

**VIETNAM NATIONAL UNIVERSITY HOCHIMINH CITY
UNIVERSITY OF INFORMATION TECHNOLOGY
ADVANCED PROGRAM IN INFORMATION SYSTEMS**

NGUYEN MINH TRUNG – NGUYEN VAN QUOC VUONG

**RESEARCH AND IMPLEMENT THE CUSTOMER
RELATIONSHIP MANAGEMENT IN RETAIL
SUPERMARKET AND APPLY THE ASSOCIATION
RULE METHOD TO SUPPORT MAKING DECISION**

BACHELOR OF ENGINEERING IN INFORMATION SYSTEMS

HO CHI MINH CITY, 2015

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BACHELOR OF ENGINEERING IN INFORMATION SYSTEMS

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HO CHI MINH CITY, 2015

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The Assessment Committee is established under the Decision., date
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3 - Member

4 - Member.

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Because of restricted of acknowledge, research methodology and time, the thesis is difficult to avoid mistakes. We look forward comments, ideas, criticism about the.

Ho Chi Minh, January 2015

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COMMENT OF ADVISOR

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COMMENT OF CRITICAL TEACHER

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ABSTRACT

In business, the customer is the source of life of the business. In other words, "No Customer No Business". How to find new potential customer source and keep faithful customer is top priority that determines the survival and development of enterprises. To solve that problem, a process in business occur to help achieve effectively new customers and reinforce the loyalty of old customers. It is the process of customer relationship management. With this process, customer information is stored and processed to determine the needs and buying behavior of customer. Moreover, it supports the customer care program wonderfully to help customers feel concerned. From there, customers will be close to business in a long time. That is the final destination which every desires.

In addition, with enormous business data accumulates over time, discovery of useful information helps manager decides accurately is essential and important. That is the application of data mining in computer science. Some methods of data mining technique helps uncover the knowledge that normal calculations cannot do. Therefore, the achieved result is quality when applying these techniques.

From above two essential problems, thesis will deeply focus on researching both of them. Among that, research method mainly finds and reads all relevant documents. At the same time, the demo application will be implemented to simulate the work - flow of two problems above with our available and new knowledge.

Chapter 1

Problem Statement

1.1 Reason choose thesis

In the competitive economy, the market and customers change frequently. Beside, focusing on selling product, the business begins to aware of the importance of customer who buys products directly. If this group does not exist, business cannot sell any products lead to lost revenue and profit. However, with the same product but there are many businesses provider that one. How customers chooses us instead of our competitor. Furthermore, the cost of selling a product to old customer is cheaper 1/6 than new one. Therefore, business should understand clearly about customer behaviors, identify who is valuable customer that need to be satisfied. This is a methodology to retain customers, one of some main functions of Customer Relationship Management (CRM) system beside of managing systemically relationship between customer and business in order to shorten the distance both sides. So that, it helps business increase loyal customers, revenue and profit.

Currently, in retail field, especially in the supermarket, customer's demands increase more and more. The number of supermarkets are growing. Beside geographical factor, customer usually chooses close supermarkets. Other factors such as promotion program, lucky-number program, take-care customer program also affects strongly to the buying psychology of customers. Every day, supermarket handles thousands orders with an enormous database. Analyzing this database helps managers make decision intelligently.

To understand the importance and the necessary of the Customer Relationship Management system and apply data mining knowledge studied in the university, we choose the topic "RESEARCH AND IMPLEMENT THE CUSTOMER RELATIONSHIP MANAGEMENT IN RETAIL SUPERMARKET AND APPLY THE ASSOCIATION RULE METHOD TO SUPPORT MAKING DECISION" for our thesis.

1.2 Purpose of thesis

- Build a customer relationship management system in supermarket and apply association rule to support making decision.
- Understand knowledge about marketing, especially about customer relationship system.
- Practice programming skills to build a web application.
- Reinforce studied knowledge and apply to the real environment.

1.3 Structure of thesis

The thesis includes four chapters:

- Chapter 1 presents about the introduction about reasons of choosing this thesis and the purpose of the thesis.
- Chapter 2 presents about fundamental knowledge about customer relationship management and methodology about association rule in data mining.
- Chapter 3 presents about building application demonstration with problem assumption, requirement analysis, system design and implementation.
- Chapter 4 presents about the conclusions of thesis with achievements and futurist works.

Chapter 2

Fundamental knowledge

2.1 CRM knowledge

2.1.1 What is CRM?

Customer Relationship Management is a comprehensive strategy and process of acquiring, retaining, and partnering with selective customers to create superior value for the company and the customer. It involves the integration of marketing, sales, customer service, and the supply-chain functions of the organization to achieve greater efficiencies and effectiveness in delivering customer value.

CRM is a phase in business progress that put the customer at center from the introduction product phase to the sale product phase and the care customer phase. It makes the customer more convenience and believes in business.

CRM is a methodology that helps business approaching, contacting customer effectively and systematically and serving customer better.

Customer's information is stored and updated in the database management system. Then the managers are able to analysis that information and classify customer to make strategies taking care customer that corresponding to each customer's group. CRM also provides services to manage customer's case that helps the business deal problem promptly.

2.1.2 CRM's functions

- Manage customer's information
- Understand consumer behavior.
- Take care customer systematically.
- Support making decision and report.
- Increase the profit.
- Increase competitive with rivals.

2.2 Data mining

2.2.1 Overview

Data mining is process that mine knowledge pattern from big data.

2.2.2 Some popular methods

- Clustering
- Classification
- Association rule
- Regression
- ...

2.2.3 Some fields that data mining apply

- Business
- Finance & sale marketing
- Commerce & banking
- Insurance
- Science & biomedicine
- Telecommunication
- ...

2.3 Association rule method

2.3.1 Overview

Association rule is a method that finds associations and correlation between the different items. For example, in shopping cart analysis, we find a rule as “Milk=>Bread”. That means when customer buys milk also buy bread with high probability. Thank for some kind of rules, manager can make the promotion marketing campaigns and arrange products effectively.

2.3.2 Application areas

Industry	Application
Finance	Credit card analysis

Insurance	Claims, fraud analysis
Telecommunication	Call record analysis
Transport	Logistic management
Consumer goods	Promotion analysis
Data service provider	Value added data
Utilities	Power usage analysis

Table 2.1 Application areas of association rules

2.3.3 Theory

Typical representation format for association rule:

$$A \Rightarrow B [s\%, c\%]$$

Within:

A: antecedent, left-hand side, body

B: consequent, right-hand side, head

s: support, frequency (“in how big part of the data the things in left-hand, right-hand side occur together”). Support denotes the frequency of the rule within transaction

$$\text{Support}(A \Rightarrow B[s, c]) = p(A \cup B) = \text{support}(\{A, B\})$$

c: confidence, strength (“if the left-hand side occurs, how likely the right-hand side occur”). Confidence denotes percentage of transactions contain A with contain also B

$$\text{Confidence}(A \Rightarrow B[s, c]) = p(B|A) = p(A \cup B) / p(A) = \text{support}(\{A, B\}) / \text{support}(\{A\}).$$

$$\text{Confidence}(A, B) = \text{support}(A, B) / \text{support}(A).$$

Frequent itemset:

Support (I) = number of transactions contain I / number of transaction in database

“I” in Support (I) is called frequent itemset if and only if $\text{support}(I) \geq \text{minsup}$ where minsup is a minimum support threshold.

Apriori trick (one of many methods of association rule)

“a subset of a frequent itemset must also be a frequent itemset”

Ex: if {A,B} is a frequent itemset, both {A} and {B} should be frequent itemset

Iterative find frequent itemset with size from 1 to k (k-itemset)

C_k: candidate with k itemset

L_k: large (frequent) with k itemset minsep given

Ex: with minsup = 50%, we find some frequent item as:
{1},{2},{3},{5},{1,3},{2,3},{2,5},{3,5} and {2,3,5}

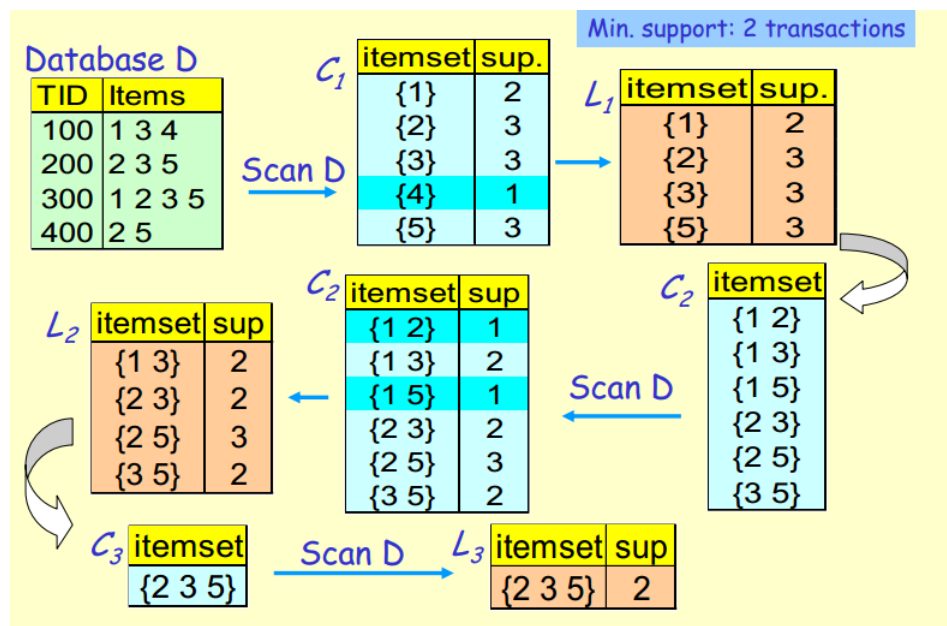


Figure 2.1 Find frequent items

Get association rule from frequent items

For every frequent item l

Generate all nonempty subsets of l

For every nonempty subset s of l

Output the rule “s => (l-s)”

If support(l)/support(s) >= minconf

Where minconf is the minimum confidence threshold

Ex: with minconf = 100%, from frequent item {1, 3} above, we have two non-subset {1}, {3}.

Then we calculate:

$$\text{Conf}(\{1\} \Rightarrow \{3\}) = \text{support}(\{1, 3\}) / \text{support}(\{1\}) = 2/2 = 100\%$$

$$\text{Conf}(\{3\} \Rightarrow \{1\}) = \text{support}(\{1, 3\}) / \text{support}(\{3\}) = 2/3 < 100\%$$

We just have one association rule $\{1\} \Rightarrow \{3\}$.

Rule $\{3\} \Rightarrow \{1\}$ can't not be association rule because its conf not $\geq 100\%$

Chapter 3

Implement Demo Application

3.1 Introduction of problem

Coop-mart supermarket has thousand order transactions daily. Each order has many different products. Each product has properties such as name, price, unit, description and image. Some product belongs to one subcategory. Each subcategory has properties such as name, description. Some subcategory belongs to one category. Each category has properties such as name and description.

When customer buy product at supermarket, they usually register to member of supermarket. Each customer has properties such as name, birthday, email, phone, address. When buying, each order has properties such as order date, customer name, list product with number specific, amount total, product number total.

Occasionally, customer will contact to supermarket to contribute information or mostly complain about product they bought. We call that is a case. Each case has properties such as title, description, priority. Default when the system creates a new case, its status is new. When supermarket is processing that case, its status changes to in-progress. When supermarket processed completely that case, its status changes to done.

To get general business view for supporting make develop campaign, manager wants to know statistic about business situation of supermarket. Detail:

- Revenue of supermarket by time
- List product, list subcategory, list category has high revenue? Support for getting more product, make suitable marketing campaign.
- Customer growth by time
- Now case status, number of new, in-progress, done case.

- From customer's data, analyzing customer's cart to find general rules when customer buy product supports for product arrangement scientifically for customer to get product convenience.

3.2 Analysis System

3.2.1 Use-case diagram

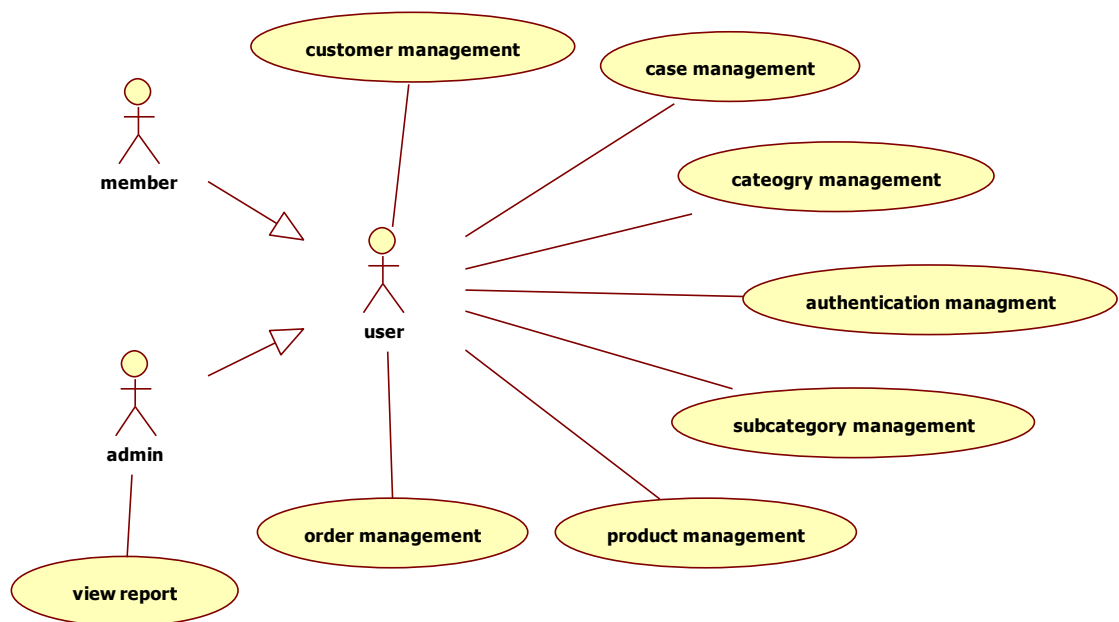


Figure 3.1 Use-case diagram

Description:

There are two types of use in system: admin and member. The admin user can be manager of supermarket, who can access the entire of system, see report to make decision. On the other hand, the member user can be employees, who access strictly to the whole system. The main task of member just input data to system. They cannot see the report as admin.

Besides, there are some groups of function, such as customer management, case management, category management, subcategory management, product management, order management and authentication management.

Go to detail:

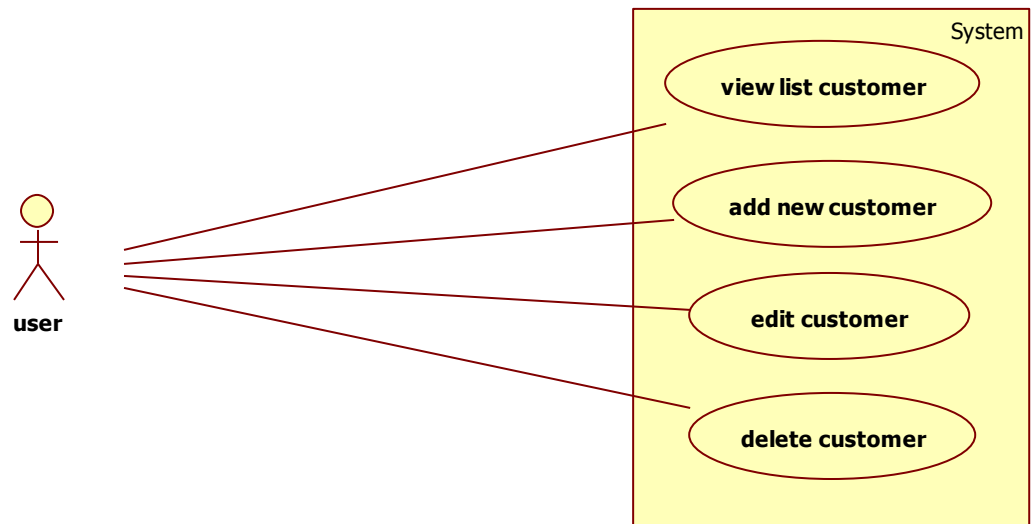


Figure 3.2 Customer management diagram

Description: in customer management group, user can view list customer, add new customer, edit existing customer and delete existing customer.

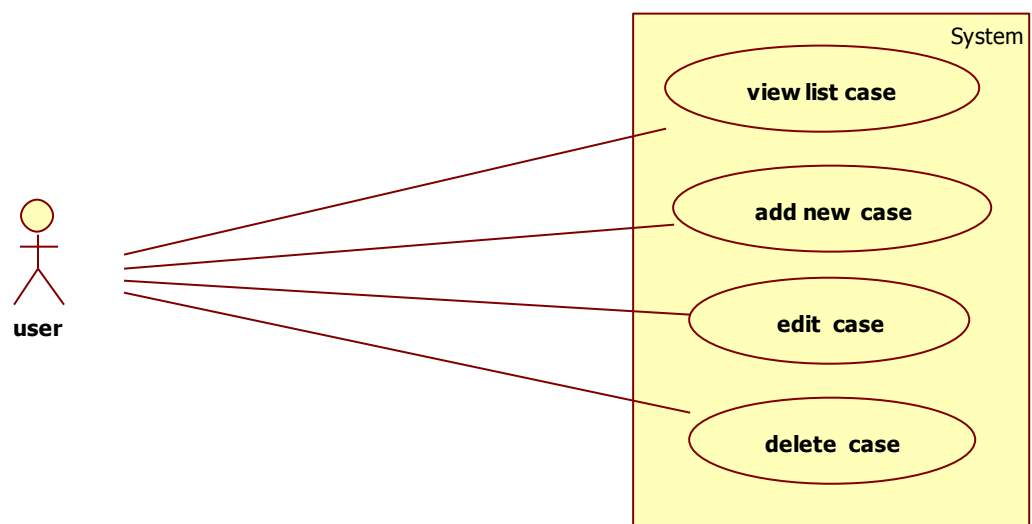


Figure 3.3 Case management diagram

Description: in case management group, user can view list case, add new case, edit existing case and delete existing case.

Note: when edit case, only can change the status of case.

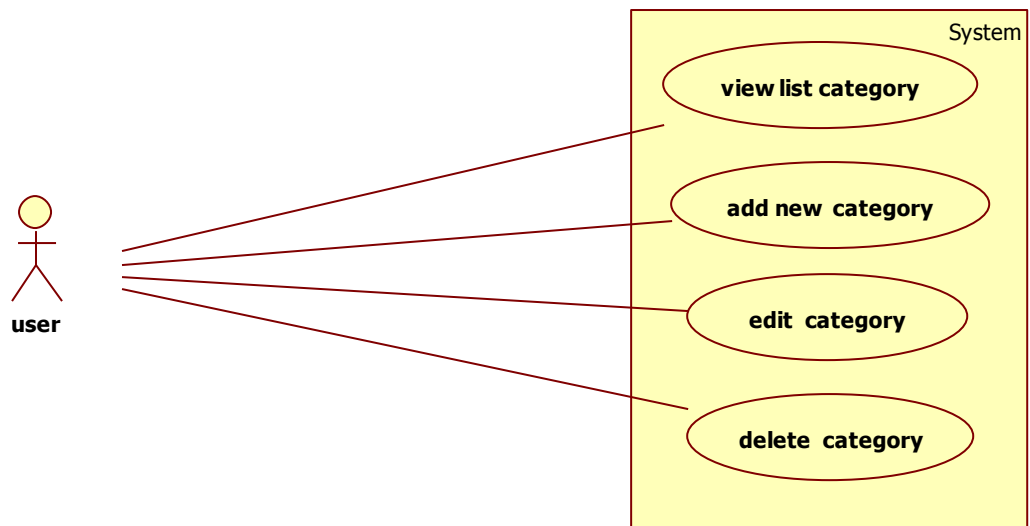


Figure 3.4 Category management diagram

Description: in category management group, user can view list category, add new category, edit existing category and delete existing category.

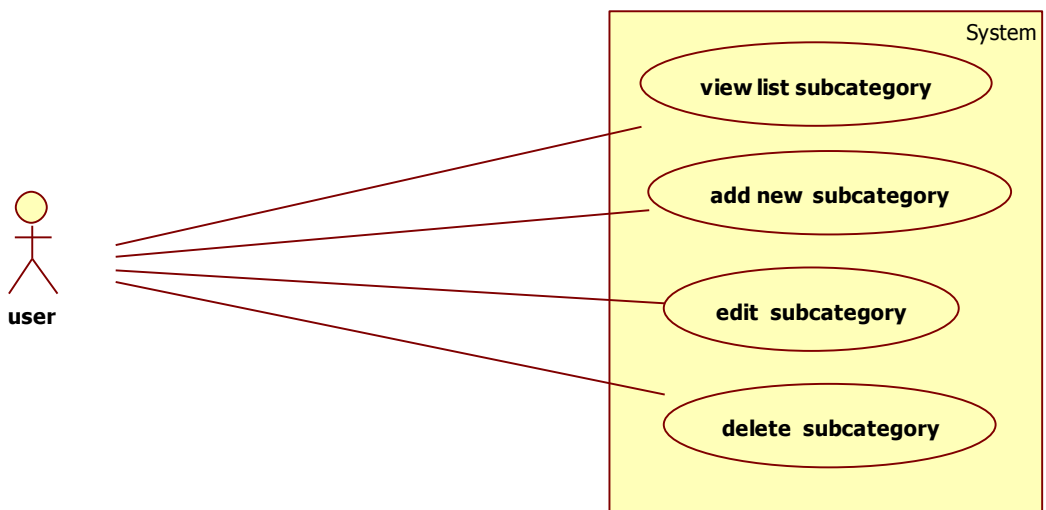


Figure 3.5 Subcategory management diagram

Description: in subcategory management group, user can view list subcategory, add new subcategory, edit existing subcategory and delete existing subcategory.

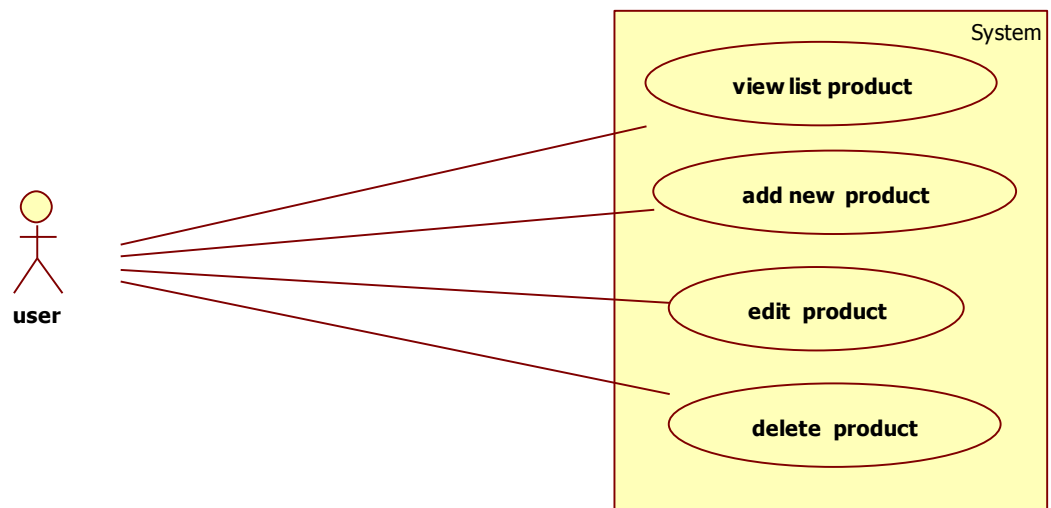


Figure 3.6 Product management diagram

Description: in product management group, user can view list product, add new product, edit existing product and delete existing product.

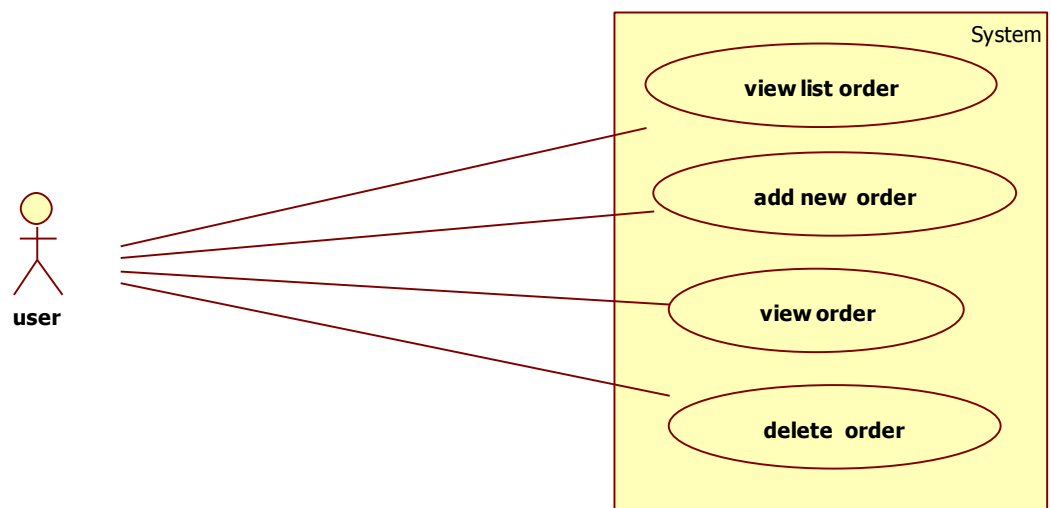


Figure 3.7 Order management diagram

Description: in order management group, user can view list order, add new order, view existing order and delete existing order.

Note: cannot edit the existing order, just view it

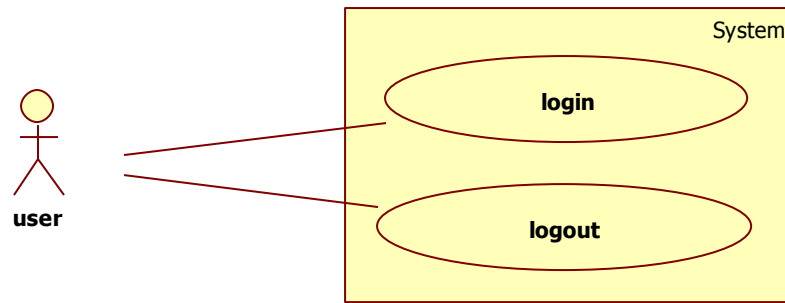


Figure 3.8 Authentication management diagram

Description: in authentication management group, user can login and logout system.

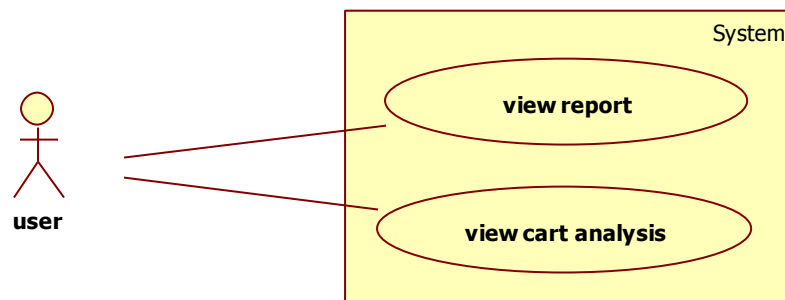


Figure 3.9 View report management diagram

Description: in view-report management group, user can view general report and view cart analysis

3.2.2 Use-case Detail

3.2.2.1 Login use-case

Use-case	Login
Description	This use-case allows user to access to system
Basic flow	Access successfully
Actor	User
Pre-condition	User goes to the login page
Post-	User logs in successfully into system, goes to home page

condition		
Step	Actor action	System response
1	Input username and password	
2	Click on Login button	
3		Validate username and password. Navigate to home page
Alternative flow	User input wrong username or password. This occurs at step 3 of basic flow.	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot access to system. An error message displays on login page.	
Step	Actor action	System response
3.1		Display error message

Table 3.1 Login use-case

3.2.2.2 Logout use-case

Use-case	Logout	
Description	This use-case allows user to logout of system	
Basic flow	Out of system successfully	
Actor	User	
Pre-condition	User logins successfully and be at any page in system	
Post-condition	User logouts of system successfully	
Step	Actor action	System response
1	Click on Logout link at the top right corner of the current page.	
2		Destroy session.

		Navigate to login page
--	--	------------------------

Table 3.2 Logout use-case

3.2.2.3 List customer use-case

Use-case	List customer	
Description	This use-case allows user to list existing customers of system	
Basic flow	List customer successfully	
Actor	User	
Pre-condition	User logins successfully	
Post-condition	System loads list customers successfully	
Step	Actor action	System response
1	Click on Customer link at the menu	
2		Get data about customer from database and display on list-customer page

Table 3.3 List customers use-case

3.2.2.4 Add new customer use-case

Use-case	Add new customer	
Description	This use-case allows user to add new customer	
Basic flow	Add new customer successfully	
Actor	User	
Pre-condition	User logins successfully and be at add-customer page	
Post-condition	The system creates and saves a new customer into database. List-customer page will display all customers that contains the new customer just created.	
Step	Actor action	System response
1	Input customer name, birthday (optional), email,	

	phone, house number, street, ward, district, city, register year, register month.	
2	Click on Add Customer button	
3		Save new customer into database and navigate to list-customer page

Table 3.4 Add new customer use-case

3.2.2.5 Edit existing customer use-case

Use-case	Edit existing customer	
Description	This use-case allows user to edit existing customer	
Basic flow	Edit existing customer successfully	
Actor	User	
Pre-condition	User logs in successfully and be at edit-customer page	
Post-condition	The system edits and saves the data of existing customer into database. List-customer page will display all customers that contains the existing customer just edited.	
Step	Actor action	System response
1	Edit customer name, birthday (optional), email, phone, house number, street, ward, district, city, register year, register month	
2	Click on Edit Customer button	
3		Save the data of existing customer just edited into database and navigate to list-customer page

Table 3.5 Edit existing customer use-case

3.2.2.6 Delete existing customer use-case

Use-case	Delete existing customer	
Description	This use-case allows user to delete existing customer	
Basic flow	Delete existing customer successfully	
Actor	User	
Pre-condition	User logs in successfully and be at list-customer page	
Post-condition	System deletes the chosen customer. List-customer page will display all customers without customer just deleted.	
Step	Actor action	System response
1	Click on Delete link in list-customer page to delete specific customer	
2		Display dialog to confirm user delete chosen customer.
3	Click Yes button on confirm dialog	
4		Delete chosen customer and display list customer without the customer just deleted
Alternative flow	User click No button on confirm dialog. This occurs at step 3 of basic flow	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot delete chosen customer. Confirm dialog is closed.	
Step	Actor action	System response
3.1	Click No button on confirm dialog	
4.1		Confirm dialog is closed and chosen customer not deleted.

Table 3.6 Delete existing customer use-case

3.2.2.7 List case use-case

Use-case	List case	
Description	This use-case allows user to list existing cases of system	
Basic flow	List case successfully	
Actor	User	
Pre-condition	User logins successfully	
Post-condition	System loads list cases successfully	
Step	Actor action	System response
1	Click on Case link at the menu	
2		Get data about case from database and display on list- case page

Table 3.7 List cases use-case

3.2.2.8Add new case use-case

Use-case	Add new case	
Description	This use-case allows user to add new case	
Basic flow	Add new case successfully	
Actor	User	
Pre-condition	User logins successfully and be at add-case page	
Post-condition	The system creates and saves a new case into database. List- case page will display all cases that contains the new case just created.	
Step	Actor action	System response
1	Input title, description (optional); choose customer name, case year, case month and priority	

2	Click on Add Case button	
3		Save new case into database and navigate to list-case page

Table 3.8 Add new case use-case

3.2.2.9 Edit existing case use-case

Use-case	Edit existing case	
Description	This use-case allows user to edit existing case	
Basic flow	Edit existing case successfully	
Actor	User	
Pre-condition	User logs in successfully and be at edit-case page	
Post-condition	The system edits and saves the data of existing case into database. List-case page will display all cases that contains the existing case just edited.	
Step	Actor action	System response
1	Edit title, description (optional), solution; choose status	
2	Click on Edit Case button	
3		Save the data of existing case just edited into database and navigate to list- case page

Table 3.9 Edit existing case use-case

3.2.2.10 Delete existing case use-case

Use-case	Delete existing case	
Description	This use-case allows user to delete existing case	
Basic flow	Delete existing case successfully	
Actor	User	

Pre-condition	User logs in successfully and be at list-case page	
Post-condition	System deletes the chosen case. List-case page will display all cases without case just deleted.	
Step	Actor action	System response
1	Click on Delete link in list-case page to delete specific case	
2		Display dialog to confirm user delete chosen case.
3	Click Yes button on confirm dialog	
4		Delete chosen case and display list case without the case just deleted
Alternative flow	User click No button on confirm dialog. This occurs at step 3 of basic flow	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot delete chosen case. Confirm dialog is closed.	
Step	Actor action	System response
3.1	Click No button on confirm dialog	
4.1		Confirm dialog is closed and chosen case not deleted.

Table 3.10 Delete existing case use-case

3.2.2.11 List categories use-case

Use-case	List category
Description	This use-case allows user to list existing categories of system
Basic flow	List categories successfully

Actor	User	
Pre-condition	User logins successfully	
Post-condition	System loads list categories successfully	
Step	Actor action	System response
1	Click on Category link at the menu	
2		Get data about category from database and display on list-category page

Table 3.11 List categories use-case

3.2.2.12 Add new category use-case

Use-case	Add new category	
Description	This use-case allows user to add new category	
Basic flow	Add new category successfully	
Actor	User	
Pre-condition	User logins successfully and be at add-category page	
Post-condition	The system creates and saves a new category into database. List-category page will display all categories that contains the new category just created.	
Step	Actor action	System response
1	Input category name, description (optional)	
2	Click on Add Category button	
3		Save new category into database and navigate to list-category page

Table 3.12 Add new category use-case

3.2.2.13 Edit existing category use-case

Use-case	Edit existing category	
Description	This use-case allows user to edit existing category	
Basic flow	Edit existing category successfully	
Actor	User	
Pre-condition	User logs in successfully and be at edit-category page	
Post-condition	The system edits and saves the data of existing category into database. List- category page will display all categories that contains the existing category just edited.	
Step	Actor action	System response
1	Edit category name, description	
2	Click on Edit Category button	
3		Save the data of existing category just edited into database and navigate to list- category page

Table 3.13 Edit existing category use-case

3.2.2.14 Delete existing category use-case

Use-case	Delete existing category	
Description	This use-case allows user to delete existing category	
Basic flow	Delete existing category successfully	
Actor	User	
Pre-condition	User logs in successfully and be at list- category page	
Post-condition	System deletes the chosen category. List-category page will display all categories without category just deleted.	
Step	Actor action	System response
1	Click on Delete link in	

	list-category page to delete specific category	
2		Display dialog to confirm user delete chosen category.
3	Click Yes button on confirm dialog	
4		Delete chosen category and display list category without the category just deleted
Alternative flow	User click No button on confirm dialog. This occurs at step 3 of basic flow	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot delete chosen category. Confirm dialog is closed.	
Step	Actor action	System response
3.1	Click No button on confirm dialog	
4.1		Confirm dialog is closed and chosen category not deleted.

Table 3.14 Delete existing category use-case

3.2.2.15 ***List subcategories use-case***

Use-case	List subcategories	
Description	This use-case allows user to list existing subcategories of system	
Basic flow	List subcategories successfully	
Actor	User	
Pre-condition	User logins successfully	
Post-condition	System loads list subcategories successfully	
Step	Actor action	System response

1	Click on SubCategory link at the menu	
2		Get data about subcategory from database and display on list-subcategory page

Table 3.15 List subcategory use-case

3.2.2.16 Add new subcategory use-case

Use-case	Add new subcategory	
Description	This use-case allows user to add new subcategory	
Basic flow	Add new subcategory successfully	
Actor	User	
Pre-condition	User logs in successfully and be at add-subcategory page	
Post-condition	The system creates and saves a new subcategory into database. List-subcategory page will display all subcategories that contains the new subcategory just created.	
Step	Actor action	System response
1	Input subcategory name, description (optional), choose category name	
2	Click on Add SubCategory button	
3		Save new subcategory into database and navigate to list-subcategory page

Table 3.16 Add new subcategory use-case

3.2.2.17 Edit existing subcategory use-case

Use-case	Edit existing subcategory
----------	---------------------------

Description	This use-case allows user to edit existing subcategory	
Basic flow	Edit existing subcategory successfully	
Actor	User	
Pre-condition	User logins successfully and be at edit-subcategory page	
Post-condition	The system edits and saves the data of existing subcategory into database. List-subcategory page will display all subcategories that contains the existing subcategory just edited.	
Step	Actor action	System response
1	Edit subcategory name, description (optional), choose category name	
2	Click on Edit SubCategory button	
3		Save the data of existing subcategory just edited into database and navigate to list-subcategory page

Table 3.17 Edit existing subcategory use-case

3.2.2.18 Delete existing subcategory use-case

Use-case	Delete existing subcategory	
Description	This use-case allows user to delete existing subcategory	
Basic flow	Delete existing subcategory successfully	
Actor	User	
Pre-condition	User logins successfully and be at list-subcategory page	
Post-condition	System deletes the chosen subcategory. List-subcategory page will display all subcategories without subcategory just deleted.	
Step	Actor action	System response
1	Click on Delete link in	

	list-subcategory page to delete specific subcategory	
2		Display dialog to confirm user delete chosen subcategory.
3	Click Yes button on confirm dialog	
4		Delete chosen subcategory and display list subcategory without the subcategory just deleted
Alternative flow	User clicks No button on confirm dialog. This occurs at step 3 of basic flow	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot delete chosen subcategory. Confirm dialog is closed.	
Step	Actor action	System response
3.1	Click No button on confirm dialog	
4.1		Confirm dialog is closed and chosen subcategory not deleted.

Table 3.18 Delete existing subcategory use-case

3.2.2.19 List products use-case

Use-case	List products
Description	This use-case allows user to list existing products of system
Basic flow	List products successfully
Actor	User
Pre-condition	User logins successfully

Post-condition	System loads list products successfully	
Step	Actor action	System response
1	Click on Product link at the menu	
2		Get about data about product from database and display on list-product page

Table 3.19 List products use-case

3.2.2.20 Add new product use-case

Use-case	Add new product	
Description	This use-case allows user to add new product	
Basic flow	Add new product successfully	
Actor	User	
Pre-condition	User logs in successfully and be at add-product page	
Post-condition	The system creates and saves a new product into database. List-product page will display all products that contains the new product just created.	
Step	Actor action	System response
1	Input product name, price, unit, image (optional), description (optional), choose category name and subcategory name	
2	Click on Add Product button	
3		Save new product into database and navigate to list-product page

Table 3.20 Add new product use-case

3.2.2.21 Edit existing product use-case

Use-case	Edit existing product	
Description	This use-case allows user to edit existing product	
Basic flow	Edit existing product successfully	
Actor	User	
Pre-condition	User logs in successfully and be at edit-product page	
Post-condition	The system edits and saves the data of existing product into database. List-product page will display all products that contains the existing product just edited.	
Step	Actor action	System response
1	Edit product name, price, unit, image (optional), description (optional), choose category name and subcategory name	
2	Click on Edit Product button	
3		Save the data of existing product just edited into database and navigate to list-product page

Table 3.21 Edit existing product use-case

3.2.2.22 Delete existing product use-case

Use-case	Delete existing product	
Description	This use-case allows user to delete existing product	
Basic flow	Delete existing product successfully	
Actor	User	
Pre-condition	User logs in successfully and be at list-product page	
Post-condition	System deletes the chosen product. List-product page will	

	display all products without product just deleted.	
Step	Actor action	System response
1	Click on Delete link in list-product page to delete specific product	
2		Display dialog to confirm user delete chosen product.
3	Click Yes button on confirm dialog	
4		Delete chosen product and display list product without the product just deleted
Alternative flow	User clicks No button on confirm dialog. This occurs at step 3 of basic flow	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot delete chosen product. Confirm dialog is closed.	
Step	Actor action	System response
3.1	Click No button on confirm dialog	
4.1		Confirm dialog is closed and chosen product not deleted.

Table 3.22 Delete existing product use-case

3.2.2.23 List orders use-case

Use-case	List orders
Description	This use-case allows user to list existing orders of system
Basic flow	List orders successfully
Actor	User

Pre-condition	User logins successfully	
Post-condition	System loads list orders successfully	
Step	Actor action	System response
1	Click on Order link at the menu	
2		Get about data about order from database and display on list-order page

Table 3.23 List orders use-case

3.2.2.24 Add new order use-case

Use-case	Add new order	
Description	This use-case allows user to add new order	
Basic flow	Add new order successfully	
Actor	User	
Pre-condition	User logins successfully and be at add-order page	
Post-condition	The system creates and saves a new order into database. List-order page will display all orders that contains the new order just created.	
Step	Actor action	System response
1	Choose customer name, order year, order month, category name, subcategory name, product name; input product number. If user wants to add more one product, clicks on Add Product, and repeats choose category name, subcategory name, product's name and	

	inputs product number. Repeat step add product if want to add more product to order	
2	Click on Save Order button	
3		Save new order into database and navigate to list-order page

Table 3.24 Add new order use-case

3.2.2.25 View existing order use-case

Use-case	View existing order	
Description	This use-case allows user to view existing order	
Basic flow	View existing order successfully	
Actor	User	
Pre-condition	User logins successfully and be at order-detail page	
Post-condition	Display list of products of chosen order with product number and amount	
Step	Actor action	System response
1	Click on Detail link in list-order page to view specific order	
2		Get data about chosen order, navigate to order-detail page to display list of products of chosen order with product number and amount

Table 3.25 View existing order use-case

3.2.2.26 Delete existing order use-case

Use-case	Delete existing order
----------	-----------------------

Description	This use-case allows user to delete existing order	
Basic flow	Delete existing order successfully	
Actor	User	
Pre-condition	User logins successfully and be at list-order page	
Post-condition	System deletes the chosen order. List-order page will display all orders without order just deleted.	
Step	Actor action	System response
1	Click on Delete link in list-order page to delete specific order	
2		Display dialog to confirm user delete chosen order.
3	Click Yes button on confirm dialog	
4		Delete chosen order and display list order without the order just deleted
Alternative flow	User clicks No button on confirm dialog. This occurs at step 3 of basic flow	
Actor	The same as basic flow	
Pre-condition	The same as basic flow	
Post-condition	User cannot delete chosen order. Confirm dialog is closed.	
Step	Actor action	System response
3.1	Click No button on confirm dialog	
4.1		Confirm dialog is closed and chosen order not deleted.

Table 3.26 Delete existing order use-case

3.2.2.27 View report use-case

Use-case	View report	
Description	This use-case allows admin to view report	
Basic flow	View report successfully	
Actor	Admin	
Pre-condition	Admin logins successfully	
Post-condition	Report page is displayed	
Step	Actor action	System response
1	Click on Aep-Thesis link at menu	
2		Get data from database, navigate to home page which display report

Table 3.27 View report use-case

3.2.2.28 View cart analysis use-case

Use-case	View cart analysis	
Description	This use-case allows admin to view cart analysis	
Basic flow	View cart analysis successfully	
Actor	Admin	
Pre-condition	Admin logins successfully	
Post-condition	Cart Analysis page is displayed	
Step	Actor action	System response
1	Click on Cart Analysis link at menu	
2		Get data from database, navigate to cart analysis page which display report

Table 3.28 View cart analysis use-case

3.2.3 Sequence Diagram

3.2.3.1 Login sequence diagram

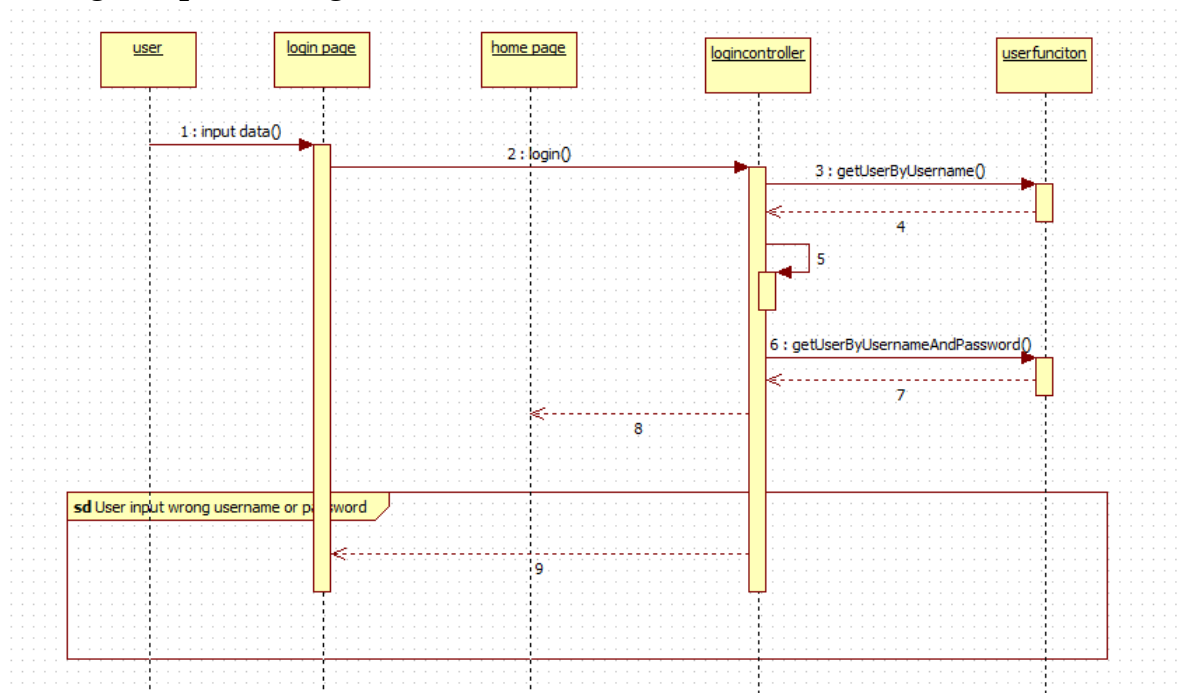


Figure 3.10 Login sequence diagram

3.2.3.2 Logout sequence diagram

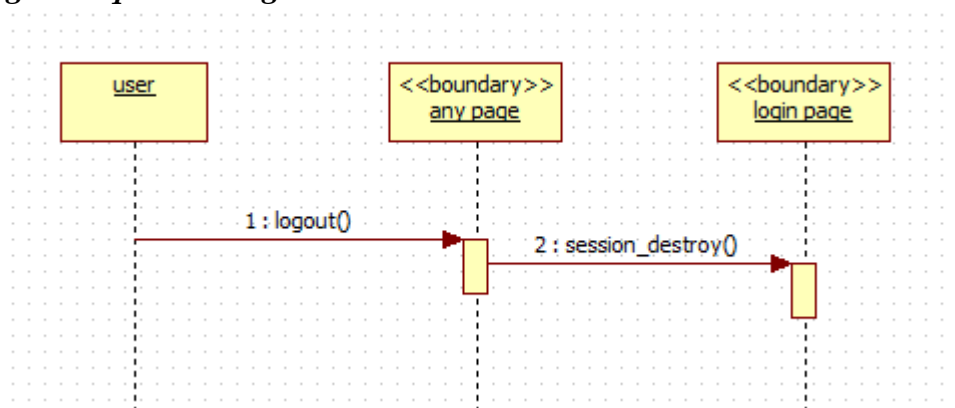


Figure 3.11 Logout sequence diagram

3.2.3.3 List customers sequence diagram

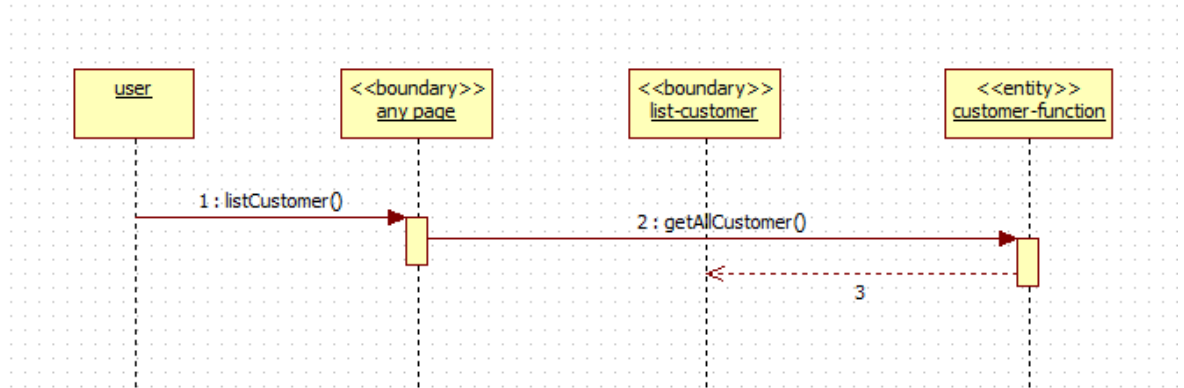


Figure 3.12 List customer sequence diagram

3.2.3.4 Add customer sequence diagram

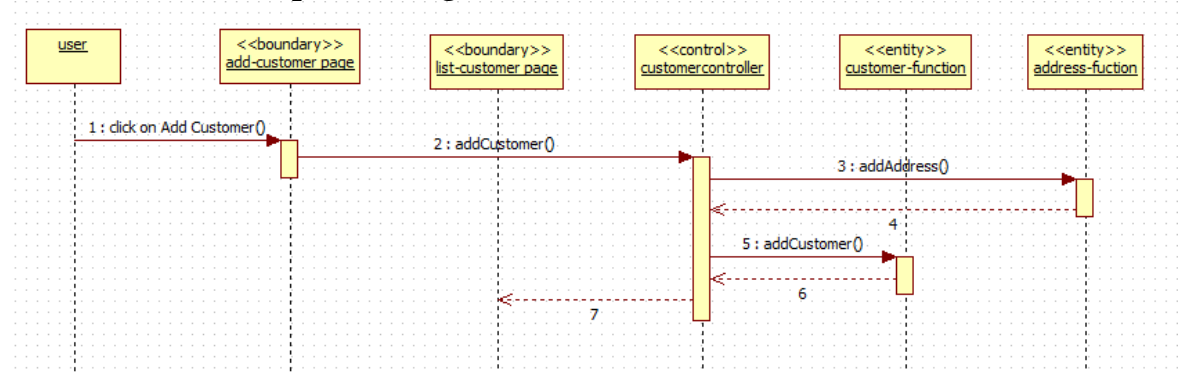


Figure 3.13 Add customer sequence diagram

3.2.3.5 Edit customer sequence diagram

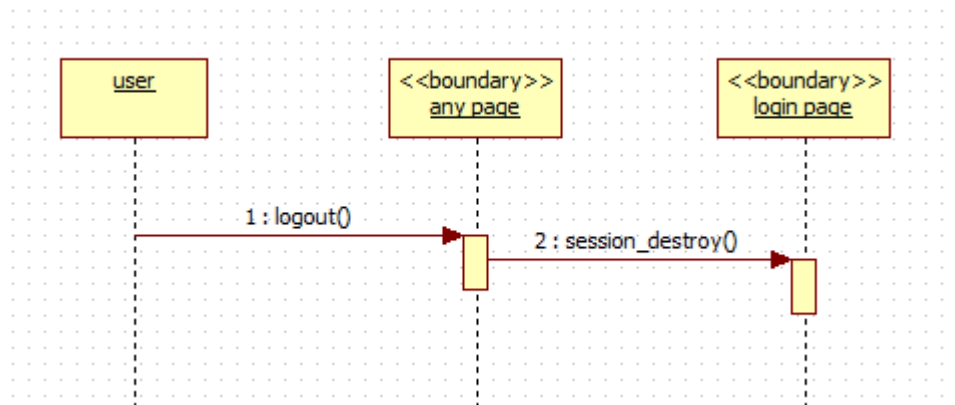


Figure 3.14 Edit customer sequence diagram

3.2.3.6 Delete customer sequence diagram

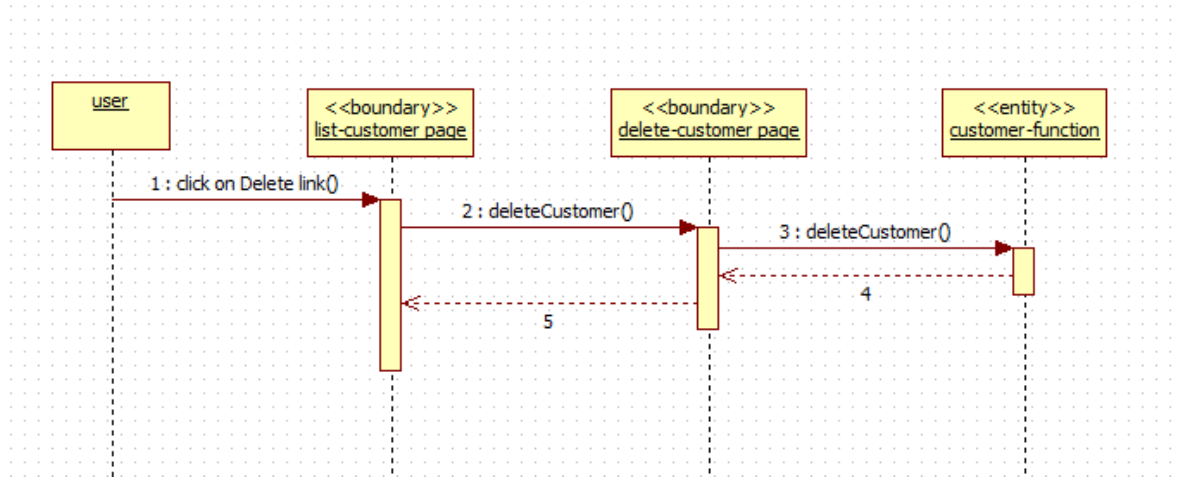


Figure 3.15 Delete customer sequence diagram

3.2.3.7 List cases sequence diagram

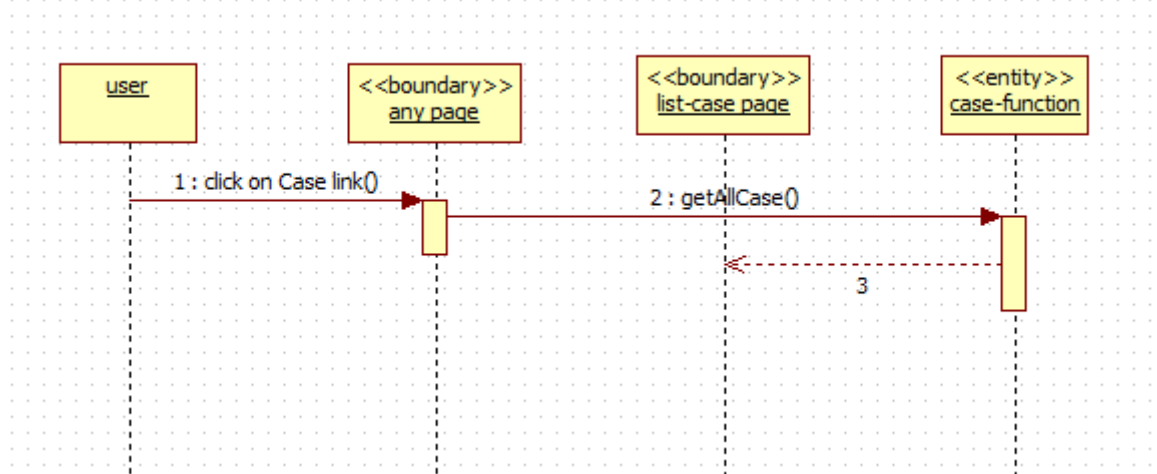


Figure 3.16 List case sequence diagram

3.2.3.8 Add case sequence diagram

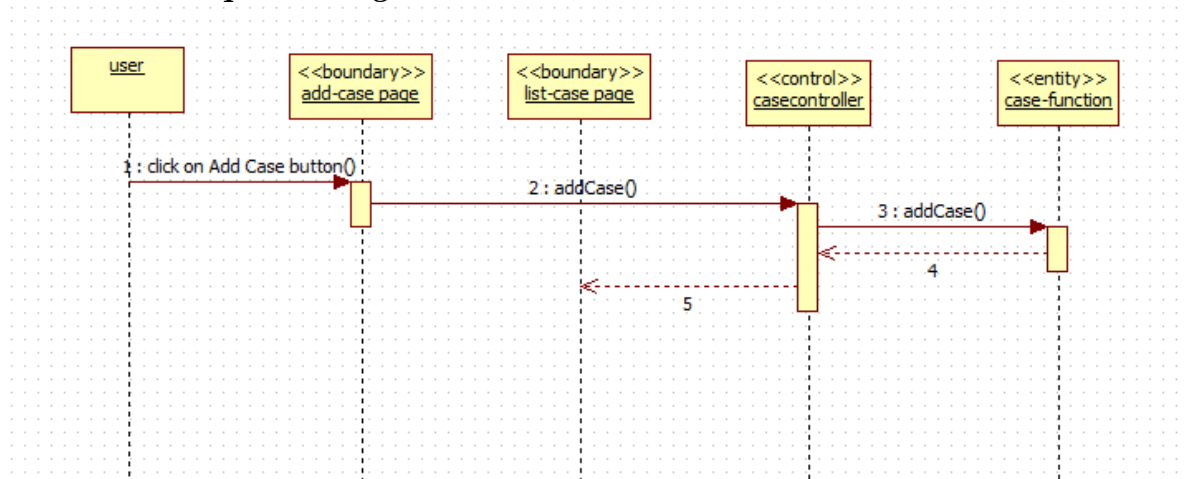


Figure 3.17 Add case sequence diagram

3.2.3.9 Edit case sequence diagram

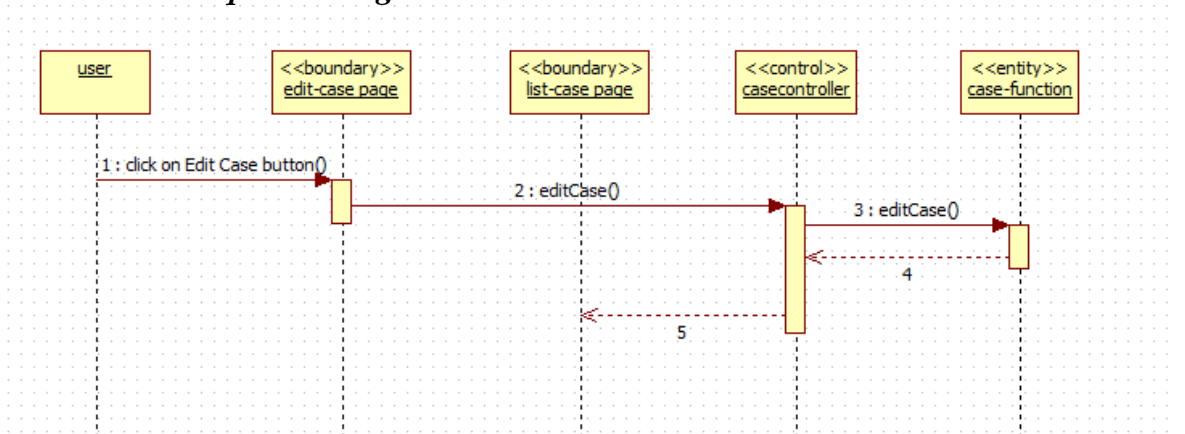


Figure 3.18 Edit case sequence diagram

3.2.3.10 Delete case sequence diagram

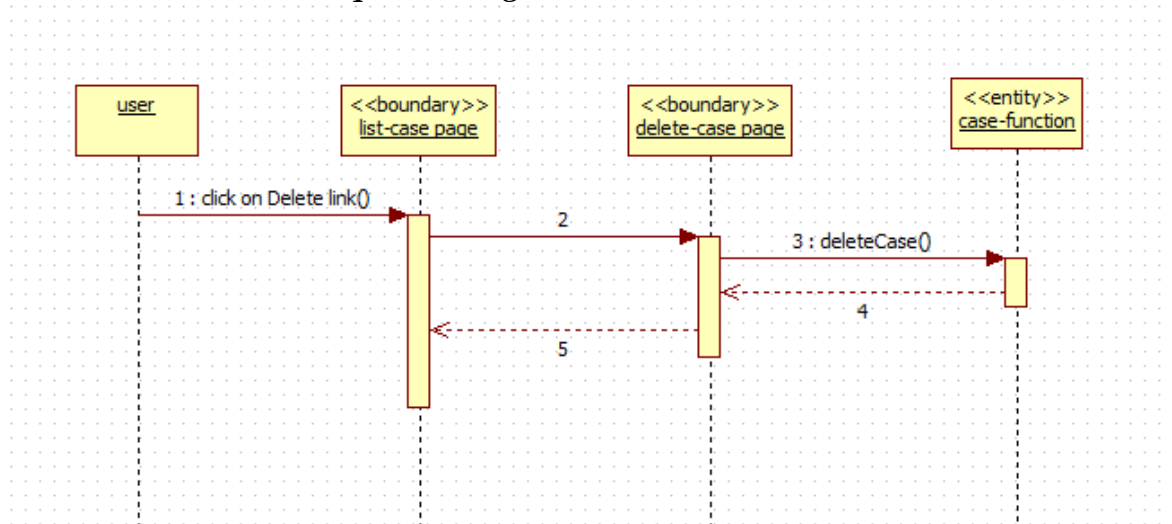


Figure 3.19 Delete case sequence diagram

3.2.3.11 List categories sequence diagram

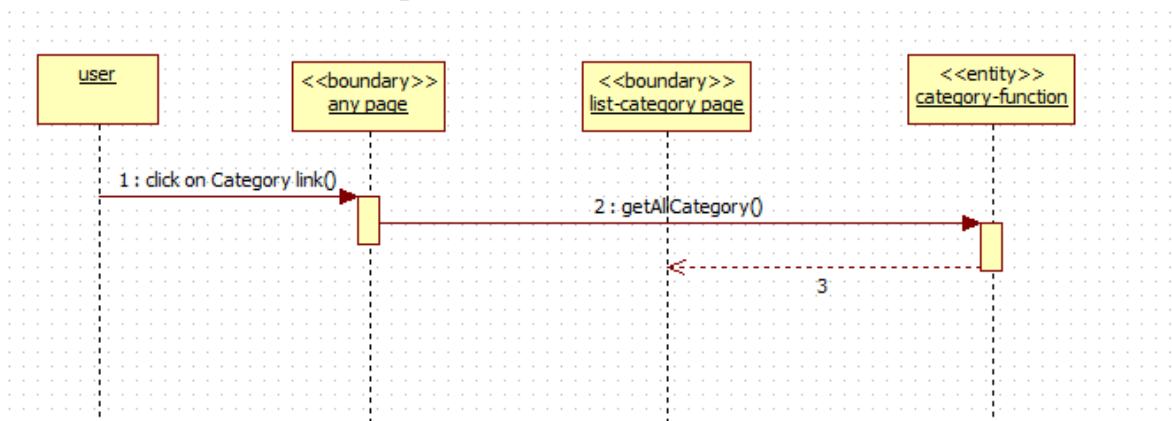


Figure 3.20 List category sequence diagram

3.2.3.12 Add category sequence diagram

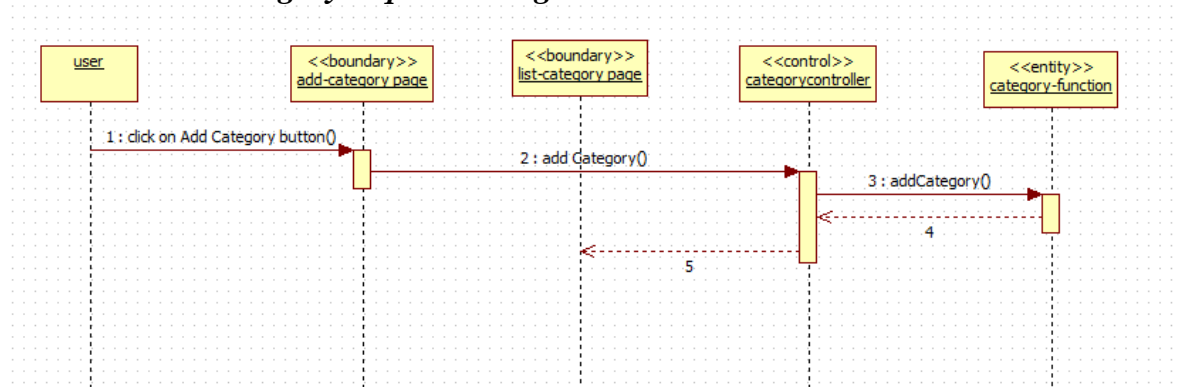


Figure 3.21 Add category sequence diagram

3.2.3.13 Edit category sequence diagram

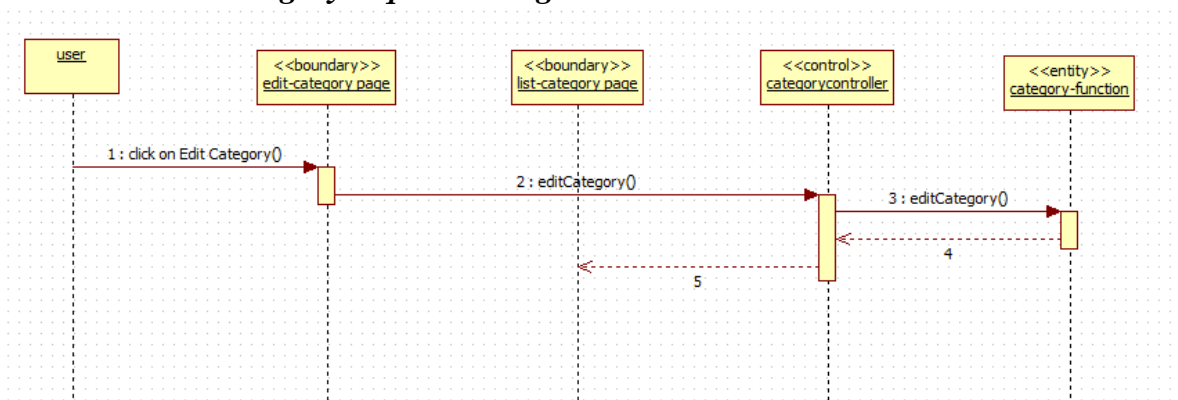


Figure 3.22 Edit category sequence diagram

3.2.3.14 Delete category sequence diagram

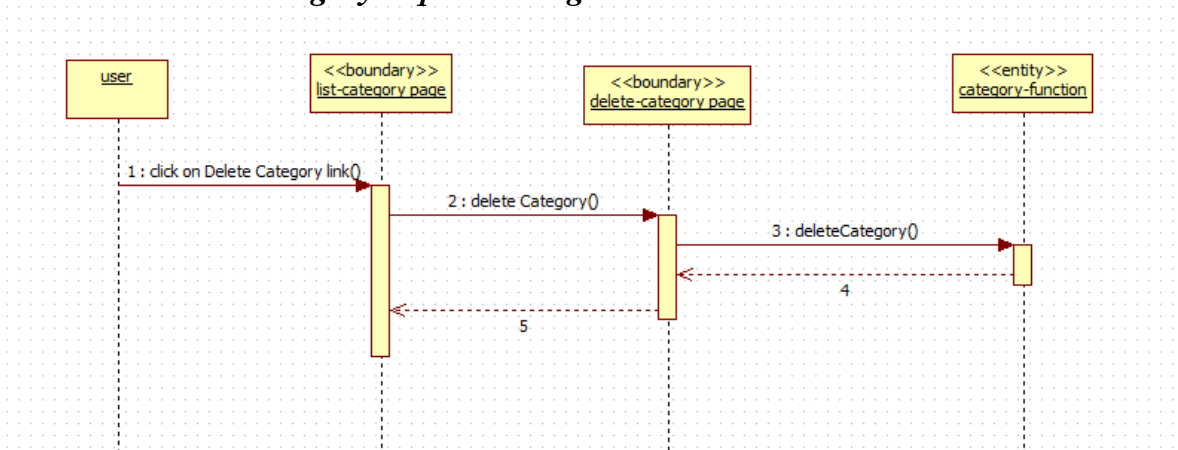


Figure 3.23 Delete category sequence diagram

3.2.3.15 List subcategories sequence diagram

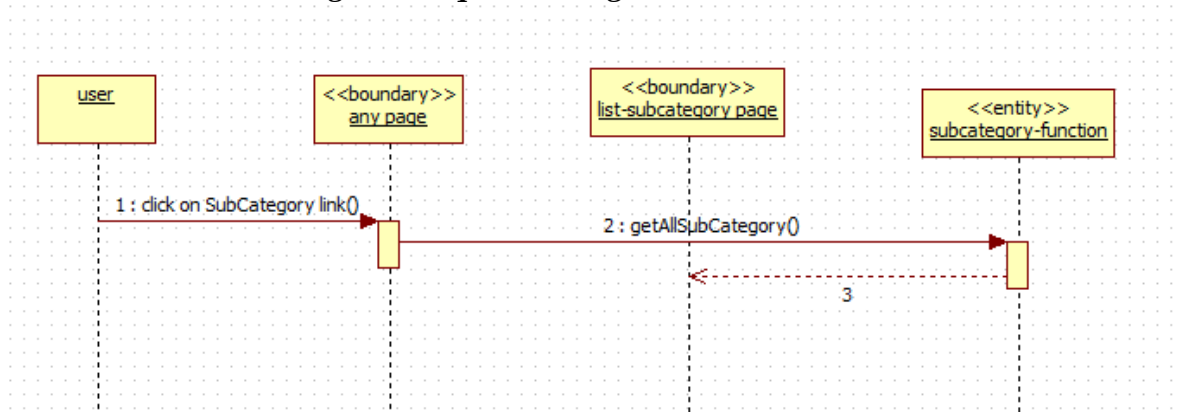


Figure 3.24 List subcategory sequence diagram

3.2.3.16 Add subcategory sequence diagram

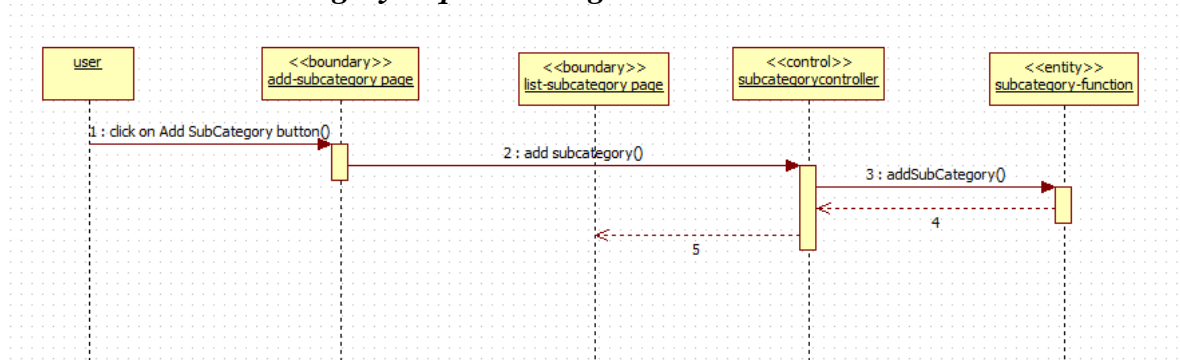


Figure 3.25 Add subcategory sequence diagram

3.2.3.17 Edit subcategory sequence diagram

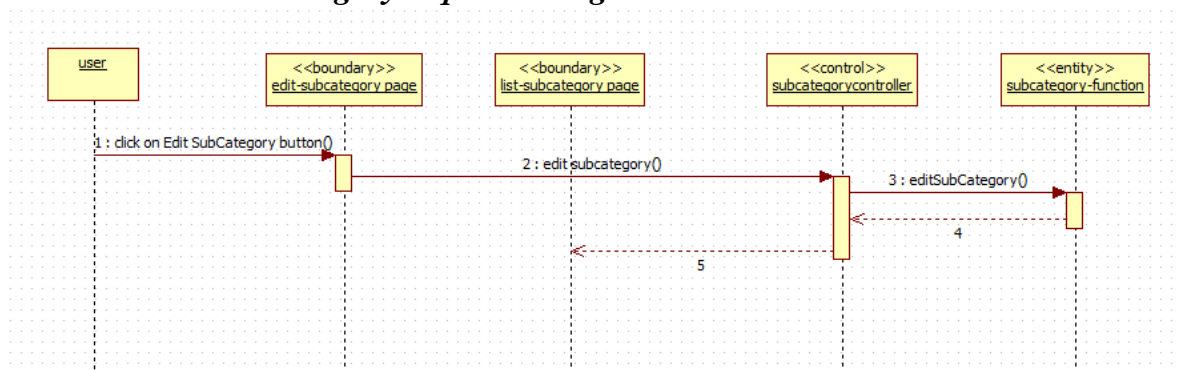


Figure 3.26 Edit subcategory sequence diagram

3.2.3.18 Delete subcategory sequence diagram

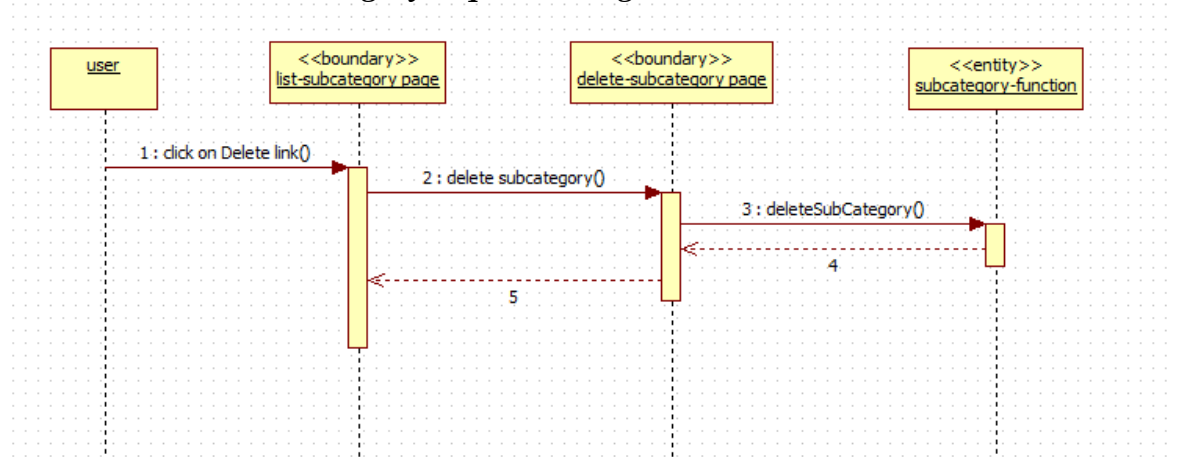


Figure 3.27 Delete subcategory sequence diagram

3.2.3.19 List products sequence diagram

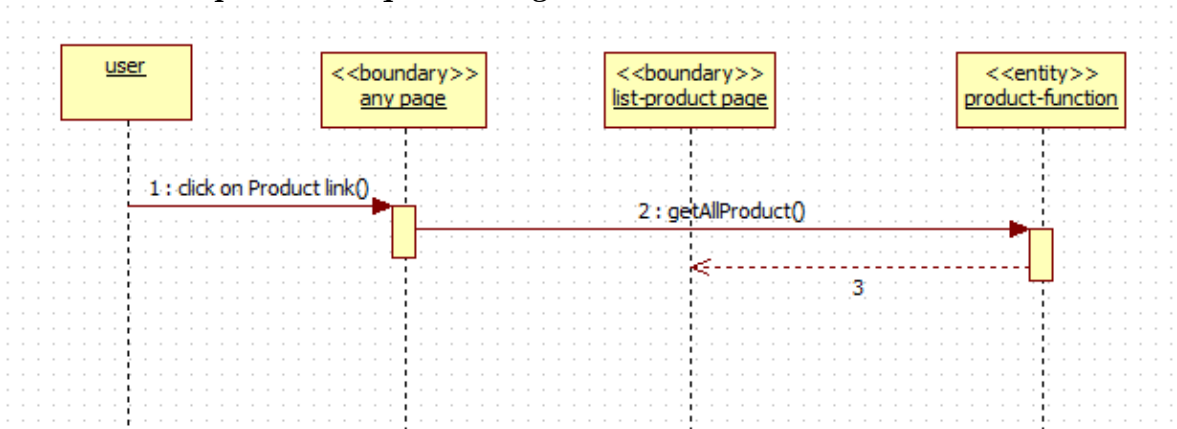


Figure 3.28 List product sequence diagram

3.2.3.20 Add product sequence diagram

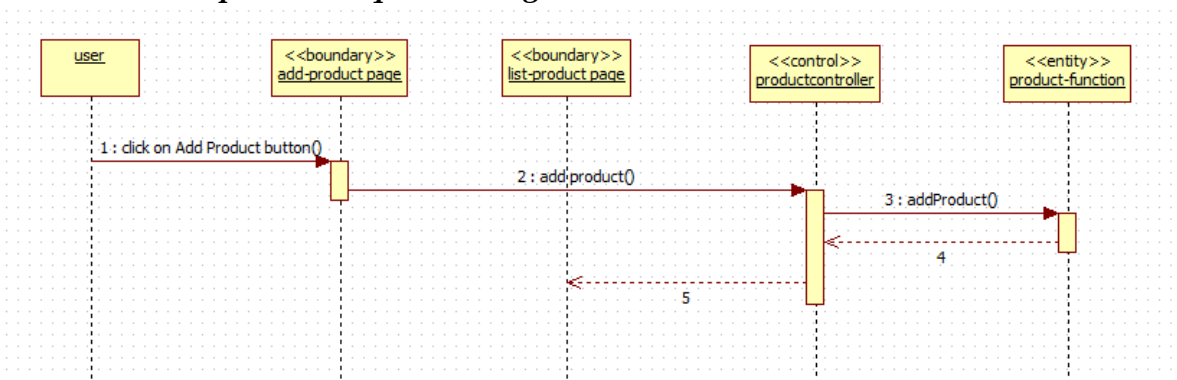


Figure 3.29 Add product sequence diagram

3.2.3.21 Edit product sequence diagram

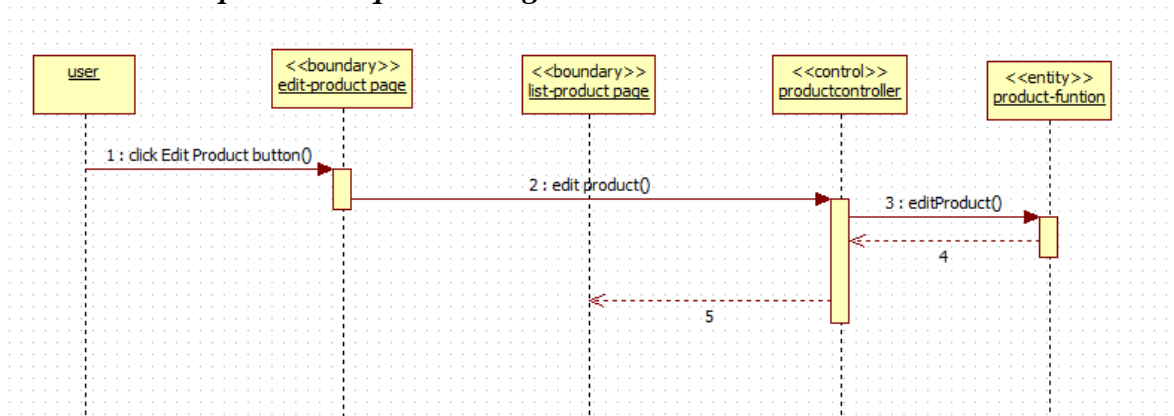


Figure 3.30 Edit product sequence diagram

3.2.3.22 Delete product sequence diagram

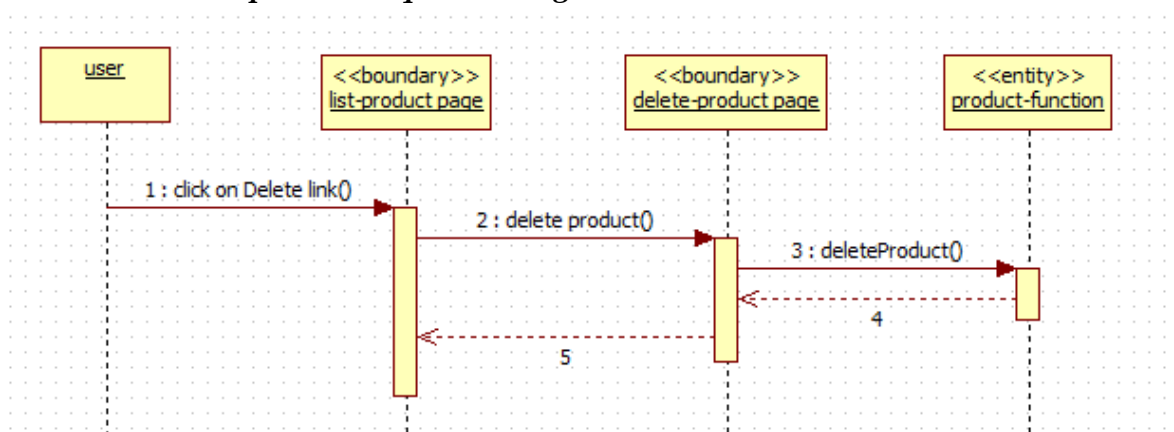


Figure 3.31 Delete product sequence diagram

3.2.3.23 List orders sequence diagram

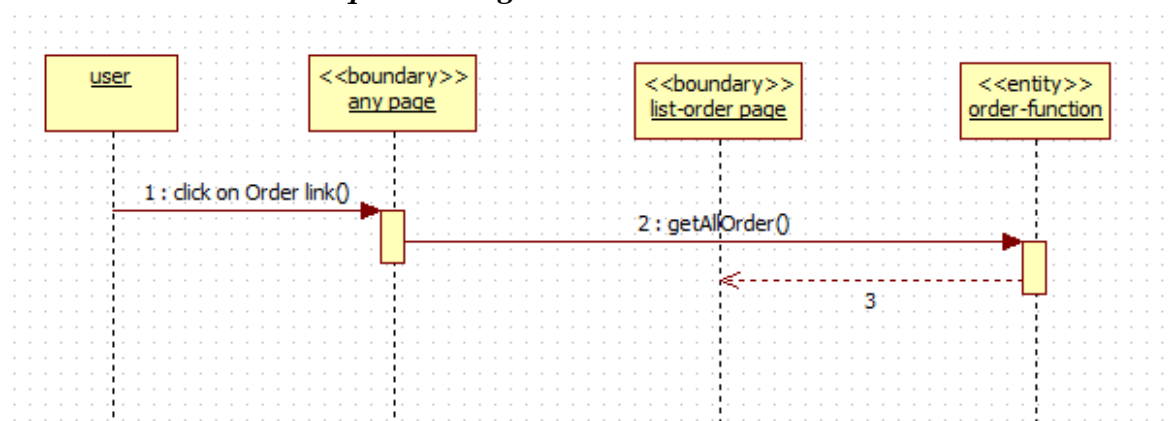


Figure 3.32 List order sequence diagram

3.2.3.24 Add order sequence diagram

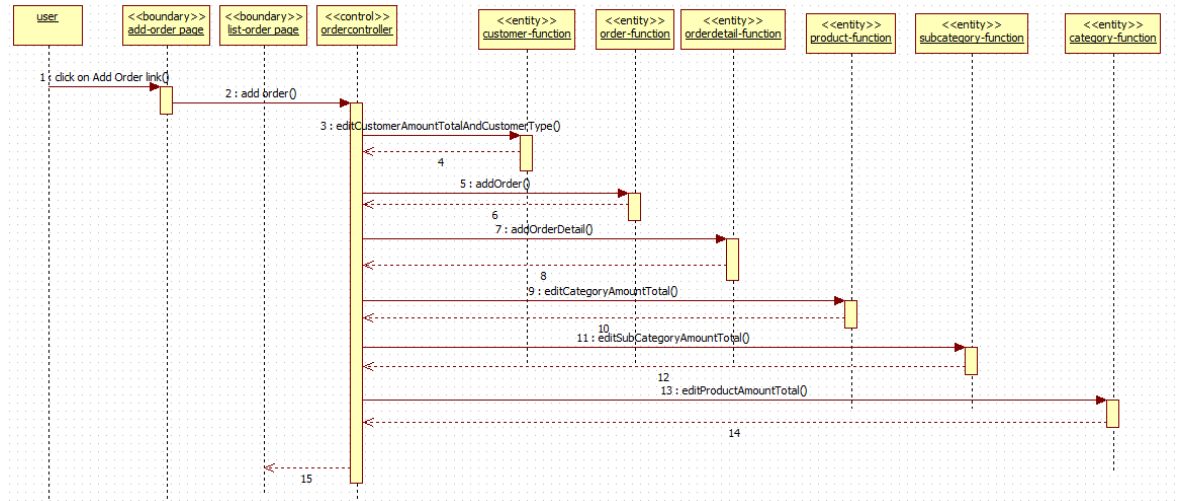


Figure 3.33 Add order sequence diagram

3.2.3.25 View order sequence diagram

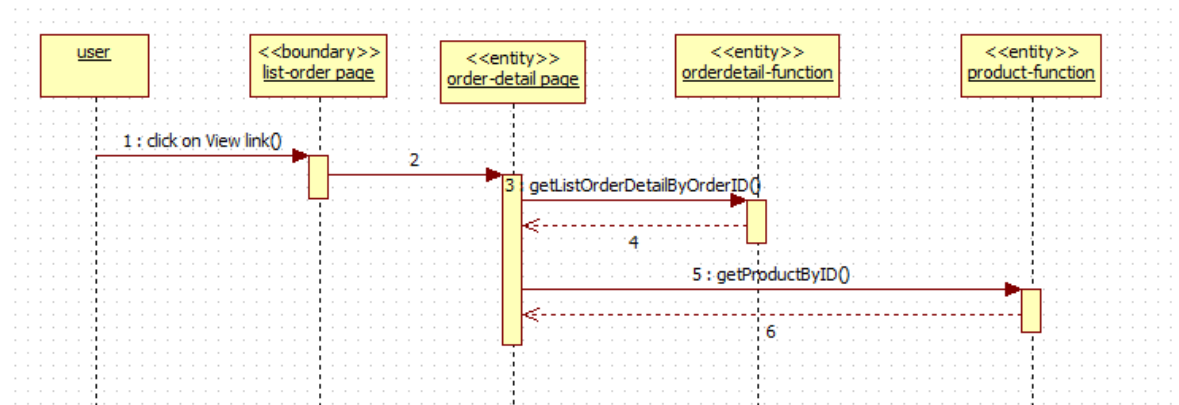


Figure 3.34 View order sequence diagram

3.2.3.26 Delete order sequence diagram

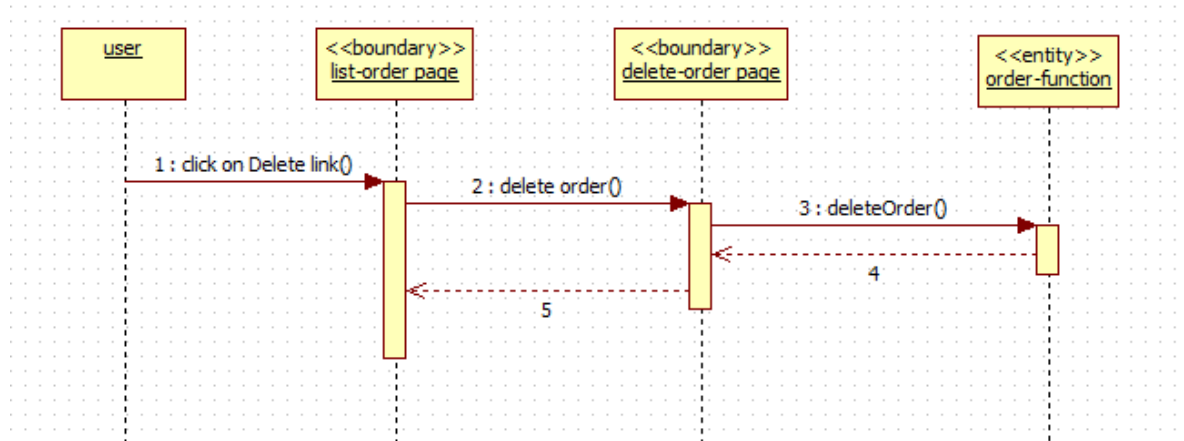


Figure 3.35 Delete order sequence diagram

3.2.3.27 View report sequence diagram

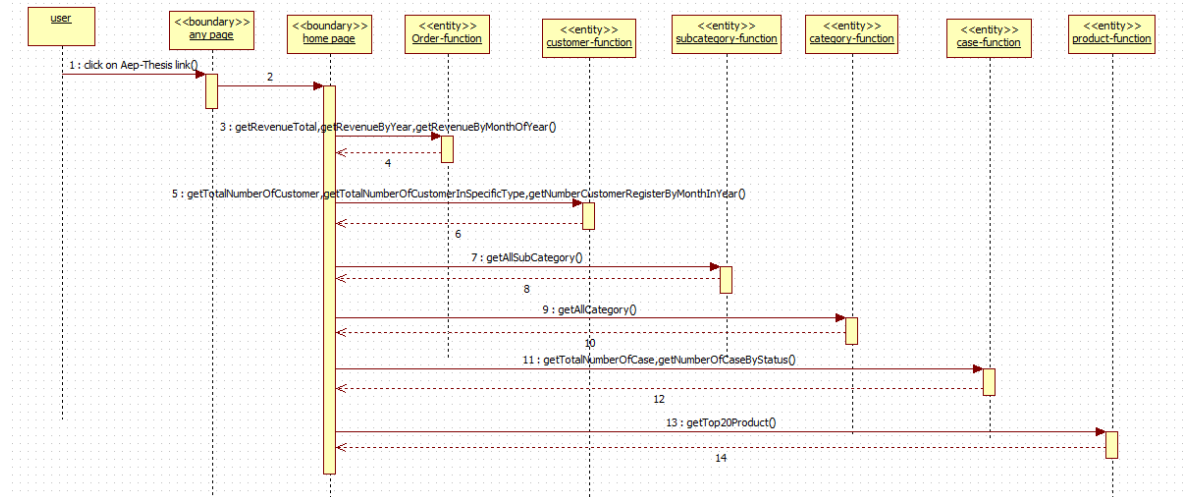


Figure 3.36 View report sequence diagram

3.2.3.28 View cart analysis sequence diagram

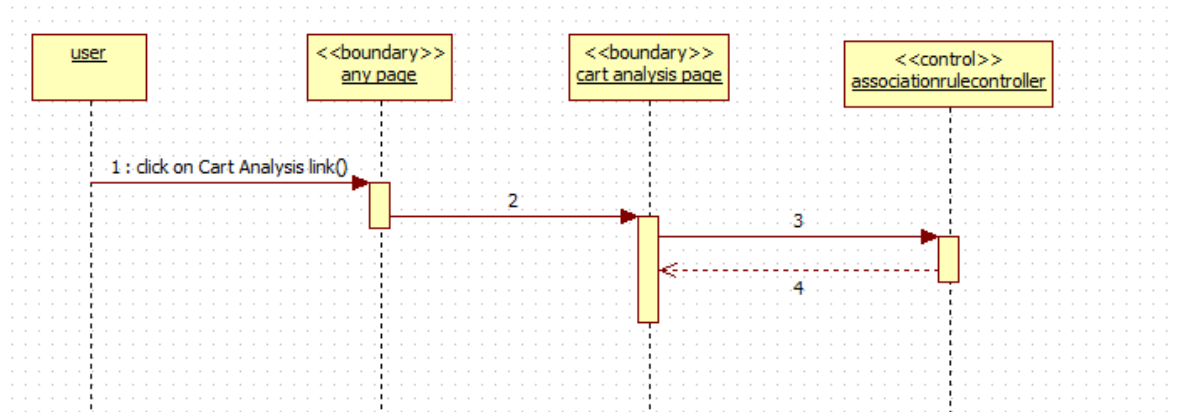


Figure 3.37 View cart analysis sequence diagram

3.3 Design System

3.3.1 System Structure

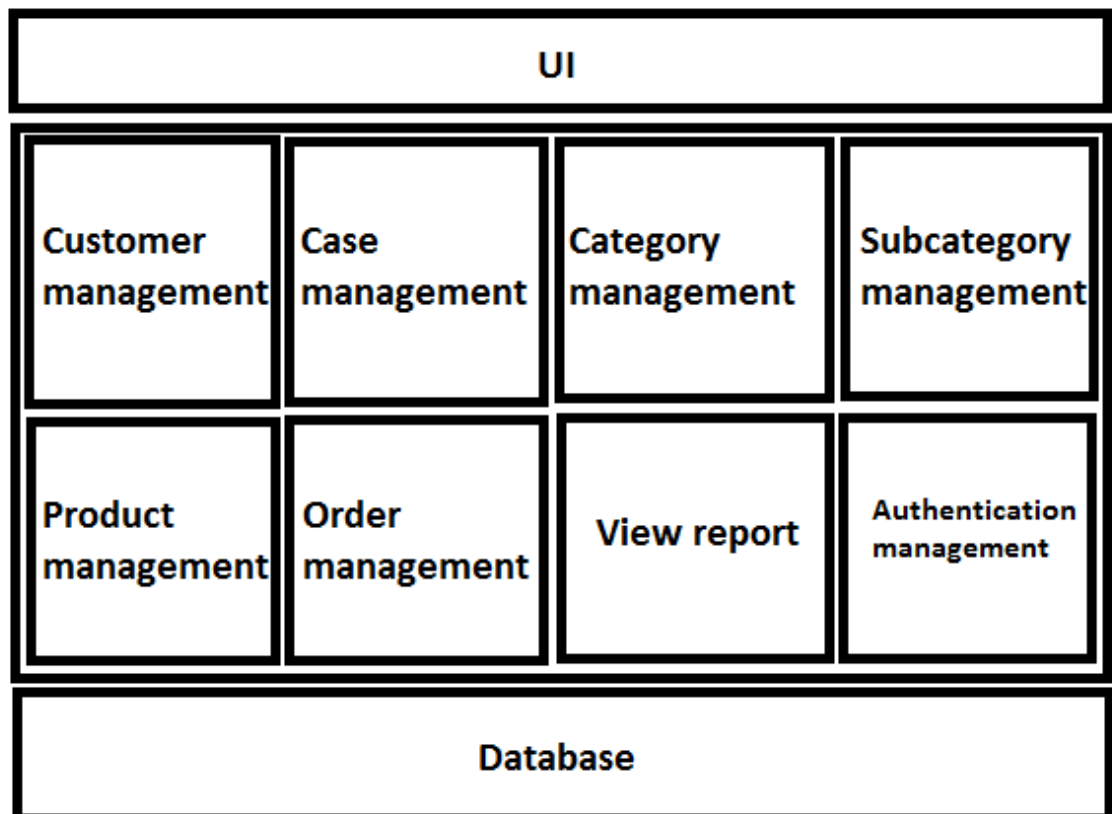


Figure 3.38 System structure

Description: the system structure has three layers

UI layer: display view to user

Business layer: has eight groups main module, such as customer management module, case management module, category management module, subcategory management module, product management module, order management module, view report module, authentication management module.

Database layer: access to database to manage data include add and get data.

Go to detail:

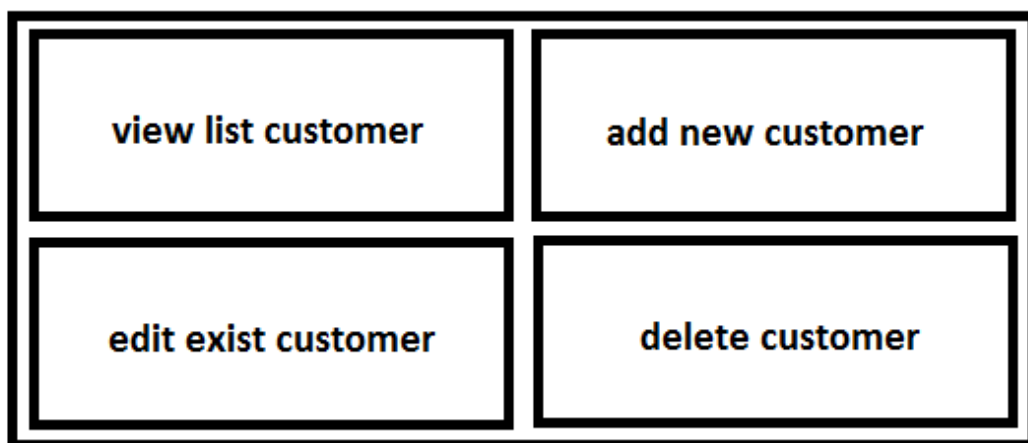


Figure 3.39 Customer management module



Figure 3.40 Case management module

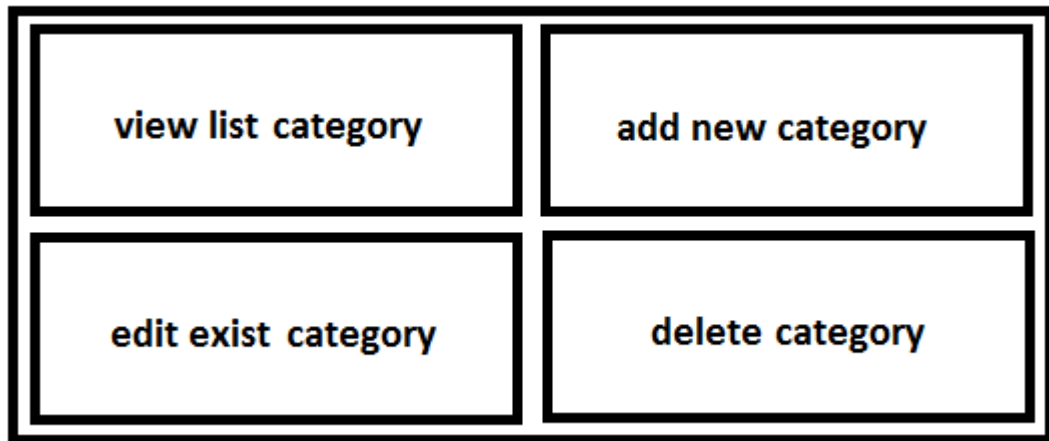


Figure 3.41 Category management module

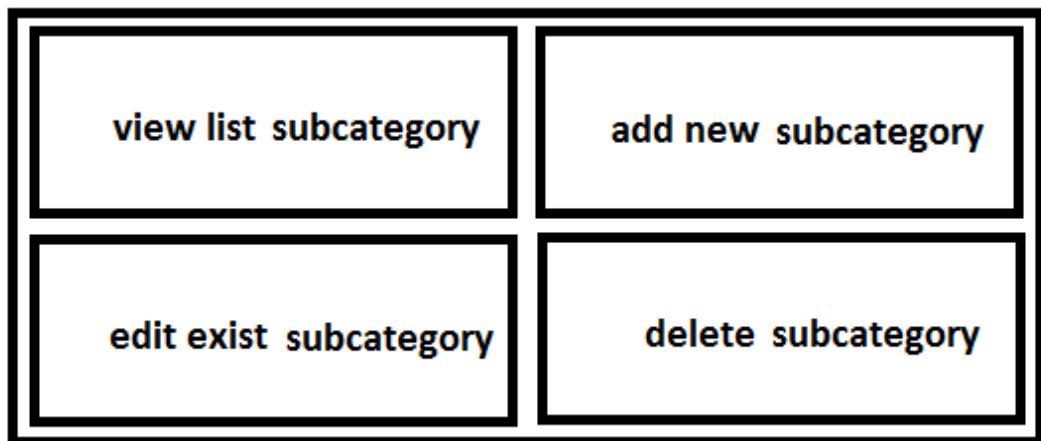


Figure 3.42 Subcategory management module

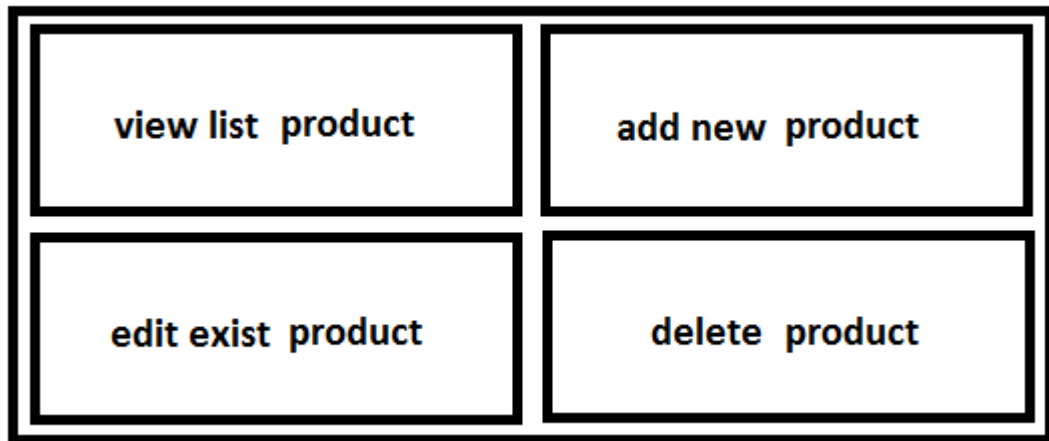


Figure 3.43 Product management module

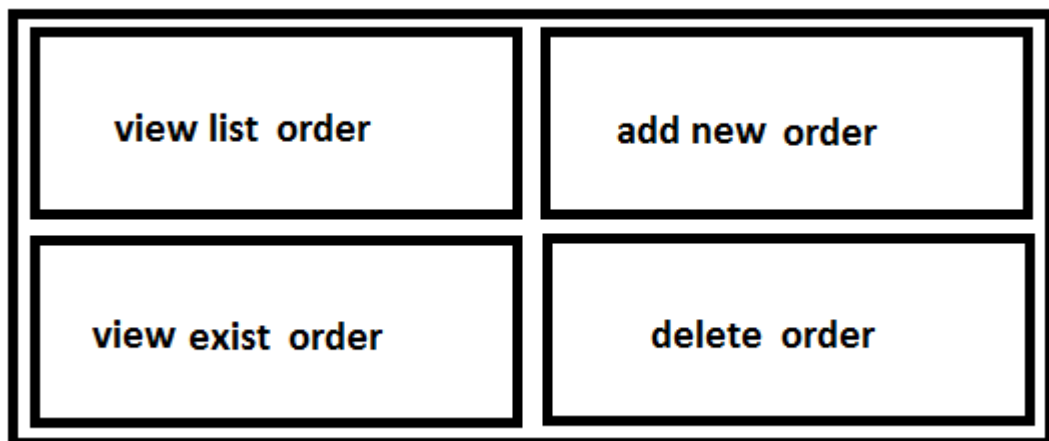


Figure 3.44 Order management module

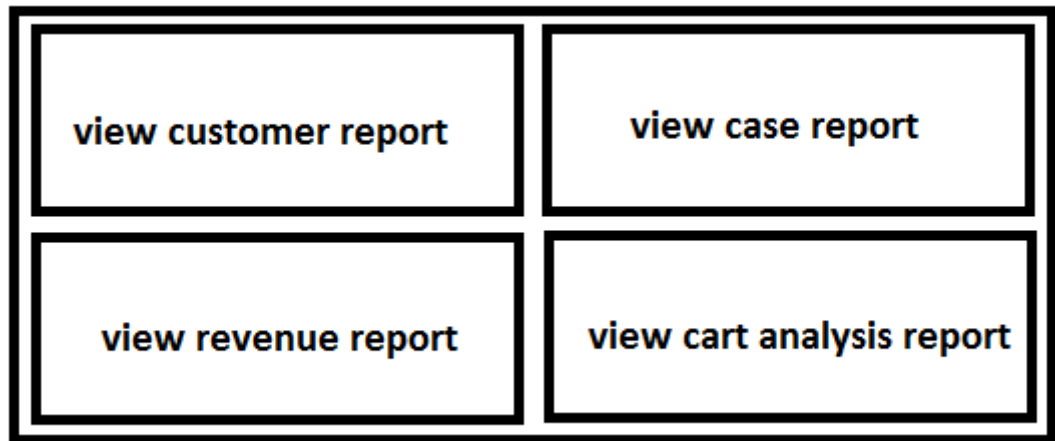


Figure 3.45 Report management module

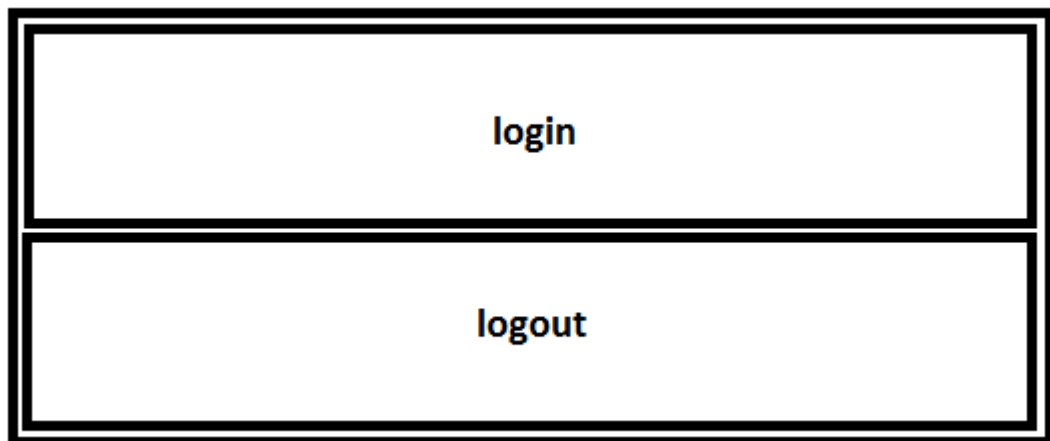


Figure 3.46 Authentication management module

3.3.2 Design Database

3.3.2.1 Database diagram

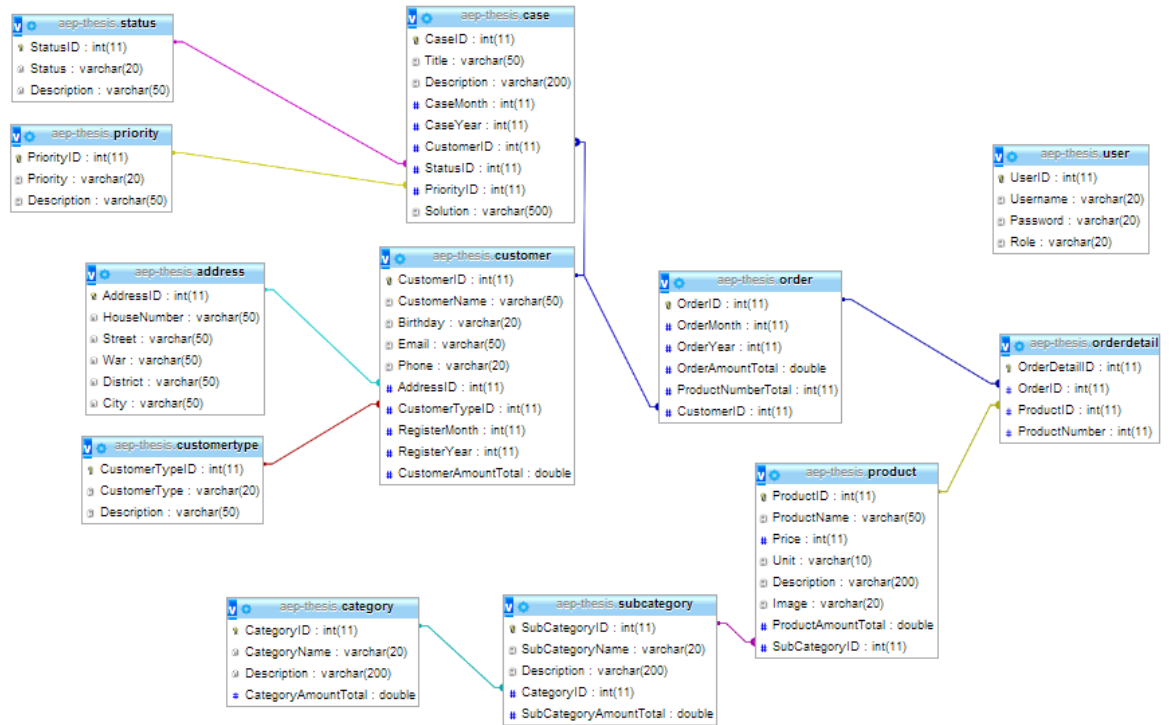


Figure 3.47 Database diagram

3.3.2.2 Description of tables

3.3.2.2.1 Category table

Name	Type	Size	Null	Key
CategoryID	Int	11	NOT NULL	PRIMARY KEY
CategoryName	Varchar	20	NOT NULL	
Description	Varchar	200	Default null	
CategoryAmountTotal	Double		Default 0	

Table 3.29 Category table

Description:

CategoryID: Identification of category, auto-increment

CategoryName: name of category

Description: Description of category

CategoryAmountTotal: total amount of category

3.3.2.2.2 *SubCategory table*

Name	Type	Size	Null	Key
SubCategoryID	Int	11	NOT NULL	PRIMARY KEY
SubCategoryName	Varchar	20	NOT NULL	
Description	Varchar	200	Default null	
CategoryID	Int	11	NOT NULL	FOREIGN KEY
SubCategoryAmountTotal	double		Default 0	

Table 3.30 SubCategory table

Description:

SubcategoryID: Identification of subcategory, auto-increment, primary key

SubcategoryName: Name of subcategory

Description: Description of subcategory

CategoryID: id of Category, foreign key reference to CategoryID field of Category table

SubcategoryAmountTotal: Total amount of subcategory

3.3.2.2.3 *Product table*

Name	Type	Size	Null	Key
ProductID	Int	11	NOT NULL	PRIMARY KEY
ProductName	Varchar	50	NOT NULL	
Price	Int	11	NOT NULL	
Unit	Varchar	10	NOT NULL	
Description	Varchar	200	Default null	
Image	Varchar	20	Default null	
ProductAmountTotal	Double		Default 0	
SubCategoryID	Int	11	NOT NULL	FOREIGN KEY

Table 3.31 Product table

Description:

ProductID: Identification of Product, auto-increment, primary key

ProductName: Name of product

Price: Price of product

Unit: Unit of product

Description: Description of product

Image: image of product

ProductAmountTotal: total amount of product.

SubCategoryID: Identification of subcategory, foreign key reference to SubCategoryID field of Subcategory table

3.3.2.2.4 *Address table*

Name	Type	Size	Null	Key
AddressID	Int	11	NOT NULL	PRIMARY KEY
HouseNumber	Varchar	50	NOT NULL	
Street	Varchar	50	NOT NULL	
Ward	Varchar	50	Not null	
District	Varchar	50	Not null	
City	Varchar	50	Not null	

Table 3.32 Address table

Description:

AddressID: identification of address, auto-increment, primary key

HouseNumber: number of house

Street: name of street

Ward: name of ward

District: name of district

City: name of city

3.3.2.2.5 *CustomerType table*

Name	Type	Size	Null	Key
CustomerTypeID	Int	11	NOT NULL	PRIMARY KEY
CustomerType	Varchar	20	NOT NULL	
Description	Varchar	50		

Table 3.33 CustomerType table

Description:

CustomerTypeID: Identification of customer type, auto-increment, primary key

CustomerType: name of customer type, with four values:

- Bronze: if customer amount total < 500000VND
- Silver: if customer amount total > 500000VND and < 1000000VND
- Gold: if customer amount total > 1000000VND and < 5000000VND
- Diamond: if customer amount total > 5000000VND

Description: Description of customer type

3.3.2.2.6 Customer table

Name	Type	Size	Null	Key
CustomerID	Int	11	NOT NULL	PRIMARY KEY
CustomerName	Varchar	50	NOT NULL	
Birthday	Varchar	20	NOT NULL	
Email	Varchar	20	NOT NULL	
Phone	Varchar	20	NOT NULL	
AddressID	Int	11	NOT NULL	FOREIGN KEY
CustomerTypeID	Int	11	NOT NULL	FOREIGN KEY
RegisterMonth	Int	11	NOT NULL	
RegisterYear	Int	11	NOT NULL	
CustomerAmountTotal	Double			

Table 3.34 Customer table

Description:

CustomerID: Identification of customer, auto-increment, primary key

CustomerName: Name of customer

Birthday: Date of birth of customer.

Email: Email of customer.

Phone: phone number of customer

AddressID: Identification of address, foreign key reference to AddressID field of Address table

CustomerTypeID: identification of Customer Type, foreign key reference to CustomerTypeID field of CustomerType table

RegisterMonth: Month of registration

RegisterYear: Year of registration

CustomerAmountTotal: Total amount of customer.

3.3.2.2.7 *Priority table*

Name	Type	Size	Null	Key
PriorityID	Int	11	NOT NULL	PRIMARY KEY
Priority	Varchar	20	NOT NULL	
Description	Varchar	50	Default null	

Table 3.35 Priority table

Description:

PriorityID: identification of priority, auto-increment, primary key

Priority: name of priority, with three values:

- Low: the low priority of case
- Medium: the medium priority of case
- High: the high priority of case

Description: Description of priority.

3.3.2.2.8 *Status table*

Name	Type	Size	Null	Key
StatusID	Int	11	NOT NULL	PRIMARY KEY
Status	Varchar	20	NOT NULL	
Description	Varchar	50	Default null	

Table 3.36 Status table

Description:

StatusID: identification of status.

Status: Name of status, with three values:

- New: default when create new case

- In progress: when the case is in processing
- Done: when the case is finish

Description: Description of status.

3.3.2.2.9 *Case table*

Name	Type	Size	Null	Key
CaseID	Int	11	NOT NULL	PRIMARY KEY
Title	Varchar	50	NOT NULL	
Description	Varchar	200	NOT NULL	
CaseMonth	Int	11	NOT NULL	
CaseYear	Int	11	NOT NULL	
CustomerID	Int	11	NOT NULL	FOREIGN KEY
StatusID	Int	11	NOT NULL	FOREIGN KEY
PriorityID	Int	11	NOT NULL Default 1	FOREIGN KEY
Solution	Varchar	500	Default null	

Table 3.37 Case table

Description:

CaseID: Identification of case, auto-increment, primary key

Title: Title of case.

Description: Description of case

CaseMonth: month of case occur

CaseYear: year of case occur

CustomerID: Identification of Customer, foreign key reference to CustomerID field of Customer table

StatusID: Identification of Status, foreign key reference to StatusID field of Status table

PriorityID: Identification of Priority, foreign key reference to PriorityID field of Priority table

Solution: Solution of the case.

3.3.2.2.10 *Order table*

Name	Type	Size	Null	Key
OrderID	Int	11	NOT NULL	PRIMARY KEY
OrderMonth	Int	11	NOT NULL	
OrderYear	Int	11	NOT NULL	
OrderAmountTotal	Double		NOT NULL Default 0	
ProductNumberTotal	Int	11	NOT NULL Default 0	
CustomerID	Int	11	NOT NULL	FOREIGN KEY

Table 3.38 Order table

Description:

OrderID: Identification of order, auto-increment, primary key

OrderMonth: Month of order

OrderYear: year of Order

OrderAmountTotal: Total Amount of Order

ProductNumberTotal: Total number of Product

CustomerID: Identification of Customer, foreign key reference to CustomerID field of Customer table

3.3.2.2.11 *OrderDetail table*

Name	Type	Size	Null	Key
OrderDetailID	Int	11	NOT NULL	PRIMARY KEY
OrderID	Int	11	NOT NULL	FOREIGN KEY
ProductID	Int	11	NOT NULL	FOREIGN KEY
ProductNumber	Int	11	NOT NULL Default 0	

Table 3.39 OrderDetail table

Description:

OrderDetailID: Identification of OrderDetail, auto-increment, primary key

OrderID: Identification of Order, foreign key reference to OrderID field of Order table

ProductID: Identification of Product, foreign key reference to ProductID field of Product table

ProductNumber: Number of product that order

3.3.2.2.12

User table

Name	Type	Size	Null	Key
UserID	Int	11	NOT NULL	PRIMARY KEY
Username	Varchar	20	NOT NULL	
Password	Varchar	20	NOT NULL	
Role	Varchar	20	NOT NULL	

Table 3.40 User table

Description:

UserID: Identification of user, auto-increment, primary key

Username: username of user

Password: Password of user

Role: Role of user, with two values: admin and member

3.3.3 User Interface-Screen

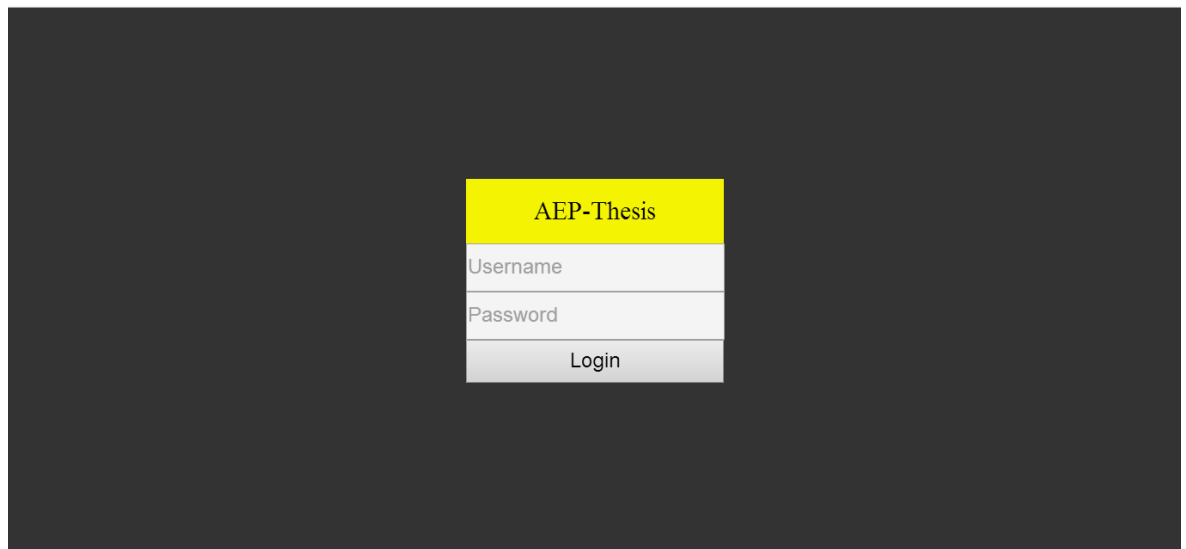


Figure 3.48 Login screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis								Hi, trung. Logout
List Customers															
CustomerID	Category Name	Birthday	Email	Phone	House Number	Street	Ward	District	City	Customer Type	Register Year	Register Month	Customer Amount Total	Add Customer	
1	Bùi Hoài Anh	12/02/1989	buihoaianh@gmail.com	01656485001	12	50A	Tân Tạo	Quận Bình Tân	Hồ Chí Minh	Bronze	2013	1	0	Edit - Delete	
2	Nguyễn Thị Liên	24/12/1976	lien1976@yahoo.com	0122657241	69	4	KCN Tân Tạo	Quận Bình Tân	Hồ Chí Minh	Bronze	2013	1	0	Edit - Delete	
3	Lê Thị Yến Ngọc	08/04/1985	ltyngoc1985@yahoo.com	0909678551	26	C1	Bình Trị Đông	Bình Tân	Hồ Chí Minh	Bronze	2013	1	0	Edit - Delete	
4	Nguyễn Thị Vân	06/08/1982	nguyenthivan@gmail.com	0909782786	601	CMT8	P4	Quận 3	Hồ Chí Minh	Bronze	2013	1	0	Edit - Delete	
5	Nguyễn Thị Diễm My	17/12/1989	diemmy9xx@gmail.com	0162647861	195/2	Tân Trang	Tân Phú	Tân Bình	Hồ Chí Minh	Bronze	2013	1	0	Edit - Delete	
6	Lê Thị Hà	27/02/1982	ltha1982@gmail.com	0902765231	7	Đông Nai	Bắc Hải	Quận 10	Hồ Chí Minh	Bronze	2013	1	0	Edit - Delete	
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Figure 3.49 List customer screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout						
-----------	----------	------	----------	-------------	---------	-------	---------------	-------------------	--	--	--	--	--	--

*: required value

Customer Name*

Birthday

Email*

Phone*

House Number*

Street*

Ward*

District*

City*

Register Year*

Register Month*

Add Customer

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---	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Figure 3.50 Add new customer screen

AEP-Theis

Customer

Case

Category

SubCategory

Product

Order

Cart Analysis

Hi, trung. [Logout](#)

Customer Name*

Bùi Hoài Anh

Birthday

12/02/1989

Email*

buihoaianh@gmail.com

Phone*

01656485001

House Number*

12

Street*

50A

Ward*

Tân Tạo

District*

Quận Bình Tân

City*

Hồ Chí Minh

Register Year*

2013

Register Month*

January

Edit Customer

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Figure 3.51 Edit existing customer screen

AEP-Theis Customer Case Category SubCategory Product Order Cart Analysis Hi, trung. Logout										
List Cases										
CaseID	Title	Description	Case Year	Case Month	Customer Name	Status	Priority	Solution	Add Case	
1	Bếp điện từ bị hư	Bếp điện từ SANKO SPN7511 B2000W bị hư sau khi mua 2 ngày	2013	1	Bùi Hoài Anh	New	Low		Edit - Delete	

Figure 3.52 List case screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
*: required value								
Title*			<input type="text"/>					
Description			<input type="text"/>					
Customer Name*			<input type="text"/>					
Case Year*			<input type="text" value="2013"/>					
Case Month*			<input type="text" value="January"/>					
Priority*			<input type="text"/>					
<input type="button" value="Add Case"/>								

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Figure 3.53 Add new case screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
*: required value								
Title*			<input type="text" value="Bếp điện từ bị hư"/>					
Description			<input type="text" value="Bếp điện từ SANKO SPN7511 B2000W bị hư sau khi mua 2 ngày"/>					
Status			<input type="text" value="In progress"/>					
Solution			<input type="text"/>					
Case Month			<input type="text" value="January"/>					
Case Year			<input type="text" value="2013"/>					
Customer Name			<input type="text" value="Bùi Hoài Anh"/>					
Priority			<input type="text" value="Low"/>					
<input type="button" value="Edit Case"/>								

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Figure 3.54 Edit status of existing case screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
List Categories								
CategoryID	Category Name		Description		Add Category			
1	Đồ Dùng		đồ dùng		Edit - Delete			
2	Hóa Phẩm		hóa phẩm		Edit - Delete			
3	May Mặc		may mặc		Edit - Delete			
4	Thực Phẩm Tươi Sống		thực phẩm tươi sống		Edit - Delete			
5	Thực Phẩm Công Nghệ		thực phẩm công nghệ		Edit - Delete			

Figure 3.55 List category screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
-----------	----------	------	----------	-------------	---------	-------	---------------	-----------------------------------

Category Name*

Description

*: required value

Add Category

Figure 3.56 Add new category screen

AEP-Theis

Customer

Case

Category

SubCategory

Product

Order

Cart Analysis

Hi, trung. [Logout](#)

Category Name*

Đồ Dùng

đồ dùng

Description

Edit Category

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Figure 3.57 Edit existing category screen

SubCategory ID	Category Name	SubCategory Name	Description	Add SubCategory
1	Đồ Dùng	Dụng Cụ Vệ Sinh	dụng cụ vệ sinh	Edit - Delete
2	Đồ Dùng	Điện Gia Dụng	điện gia dụng	Edit - Delete
3	Đồ Dùng	Đồ Dùng Gia Đình	đồ dùng gia đình	Edit - Delete
4	Hóa Phẩm	Baby	baby	Edit - Delete
5	Hóa Phẩm	Hóa Phẩm, Sản Phẩm V	hóa phẩm, sản phẩm vệ sinh	Edit - Delete
6	Hóa Phẩm	Chăm sóc sức khỏe &	chăm sóc sức khỏe & sắc đẹp	Edit - Delete
7	May Mặc	May Mặc Dành Cho Nữ	may mặc dành cho nữ	Edit - Delete
8	May Mặc	May Mặc Dành Cho Nam	may mặc dành cho nam	Edit - Delete
9	May Mặc	Dệt May	dệt may	Edit - Delete
10	Thực Phẩm Tươi Sống	Thực Phẩm Đông Lạnh	thực phẩm đông lạnh	Edit - Delete
11	Thực Phẩm Tươi Sống	Thực Phẩm Chế Biến	thực phẩm chế biến	Edit - Delete

Figure 3.58 List subcategory screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
-----------	----------	------	----------	-------------	---------	-------	---------------	-----------------------------------

SubCategory Name*

Category Name*

Description

*: required value

Add SubCategory

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Figure 3.59 Add new subcategory screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
-----------	----------	------	----------	-------------	---------	-------	---------------	-----------------------------------

SubCategory Name*

Category Name*

Description

*: required value

Edit SubCategory

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Figure 3.60 Edit existing subcategory screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout		
List Products										
ProductID	Category Name	SubCategory Name	Product Name			Price(VND)	Unit	Image	Description	Add Product
1	Đồ Dùng	Dụng Cụ Vệ Sinh	Bộ lau nhà 360 độ OMBO-07			169000	Bộ			Edit - Delete
2	Đồ Dùng	Dụng Cụ Vệ Sinh	Cây lau nhà cán inox HI-2051			69000	Cây			Edit - Delete
3	Đồ Dùng	Dụng Cụ Vệ Sinh	Túi rác cuộn FY không lõi đồ 43x56cm			34800	Bịch			Edit - Delete
4	Đồ Dùng	Dụng Cụ Vệ Sinh	Cây lau nhà tròn inox Jiading 2119			79000	Cây			Edit - Delete
5	Đồ Dùng	Dụng Cụ Vệ Sinh	Chổi quét nhà nhựa PEACOOK 9909			34200	Cây			Edit - Delete
6	Đồ Dùng	Điện Gia Dụng	Bếp điện từ SANKO SPN7511 B2000W			509000	Cái			Edit - Delete
7	Đồ Dùng	Điện Gia Dụng	Lò nướng thủy tinh điện COMET CM8615 12L			665000	Cái			Edit - Delete
8	Đồ Dùng	Điện Gia Dụng	Nồi cơm điện nắp liền Gold. ARC-G18PA1-1.8L			339000	Cái			Edit - Delete
9	Đồ Dùng	Điện Gia Dụng	Máy xay sinh tố TATUNG TVJ-400A			505000	Cái			Edit - Delete
10	Đồ Dùng	Điện Gia Dụng	Bàn ủi hơi nước PHILIPS GC-1930			839000	Cái			Edit - Delete
11	Đồ Dùng	Đồ Dùng Gia Đình	Bộ ly thủy tinh Studio B16112 345ml 6 cái			55600	Bộ			Edit - Delete
12	Đồ Dùng	Đồ Dùng Gia Đình	Lẩu inox Tosumo 24cm			49900	Cái			Edit - Delete
13	Đồ Dùng	Đồ Dùng Gia Đình	Nồi lẩu điện 2L S-6-CTED1			85000	Cái			Edit - Delete
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Figure 3.61 List product screen

AEP-Theis	Customer	Case	Category	SubCategory	Product	Order	Cart Analysis	Hi, trung. Logout
-----------	----------	------	----------	-------------	---------	-------	---------------	-------------------

*: required value

Product Name*

Category Name*

SubCategory Name*

Price*

Unit*

Image

Description

--Choose--

--Choose--

Add Product

Figure 3.62 Add new product screen

AEP-Theis
Customer
Case
Category
SubCategory
Product
Order
Cart Analysis
Hi, trung. Logout

Product Name*

Bộ lau nhà 360 độ OMBO-07

Category Name*

Đồ Dùng

SubCategory Name*

Dụng Cụ Vệ Sinh

Price*

169000

Unit*

Bộ

Image

Description

Edit Product

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Figure 3.63 Edit existing product screen

OrderID	Customer Name	Order Year	Order Month	Product Number Total	Order Amount Total(VND)	Add Order
1	Bùi Hoài Anh	2013	1	4	798500	Detail - Delete
2	Bùi Hoài Anh	2013	2	21	465000	Detail - Delete
3	Bùi Hoài Anh	2013	1	14	1275100	Detail - Delete

Figure 3.64 List order screen

AEP-Theis

Customer

Case

Category

SubCategory

Product

Order

Cart Analysis

Hi, trung. [Logout](#)

*: required value

Customer Name*

Order Year*

Order Month*

Category Name*

SubCategory Name*

Product Name*

Product Number*

Add Product

Product Number Total: 0 Order Amount Total: 0 VND

Save Order

Figure 3.65 Add new order screen

OrderID	Product Name	Price	Unit	Product Number	Amount Total(VND)
2	Bột giặt ABA matic nhiệt 3kg	92400	Bịch	1	92400
2	Nước súc miệng Litterine	103500	Chai	1	103500
2	Cá viên ND 300g	24000	Bịch	1	24000
2	Xúc xích heo 10 MASAN trung bình	19000	Bịch	1	19000
2	Nước ngọt tăng lực BIDRICO	9300	Chai	5	46500
2	Bia Heinen Lon 330ml	12000	Lon	7	84000
2	Mì Omachi sườn hầm 80g	5400	Gói	4	21600
2	Lẩu hải sản 10 loại 450g	74000	Bịch	1	74000
Order Amount Total: 465000					

Figure 3.66 View existing order screen

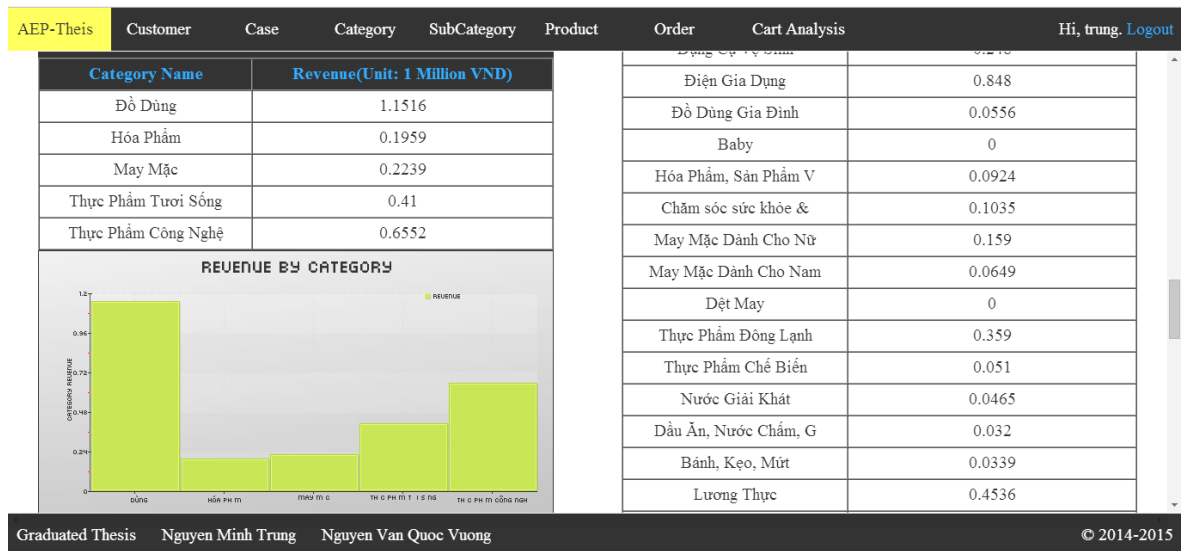


Figure 3.67 View report screen

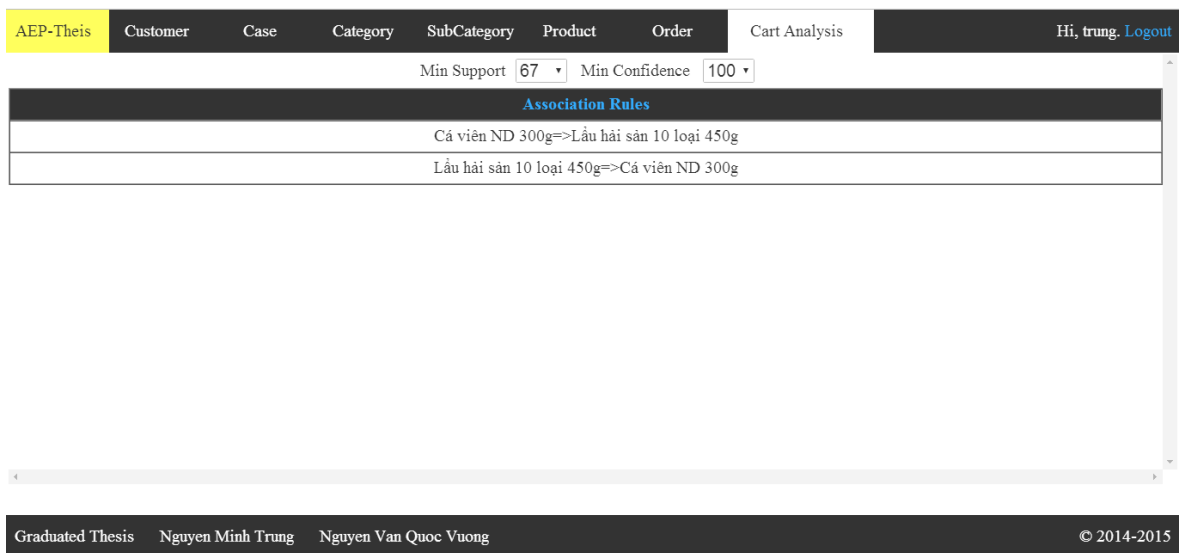


Figure 3.68 View cart analysis screen

3.4 Implement System

Programming language: PHP

Database server: MySQL

Web server: Apache

Technologies: HTML, CSS, Javascript, JQuery, AJAX

Chart: pChart library

Data mining method: Association rule - Apriori algorithm

Chapter 4

Conclusion and future work

4.1 Conclusion

Based on the demo data, we found that:

- With revenue report
 - Revenue in 2014 greater than 2013 => supermarket is growing.

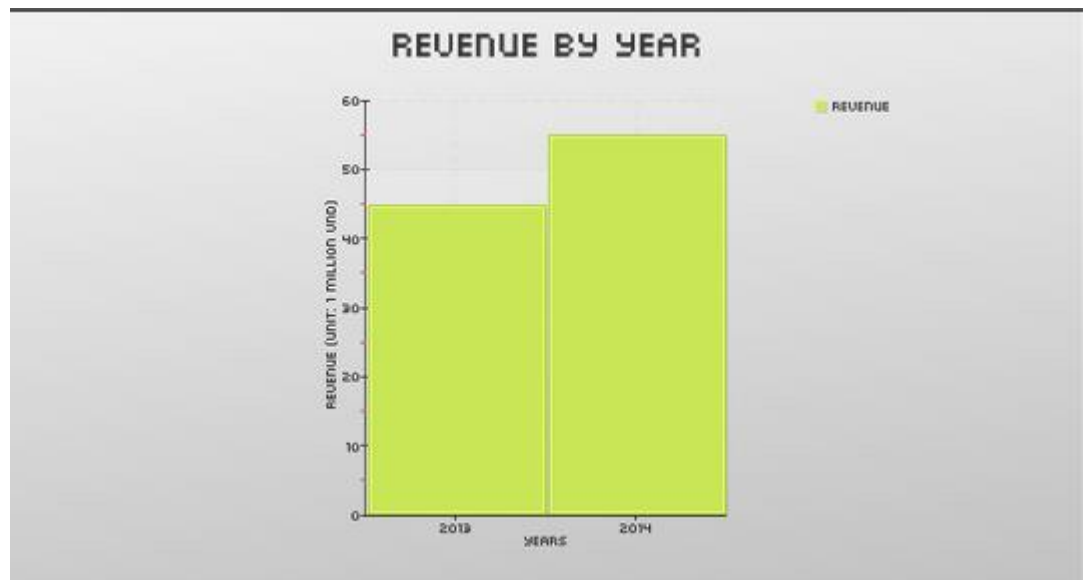


Figure 4.1 Revenue by year

- Customers prefer buy products in January, February, November and December.



Figure 4.2 Revenue by month

- Revenue of “Đồ Dùng” category is the highest.
- Revenue of “Hóa Phẩm” category is the lowest.

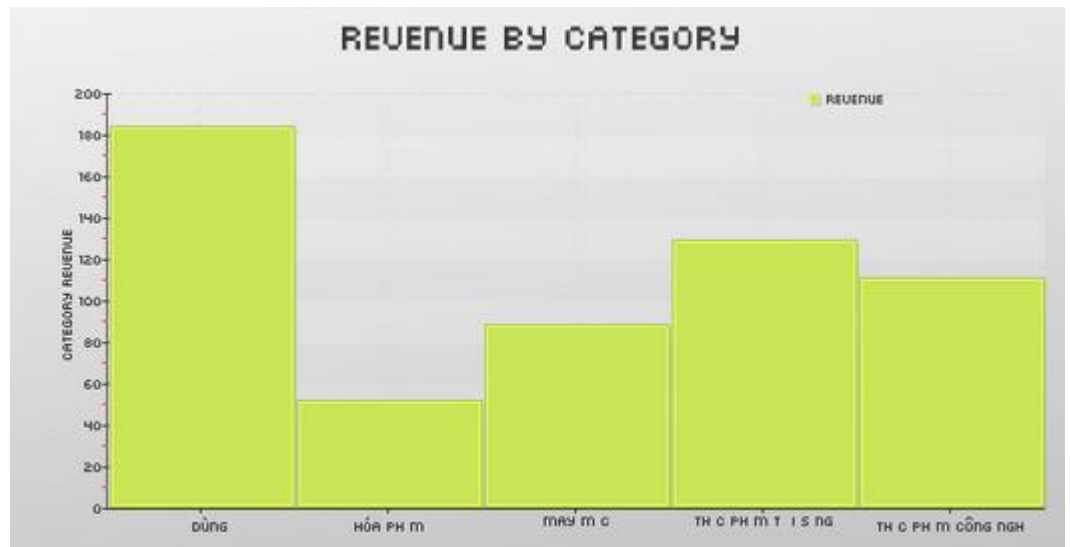


Figure 4.3 Revenue by category

- Revenue of “Điện Gia Dụng” subcategory is the highest.

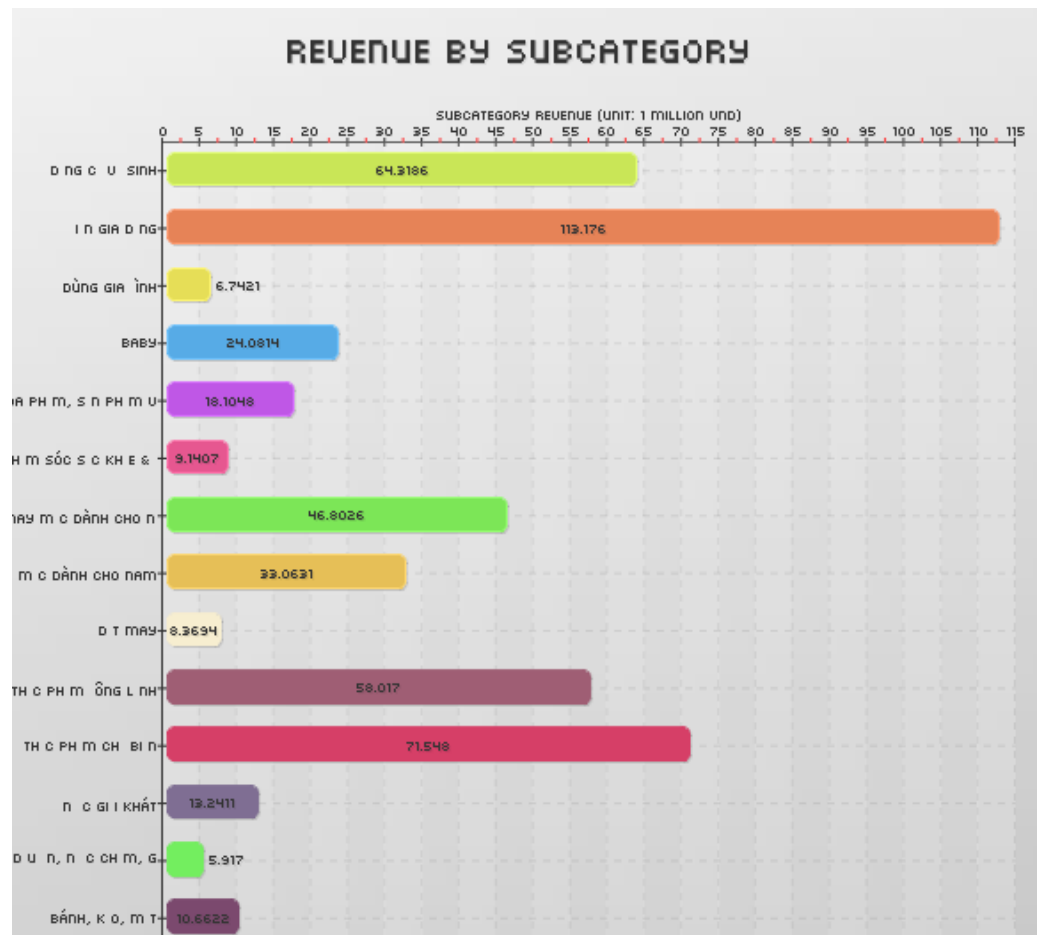


Figure 4.4 Revenue by subcategory

- Revenue of “Mì tôm chua cay 30 gói Hào Hào” product is the highest.

Product Name	Revenue(Unit: 1 Million VND)
Mì tôm chua cay 30 gói Hào Hào	6.696
Lò nướng thủy tinh điện COMET CM8615 12L	6.65
Bếp điện từ SANKO SPN7511 B2000W	6.617
Bàn ủi hơi nước PHILIPS GC-1930	5.034
Máy xay sinh tố TATUNG TVJ-400A	4.545
Tà quần GOO.N L28	4.401
Váy công sở VT	3.99

Figure 4.5 Top 20 products have the highest revenue

- With customer report
 - “Bronze” customers take 75%
 - “Silver” customers take 4%
 - “Gold” customers take 15%
 - “Diamond” customers take 6%

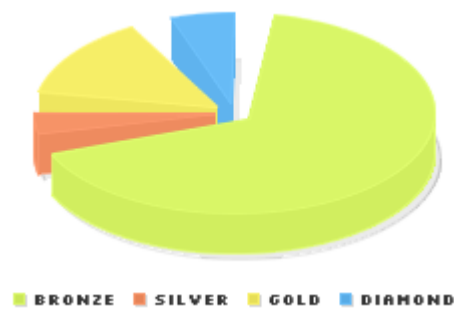


Figure 4.6 Customer type

- The number of customers that register in 2014 is greater than in 2013 and customers prefer to register in March.



Figure 4.7 Customer growth

- With case report
 - “New case” takes 40%
 - “In-progress case” takes 20%
 - “Done case” takes 20%

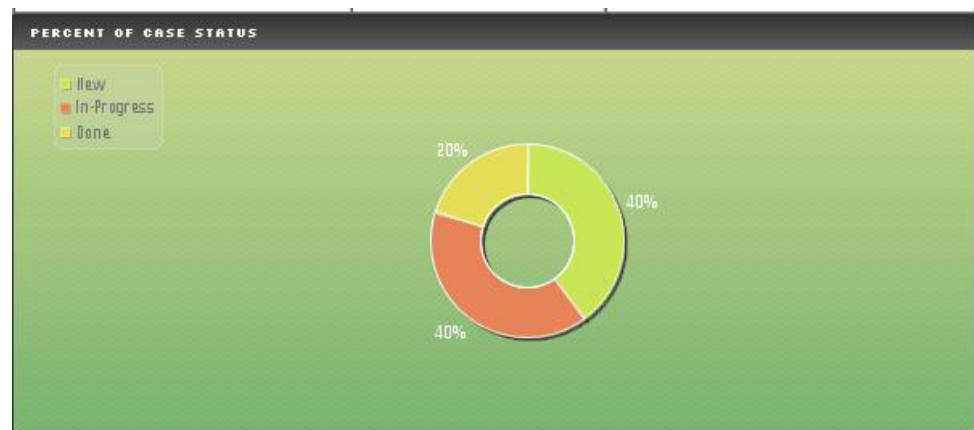


Figure 4.8 Case status

- With cart-analysis report:

We use minsup = 5% and minconf = 35%. Therefore, we have some rules as following:

Rules	Support(%)	Confidence(%)
Xúc xích heo 10 MASAN lớn=>BỘ lau nhà 360 độ OMBO-07	5	35
Sữa tắm trắng da Niisha sunflower 1.1L=>BỘ lau nhà 360 độ OMBO-07	5	46
Lẩu hải sản 10 loại 450g=>Cá viên ND 300g	8	38
Bánh Bao Đức Phát 10 cái=>Cá viên ND 300g	7	40
Nước mắm Nam Ngư 1L=>Cá viên ND 300g	5	43
Quần tây nam không ly LS-P299 MD=>Cá viên ND 300g	5	46
Sữa tắm trắng da Niisha sunflower 1.1L=>Cá viên ND 300g	5	46
Gà quay thường=>Bia Heiniken Lon 330ml	8	50
Bia Heiniken Lon 330ml=>Gà quay thường	8	63
Sữa vinamilk không đường 220ml=>Lẩu hải sản 10 loại 450g	5	67
Nước mắm Nam Ngư 1L=>Lẩu hải sản 10 loại 450g	5	43
Xúc xích heo 10 MASAN lớn=>Bánh Bao Đức Phát 10 cái	5	35

Figure 4.9 Rules

So we get strong rule is “Bia Heiniken Lon 330ml=>Gà quay thường” with support=8% and confidence=63%.

During thesis, we reinforce the old and new knowledge. That is useful for our future career such as process making web product, related technologies and soft skills in time management and small group management.

Outcome detail following:

- Understanding process customer relationship management and data mining technique by Apriori algorithm of association rule method
- Fully analysis features as requirement

- Fully design from general to detail include system design, database design and user interface design that friendly to user
- Fully implement feature as requirement includes one important aspect of customer relationship management and implement Apriori algorithm of association rule method is the most important result present our effort and mind investment into thesis.

4.2 Future work

- Using framework to expand and maintain easily
- Optimize algorithm to increase performance of system
- Add some features of CRM system about marketing such as create email campaign
- Performing testing techniques to insure the quality of the application
- Researching and applying other techniques of data mining to find other quality information to support in decision making in the business of manager.

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