CAN THO UNIVERSITY
COLLEGE OF INFORMATION AND COMMUNICATION TECHNOLOGY

PROJECT - FUNDAMENTAL REPORT
INFORMATION TECHNOLOGY

Topic

GROCERY MANAGEMENT APLICATION GROCERYPOS

Author: Nguyen Thanh Phat
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Code year: K46

Cantho, 02/2023

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Acknowledge

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Abstract

Part I

Introduction

1 Background

The rapid development of information technology has led to its widespread use in various fields, including business operations. As such, the integration of software applications into sales business operations has become a vital need to improve management quality and increase revenue. However, choosing a suitable software application on a suitable platform (web, desktop application, mobile application) for business operations remains a difficult issue, particularly for small and medium-sized businesses.

2 Problem statement

Several sales management applications are available in the market that is suitable for typical business owners, such as KiotViet, a sales management software. Some medium-sized stores have also invested in a suitable management model through a website or computer application, along with supporting devices.
Nevertheless, most applications are commercial, which small store owners cannot afford to invest in, along with the necessary equipment. Therefore, they are forced to rely on manual bookkeeping methods to manage their sales.

3 Aims and objectives

The purpose of this project is to develop a software application that integrates with sales business operations to enhance management quality and increase revenue. This project aims to provide a cost-effective solution for small and medium-sized businesses to manage their sales operations. The developed software application will have a user-friendly interface that allows for easy integration and adoption by businesses.

4 Research objects and scope

4.1 Research Objectives:

The research aims to develop and evaluate a mobile application solution for small businesses to assist in managing sales and inventory. The application will be developed using the Flutter framework and will utilize Firebase as the data platform. The specific objectives of the research are to:

- Investigate challenges faced by small businesses in managing sales and inventory.
- Develop a mobile application solution for small businesses using the Flutter framework and Firebase.
- Evaluate the usability and effectiveness of the developed application through user testing and surveys.

The outcomes of the study will contribute to the knowledge of mobile application solutions for small businesses.

4.2 Research Scope:

- The research investigates the retail business processes of small grocery store owners and businesses. The scope of the study is limited to small businesses and will not consider larger organizations.
- A cross-platform mobile application will be developed using the Flutter library and Google's Firebase technology.

5 Solution approach

- Building a cross-platform mobile application using Flutter.
- Researching Firebase technologies including Firebase Authentication, Firebase Firestore and Firebase Storage.
- Business processes related to the retail operations of small grocery store owners.

6 Summary of contributions and achievements

- This research provides a solution for managing the retail sales aspect of small businesses through the development of a cross-platform mobile application with a user-friendly interface.
- The application is designed to assist small businesses in managing sales and inventory, addressing the challenges they face in this area.

7 Organization of the report

This report includes the following sections:

Introduction: This section provides an overview of the thesis, including the issues that need to be addressed, the history of problem-solving, the objectives of the thesis, the contribution of the thesis, and the content that will be covered.

Content: This section includes a detailed description of the problem, analysis, functional specification, data design and implementation, interface for the application, and evaluation of software testing. The content section is divided into three chapters.

Chapter 1: Problem description. This chapter provides a detailed description of the problem, including functions, requirements, and theoretical foundation.

Chapter 2: System design. This chapter provides an overview of the system, including the architectural design, data design, functional design, and diagrams to help build the system.

Chapter 3: Implementation. This chapter provides an implementation of the system design.

Chapter 4: Testing and evaluation. This chapter presents the testing plan and management, testing scenarios for the main functions of the system.

Conclusion: This section presents the results achieved, the remaining limitations, and the system's further development.

Part II

Content

Chapter 1

Requirements and specification

1.1 Overall Description

1.1.1 Product Perspective

Information systems in management are being widely applied in all fields of society in general and in business industries in particular. Mobile devices today such as smartphones and tablets are not only purely personal entertainment devices, but also provide strong support in handling tasks.

For small retail stores, the process of tracking and recording books and documents can be time-consuming and labor-intensive. A tablet or phone can replace traditional notebooks, saving costs, time and effort for the store owner. At the same time, it avoids the loss of important information and updates operational information quickly and accurately.

In practice, such small retail models will have a manager, usually the store owner. Therefore, to facilitate the most effective management possible and to simplify the interface design, the system should have only one agent: the User.

The user has user authentication functions including login, sign up and logout. After authentication, the user can access management functions, specifically:

Inventory management: Manage inventory, manage products and manage categories.

Sales management: Create invoice, manage invoices, print invoices and manage revenue and expenditure.

Store information management: Manage suppliers, manage customers and store information.

1.1.2 Product Functions

1. **User Authentication:** This feature allows the user to securely access the system by providing login and sign up logout functionality.

2. **Inventory Management:** This feature enables the user to effectively manage the store's inventory by providing the following sub-features:
    - **Inventory Tracking:** Allows the user to track the quantity and status of items in stock.
    - **Product Management:** Enables the user to add, edit and delete products in the system.
    - **Category Management:** Allows the user to organize products into categories for easier management.
3. **Sales Management:** This feature facilitates the sales process by providing the following sub-features:
    - **Invoice Creation:** Allows the user to Create invoice for sales transactions.
    - **Invoice Management:** Enables the user to view, edit and delete invoices.
    - **Invoice Printing:** Allows the user to print invoices for record-keeping and customer reference.
    - **Revenue and Expenditure Management:** Enables the user to track and manage the store's revenue and expenditure.
4. **Store Information Management:** This feature enables the user to manage information related to the store by providing the following sub-features:
    - **Supplier Management:** Allows the user to add, edit and delete supplier information.
    - **Customer Management:** Enables the user to add, edit and delete customer information.

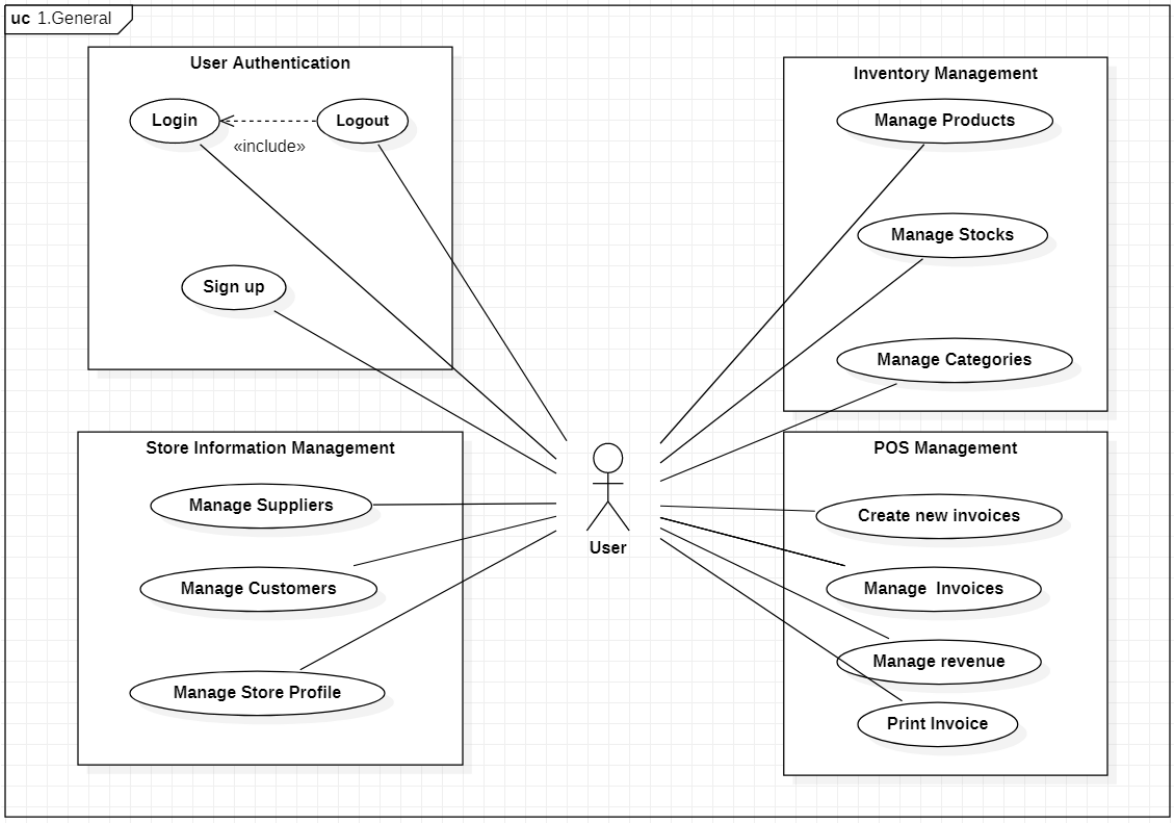

Figure 1.1: General Usecase

1.1.3 User Classes and Characteristics

- **User Class:** Store Owner/Manager
- **Authentication:** The user has the ability to authenticate themselves through login, sign up and logout functions on the mobile application. This ensures that only authorized users have access to the management functions.
- **Inventory Management:** Once authenticated, the user can access the inventory management function on the mobile application which allows them to manage inventory, products, and categories.
- **Sales Management:** The user can also access the sales management function on the mobile application which allows them to create and manage invoices, print invoices, and manage revenue and expenditure.
- **Store Information Management:** The user can access the store information management function on the mobile application which allows them to manage suppliers, customers, and store information.

  All information is stored and retrieved from a remote database, allowing for real-time updates and accurate tracking of inventory levels, sales transactions, and store information.

1.1.4 Operating Environment

1.2 Requirements Specification

1.2.1 External Interface Requirements

- **User Interfaces:** The system should have a user-friendly interface on the mobile application for the store owner/manager to access and use the various management functions. The interface should be designed to be easy to navigate and intuitive to use.
- **Hardware Interfaces:** The system should be compatible with common mobile devices such as smartphones and tablets. It should also be able to connect to a remote database server through a network connection.
- **Software Interfaces:** The system should be able to interface with the remote database server to store and retrieve information. It should also be able to interface with other software systems such as accounting or inventory management software if necessary.
- **Communication Interfaces:** The system should be able to communicate with the remote database server through a secure network connection. It should also be able to communicate with other devices or systems if necessary.

1.2.2 Functional Requirement

1.2.2.1 Login

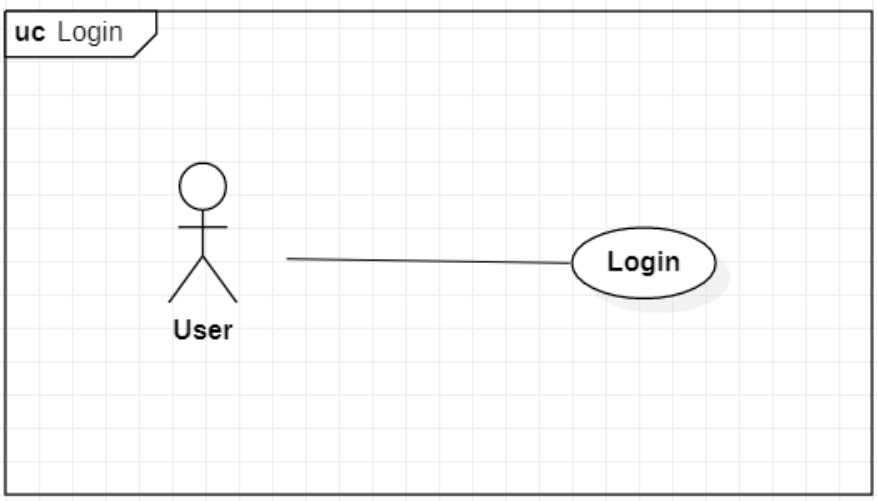

Figure 1.2: UC01a.Login

Use case	User Authentication: Log in
ID	UC01a
Main actor	User
Priority	High
Brief description	Allows the user to securely access the system by providing login functionality.
Trigger	The user opens the application and selects the login option.
Type	Primary
Relationship	
Normal flows	1. The user opens the application. 2. User enters email and password 3. The system verifies the credentials. 4. The user is granted access to the system. 5. The user can access additional functions such as inventory management, sales management and store information management. 6. End login event
Subflows	
Exceptional flow	1. The user enters incorrect login credentials. 2. The system displays an error message and prompts the user to try again.

Table 1.1: User Authentication: Log in

1.2.2.2 Sign up

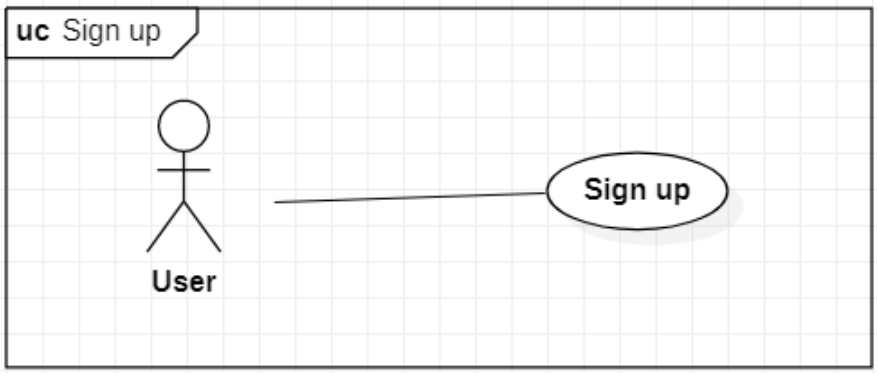

Figure 1.3: UC01b.Sign up

Use case	User Authentication: Sign up
ID	UC01b
Main actor	User
Priority	High
Brief description	Allows the user to create an account in the system.
Trigger	The user opens the application to create an account.
Type	Primary
Relationship	
Normal flows	1. The user opens the application. 2. User enters required information: Name, Address and User credentials User's Email/Phone and Password. 3. The system verifies the credentials. 4. System verifies information and creates a new account for the user. 5. The user is granted access to the system. 6. The user can access additional functions such as inventory management, sales management and store information management. 7. End sign up event
Subflows	
Exceptional flow	1. System error while accessing sign up feature. 2. The system displays an error message and prompts the user to try again.

Table 1.2: User Authentication: Sign up

1.2.2.3 Log out

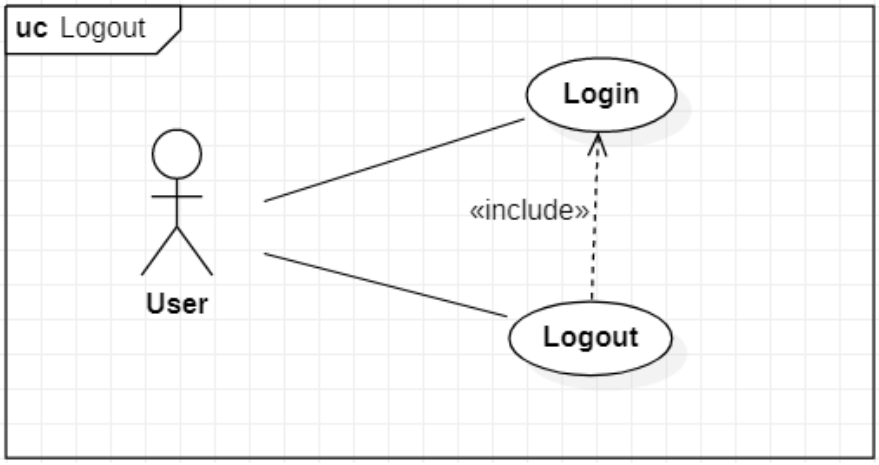

Figure 1.4: UC01c.Log out

Use case	User Authentication: Logout
ID	UC01c
Main actor	User
Priority	High
Brief description	Allows the user to securely log out of the system.
Trigger	User wants to log out of the system.
Type	Primary
Relationship	
Normal flows	1. User logs into the system (UC01a) 2. User navigates to logout feature. 3. System logs user out of the system. 4. User is no longer able to access the system until they log in again. 5. End log out event
Subflows	
Exceptional flow	1. The system displays an error message and prompts the user to try again.

Table 1.3: User Authentication: Log out

1.2.2.4 Manage Stock

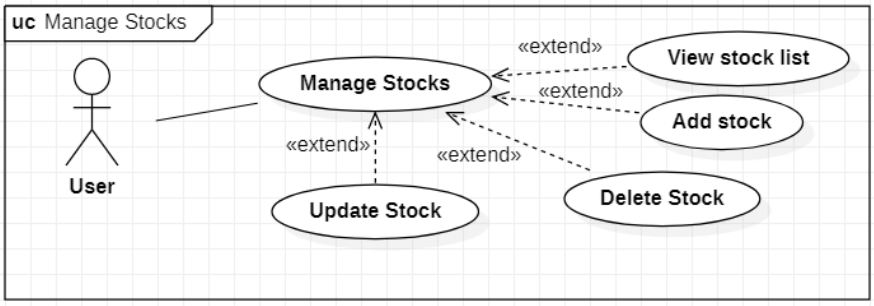

Figure 1.5: UC02a.Manage Stock

Use case	Inventory Management: Manage Stock
ID	UC02a
Main actor	User
Priority	High
Brief description	Allows the user to track the quantity and status of items in stock.
Trigger	User wants to track inventory.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to inventory tracking feature. 3. System displays inventory tracking interface. 4. User views and updates inventory information as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing inventory tracking feature.

Table 1.4: Inventory Management: Manage Stock

1.2.2.5 Manage Products

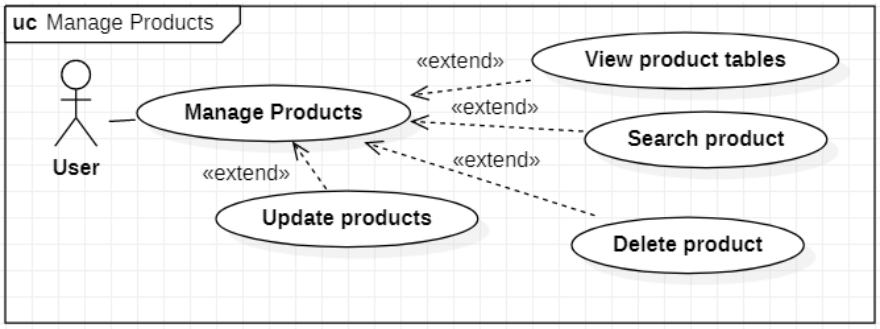

Figure 1.6: UC02b.Manage Products

Use case	Inventory Management: Manage Products
ID	UC02b
Main actor	User
Priority	High
Brief description	Allows the user to add, edit and delete products in the system.
Trigger	User wants to track inventory.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to product management feature. 3. System displays product management interface. 4. User adds, edits or deletes products as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing product management feature.

Table 1.5: Inventory Management: Manage Products

1.2.2.6 Manage Categories

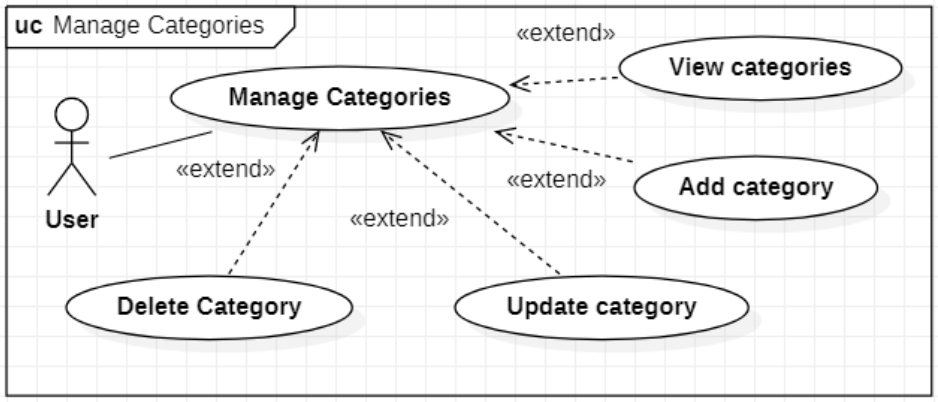

Figure 1.7: UC02c.Manage Categories

Use case	Inventory Management: Manage Categories
ID	UC02c
Main actor	User
Priority	High
Brief description	Allows the user to add, edit and delete categories in the system.
Trigger	User wants to track inventory.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to product category management. 3. System displays category management interface. 4. User adds, edits or deletes categories as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing category management feature.

Table 1.6: Inventory Management: Manage categories

1.2.2.7 Create invoice

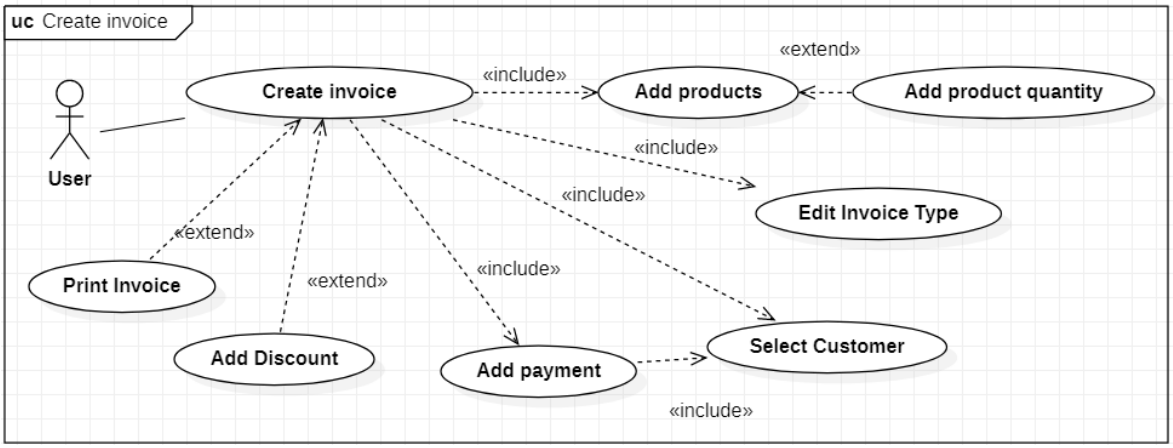

Figure 1.8: UC03a.Create Invoice

Use case	Sales Management: Create invoice
ID	UC03a
Main actor	User
Priority	High
Brief description	Allows the user to Create invoice for sales transactions.
Trigger	User wants to create an invoice.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to invoice creation feature. 3. System displays invoice creation interface. 4. User input required products and product quantity.Then input customer if invoice is order and option discount. 5. End of use case.
Subflows	1. User adds products to the invoice and update the quantity of products as needed. 2. Select invoice type. 3. User enters customer information. 4. User applies discounts or promotions. 5. Add full payment if retail or add customer payment if customer invoices
Exceptional flow	1. System error while accessing invoice creation feature.

Table 1.7: Sales Management: Create Invoice

1.2.2.8 Manage Invoices

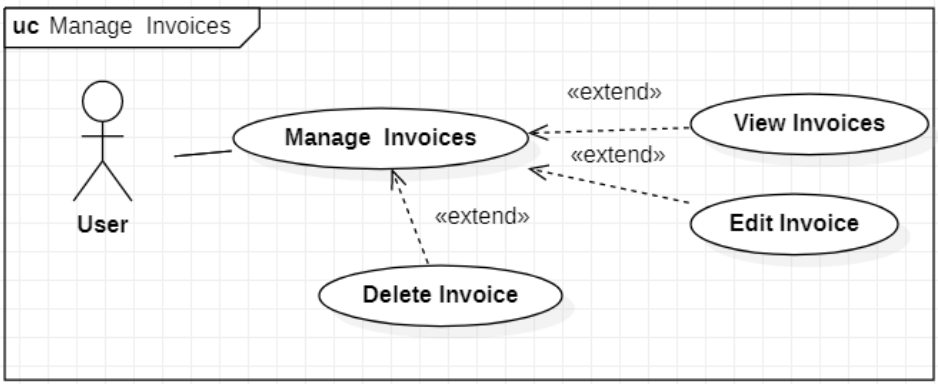

Figure 1.9: UC03b.Manage Invoices

Use case	Sales Management: Manage invoices
ID	UC03b
Main actor	User
Priority	High
Brief description	Enables the user to view, edit and delete invoices. User wants to manage invoices.
Trigger	User wants to track inventory.
Type	Primary
Relationship	Include UC01a, UC03a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to invoice management feature. 3. System displays invoice management interface. 4. User views, edits or deletes invoices as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing invoice management feature.

Table 1.8: Sales Management: Manage Invoices

1.2.2.9 Manage Revenue and Expenditure

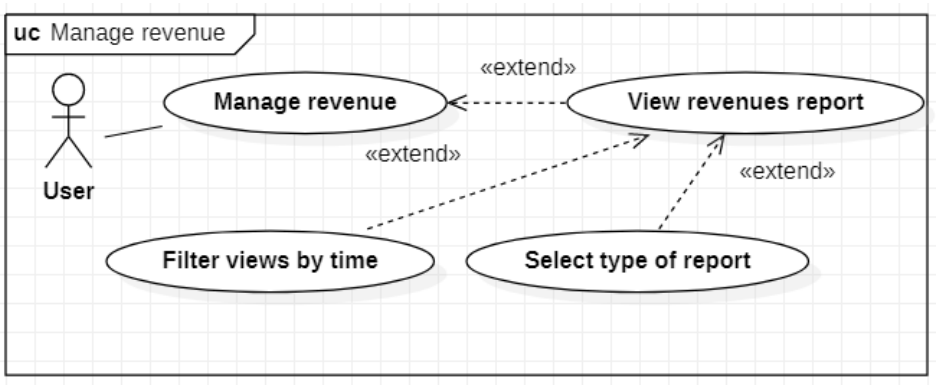

Figure 1.10: UC03c.Manage Revenue

Use case	Sales Management: Manage Revenue and Expenditure
ID	UC03c
Main actor	User
Priority	High
Brief description	Enables the user to track and manage the store's revenue and expenditure.
Trigger	User wants to manage revenue and expenditure.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to revenue and expenditure management feature. 3. System displays revenue and expenditure management interface. 4. User views and updates views revenue and expenditure information as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing revenue and expenditure management feature.

Table 1.9: Sales Management: Manage Revenue and Expenditure

1.2.2.10 Print Invoices

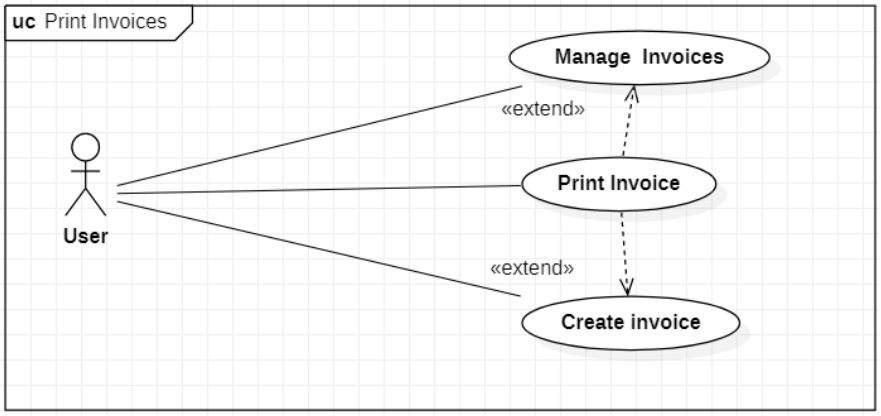

Figure 1.11: UC03d.Print Invoice

Use case	Sales Management: Print Invoices
ID	UC03d
Main actor	User
Priority	High
Brief description	Allows the user to print invoices for record-keeping and customer reference.
Trigger	User wants to print an invoice.
Type	Primary
Relationship	Include UC01a, Extend UC03a , UC03b
Normal flows	1. User logs into the system (UC01a). 2. User navigates to invoice printing feature from UC03a , UC03b. 3. System displays invoice printing interface. 4. User selects printer and modify printing formats as needed. 5. System prints the selected invoice. 6. End of use case.
Subflows	
Exceptional flow	1. System error while accessing printer or printing feature.

Table 1.10: Sales Management: Print Invoices

1.2.2.11 Manage Suppliers

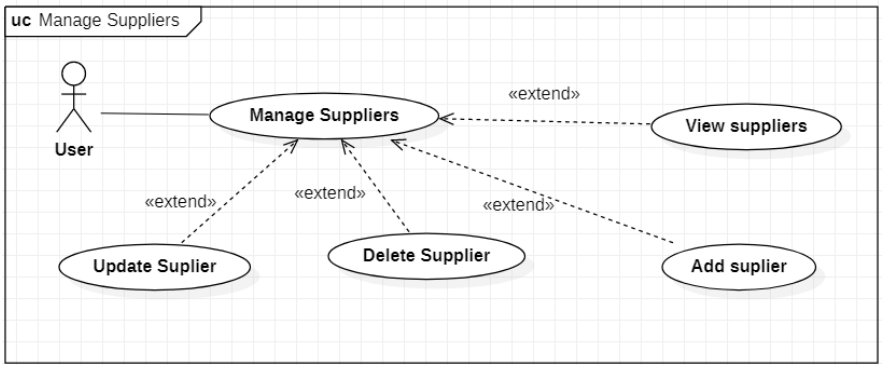

Figure 1.12: UC04a.Manage Suppliers

Use case	Store Information Management: Manage Suppliers
ID	UC04a
Main actor	User
Priority	High
Brief description	Allows the user to add, edit and delete supplier information.
Trigger	User wants to manage supplier information.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to supplier management feature. 3. System displays supplier management interface. 4. User adds, edits or deletes supplier information as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing supplier management feature

Table 1.11: Store Information Management: Manage Suppliers

1.2.2.12 Manage Customers

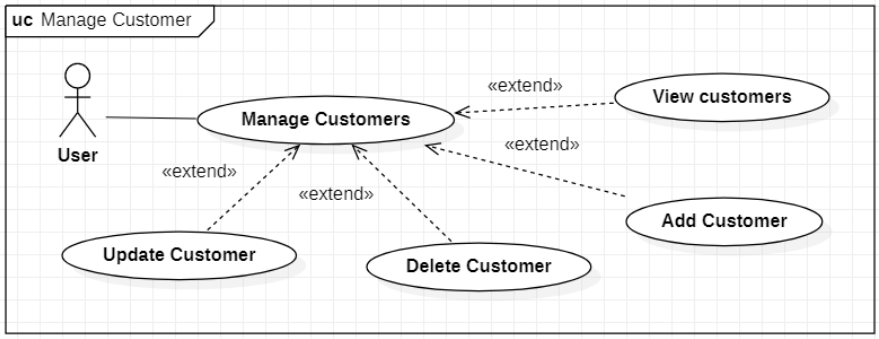

Figure 1.13: UC04b.Manage Customers

Use case	Store Information Management: Manage Customers
ID	UC04b
Main actor	User
Priority	High
Brief description	Allows the user to add, edit and delete customer information.
Trigger	User wants to manage customer information.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to customer management feature. 3. System displays customer management interface. 4. User adds, edits or deletes customer information as needed. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing customer management feature

Table 1.12: Store Information Management: Manage Customers

1.2.2.13 Manage Store

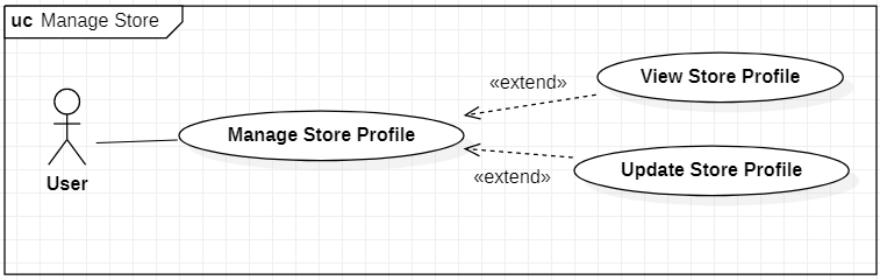

Figure 1.14: UC04c.Manage Store

Use case	Sales Management: Print Invoices
ID	UC04c
Main actor	User
Priority	High
Brief description	Allows the user to edit basic store information such as store name, address and contact.
Trigger	User wants to edit basic store information.
Type	Primary
Relationship	Include UC01a
Normal flows	1. User logs into the system (UC01a). 2. User navigates to store information feature. 3. System displays store information interface. 4. User edits basic store information such as store name, address and contact. 5. End of use case.
Subflows	
Exceptional flow	1. System error while accessing store information feature.

Table 1.13: Store Information Management: Manage Store Information

1.2.3 Nonfunctional Requirements

Chapter 2

Software Design

2.1 Application Architecture

2.1.1 Architectural Design

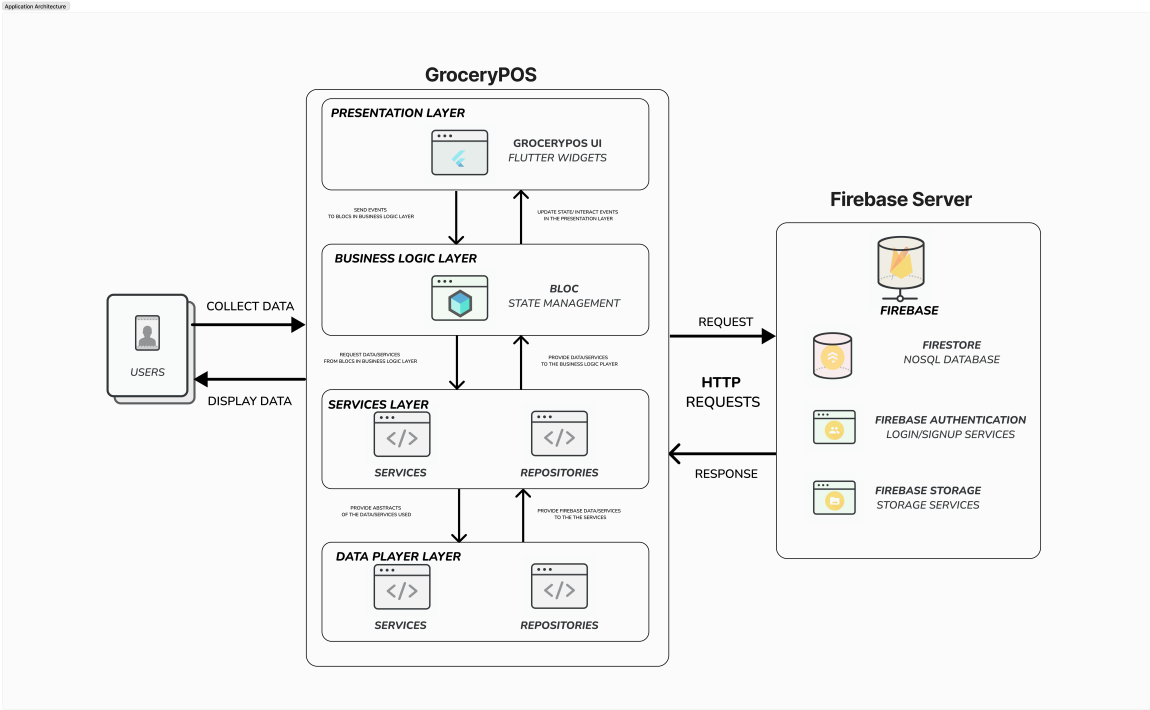

Figure 2.1: Application Architecture

2.1.2 Decomposition Description

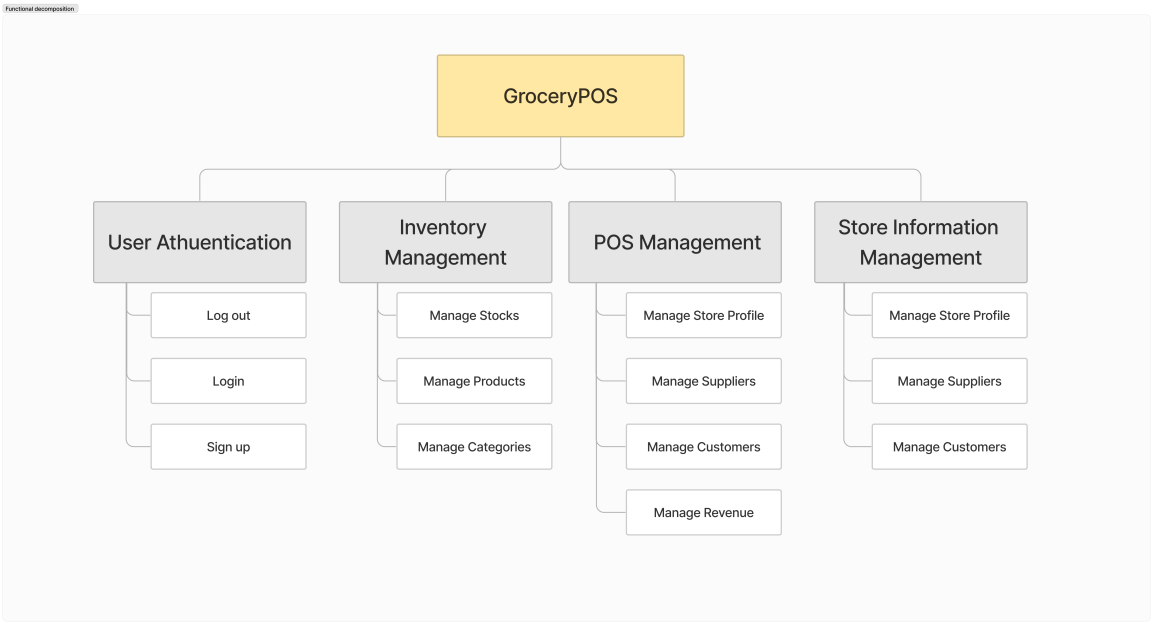

Figure 2.2: Decomposition Description

2.2 Data Design

2.2.1 Data Description

2.2.1.1 Conceptual Data Model

2.2.1.2 Logical Data Model

2.2.1.3 Physical Data Model

2.2.2 Data Dictionary

2.3 Detailed Design

Chapter 3

Implementation

Chapter 4

Testing

Part III

Conclusion