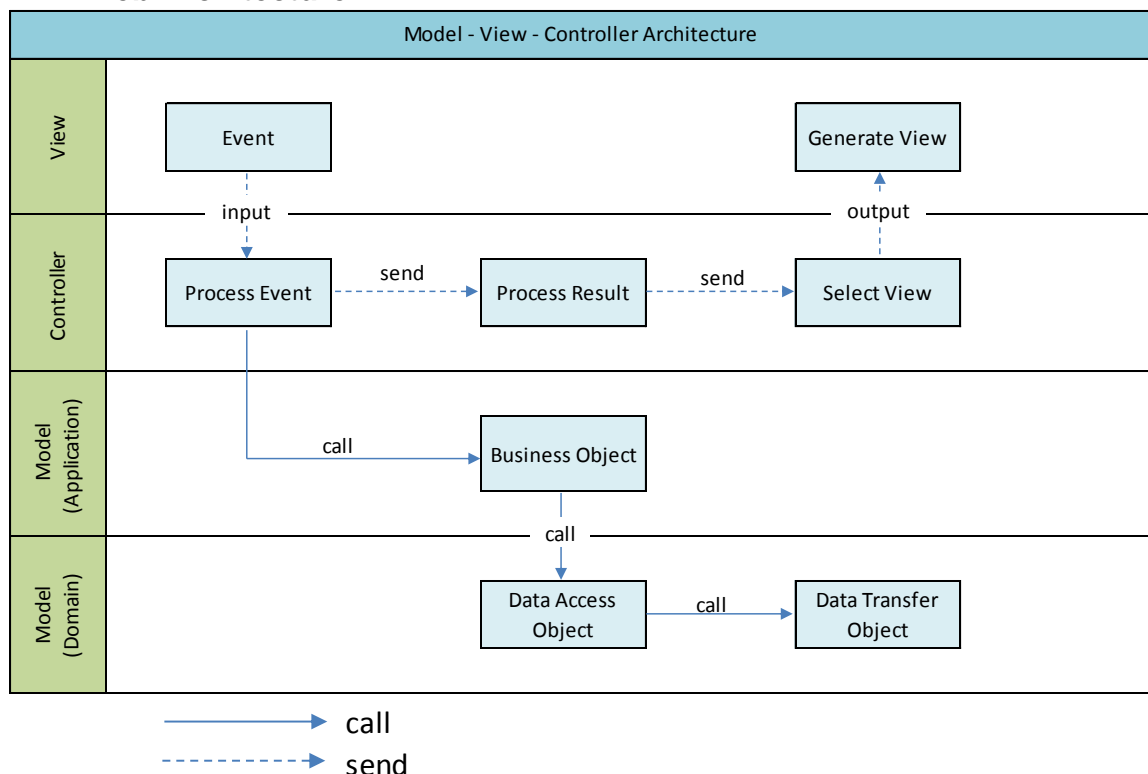
## D. Software Design Description

### 1. Design Overview

- This document describes the technical and user interface design of Reasonable Spending Suggestion. It includes the architectural design, the detailed design of common functions and business functions.
- The architectural design describes the overall architecture of the system and the architecture of each main component and subsystem.
- The detail design describes static and dynamic structure for each component and functions. It includes class diagram, class explanations and sequence diagrams for each use cases.
- Document overview:
  - **Section 2:** The overall description of the system architectural design.
  - **Section 3:** Component diagrams that describe the connection and integration of the system.
  - **Section 4:** Detail design description, which includes class diagram, class explanation, and sequence diagram to details the application functions.
  - **Section 5:** The user interface includes web interface and mobile interface.
  - **Section 6:** Database design with entity relationship diagram.
  - **Section 7:** The algorithm uses to compute the suggestions for user.

### 2. System Architectural Design

#### 2.1. Web Architecture

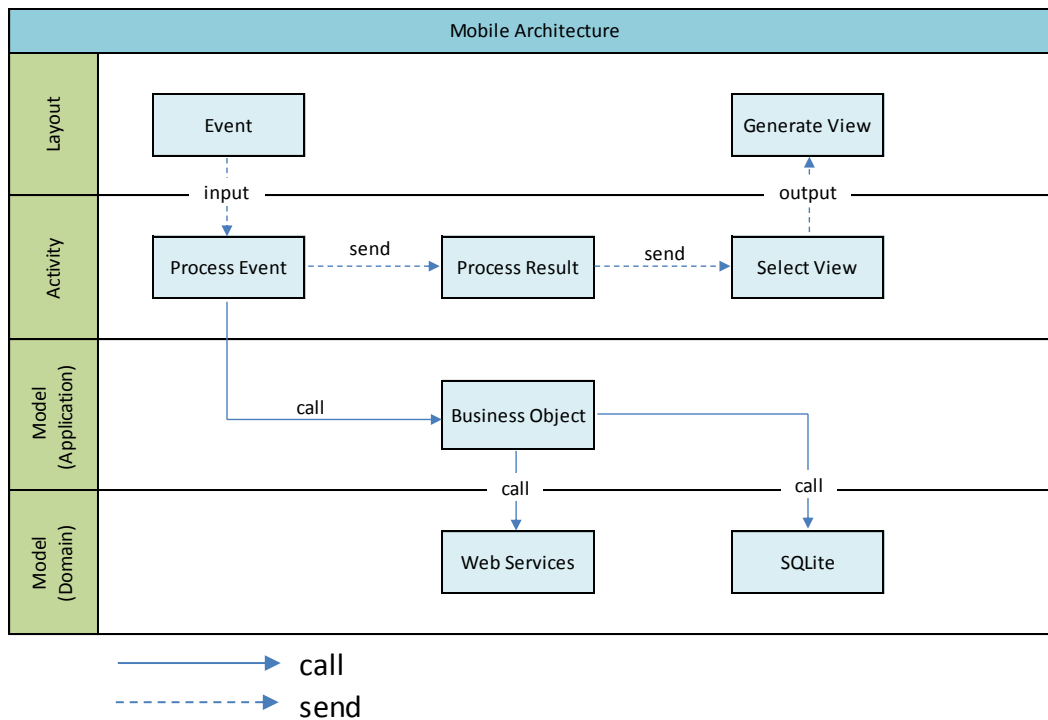


**Figure 2 MVC Architecture**

- **Model** is the part of the application that handles the logic for the application data. **Model** often receives data from database, process business, and then sends result to **Controller**.
- **View** is the part of the application that handles the display of the data. **View** often receives data from **Controller** and shows the data to user.

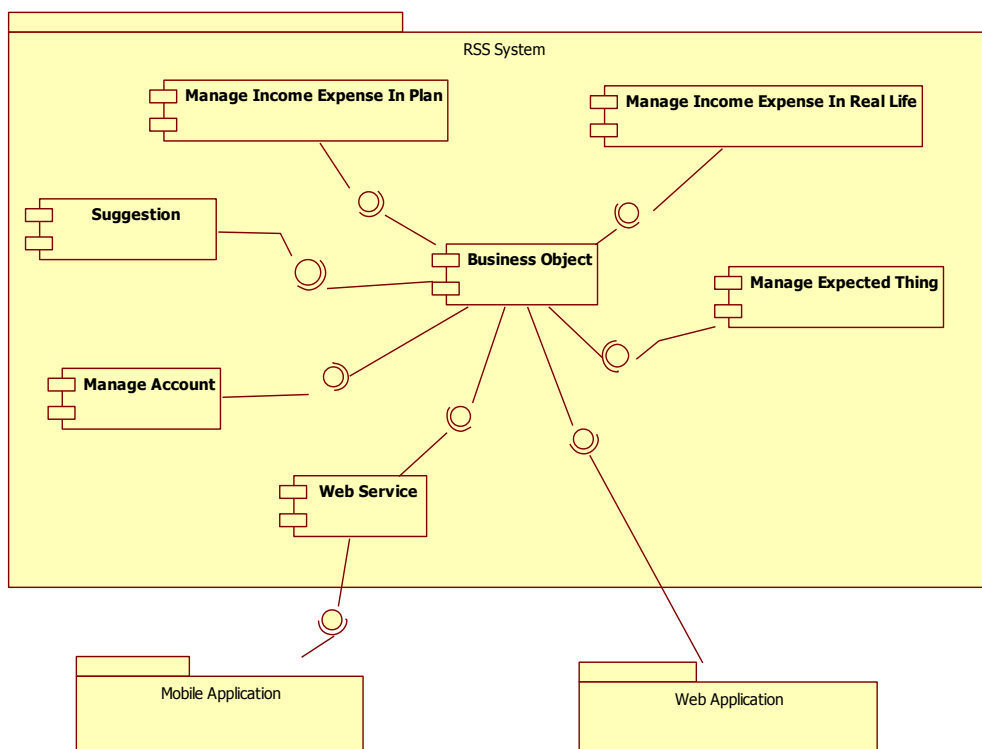
- **Controller** is the part of the application that handles user interaction. **Controller** often receives request from user, sends request to suitable **Model**, receives result from **Model**, and sends result to suitable **View**.

## 2.2. Mobile Architecture



*Figure 3 Mobile Architecture*

## 3. Component diagram



*Figure 4 Component Diagram*

## 4. Detailed Description of Components

### 4.1. Class diagram

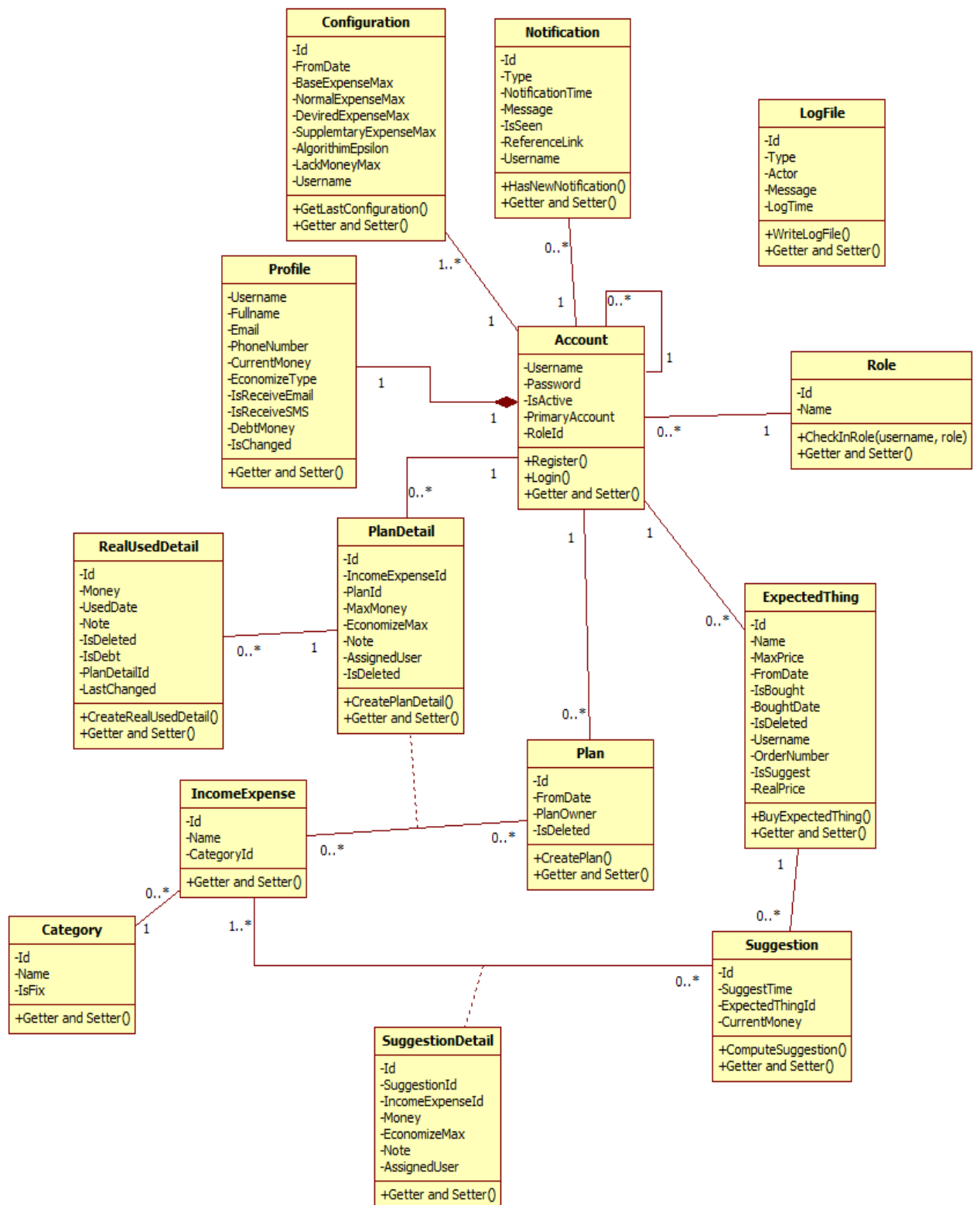


Figure 5 Class diagram

## 4.2. Class diagram Explanation

### 4.2.1. Account

#### Attributes

Attribute	Type	Visibility	Description
Username	String	Private	Username for each user
Password	String	Private	User's password
IsActive	Boolean	Private	Status of this account
PrimaryAccount	String	Private	Username of primary account if this is supplementary account.
RoleID	Integer	Private	User's role

#### Methods

Method	Return Type	Visibility	Description
Register	Void	Public	For new user to register
Login	Boolean	Public	Used to log in the system

### 4.2.2. Role

#### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique identifier of each role
Name	String	Private	Role name

#### Methods

Method	Return Type	Visibility	Description
CheckInRole	Boolean	Public	Check user is in which role

### 4.2.3. Profile

#### Attributes

Attribute	Type	Visibility	Description
Username	String	Private	Username of user
Fullname	String	Private	Role name
Email	String	Private	User's email
PhoneNumber	String	Private	User's phone number
CurrentMoney	Integer	Private	the money which user is having
DebtMoney	Integer	Private	The money which user is borrow from someone
EconomizeType	String	Private	User's economize type: maximum or balance
IsReceiveEmail	Boolean	Private	User receives email from system.
IsReceiveSMS	Boolean	Private	User receives SMS from system.
IsChanged	Boolean	Private	Mark for changing money from the last suggestion time.

### 4.2.4. Configuration

#### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each configuration
FromDate	DateTime	Private	Configuration apply from this date to FromDate of next configuration
BaseExpenseMax	Float	Private	Maximum percent of Base Expense



			which is decreased when algorithm runs
NormalExpenseMax	Float	Private	Maximum percent of Normal Expense which is decreased when algorithm runs
DerivedExpenseMax	Float	Private	Maximum percent of Derived Expense which is decreased when algorithm runs
SupplementaryExpenseMax	Float	Private	Maximum percent of Supplementary Expense which is decreased when algorithm runs
AlgorithmEpsilon	Integer	Private	The epsilon to compute percent of each expense type when users want to get percent from system.
LackMoneyMax	Integer	Private	The suggestion can be lack some money to buy expected thing, the lack money must be less than or equal LackMoneyMax.
Username	String	Private	This configuration applies for username

#### Methods

Method	Return Type	Visibility	Description
GetLastConfiguration	Configuration	Public	Get the newest configuration of user

#### 4.2.5. Notification

##### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each notification
Type	String	Private	Notification's type: suggestion, warning, reminding, etc.
NotificationTime	Datetime	Private	The time which notification is created
Message	String	Private	The content of notifications.
IsSeen	Boolean	Private	Marking user is seen this notification
Username	String	Private	This notification sends to username
ReferenceLink	String	Private	URL link to notify details page

##### Methods

Method	Return Type	Visibility	Description
HasNewNotification	Boolean	Public	Check user has new notifications.

#### 4.2.6. LogFile

##### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each LogFile
Type	String	Private	Log's type: suggestion, warning, reminding, etc.
Actor	String	Private	Name of object which writes log.
Message	String	Private	The content of log.
LogTime	Datetime	Private	The time which log is created.

##### Method

Method	Return Type	Visibility	Description
WriteLogFile	Void	Public	Write log file to database

#### 4.2.7. Plan Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each Plan
FromDate	Datetime	Private	It includes month and year which plan applies for
PlanOwner	String	Private	The owner's username of this plan
IsDeleted	Boolean	Private	Marking plan which is deleted

#### Methods

Method	Return Type	Visibility	Description
CreatePlan	Integer	Public	Create new plan and return plan ID

#### 4.2.8. PlanDetail Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each PlanDetail
IncomeExpenseId	Integer	Private	ID of income or expense which plan detail applies for
PlanId	Integer	Private	ID of plan
MaxMoney	Integer	Private	Maximum money for this income or expense
EconomizeMax	Float	Private	Maximum percent which can be decreased of expense
Note	String	Private	Note of plan detail
AssignedUser	String	Private	Plan detail is used by this username
IsDeleted	Boolean	Private	Marking plan detail is deleted.

#### Methods

Method	Return Type	Visibility	Description
CreatePlanDetail	Integer	Public	Create new plan detail and return plan detail ID

#### 4.2.9. RealUsedDetail Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each RealUsedDetail
Money	Integer	Private	Money of income or expense in real life
UsedDate	Integer	Private	Date which receives or spends money.
Note	String	Private	Note of this income or expense
IsDeleted	Boolean	Private	Marking this is deleted.
PlanDetailID	Integer	Private	Plan detail of real use detail
LastChanged	Datetime	Private	Last time changed this real used
IsDebt	Boolean	Private	Check is real used debt

#### Methods

Method	Return Type	Visibility	Description
CreateRealUsedDetail	Integer	Public	Create new real used detail and return real used detail ID

#### 4.2.10. IncomeExpense

##### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each income or expense
Name	String	Private	Name of income or expense
CategoryID	Integer	Private	Category of IncomeExpense

#### 4.2.11. Category

##### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each Category
Name	String	Private	Name of category
IsFix	Boolean	Private	Category which user can not add more IncomeExpense

#### 4.2.12. ExpectedThing

##### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of each expected thing
Name	String	Private	Name of expected thing
MaxPrice	Integer	Private	Maximum price which user can buy
FromDate	Datetime	Private	Thing is expected from month and year
IsBought	Boolean	Private	Marking expected thing is bought
BoughtDate	Datetime	Private	Expected thing is bought in this date
IsDeleted	Boolean	Private	Marking expected thing is deleted
Username	String	Private	The owner username of this expected thing
OrderNumber	Integer	Private	The order number of expected thing
IsSuggest	Boolean	Private	Expected thing is suggested or not
RealPrice	Integer	Private	Real price of expected thing after bought

##### Methods

Method	Return Type	Visibility	Description
BuyExpectedThing	Integer	Public	Change expected thing from status <b>NotBought</b> to <b>Bought</b> .

#### 4.2.13. Suggestion

##### Attributes

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of suggestion
SuggestionTime	Datetime	Private	The time which suggestion is created
ThingId	Integer	Private	Suggestion for this expected thing
CurrentMoney	Integer	Private	CurrentMoney of user when make this suggestion

##### Methods

Method	Return Type	Visibility	Description
ComputeSuggestion	Void	Public	Create suggestions for each expected thing

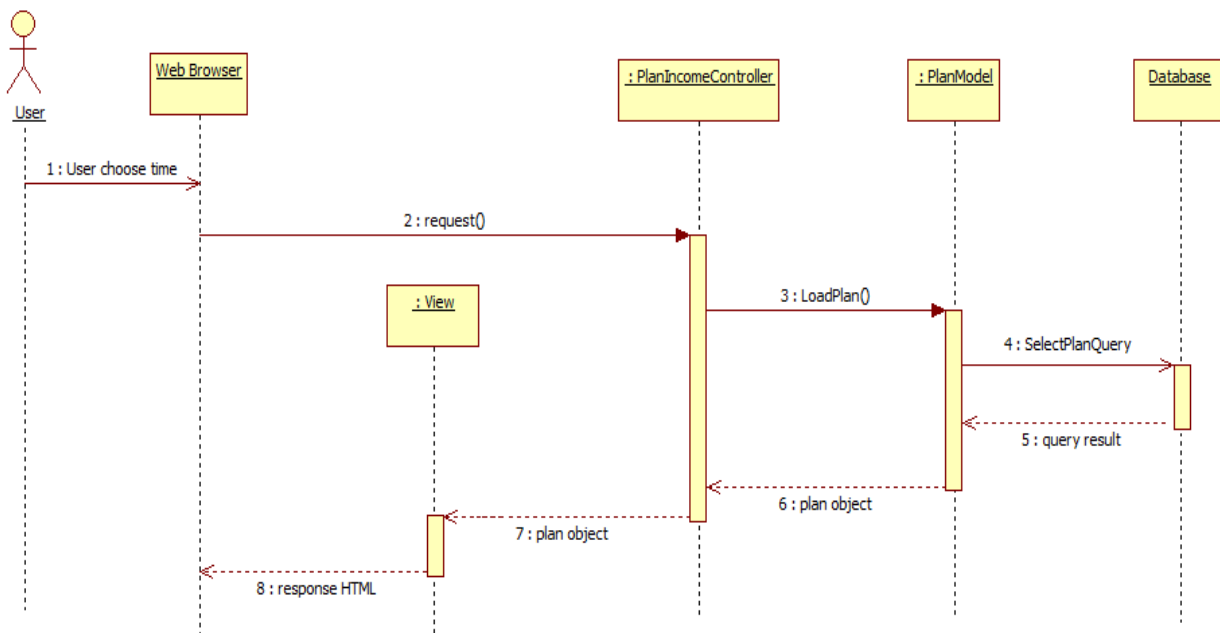
#### 4.2.14. SuggestionDetail

**Attributes**

Attribute	Type	Visibility	Description
Id	Integer	Private	Unique Identifier of suggestion detail
SuggestionId	Integer	Private	ID of suggestion
IncomeExpenseId	Integer	Private	ID of expense which is decreased
Money	Integer	Private	The suggestion money for expense.
EconomizeMax	Float	Private	Maximum economize of expense
Note	String	Private	Description of suggestion detail
AssignUsername	String	Private	User of suggestion detail

### 4.3. Sequence diagram

#### 4.3.1. View Income Plan



**Figure 6 Sequence diagram View Income Plan**

### 4.3.2. Create Income Plan

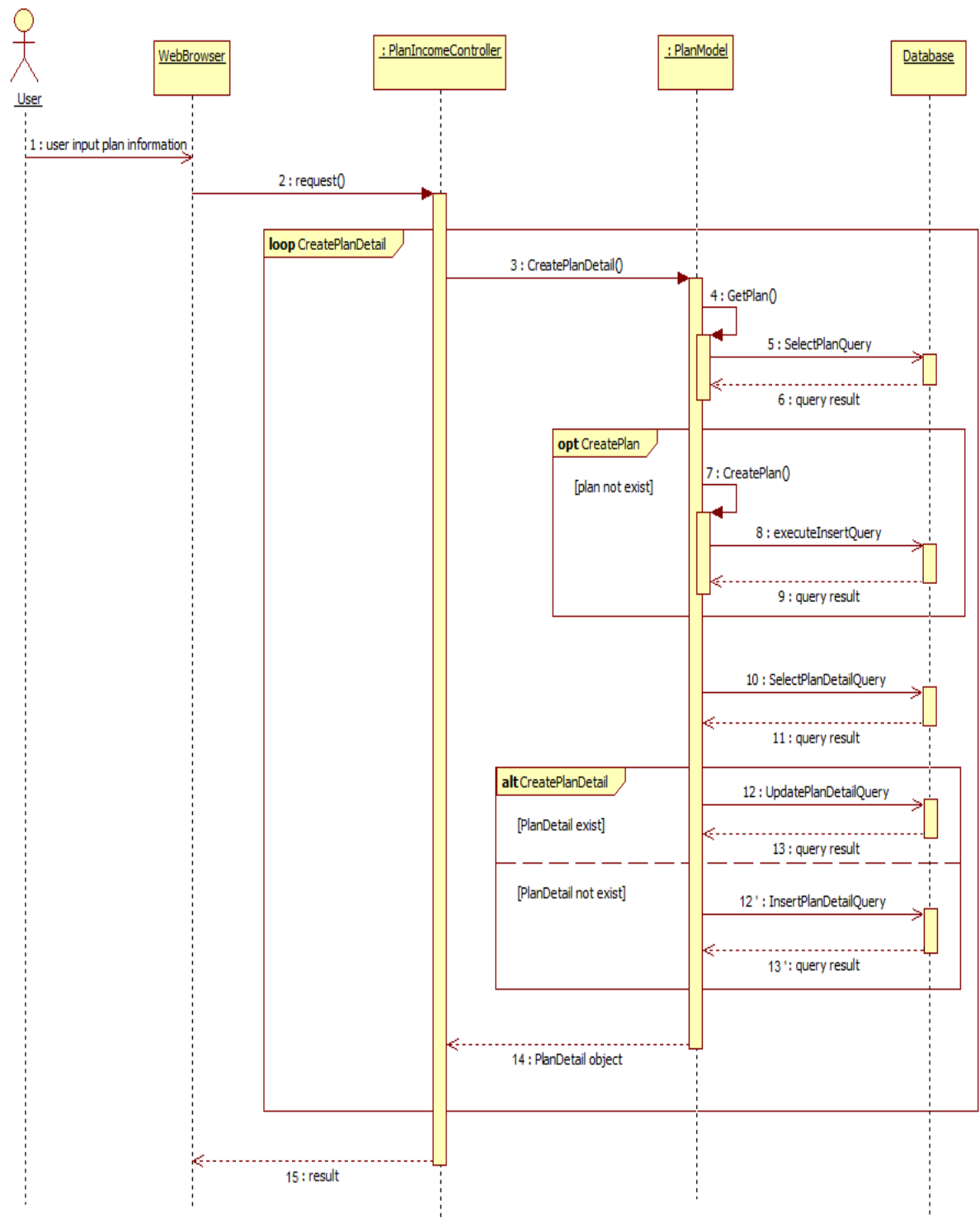
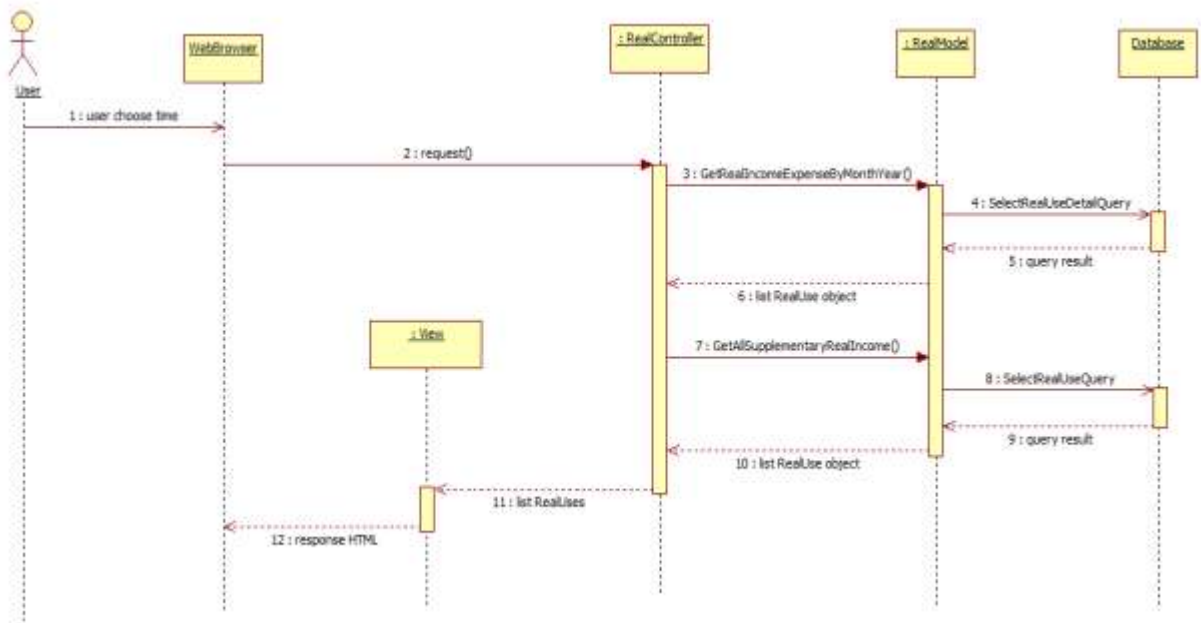


Figure 7 Sequence diagram Create Income Plan

### 4.3.3. View Income in Real Life



*Figure 8 Sequence diagram View Income in Real Life*

## Create Expense in Real Life

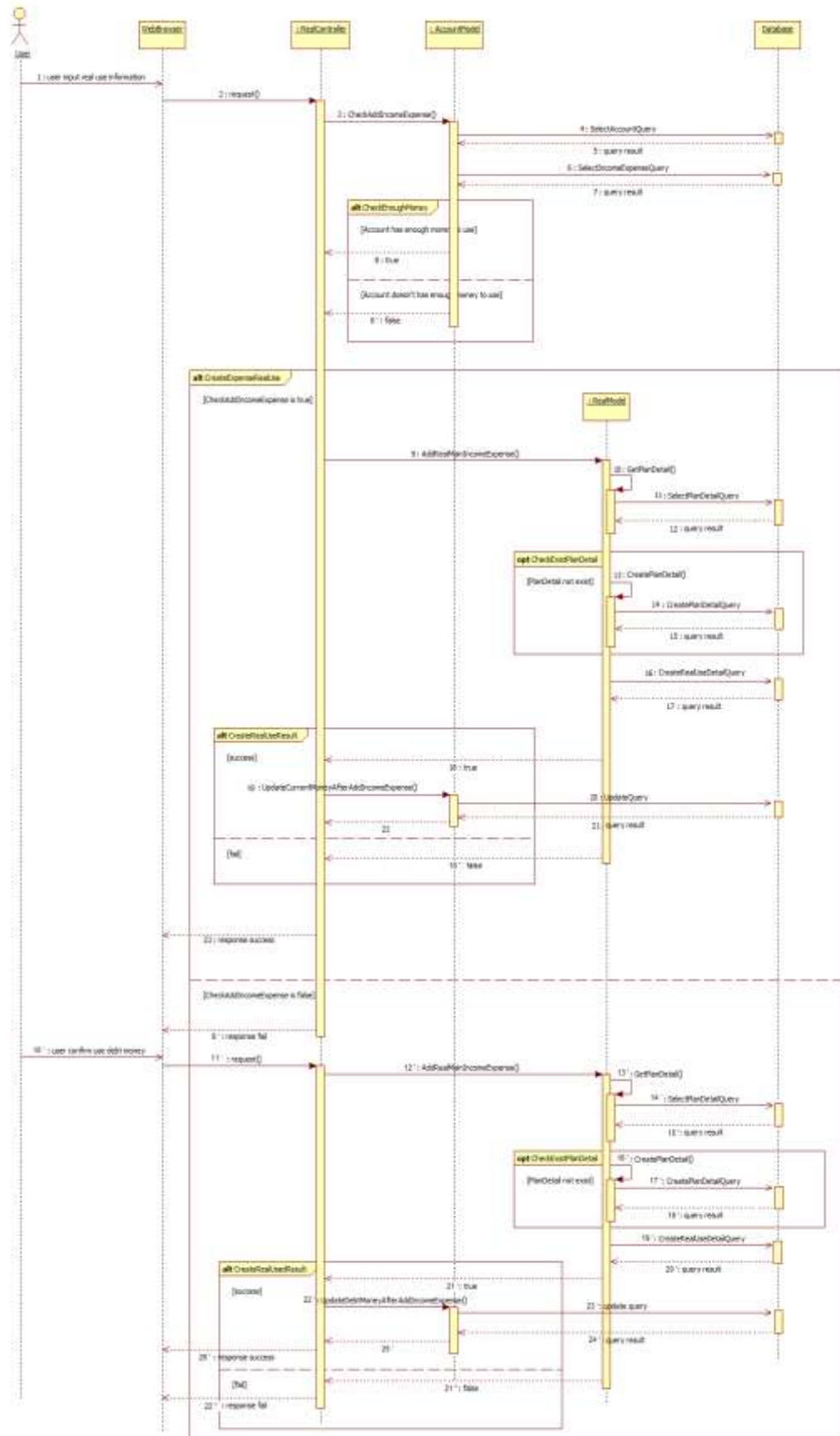


Figure 9 Sequence diagram Create Expense in Real Life

#### 4.3.4. Create Expected Thing

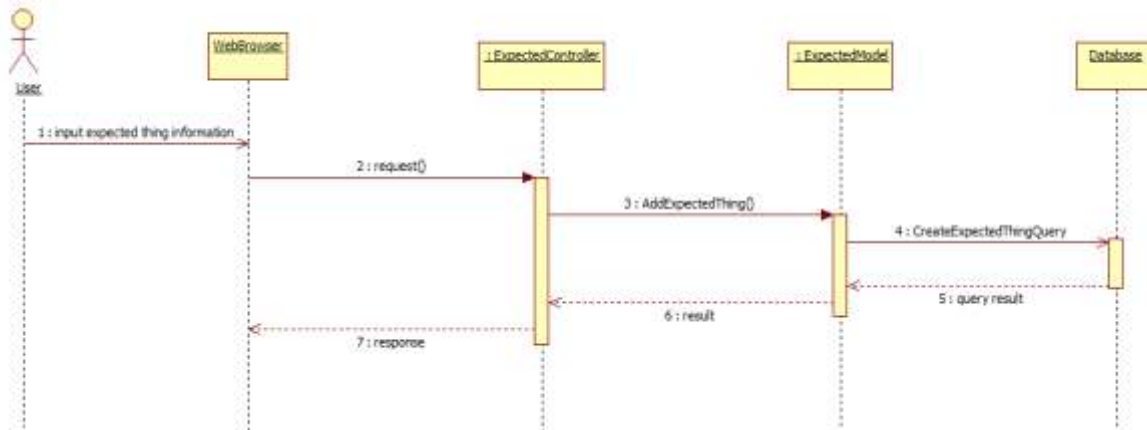


Figure 10 Sequence diagram Create Expected Thing

#### 4.3.5. Buy Expected Thing

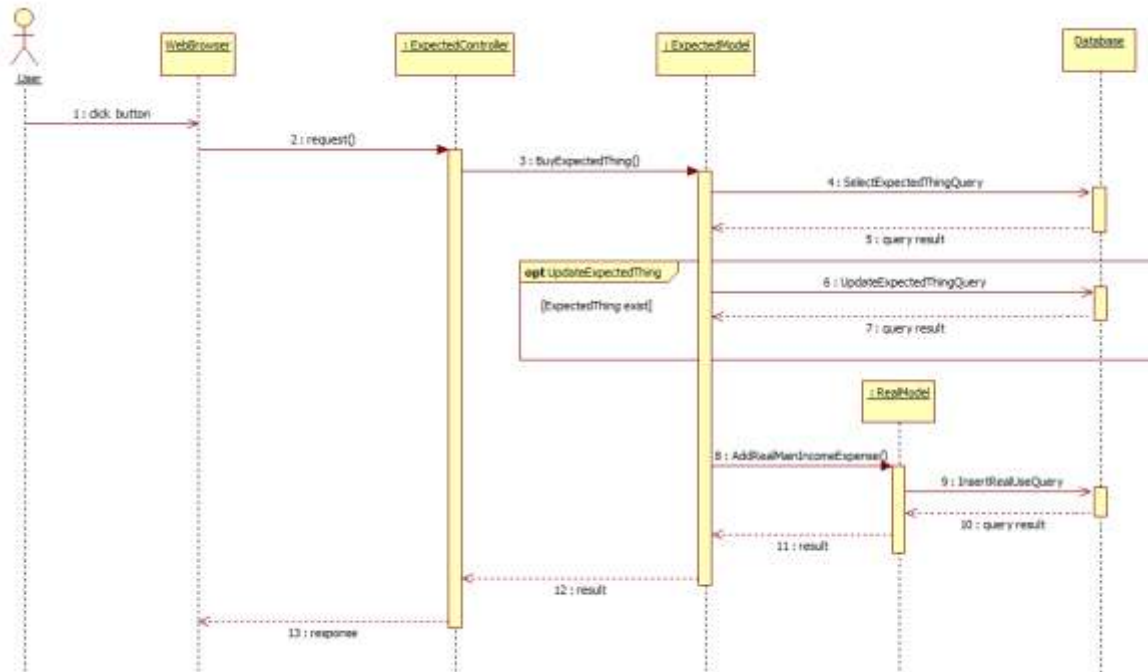


Figure 11 Sequence diagram Buy Expected Thing



## 5. User Interface Design

### 5.1. Web Interface Design

#### 5.1.1. Login



*Figure 12 Login*

#### Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Username	Fill username	No	Yes	Textbox	String	N/A
2	Password	Fill password	No	Yes	Password	String	N/A

#### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
3	Login	Log-in into the system	N/A	Navigate to home page
4	Register	Click to register account	N/A	Navigate to register page

### 5.1.2. Register

**Đăng Ký Tài Khoản**

**\* Thông tin bắt buộc**

\*TÀI KHOẢN 1

\*MẬT KHẨU 2

\*XÁC NHẬN MẬT KHẨU 3

**THÔNG TIN CÁ NHÂN**

\*TÊN ĐẦY ĐỦ 4

\*EMAIL 5

SỐ ĐIỆN THOẠI 6

\*SỐ TIỀN HIỆN ĐANG CÓ 1000 7

HÌNH THỨC TIẾT KIỆM ☒ Tiết kiệm vừa phải ☐ Tiết kiệm tối đa 8

HÌNH THỨC THÔNG BÁO ☒ Email ☐ SMS 9

[Quay lại trang Login](#) 11 **Tạo tài khoản** 10

**Figure 13 Register**

#### Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Username	Fill username	No	Yes	Textbox	String	N/A
2	Password	Fill password	No	Yes	Password	String	N/A
3	Confirm password	Fill password	No	Yes	Password	String	N/A
4	Full Name	Fill full name	No	Yes	Textbox	String	N/A
5	Email	Fill email	No	Yes	Textbox	String	N/A
6	Phone number	Fill phone number	No	No	Textbox	Integer	N/A
7	Current Money	Fill current money	No	Yes	Textbox	Integer	N/A
8	Saving mode	Choose saving mode	No	No	Radio button	N/A	N/A
9	Notification mode	Choose notification mode	No	No	Checkbox	N/A	N/A

### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
10	Register	Register new account	N/A	Navigate to home page
11	Return Login page	Click to return login page	N/A	Navigate to login page

### 5.1.3. Manage Income Plan

Figure 14 Manage Income Plan

### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Month	Choose month	N/A	Show specific month data
2	Year	Choose year	N/A	Show specific year data
3	Clone Plan	Click to show clone pop-up	N/A	Show pop-up to create income plan
4	Add button	Click to show add an income plan pop-up	N/A	Show add an income plan pop-up
5	Update button	Click to show update income pop-up	N/A	Show update the income pop-up
6	Delete button	Click to delete the income plan	N/A	Delete the income plan

**Tạo kế hoạch từ tháng trước**

Kế hoạch thu nhập của tháng  năm

STT	TÀI KHOẢN CHÍNH	SỐ TIỀN
1	Lương	8,000

STT	TÀI KHOẢN PHỤ	SỐ TIỀN
-----	---------------	---------

*Figure 15 Clone Plan*

### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Month	Choose month	N/A	Show specific month data
2	Year	Choose year	N/A	Show specific year data
3	Clone Plan button	Click to create a new plan with specific data	N/A	Close pop-up, show manage income plan page with new data
4	Cancel button	Click to cancel create	N/A	Close pop-up

**Nhập khoản thu nhập tài khoản chính**

\* Thông tin bắt buộc nhập

\* Loại thu nhập:

\* Số tiền:

\* Thời gian:

Ghi chú:

*Figure 16 Add Income Plan*

## Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Income name	Fill income name	No	Yes	Dropdown list	String	N/A
2	Money	Fill money	No	Yes	Textbox	Integer	N/A
3	Time	Choose month	No	Yes	Checkbox	N/A	N/A
4	Note	Fill note	No	No	Textbox	String	N/A

## Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
5	Add button	Click to create a new income plan	N/A	Close pop-up, show manage income plan with new data
6	Cancel button	Click to cancel create	N/A	Close pop-up

### 5.1.4. Manage Expense Plan

**Kế hoạch chi tiêu tháng 8 / 2014**

Kế hoạch chi tiêu của tháng 8 năm 2014

 Tạo tự động

**Chi tiêu cơ bản**

Tổng số tiền kế hoạch của chi tiêu cơ bản là: 00 (đơn vị 1,000 đồng)

STT	TÊN CHI TIÊU	SỐ TIỀN	GHI CHÚ	GIẢM TỐI ĐA
-----	--------------	---------	---------	-------------

 Thêm

**Chi tiêu mở rộng**

Tổng số tiền kế hoạch của chi tiêu mở rộng là: 00 (đơn vị 1,000 đồng)

STT	TÊN CHI TIÊU	SỐ TIỀN	GHI CHÚ	GIẢM TỐI ĐA
-----	--------------	---------	---------	-------------

 Thêm

**Figure 17 Manage Expense Plan**

Refer to 5.1.3 Manage Income Plan

### 5.1.5. Manage Real Income

**Quản lí hoạt động thu nhập**

Thu nhập thực tế của tháng 7 năm 2014

**Thu nhập tài khoản chính**

Tổng tiền thu nhập của tài khoản chính: 3,000 (đơn vị 1,000 đồng)

STT	TÊN THU NHẬP	SỐ TIỀN	NGÀY NHẬN	GHI CHÚ	
1	Khác	2,000	19/07/2014		<div>4</div> <div>Sửa</div> <div>Xóa</div> <div>5</div>
2	Khác	1,000	18/07/2014	trung so	<div>Sửa</div> <div>Xóa</div>

Thêm 3

Figure 18 Manage Real Income

#### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Month	Choose month	N/A	Show specific month data
2	Year	Choose year	N/A	Show specific year data
3	Add button	Click to show add an real income pop-up	N/A	Show add an real income pop-up
4	Update button	Click to show update real income pop-up	N/A	Show update the income pop-up
5	Delete button	Click to delete the income plan	N/A	Delete the real income

**Nhập thu nhập tài khoản chính**

\* Thông tin bắt buộc nhập:

\* Tên thu nhập: Lương 1

\* Số tiền (1,000 đồng): 100 2

\* Ngày nhận: 20/07/2014 3

Ghi chú:  4

Thêm Xóa 5 6

Figure 19 Create Real Income

## Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Income name	Fill income name	No	Yes	Dropdown list	String	N/A
2	Money	Fill money	No	Yes	Textbox	Integer	N/A
3	Time	Choose date time	No	Yes	Date time picker	String	N/A
4	Note	Fill note	No	No	Textbox	String	N/A

## Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
5	Add button	Click to create a new real income	N/A	Close pop-up, show manage real income with new data
6	Cancel button	Click to cancel create	N/A	Close pop-up

### 5.1.6. Manage Real Expense

Chi tiêu thực tế của tháng 7 năm 2014

+ Thêm (\*)Chi tiêu dùng tài khoản nợ

**Chi tiêu cơ bản**

Tổng số tiền chi tiêu này là: 2,000 (đơn vị 1,000 đồng)

STT	TÊN CHI TIÊU	SỐ TIỀN	NGÀY CHI	GHI CHÚ
1	Nhà cửa	2,000	18/07/2014	

Sửa Xóa

**Chi tiêu mở rộng**

Tổng số tiền chi tiêu này là: 00 (đơn vị 1,000 đồng)

STT	TÊN CHI TIÊU	SỐ TIỀN	NGÀY CHI	GHI CHÚ
-----	--------------	---------	----------	---------

**Chi tiêu phát sinh**

Tổng số tiền chi tiêu này là: 3,000 (đơn vị 1,000 đồng)

STT	TÊN CHI TIÊU	SỐ TIỀN	NGÀY CHI	GHI CHÚ
1	* Mua sắm	3,000	18/07/2014	mua quần áo

Sửa Xóa

**Figure 20 Manage Real Expense**

Refer to 5.1.5 Manage Real Income



### 5.1.7. Manage Expected Thing



Figure 21 Manage Expected Things

#### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Add button	Click to show add a new thing pop-up	N/A	Show add a new thing pop-up
2	Predicted button	Click to show predicted time-can-buy	N/A	Show predicted data
3	Buy button	Click to mark that thing is bought	N/A	Mark bought thing
4	Update button	Click to show update change thing information: money and name	N/A	Change thing name and money
5	Delete button	Click to delete the expected thing	N/A	Delete the expected thing
6	Change order button	Click to change priority of thing	N/A	Change priority of expected thing
7	Change order button 2	Click to change priority of thing	N/A	Change priority of expected thing



**Figure 22 Add Expected Thing**

#### Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Thing name	Fill name	No	Yes	Dropdown list	String	N/A
2	Money	Fill money	No	Yes	Textbox	Integer	N/A

#### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
3	Add button	Click to create a new expected thing	N/A	Close pop-up, show manage expected thing page with new data
4	Cancel button	Click to cancel create	N/A	Close pop-up

#### 5.1.8. View Suggestion

**Figure 23 View Suggestion**

## Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Detail button	Click to show suggestion details page	N/A	Show suggestion details page

### 5.1.9. Manage Debit



Figure 24 Manage Debit

## Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Pay debit button	Click to mark expense is not debit	N/A	Remove expense from list

### 5.1.10. View Report

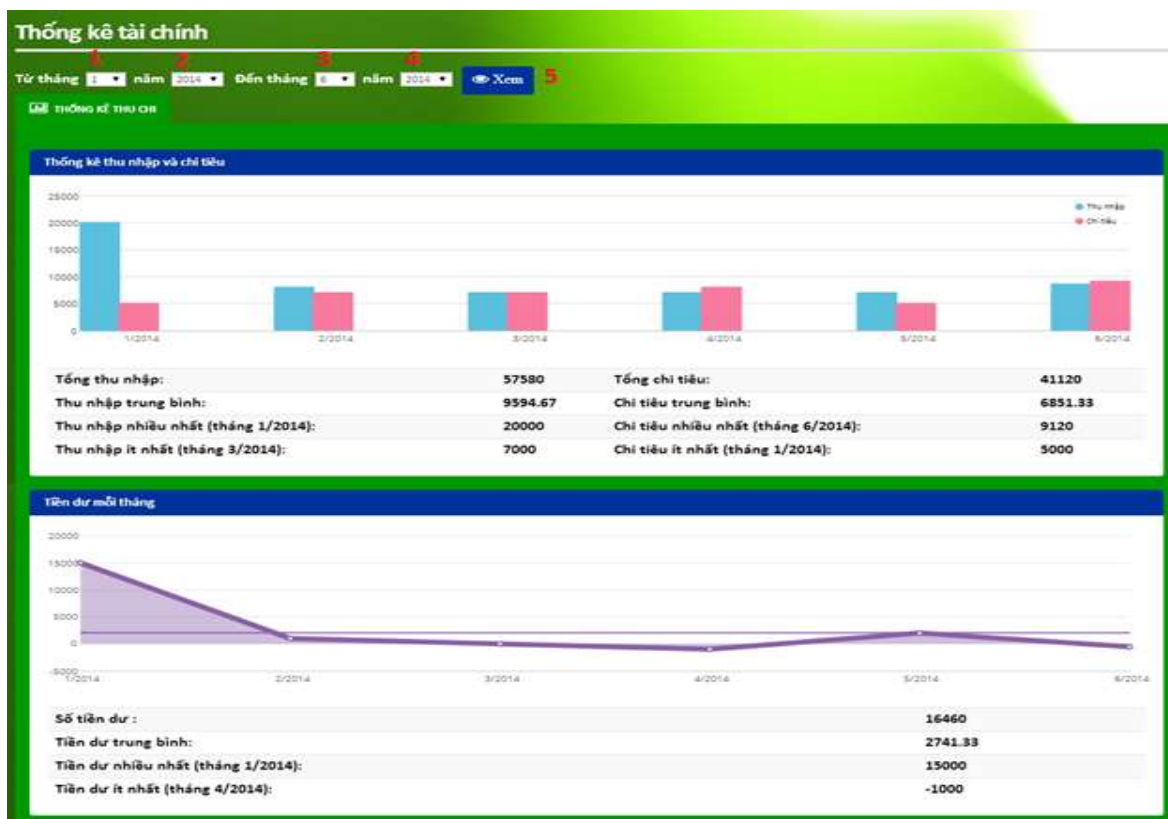


Figure 25 View Report

## Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	From month button	Choose month start	N/A	Choose month start
2	From year button	Choose year start	N/A	Choose year start
3	To month button	Choose month end	N/A	Choose month end
4	To year button	Choose year end	N/A	Choose year end
5	Show button	Show data from start to end	N/A	Show data

### 5.1.11. Manage Account Information

Figure 26 Manage Account Information

#### Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Password	Fill password	No	Yes	Password	String	N/A
2	Confirm password	Fill password	No	Yes	Password	String	N/A
3	Full Name	Fill full name	No	Yes	Textbox	String	N/A
4	Email	Fill email	No	Yes	Textbox	String	N/A
5	Phone number	Fill phone number	No	No	Textbox	Integer	N/A
6	Current Money	Fill current money	No	Yes	Textbox	Integer	N/A
7	Saving mode	Choose saving mode	No	No	Radio button	N/A	N/A
8	Notification mode	Choose notification mode	No	No	Checkbox	N/A	N/A

### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
9	Save button	Save information	N/A	Save information

#### 5.1.12. Manage Account (for admin)

Figure 27 Manage Account (for admin)

### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Status button	Change user status	N/A	Change user status

#### 5.1.13. Configure System (for admin)

Figure 28 Configure System (for admin)

## Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Base expense decrease max	Base expense decrease max	No	No	Textbox	Integer	N/A
2	Normal expense decrease max	Normal expense decrease max	No	No	Textbox	Integer	N/A
3	Devired expense decrease max	Devired expense decrease max	No	No	Textbox	Integer	N/A
4	Maximum money	Fill maximum money	No	No	Textbox	Integer	N/A
5	Maximum money recalculate suggestion	Fill money	No	No	Textbox	Integer	N/A

## Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
6	Save button	Save information	N/A	Save information
7	Reset button	Reset information	N/A	Reset information

## 5.2. Mobile Interface

### 5.2.1. Login



Figure 29 Login

### Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Username	Fill username	No	Yes	Textbox	String	N/A
2	Password	Fill password	No	Yes	Password	String	N/A

### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
3	Login button	Log-in into the system	N/A	Navigate to home page

### 5.2.2. Home screen

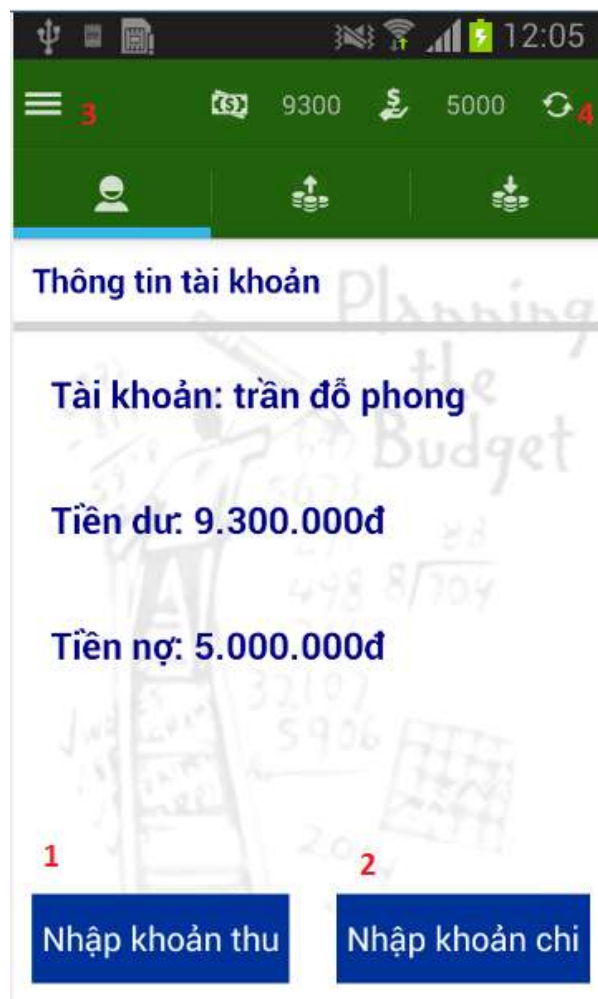
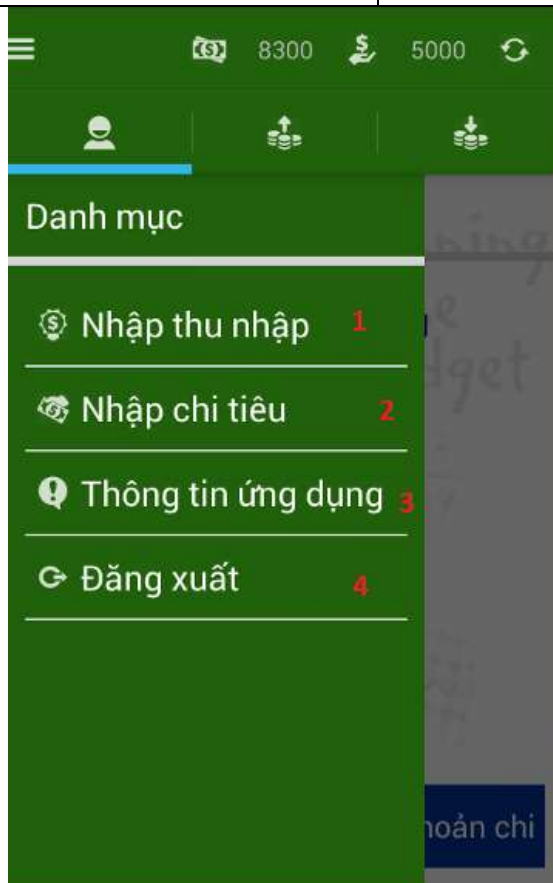


Figure 30 Home Screen

**Buttons/Hyperlinks**

No	Function	Description	Validation	Outcome
1	Input income button	Show input income screen	N/A	Navigate to input income screen
2	Input expense button	Show input expense screen	N/A	Navigate to input expense screen
3	Menu button	Show menu	N/A	Show menu
4	Refresh button	Refresh application, synchronize data	N/A	Show home screen




*Figure 31 Menu*

**Buttons/Hyperlinks**

No	Function	Description	Validation	Outcome
1	Input income button	Show input income screen	N/A	Navigate to input income screen
2	Input expense button	Show input expense screen	N/A	Navigate to input expense screen
3	Application information button	Show application information	N/A	Show application information
4	Logout button	Logout	N/A	Show login screen

5.2.3. Expense list

A screenshot of a mobile application interface showing an expense list. The top bar is green with a menu icon, a balance of 8300, and a target of 5000. Below the bar are three icons: a person, an upward arrow, and a downward arrow. The title 'Danh sách chi tiêu (đơn vị: 1.000đ)' is in blue. The list contains two entries: 'Mua sắm' on 07/08/2014 for 3.000, and 'Nhà cửa' on 23/08/2014 for 3.000. A faint background watermark shows a ladder and handwritten numbers.

Danh sách chi tiêu (đơn vị: 1.000đ)		
Mua sắm	07/08/2014	3.000
Nhà cửa	23/08/2014	3.000

Figure 32 Expense List

5.2.4. Income list

A screenshot of a mobile application interface showing an income list. The top bar is green with a menu icon, a balance of 8300, and a target of 5000. Below the bar are three icons: a person, an upward arrow, and a downward arrow. The title 'Danh sách thu nhập (đơn vị: 1.000đ)' is in blue. The list contains two entries: 'Lương' on 02/08/2014 for 2.000, and 'Khác' on 07/08/2014 for 2.000. A faint background watermark shows a ladder and handwritten numbers.

Danh sách thu nhập (đơn vị: 1.000đ)		
Lương	02/08/2014	2.000
Khác	07/08/2014	2.000

Figure 33 Income List



### 5.2.5. Add Expense

**Nhập khoản chi tiêu**

Tên chi tiêu: Nhà cửa **1**

Số tiền: 2 **2** đơn vị: 1.000đ

Ngày chi: 07/08/2014 **3**

Ghi chú **4**

**Thêm chi tiêu** **5**

*Figure 34 Add Expense*

#### Fields

No	Field Name	Description	Read only	Mandatory	Control Type	Data Type	Length
1	Expense name	Fill expense name	No	Yes	Dropdown list	String	N/A
2	Money	Fill money	No	Yes	Textbox	Integer	N/A
3	Time	Choose date time	No	Yes	Date time picker	String	N/A
4	Note	Fill note	No	No	Textbox	String	N/A

#### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
5	Add button	Click to create a new real income	N/A	Show home screen

### 5.2.6. Update, Delete Expense

**Nhập khoản chi tiêu**

Tên chi tiêu: Mua sắm

Số tiền: 3.000 đơn vị: 1.000đ

Ngày chi: 07/08/2014

Ghi chú:

**Cập nhật 1**

**Xóa 2**

*Figure 35 Update, Delete Expense*

#### Fields

Refer to 5.2.5 Add Expense

#### Buttons/Hyperlinks

No	Function	Description	Validation	Outcome
1	Update button	Click to change real income information	N/A	Show home screen
2	Delete button	Click to change real expense information	N/A	Show home screen

### 5.2.7. Add Income

< 🤖 Nhập khoản thu nhập

Tên thu nhập Lương

Số tiền  đơn vị: 1.000đ

Ngày thu 07/08/2014

Ghi chú

Thêm thu nhập

**Figure 36 Add Income**

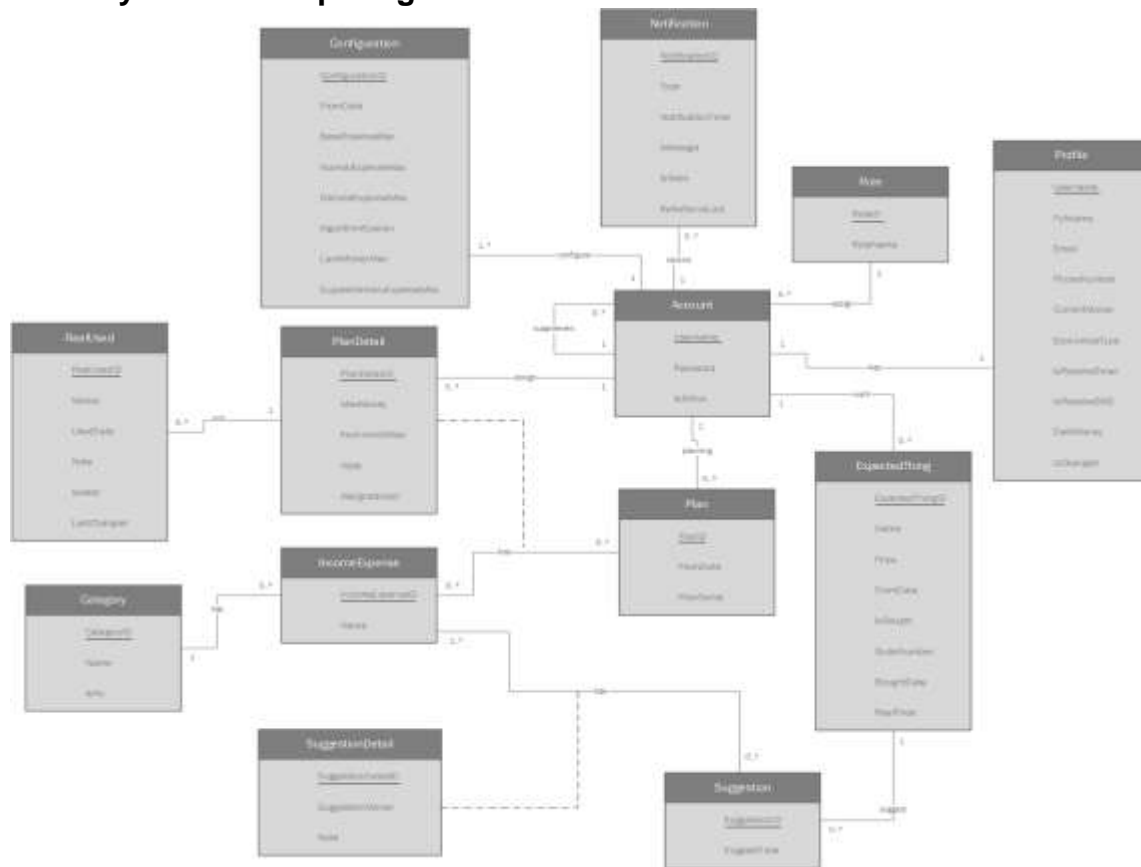
Refer to 5.2.5 Add Expense

### 5.2.8. Update, Delete Income

Refer to 5.2.8 Update, Delete Expense

## 6. Database Design

### 6.1. Entity Relationship Diagram



**Figure 37 Entity Relationship Diagram**

### 6.2. Data Dictionary

Entity Data dictionary: describe content of all entities	
Entity Name	Description
Account	Describe all accounts in the system.
Role	Describe all roles in the system.
Profile	Describe all profiles of user in the system. Each user has only one profile.
Notification	Describe all notifications of user in the system.
Configuration	Describe all configuration of user in the system.
Plan	Describe all plans of user in the system.
PlanDetail	Describe all plan details of each plan in the system.
RealUsedDetail	Describe all incomes or expenses in real life of user.
IncomeExpense	Describe all incomes or expenses in the system.
Category	Describe all categories of income or expense in the system.
ExpectedThing	Describe all expected things of user in the system.
Suggetion	Describe all suggestions of user in the system.
SuggestionDetail	Describe all suggestion details of each suggestion in the system.

**Table 1 Data dictionary**

Entity name	Attributes	Description	Domain	Null
Account	Username {PK}	Account username	String, length:50	No
	Password	Account password	String, length:50	No
	IsActive	Account status	Boolean	No
Role	RoleID {PK}	Unique identifier of a role	Integer	No
	Name	Role name	String, length:50	No
Profile	Username {PK,FK}	Profile username	String, length:50	No
	Fullname	Profile full name	Unicode String, length:100	No
	Email	User email	String, length:50	No
	PhoneNumber	User phone number	varchar(20)	Yes
	CurrentMoney	User current money	Integer	No
	EconomizeType	User economize type	String, length:50	Yes
	IsReceiveEmail	Check user receive email	Boolean	No
	IsReceiveSMS	Check user receive SMS	Boolean	No
	DebtMoney	User debt money	Integer	No
	IsChanged	Check user changed status	Boolean	No
Notification	NotifyID {PK}	Unique identifier	Integer	No
	Type	Notification type	Unicode String, length:50	No
	NotifyTime	Notification time	datetime	No
	Message	Notification message	Unicode String, length:1000	No
	IsSeen	Check user is seen	Boolean	No
	ReferenceLink	Reference link of notification	String, length:250	Yes
Configuration	ConfigID {PK}	Unique identifier, auto increment.	Integer	No
	FromDate	Configuration applies from date	datetime	No
	BaseExpenseMax	Maximum percent can be decreased of base expense	float	No
	NormalExpenseMax	Maximum percent can be decreased of normal expense	float	No
	DerivedExpenseMax	Maximum percent can be	float	no

		decreased of derived expense		
	AlgorithmEpsilon	Maximum money to compute algorithms again.	Integer	No
	LackMoneyMax	Maximum money which suggestion can be lack.	Integer	No
	SupplementaryExpenseMax	Maximum percent can be decreased of supplementary expense	float	No
Plan	PlanID {PK}	Unique identifier	Integer	No
	FromDate	Plan applies from date	datetime	No
	PlanOwner {FK}	Owner of plan	String, length:50	No
PlanDetail	PlanDetailID {PK}	Unique identifier	Integer	No
	MaxMoney	Maximum money of plan detail	Integer	No
	EconomizeMax	Maximum percent can be decreased of plan detail	float	Yes
	Note	Plan detail note	Unicode String, length:250	Yes
	AssignedUser{FK}	Plan detail is assigned for username	String, length:50	No
RealUsedDetail	UsedDetailID {PK}	Unique identifier	Integer	No
	Money	Money of real used detail	Integer	No
	UsedDate	Used date of real used detail	datetime	Yes
	Note	Note of real used detail	Unicode String, length:300	Yes
	IsDebt	Check is debt real used detail	bit	No
	LastChanged	Last time changed this using	datetime	No
IncomeExpense	IncomeExpenseID {PK }	Unique identifier	Integer	No
	Name	Income or Expense Name	Unicode String, length:200	No
Category	CategoryID {PK}	Uniquely identifier	Integer	No
	Name	Category name	Unicode String, length:200	No
	IsFix	Check is user can add new income or expense	Boolean	No
ExpectedThing	ExpectedThingID {PK}	Unique identifier	Integer	No
	Name	Expected thing name	Unicode String, length:200	No
	Price	Maximum price of expected thing	Integer	No

	FromDate	User expected thing from date	datetime	No
	IsBought	Check is bought expected thing	Boolean	No
	BoughtDate	Bought date of expected thing	datetime	Yes
	OrderNumber	Order number of expected thing	Integer	No
	RealPrice	Real price of expected thing after bought	Integer	Yes
Suggestion	SuggestionID {PK }	Unique identifier	Integer	No
	SuggestionTime	Suggestion time	datetime	No
Suggestion Detail	SuggestionDetailID {PK}	Unique identifier	Integer	No
	Money	Suggestion Money	Integer	No
	Note	Note of suggestion	Unicode String, length:300	Yes

**Table 2 Attributes Data Dictionary**

## 7. Algorithms

### 7.1. Define problem

We have the current money of user, the plan of incomes and expenses in next months. User can have some expected things with its maximum price. The system computes algorithms to give user a suggestion about economizing expenses in next months to enough money for buying expected things. The total economizing expenses must be in allowance range that is balance the finance of user.

### 7.2. Define keyword

- Economize Max: The maximum percent that can be decrease of expense category.
- Lack Money Max: When algorithm decreases maximum expense but total money of next month is not enough to buy expected thing. The system will give user a suggestion if the money, which is need more to buy expected thing, is less than or equal Lack Money Max.

### 7.3. Solution

There are four cases result of algorithm:

- a) **Case 1:** The total money of next month is enough to buy expected thing. User does not need economize.
  - Total money = Current Money + Total Incomes – Total Expenses
  - Total money >= expected thing price.
- b) **Case 2:** User needs economize some expenses in next month to enough money to buy expected thing.
  - Expected Thing Price = Current Money + Total Incomes – Total Expenses + Total Economy.
  - Total Economy <= Total Economy Max.

Compute Total Economy Max:

- Total Economy Max = Sum (Economy Max of each Expense Category).
- Economy Max of each Expense Category = Min (Economize Max of Category X Sum (Expenses of Category), Sum (Economize Max of Expense X Expense)).
- Example:
  - Problem: User has a plan of Derived Expense with Economize Max is 50%.  
In this category, there are two types of expenses are "Shopping" and "Entertainment".  
The expense for Shopping is 200 and percentage of Economize Max is 30%.  
The expense for Entertainment is 400 and percentage of Economize Max is 10%.  
What is Economy Max of Derived Expense of user?
  - Solution: Economy Max of Derived Expense  
$$= \text{Min} (50\% \times (200 + 400), 30\% \times 200 + 10\% \times 400)$$
$$= 100$$

Compute Total Economy:

- Compute Economy follow by priority: Derived Expense, Supplementary Expense, Normal Expense, and Base Expense.  
It means that first algorithm decreases Derived Expense to Economy Max, second it decreases Supplementary Expense until Economy Max, etc. until the money need to buy expected thing is enough.
- Compute Economy in each category follow by balance:  
$$\text{Economy of Expense} = \text{Economy of category} \times (\text{Economize Max of Expense} \times \text{Expense} / \text{Sum} (\text{Economize Max of Expenses} \times \text{Expenses}))$$
- Example:
  - Problem: User has a plan of Derived Expense with Economize Max is 50%.  
In this category, there are two types of expenses are "Shopping" and "Entertainment".  
The expense for Shopping is 200 and percentage of Economize Max is 30%.  
The expense for Entertainment is 400 and percentage of Economize Max is 10%.  
Users want to buy expected thing but they need to save more 50 in category Derived Expense.  
What are Economy of Shopping and Entertainment?
  - Solution:  
Economy of "Shopping"  
$$= 50 \times (30\% \times 200 / (30\% \times 200 + 10\% \times 400))$$
$$= 30.$$
  
Economy of "Entertainment"



$$= 50 \times (10\% \times 400 / (30\% \times 200 + 10\% \times 400))$$

$$= 20.$$

- c) **Case 3:** User needs to economize expenses in next month, but the total money is not enough to buy expected thing. User needs some lack money, which is in allowance range.
- Expected Thing Price = Current Money + Total Incomes – Total Expenses + Total Economy Max + Lack Money.
  - Lack Money <= Lack Money Max  
User configures Lack Money Max.
- d) **Case 4:** User needs to economize expenses in next month, and the lack money is greater than Lack Money Max. The system will not give user a suggestion.
- Expected Thing Price = Current Money + Total Incomes – Total Expenses + Total Economy Max + Lack Money.
  - Lack Money > Lack Money Max.

#### 7.4. Example

- **Problem:** User has the current money is 4,000. The total incomes in next month is 7,500. They can buy an expected thing if they lack some money is 500. The plan of expenses in next month is described in the below table:

List of Expenses		Money	Economize Max
Base Expenses		1,200	0%
	House	1,000	0%
	Electronic	200	0%
Normal Expenses		1,500	20%
	Birthday	1,500	20%
Derived Expenses		3,500	50%
	Shopping	2,000	30%
	Entertainment	1,000	20%
	Others	500	10%
Supplementary Expenses		300	0%
	PhuongPVL	300	0%
Total Expenses		6,500	

User has a list of expected things in the below table:

Name of expected things	Maximum of price
TV	5,000
Air - condition	6,000
Motorbike	6,600
Laptop	10,000

What is suggestion for this user?

- **Solution:**

Current money	4,000
Total Incomes	7,500
Total Expenses	6,500
Money at the end of month	5,000
Lack Money Max	500

- a) **Case 1:** Expected Thing Price: 5,000. The system gives a suggestion that user does not need economize.
- b) **Case 2:** Expected Thing Price: 6,000. User needs more 1,000.
- First, Economy of Derived Expenses =  $2,000 \times 30\% + 1,000 \times 20\% + 500 \times 10\% = 850$ .
  - Second, Economy of Derived Normal Expenses =  $1,000 - 850 = 250$
  - We have the suggestion after economizing:

List of Expenses		Money
Base Expenses		1,200
	House	1,000
	Electronic	200
Normal Expenses		1,250
	Birthday	1,250
Derived Expenses		2,650
	Shopping	1,400
	Entertainment	800
	Others	450
Supplementary Expenses		300
	PhuongPVL	300
Total Expenses		5,400

- c) **Case 3:** Expected Thing Price: 6,600. User needs more 1,600.
- First, Economy of Derived Expenses =  $2,000 \times 30\% + 1,000 \times 20\% + 500 \times 10\% = 850$ .
  - Second, Economy of Derived Normal Expenses =  $1,500 \times 20\% = 300$ .
  - Third, Lack Money =  $1,600 - (850 + 300) = 450$ .
  - We have the suggestion after economizing:

List of Expenses		Money
Base Expenses		1,200
	House	1,000
	Electronic	200
Normal Expenses		1,200
	Birthday	1,200
Derived Expenses		2,650
	Shopping	1,400
	Entertainment	800
	Others	450
Supplementary Expenses		300
	PhuongPVL	300
Total Expenses		5,350

- d) **Case 4:** Expected Thing Price: 10,000. User need more 5,000.
- First, Economy of Derived Expenses =  $2,000 \times 30\% + 1,000 \times 20\% + 500 \times 10\% = 850$ .
  - Second, Economy of Derived Normal Expenses =  $1,500 \times 20\% = 300$ .
  - Third, Lack Money =  $5,000 - (850 + 300) = 3,850$ .

- The system does not give user a suggestion because of Lack Money > Lack Money Max (3,850 > 500).