Project Report

Management Information System,

Romafour (Pvt) Ltd.

Management Information System

Final Report

Submitted in partial fulfillment of the requirement for the project for Object Oriented Software Design module

From July 2014 to October 2014

Submitted by,

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Declaration

We, the members of group Vuro of Computer Science and Engineering Department of University of Moratuwa, hereby declare that to the best of our knowledge and belief that, this project report is an original work done by our group and we have adhered to the honour code pledge of the Department of Computer Science and Engineering.

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Special thanks go to the management of Romafour (Pvt) Ltd, for their tremendous support and help given throughout the progression of this project.

Last but not least our thanks and appreciation also goes to all of our colleagues and the people who have willingly helped to make this project a success.

Table of Contents

List of Figurers

List of Tables

Chapter 1

Introduction

1.1 The Project Client

The client of our project is Romafour (Pvt) Ltd, a clothing retail store in Sri Lanka. Romafour Colombo is a sophisticated clothing store which specializes in fashionable high quality clothing for all ages and genders. They offer wide variety of latest fashionable clothing at great price bargain. These services are also provided with highest regard for customer satisfaction.

The Objectives of the Client are,
"(Our mission is) To be a market Leader in clothing industry and exceeding our customers' expectations by providing high quality unique products."
Official Website

Romafour Colombo operates in a niche high end market for clothes sales in Sri Lanka. Romafour showroom was opened on November 19, 2003 at Bambalapitiya, Colombo. After 10 years of successful trading, a second showroom was opened at Borella last year, thus expanding their operations further.

1.2 The Business Case

Romafour (Pvt) Ltd is a clothing retailer with the mission of selling high quality fashionable clothing for all ages and genders. They recently expanded their business by building another showroom. The top management needs information in order to provide high quality service to their customers.

1.2.2 Impact to the Organization,

Costs:

- **Training for the employees to handle the system.**
  This cost is expected to be very small since MIS would be mostly used by the managers and other executives who are already trained to handle a basic computer IS.
- **Cost of infrastructure (Computers & POS Terminals)**
  This is also expected to be low since a basic computer system was already established by the client in the past and this can be remodelled to implement the new MIS.

Benefits

- **Reduction in working Capital**
  With the expected Inventory Management System, manual counting of inventory will be reduced but with Purchasing Manager having accurate information such sales and inventory will lead to lean management of inventory. This will free the working capital tied in huge inventory holding and made available for investment in other areas.

- **Increase of Sales**
  With Purchasing and Sales managers having accurate information, this can be used to for marketing as well as introducing clothing favoured by their customers. These changes are expected to lead to higher sales in the future.

- **Improvement in Performance Level of the Management**
  With readily available information, the managers' time is expected to free up thus letting them concentrate in the core business activities and reduce any inefficiencies in the organization.

1.3 The Structure of the Report

This report documents the project development. Unified Process was used in the development of the project. UP includes four phases known as Inception, Elaboration, Construction and Transition.

In this report,

Chapter 1 includes a brief description of the client along with business case.

Chapter 2 includes documentation of tasks such as requirement gathering and analysis which is the core of the Inception Phase.

Chapter 3 includes the documentation for tasks done during Elaboration Phase such as modelling of behaviour and architecture of the system.

Chapter 4 includes the documentation for the Construction Phase such as different types of the architecture and solutions used in the system.

Chapter 5 includes the documentation for the Transition Phase such as testing

Chapter 6 gives the conclusion of the report.

Chapter 2

Inception Phase

2.1 Introduction

The Inception Phase is the first and most important phase in a project development. It is by the end of the phase that the client decides whether to go ahead with the project.

The objectives of the inception phase in a UP are,

- Identifying the business need for the project
- Developing the vision of the system
- Identifying the scope of the new system and the project
- Developing preliminary schedules and cost estimates
- Developing the business case for the system

The following tasks were done in order to achieve the above objectives

1. Understanding of the business Environment
   This includes description of the need for a system, analysis of the various stakeholders of the system.

2. Creating the system vision
   This includes the description of system capabilities and scopes.

3. Requirements Gathering and Documentation
   The requirements of the system are defined further and documented.

4. Requirements Analysis and Specification
   The requirements are analyzed, prioritized and the specified.

5. Developing a resource plan
   An estimated resource plan is developed which includes the timeframe and cost.

2.2 Business Environment

2.2.1. Present Problems and Solutions

Manual system on Inventory Management has led to high working capital being tied down and outdated products being sent back to suppliers thus resulting in wastages. Customers expecting recent fashion from Romafour (Pvt) Ltd have expressed concerns on the displayed products lag in fashion. Using the manual systems for some of the other work as well has lead a huge part of managerial time being tied down to mundane work thus drawing the managers' focus from core area of the business.

After the system is implemented the most of the manual workload will be eliminated and accurate information will be available to the managers thus improving the overall performance of the business.

2.3 System Vision

To reduce inefficiencies and improve overall performance of the system by making available accurate and real time information to the top management.

2.3.1. System Capabilities

- Manage inventory details
- Maintain customer details
- Manage employee details and process salaries.
- Generate reports when required

2.4 Requirements Gathering and Documentation

The requirements for the system were gathered through discussion with the perceived users of the system.

There are two types of requirements for the system, Functional and Non-functional requirements. The functional requirements are the activities that the system must perform. Non - functional requirements include requirements related to the technology, security, performance expectations, usability and reliability.

2.4.1 Functional Requirements

1. Though the clients POS data are recorded, this data is mainly used for accounting purposes. The client would like to store the details of their customer's details, their purchases and any other useful information that is easily retrieved.
2. Billing and recording of invoices at POS.
3. Details of previous purchases should be used from the database in order to calculate the discounts for the current purchases at POS.
4. The Employee details are currently stored in MS Excel Sheets with data duplication for each specific task. The client specified that employee database being centralized for better control of information.
5. Client has also requested automated process for employee salary calculation. Employee salary is determined by basic salary, benefits and incentives for the sales amount done for the period. These extra payments will be scrutinized by the HR Manager and approved.
6. Employee attendance is done through finger print scanners but the data is not integrated properly the client wishes to automate this so the employee salary calculation becomes easier.
7. Employees should be able to check their salary amount due to overtimes through the system.
8. The client's process of determining incentives to sales representative should be automated according to conditions specified by the client.
9. Client also expressed the implementation of Inventory Management with Purchasing Manager being notified immediately when inventory replenishing limit is reached on stored products as well as the one displayed on each floors of their show room.

10. They also specified a process which will allow their managers to query information stored in the database to improve performance.
11. Report Generation
    The system should generate reports on the following as and when needed for management purposes,
    i. Inventory being held
    ii. Sales recorded by period or category
    iii. Total Employee salary for a period
    iv. Breakdown of salary for each Employee
    v. Employee performance levels (Comments from customers, review by supervisors, and other details)

2.4.2. **Non Functional Requirements**

- **Extensibility of the software:**
  The system should be designed such that it allows for the extensibility of the software.
  Since the accounting package was not a functional requirement and if in future the client decides to add the accounting package, the current system should allow extensibility.

- **Platform compatibility:**

  We decided to develop the system based on Java. So, that it may be compatible with any platforms the client may use.

2.5 Requirements Specification

The use case diagrams below could be used to specify the functional requirements set out by the client.

Here, the system was divided into 3 sub systems for simplification,

1. Customer & Sales Management Sub System

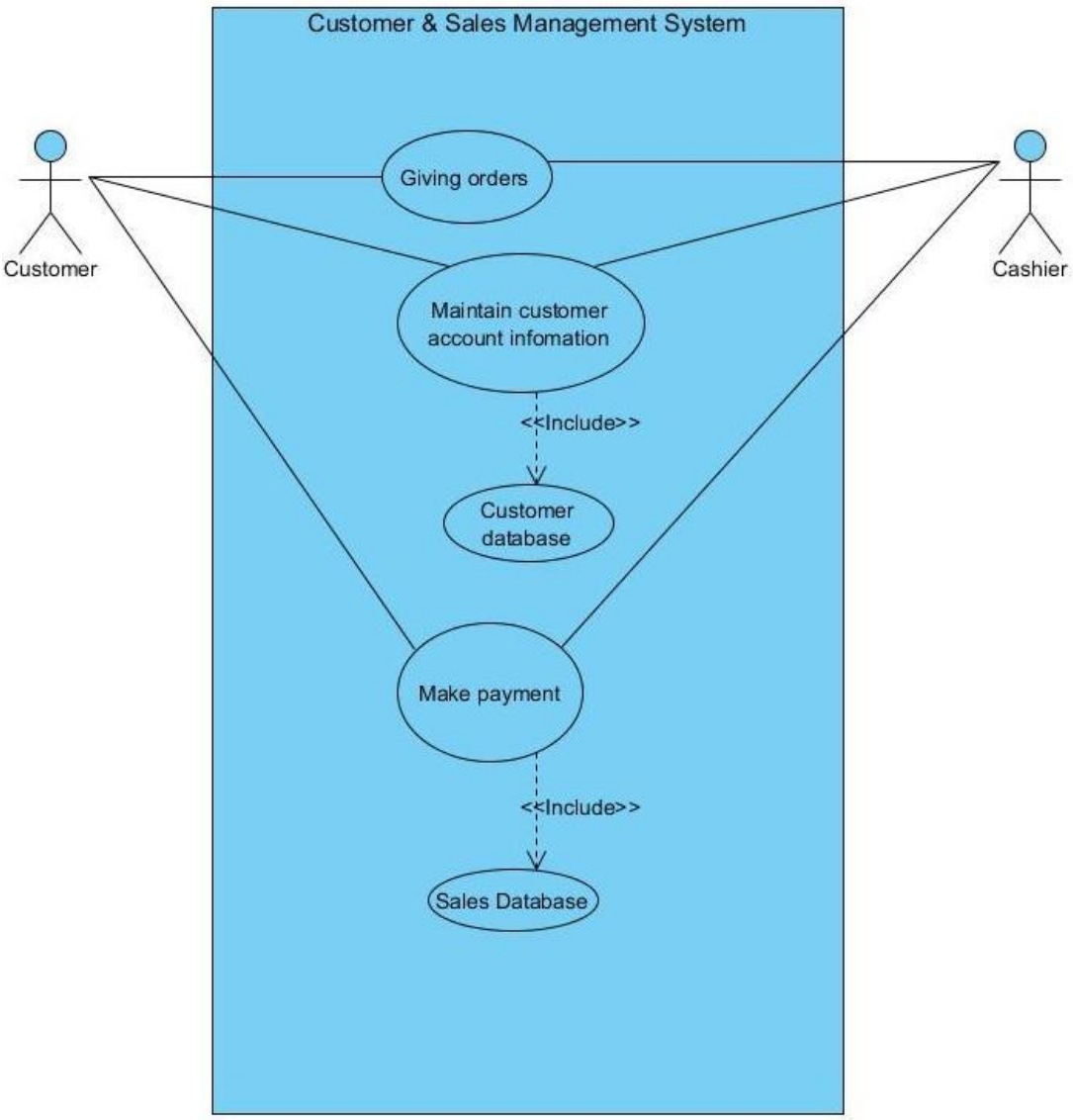

Figure. 2.5.1. Use Case Diagram of Sales Sub System

2. Inventory Management System

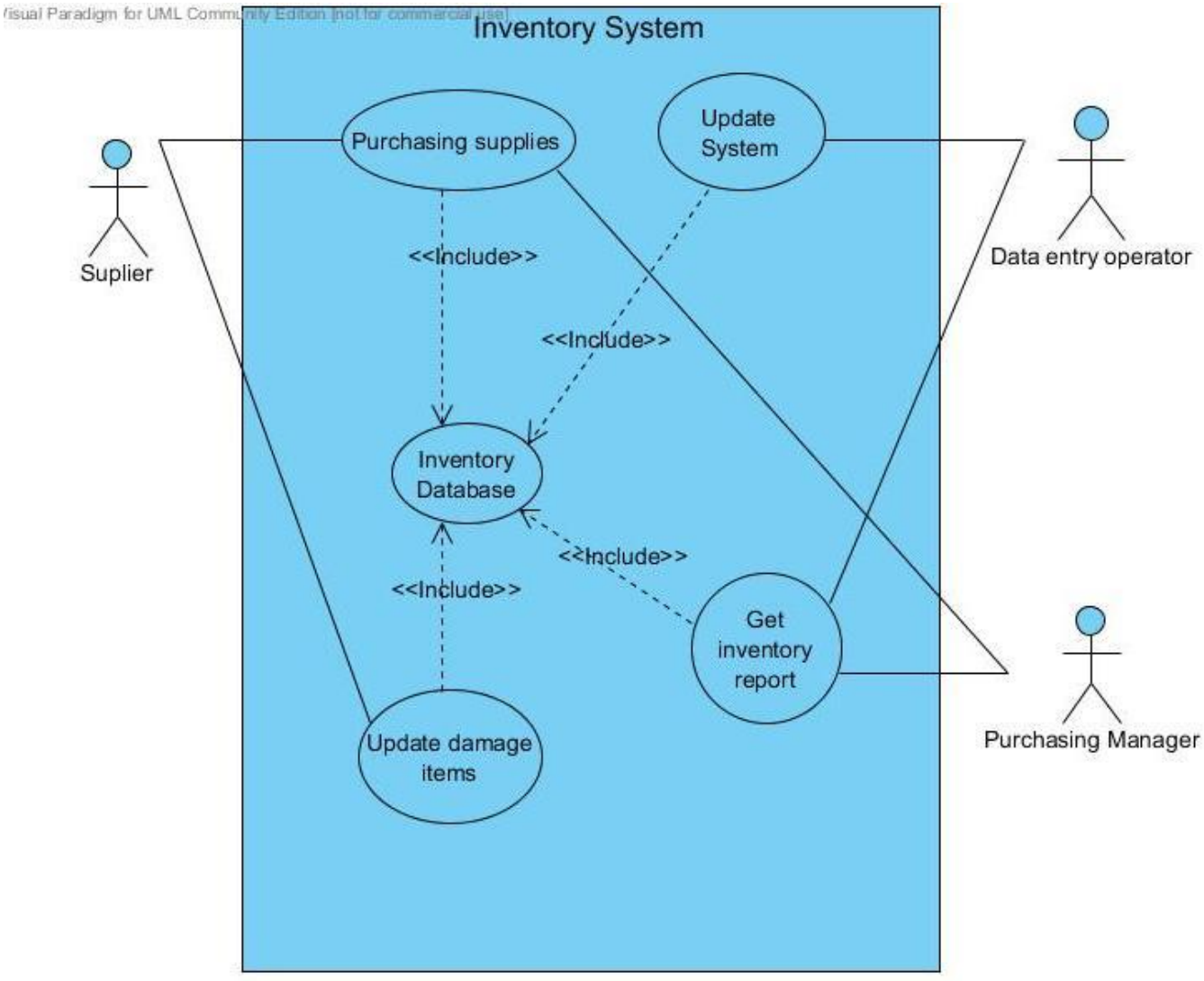

Figure 2.5.2 Use Case Diagram of Inventory Sub System

3. Employee Management Sub System

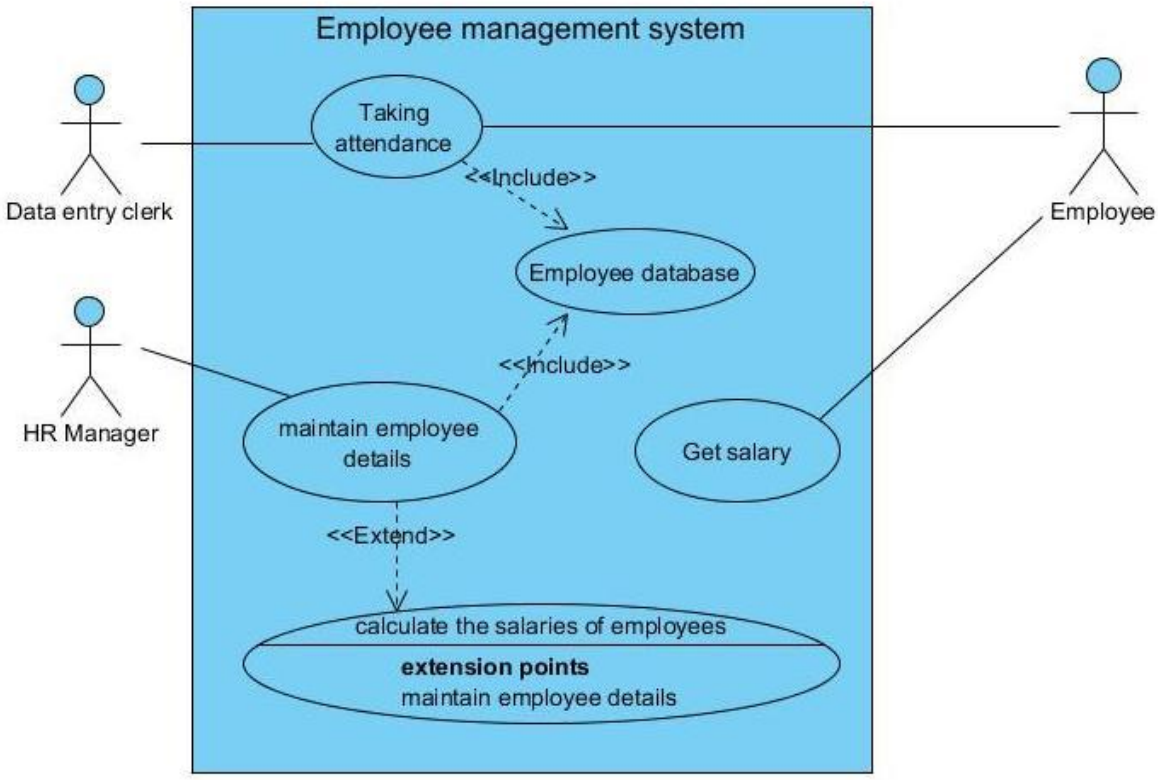

Figure 2.5.3 Use Case Diagram of Employee Management Sub System

2.6. Resource Plan

2.6.1. Work Break Down Structure

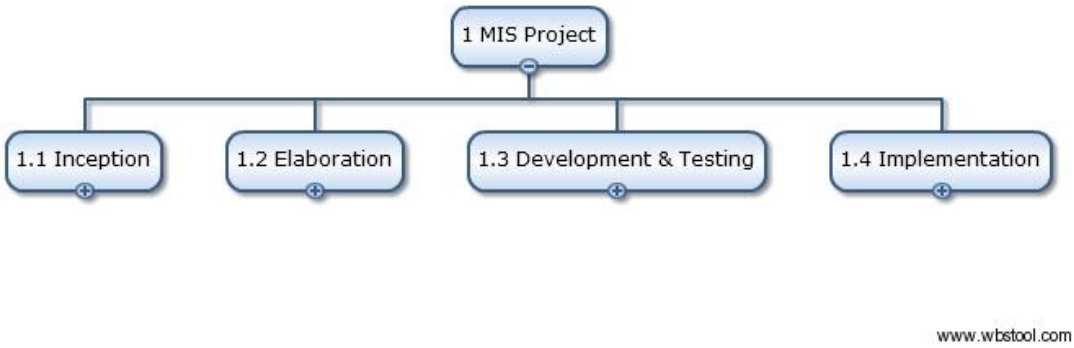

Figure 2.6.1 WBS

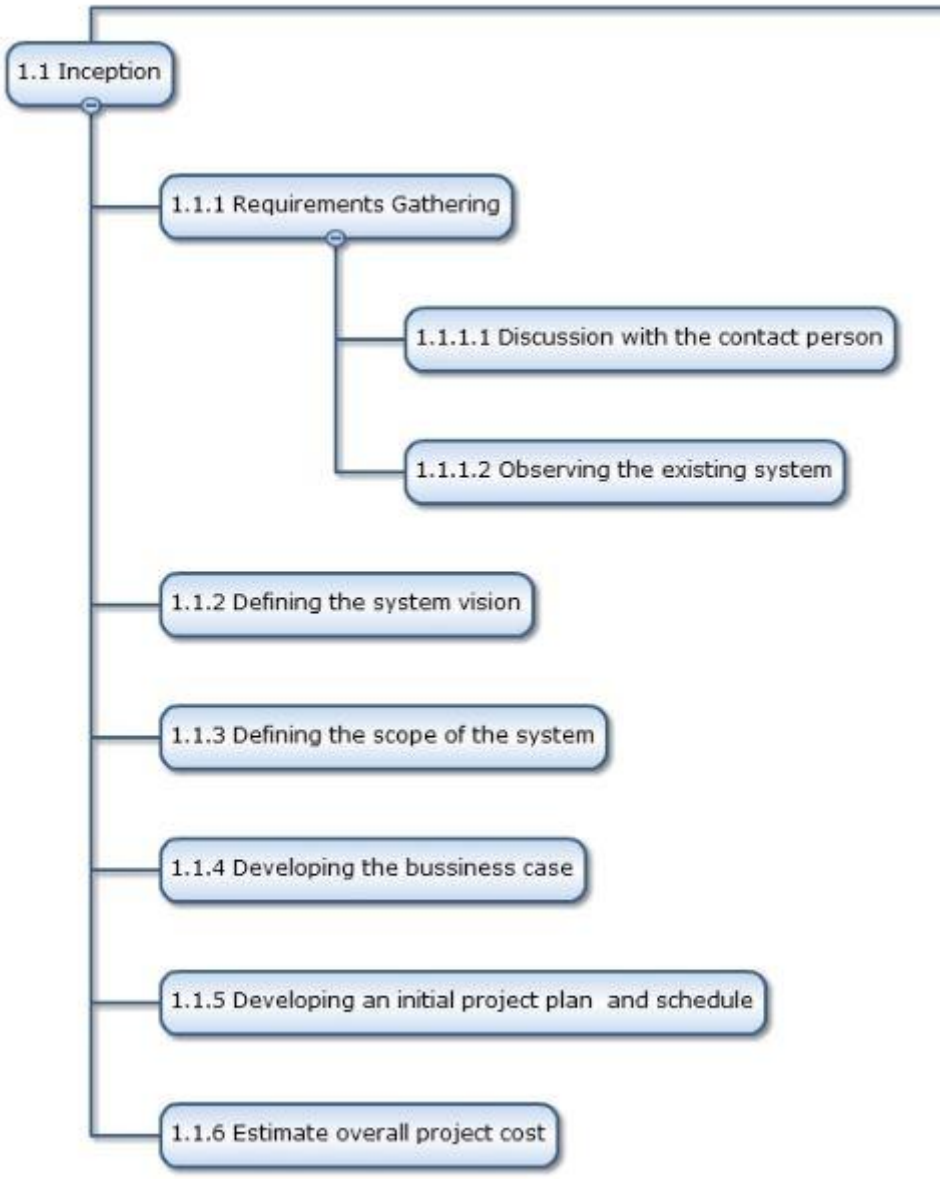

Figure 2.6.2 WBS of Inception Phase

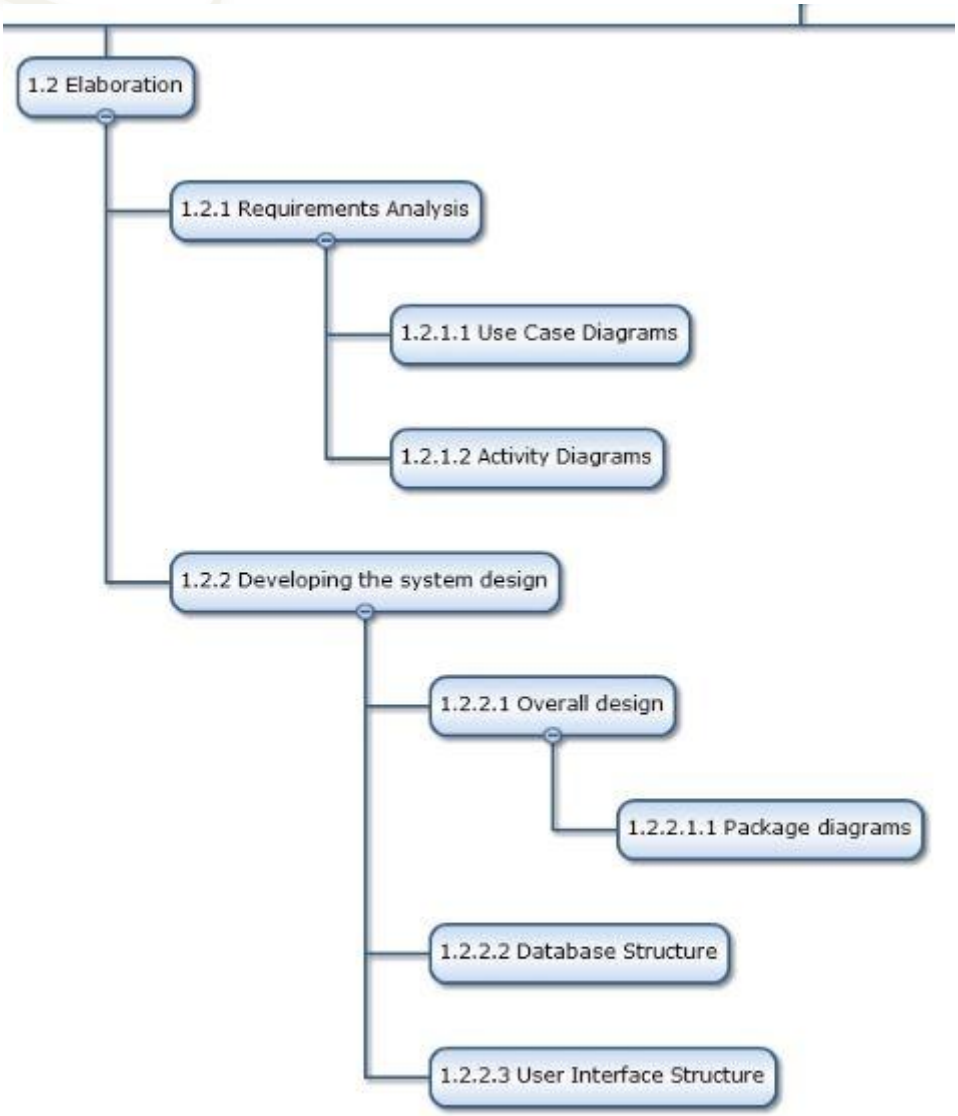

Figure 2.6.3 WBS of Elaboration Phase

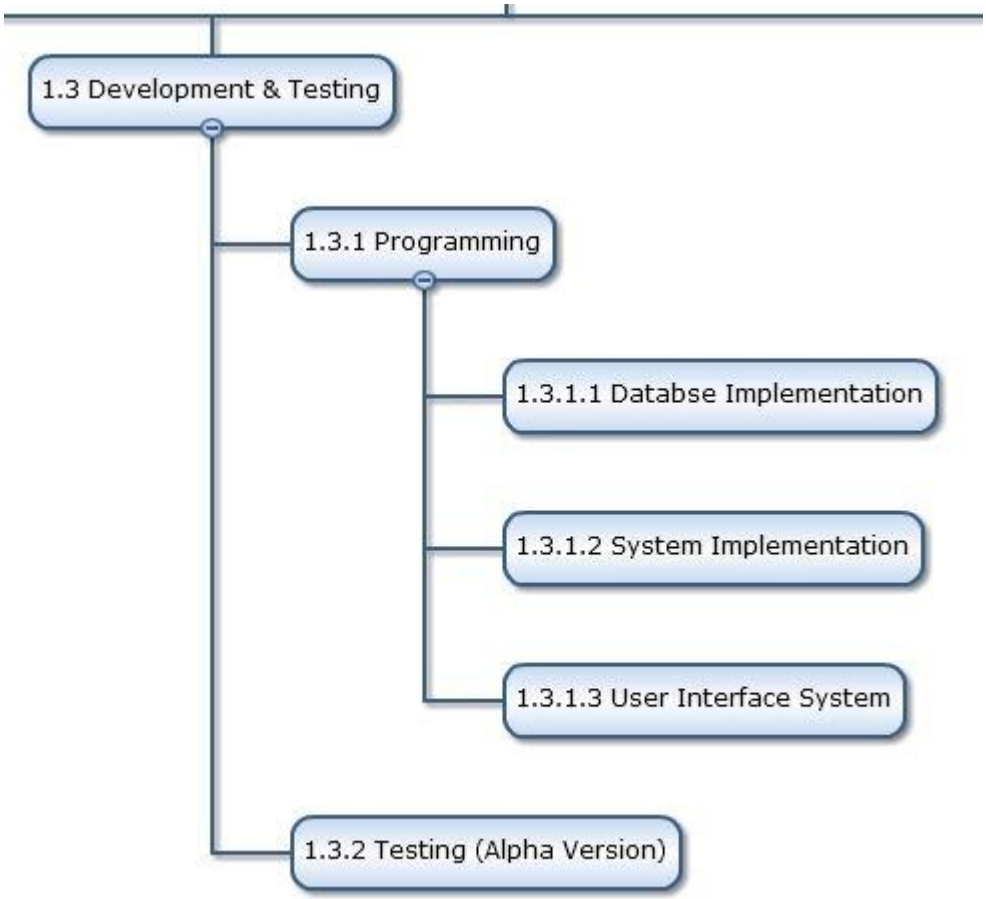

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Figure 2.6.4 WBS of Construction Phase

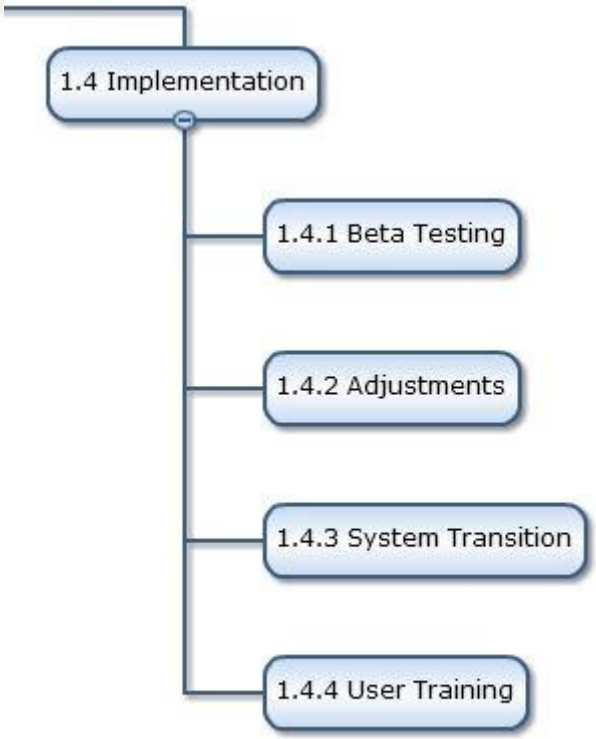


Figure 2.6.5 WBS of Implementation Phase

2.6.2 Initial Project Plan

Initial Project Plan		
Inception Phase- 2 Weeks		Total time (Human Hours)
Process	**Time (Human hours)**	
Requirements Gathering		
Discussion with the contact person	10	
Observing the existing System	05	
Defining the system Vision	02	
Defining the scope of the system	09	
Developing the business case	06	
Developing initial project plan and schedule	05	
Estimate overall project cost	03	40
Elaboration Phase- 4 Weeks		
Process	**Time (Human hours)**	
Requirement Analysis		
Use Case Diagram	07	
Activity Diagrams	08	
Developing the system Design		
System Design	15	
Database Design	10	
User Interface Design	10	
		50
Development and Testing Phase - 8 Weeks		
Process	**Time (Human hours)**	
Programming		
System Implementation	40	
Database Implementation	30	
User Interface Implementation	20	
System testing	20	110
Implementation - 4 Weeks		
Beta Testing	10	
Adjustments	10	

System Transition	05	
User Training	15	
		40
Total time (Human Hours)		240

Table 2. 6. 1. 1 Cost analysis

2.7. Summary

During the Inception phase, the business environment was analysed, a vision for the system developed, requirements were gathered, analysed and specified and an estimated resource plan was developed for the system.

Chapter 3

Elaboration

3.1 Introduction

Elaboration is the crucial phase in a project development. The client's needs and requirements are translated into system design. If they are not matched properly, then the system may not be able to meet the client's needs.

Models are useful to represent important aspects of certain real world scenarios. Various Types of Models are used in Elaboration Phase,

1. Domain Modelling

2. Behaviour Modelling

3.2Domain Modelling

A domain model captures the most important types of objects in the context of the business. The domain model represents the 'things' that exist or events that transpire in the business environment.

After careful analysis of the business model of the system, it was decided that the considered system contains three sub domains.
1. Sales Sub-Domain
2. Inventory Management Sub-Domain
3. Employee Payroll Sub-Domain

1. Sales Sub Domain

This is the core part of the clients business, sales of clothes

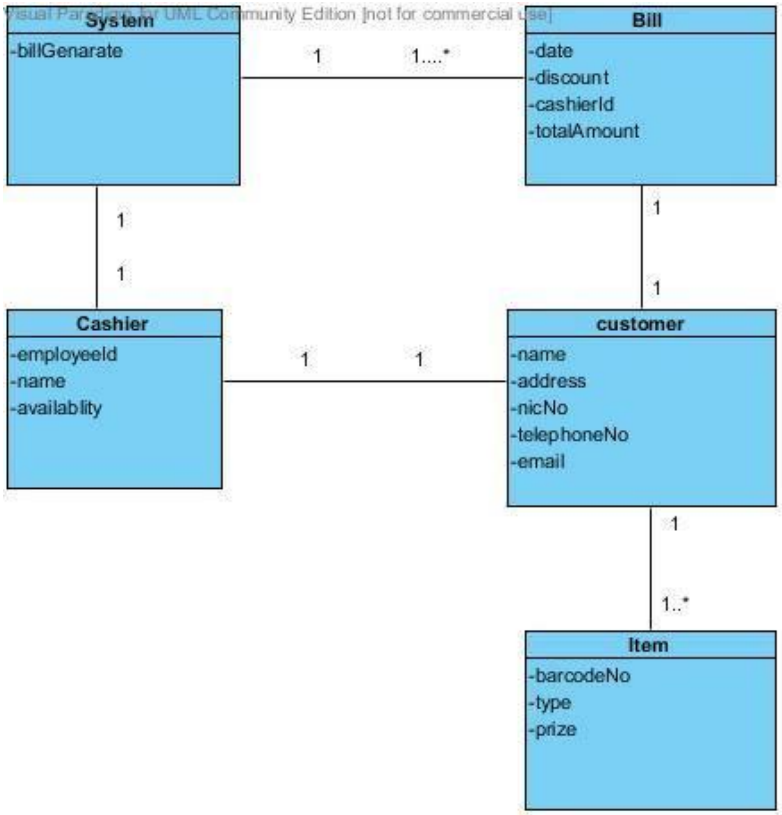


Figure. 3.2.1. Sales Sub Domain

2. Inventory Management Sub Domain

This domain describes the process of inventory management from sales, to purchase ordering, to checking and finally to warehousing.

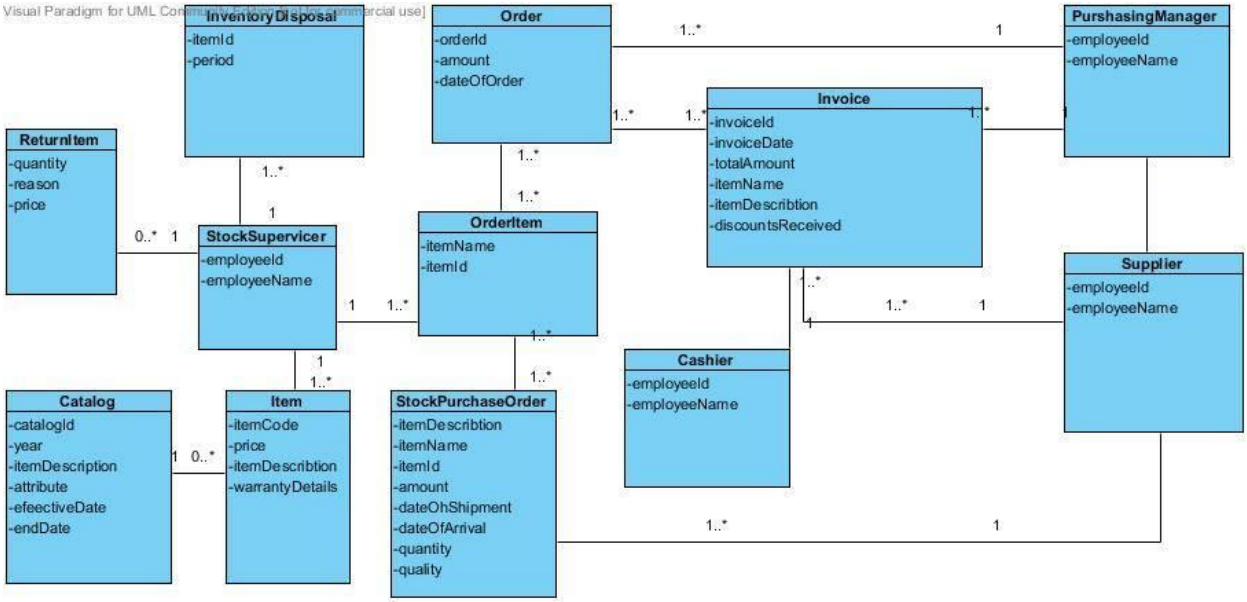


Figure. 3.2.2 Inventory Management Sub Domain

3. Employee Management Sub Domain

This domain describes the salary calculation and payment for the employees.

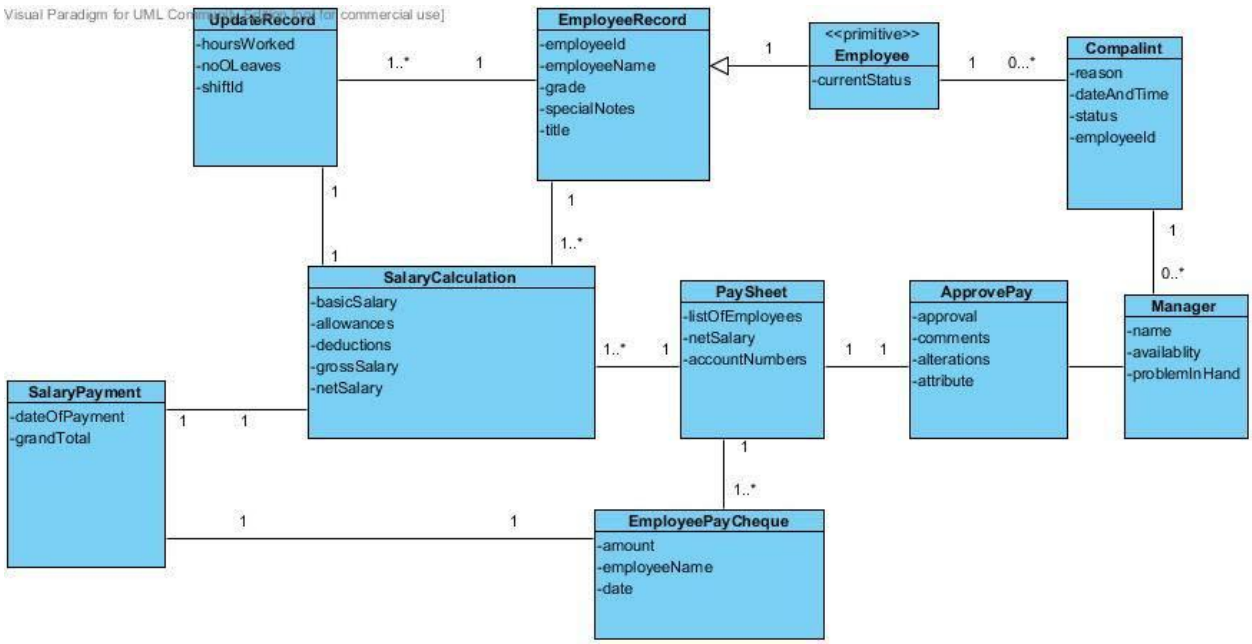


Figure. 3.2.3 Employee Management Sub Domain

3.3Behavioural Modelling

There are three types of systems that will act differently with each activity in the business transactions.

1. Sales of Items

This is the core part of the clients business. This behavior describes the workflow when a sales transaction occurs in the showroom of the client. First, the customer selects the items he needs to purchase and places the order at the POS. Here, the cahier produces the bill and updates customer details to the system. This behavior ends after customer pays the bill and leaves with the purchased items.

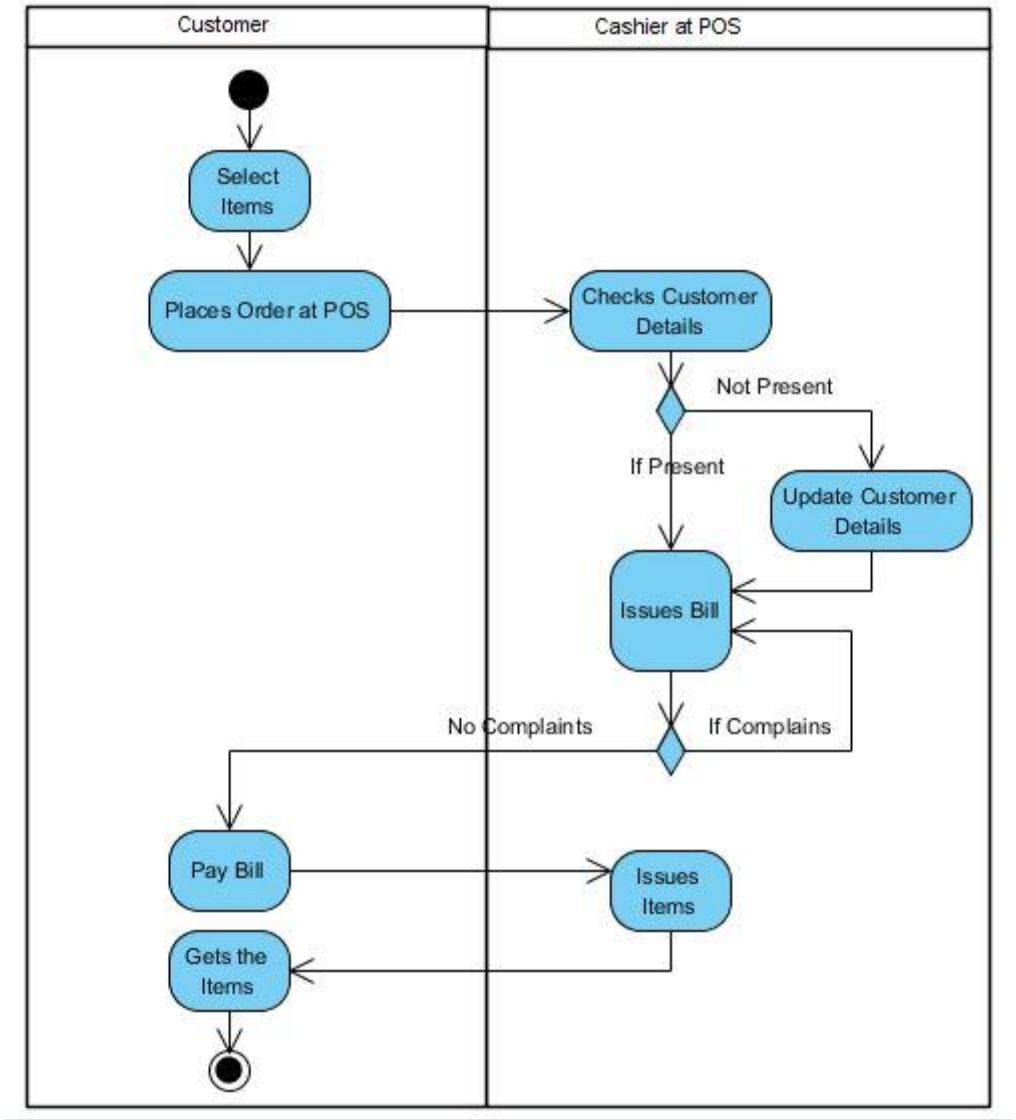


Figure. 3.3.1 Activity Diagram for sale of items

2. Inventory Management

When a sale occurs, inventory is automatically updated. If the inventory level is below the minimum level, system automatically sends a message to the procurement manager and then the procurement manager places order to the supplier. When the supplier supplies the order, procurement manager updates the inventory database. Then the cashier finalizes the invoice and makes the payment to the supplier.

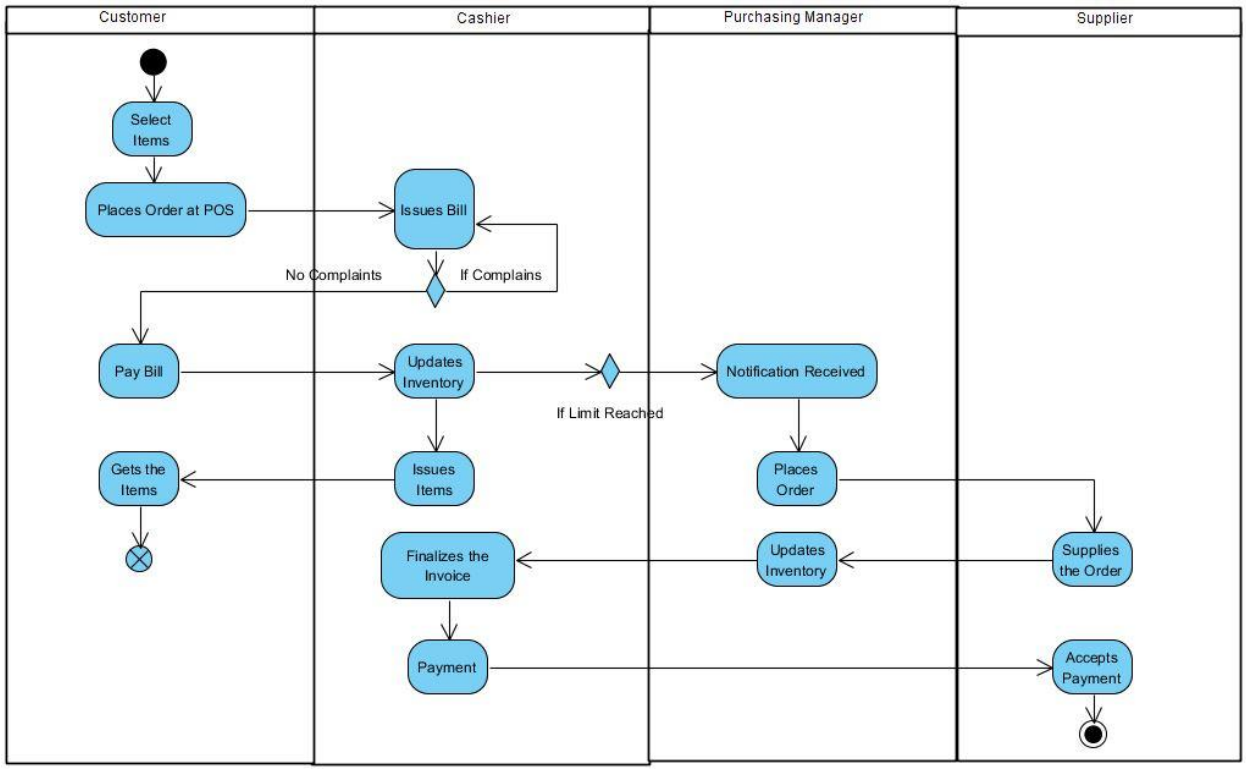


Figure. 3.3.2 Activity Diagram for Inventory Management

3. HR Management

This behavior describes the management of human resources. Data entry clerk updates the detail of employee's attendance in the database. HR manager maintains the detail in the database about the employee's performance (over time, working hours and customer feedback) during the accounting period and authorizes incentives. The system then calculates the salary according to previously given data this will be paid by the cahier to the employee.

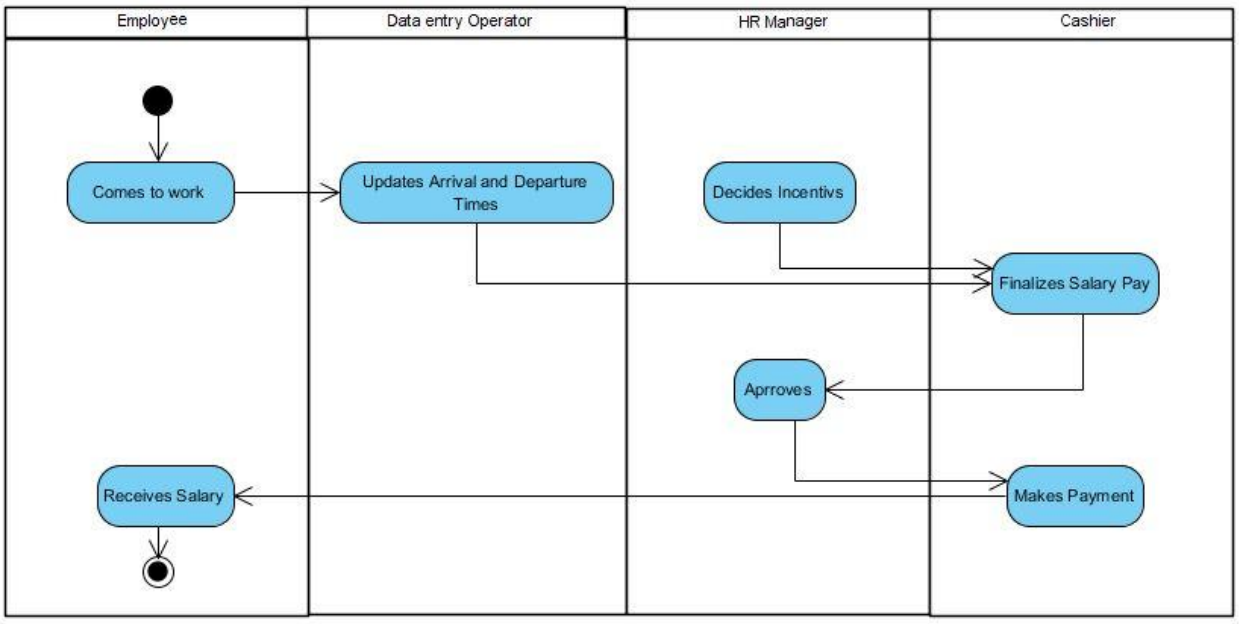


Figure. 3.3.3 Activity Diagram for Human Resource Management

3.4 Logical Architecture

After the behaviour is defined, it is important for the developing team to understand the business logic behind each domain and behaviour to successfully code the system.

3.4.1. Logical Architecture

1. Sales
   This is the core of the business sales.
4. Customer Details Maintenance
   The details of the customer are maintained along with purchasing records for targeted marketing
5. Inventory Management
   Here tasks such as purchase, purchase returns and disposals need to be taken care of.
6. Human Resource Management
   Here the details such as leaves, salary and feedback needs be saved.
7. Report Generation
   System should be able to produce

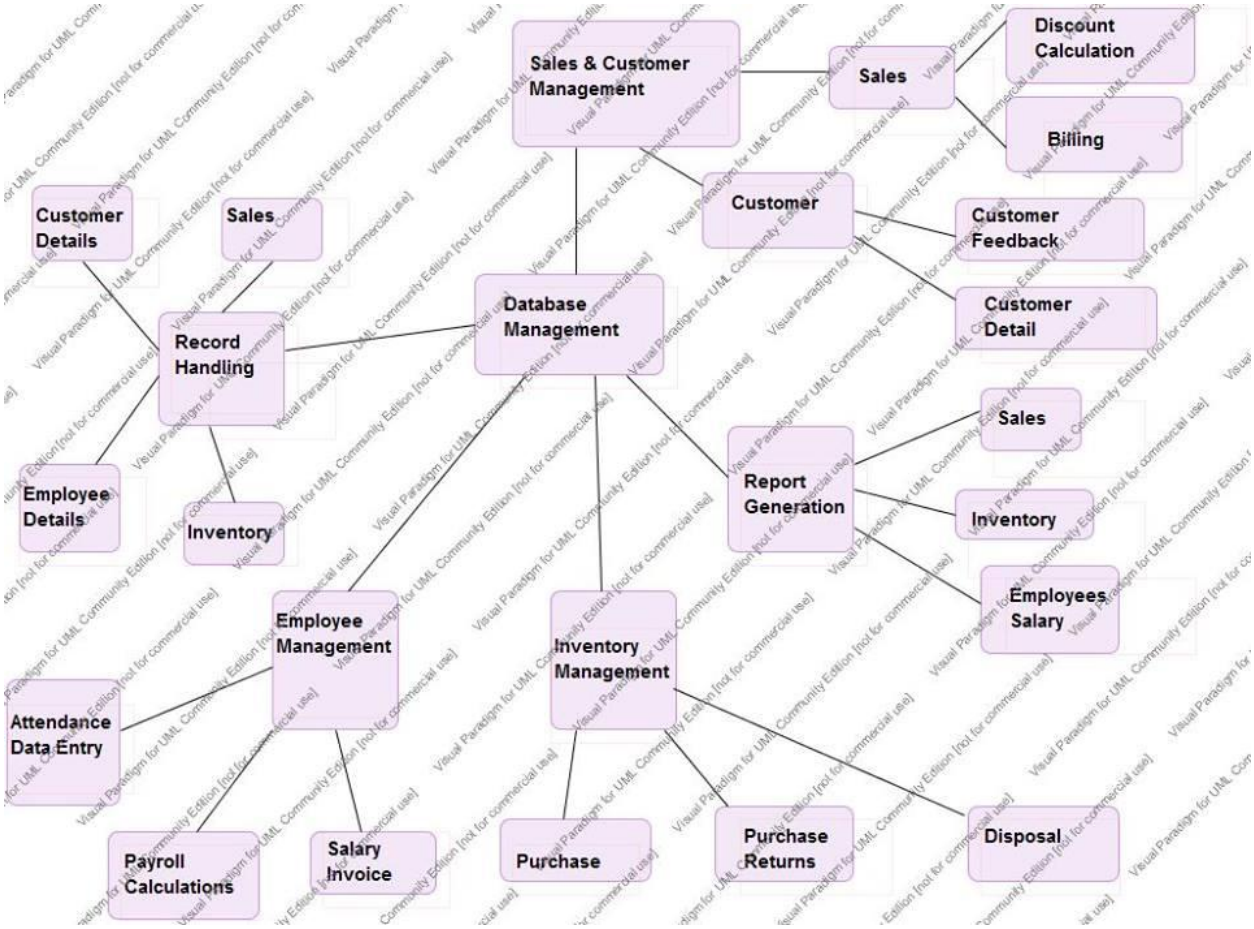


Figure.3.4.1.1 Logical Architecture

3.4.2. Layered Architecture

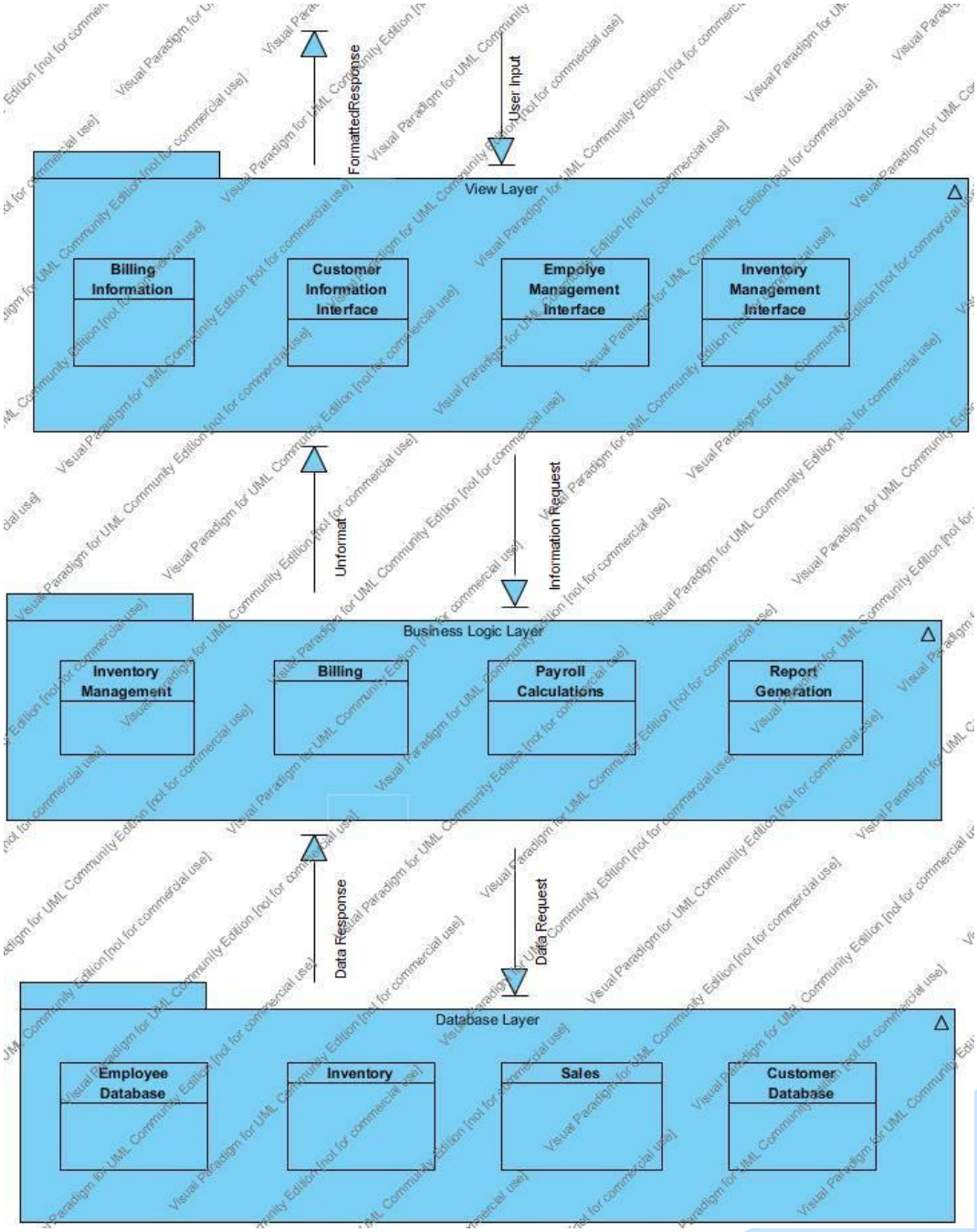


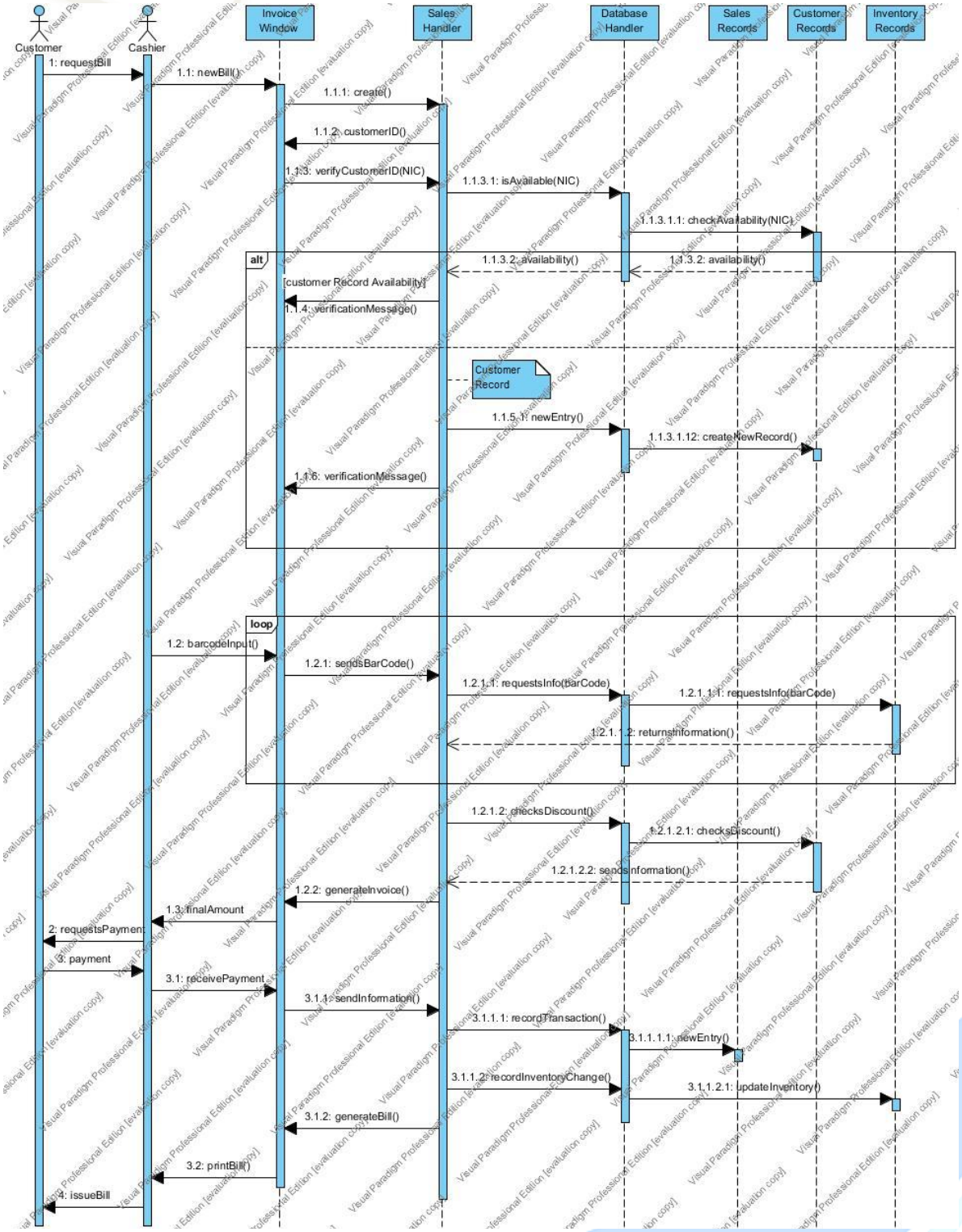
Figure 3.4.2.1 Layered Architecture

3.5Inter Object Communications

The businesses' main processes are sales to customers and inventory management. Considering the above business processes, the major events taking place in the business are,

1. Sales to customers

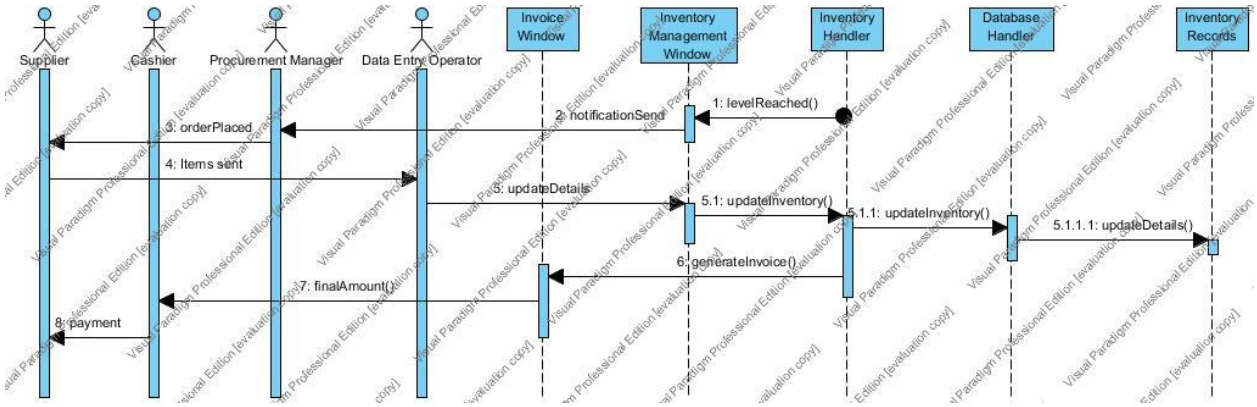
This is one of the critical events since the customers will be in the scene and the event needs to transpire smoothly in order for the business to succeed. Here at the POS (Point of Sales) cashier needs to produce a complete bill and accept payment for the sales to the customer. Sales transaction needs to be recorded and inventory level needs to be updated by the system.



3.5.1. Sequence Diagram for Sales to Customers

2. Management of inventory

   In this event, from ordering of the inventory by procurement manager to the payment to the supplier needs to be included. This also includes the updating of inventory records by data entry operator. This is the second most important event in the business, since efficient inventory management can increase the overall business performance in the market.



3.5.2. Sequence Diagram for Management of Inventory

3.6 Summary

During the Elaboration Phase, we clearly identified the requirements of our client and had a thorough understanding of the business logic. This phase is also heavily documented with various diagrams such as,

1. Work Flow Diagrams
2. Sequence Diagrams
3. Class Diagrams
4. Package Diagrams

Chapter 4

Construction

4.1 Introduction

After the thorough understanding of the system, the development continues in coding the expected system. This phase is done in iterations. Each iteration produces a part of the executable product. Testing also run parallel with implementation into some level.

4.2 Micro Level Architecture

Micro-architecture deals with important issues between the high-level view of software system architecture and low-level coding.

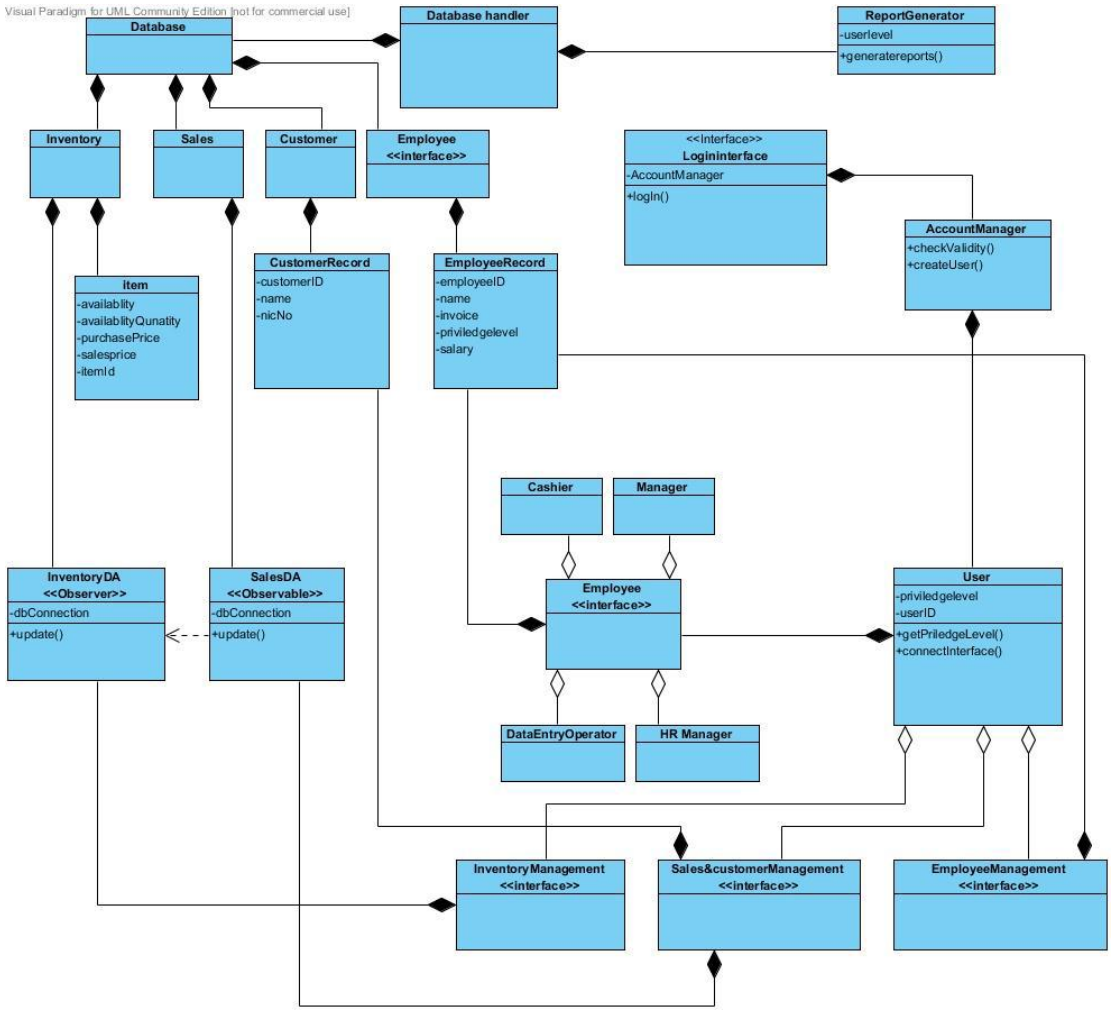


Figure 4.2.1 Micro Level Architecture

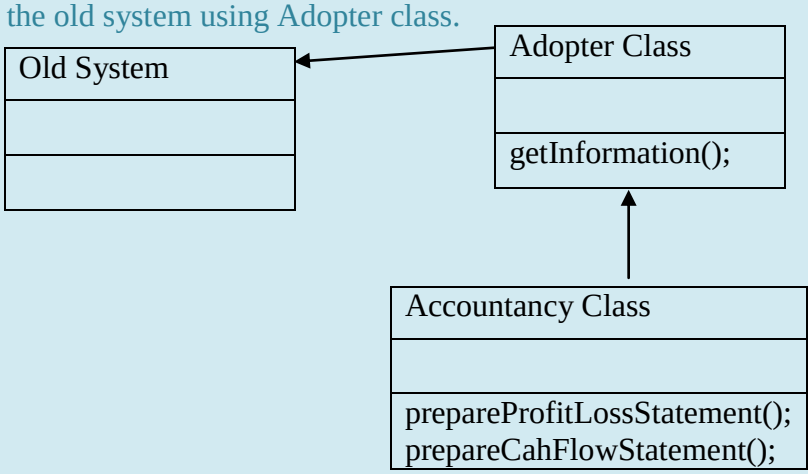
4.3 Design Pattern Based Solutions

Identified Design Patterns,

- Singleton
- Adapter
- Controller
- Observer

Name	**Singleton**
Problem	An instance when the application needs to create only one instance of an object and any further instance needs to be connected to the older instance.
Solution	A singleton class has a static variable that refers to the one instance of itself. All constructors to the class are private and are accessed through a method.
Example	In our system (municipal council) the connection to the database is made through a class called “databaseConnection”. Due to practical reasons (prevention of data corruption) the connection should only be made once by each system in a node.

Name	Adopter
Problem	In any systems, changes will be made after some time. When a new class is added this may bring out many problems in the system. If a method needs to change the specific method in the entire system needs to be changed.
Solution	When the changes are made, the new classes will be connected through an adopter class to the old system. This will minimize the problems of editing (renaming/deleting) parts of the old system. This will ensure that the older system is not affected
Example	In the system we are creating, accounting systems are not integrated due to the need of specialist knowledge. When they are integrated they can be connected to the old system using Adopter class.



Name	Controller
Problem	In many systems, the user's interaction with the system is very volatile resulting in many sequence scenarios. There may be data corruption if the system couldn't handle multiple scenarios.
Solution	We need a centralized control in displaying interfaces as well as passing messages. This will act as a connecting medium between multiple classes.
Example	In our system there are many level employees login address, i.e. login interface is different to each user as well as the system access. This is controlled by Login handler.

Name	**Observer**
Problem	In a system, the state change of a class needs to trigger a reaction in another class. How can a class observe the change in a different class without coupling?
Solution	Solution is having a method to register classes that needs changes for particular events. Then when the event occurs the class can notify all the registered interested parties.
Example	For our retail client, inventory management is quite important. Required higher ups needs to be notified when the inventory reaches the replenishing limit Procurement manager is notified immediately through InventoryManagementController.

4.4 Macro Level Architecture

Following are the frameworks we have used in the system,
1. Information Services
The client wants to provide the information on their available items to the customer and any other necessary stakeholders. Therefore we have to design the information system.

2. Persistence framework
The system uses a persistence framework for storing and retrieving all kinds of data in database which are useful for the business. It performs as a level of abstraction between the application and the database.

3. Application framework
This is used to implement the standard structure of a graphical user interface (GUI) using existing software application frameworks.

4. Message passing service
In the system, we provide for the clothing retail store, they are handling the inventories. So it is necessary to get a notification when the store reaches the minimum level. Therefore we implement a message passing system for notify the inventory level to procurement manager.

4.5 Layer Based Solutions

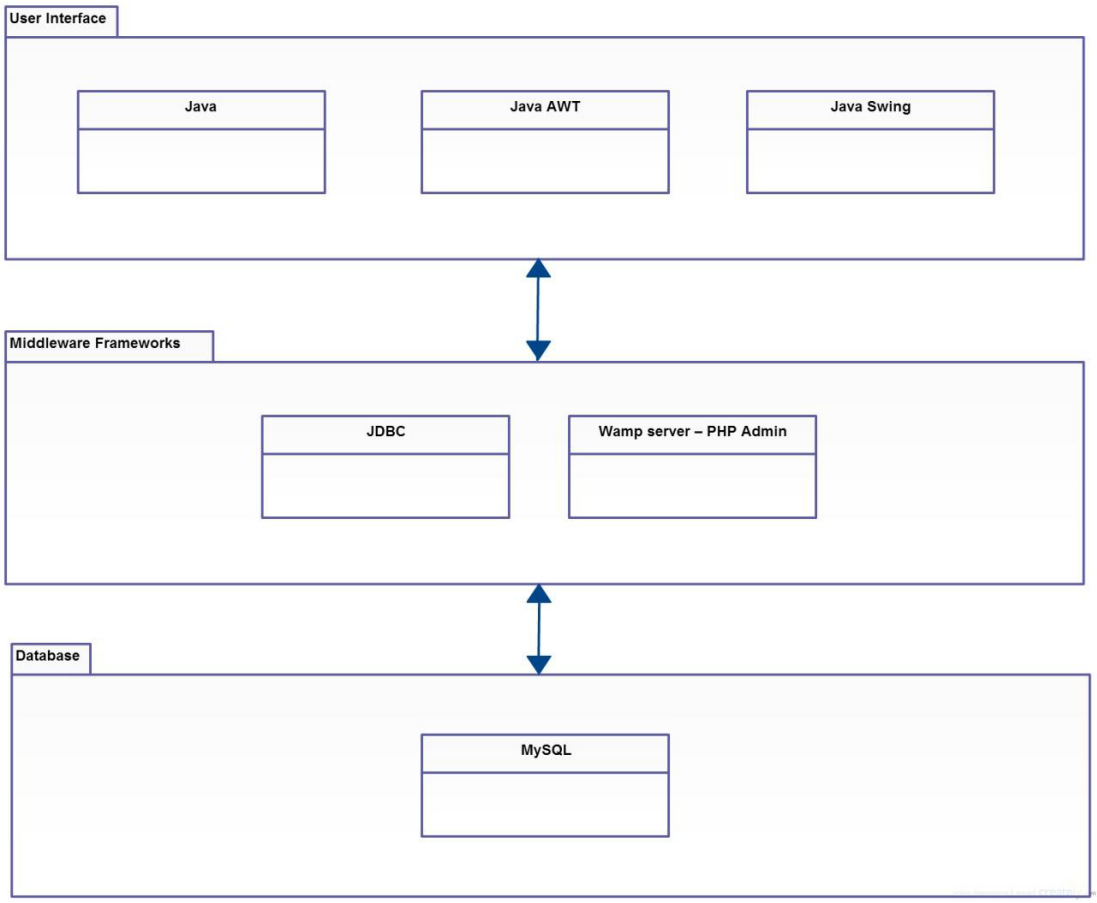


Figure 4.5.1 Layer Based Solutions

4.6 Application Level Architecture

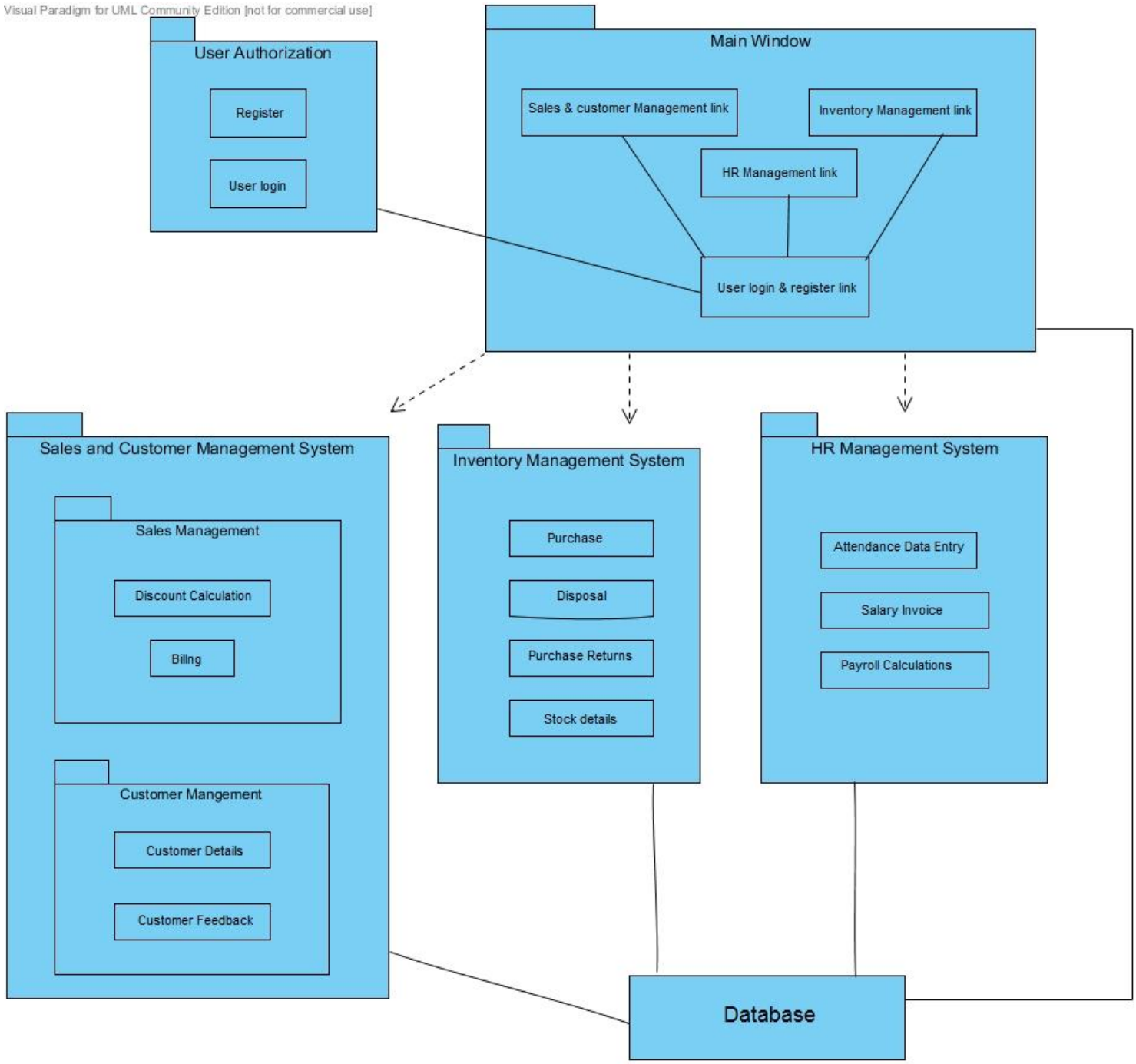


Figure 4.6.1 Application Level Architecture

4.7 Summary

After several iterations, the final executable product was done.

Java language was used in the implementation of the project

Following IDE's were used in the construction phase,

- 1. NetBeans 8.0
- Notepad++
- SQL workbench

Github was used for the collaboration between the 5 members of the team.

Chapter 5

Transition

5.1 Introduction

This is the last phase in the System Development Process. There are main two parts in transition phase,

1. System Testing

   System is tested so as to ascertain whether or not it met the functional and the non-functional requirements set by the user. Sometimes testing is also done in parallel with construction phase. After the programmer tests it the user also tests (Beta Testing) to ensure the final executable is satisfactory.

2. System Transition

   Here the system is installed in the business environment. This also includes user training, feedback and maintenance.

5.2 System Testing

System testing is done mainly in three different levels.

- Object level
- Module level
- Sub-system level
- System level

1. Testing at Object Level

   Here every methods in a class is tested before further work is preceded, this ensures faster recognition of bugs.

   In the MIS, every query sent to the database is tested with data before integration of functions takes place.

2. Testing at Module Level

   Here every module is tested before many modules are integrated into a sub system.
   In the MIS< the various interfaces can be considered as modules, and they are thoroughly tested before they are integrated.

3. Testing at sub system Level

   The project consists of three sub systems, namely

   1. Sales Management sub system
   2. Inventory Management Sub System
   3. Human Resource Management Sub System

   Each of the subsystems is tested before they are integrated into one system.

4. Testing at System Level

   After all the development, it is vital to test the entire system before it reaches the users hands. One has to check weather system meets functional and non functional requirements.

5.3 Summary

The software is developed and tested before deploying. Tests are done in a way to ensure that every method and classes are running as expected.

System should also be maintained so that the performance does not reduce with time.

Chapter 6

Conclusion

6.1 Challenges and Problems

During the course of the project, the project team faced many problems; foremost among them is the division of work. It was hard to equally distribute the work load but with practice it came easily and the work continued smoothly.

6.2 Improvements to the Project

An accounting package could be attached to the system. A web based as well as mobile based functionality could be attached to the system, thus enabling the customers and management to access information more efficiently.

Reference

Object-Oriented Analysis & Design - with the Unified Process,

John W Satzinger, Robert B Jackson, and Stephen D. Burd, Thomson, 2005