

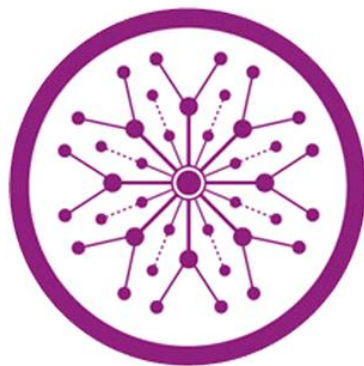
H2O Hub

Final Year Project

Session 2018-2022

A project submitted in partial fulfillment of the degree of

BS in Computer Science



Department of Computer Science

Faculty of Computer Science & Information Technology

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Project Group Members				
Sr.#	Reg. #	Student Name	Email ID	*Signature
(i)	Bcsm-f18-049	Mushahid Ali	bcsm-f18-049@superior.edu.pk	
(ii)	Bcsm-f18-149	Rahmeen Asim	bcsm-f18-149@superior.edu.pk	
(iii)				

*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

Plagiarism Free Certificate

This is to certify that, I Mushahid Ali S/D of Zahid Hussain, group leader of FYP under registration no FYP-BCSM-F21-036 at Computer Science Department, The Superior College, Lahore. I declare that my FYP report is checked by my supervisor

Date: **06-01-2022** Name of Group Leader: _Mushahid Ali_ Signature: _____

Name of Supervisor: Ms. Faiqa Maqsood

Co-Supervisor:

Designation: Lecturer

Designation:

Signature: _____

Signature: _____

HOD: Dr.Irfan-u-din

Signature: _____

Project Report

H2O Hub

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APPROVAL

PROJECT SUPERVISOR

Comments: _____

Name: _____

Date: _____

Signature: _____

PROJECT MANAGER

Comments: _____

Date: _____

Signature: _____

HEAD OF THE DEPARTMENT

Comments: _____

Date: _____

Signature: _____

Dedication

Thanks to ALLAH ALMIGHTY.

This work is dedicated to my parents, teachers and my university and thanks for their prayers.

They give us blessing to do this and, on this day, we are able to write a report.

Acknowledgements

I am really thankful to my supervisor Ms. Faiqa Maqsood for their valuable guidance, constructive criticism and encouragement through the project.

Thanks to my team members who have made valuable comment suggestion on this report which us an inspiration to improve our assignment. We thank all the people for their help directly and indirectly to complete my report.

Executive Summary

H2O Hub is an Android ecommerce-based Application that is also providing the services of water distribution and chlorine cleansing. In the ecommerce part the product includes house cleansing (like detergents, mop etc.) products and water bottles of different sizes. Customer can visit the store buy anything he want. There will be some services that also will be provided to the customer. These services include water distribution services and chlorine cleaning services. The customer can avail his required services through the App. For the service customer will the form in the App. The admin will get the data and will contact with the customer for the confirmation of the service. admin can handle everything including products, orders, reports. There are two payments option for the customer he can pay online and also he can use the option of cash on delivery.

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Chapter 1

Introduction

Chapter 1: Introduction

H2O Hub is an android application in which there will be an e-commerce part in which the customer wants to sell house cleansing products (like detergents, mop etc.) and water bottle of different sizes. There will be another section in the application to provide different types of services like water distribution and chlorine cleaning services.

- In water distribution system the water will be supplied to each home that will purchase the service.
 - In chlorine service, water tank cleaning service will be provided to the customer.

1.1. Background

- As we know the sever condition of water availability. In most of the places there are water mafias operating their network and selling water at high rates.
- Still the clean water is not available for everyone even when they are paying for the water. The people still forced to drink the impure water.
- In the existing system all the work is done offline no online activities are involved. All the services are done physically that was a headache.
- There are many existing Apps like this which are based on e-commerce and selling products online. But only the ecommerce store is not the solution for the given system. The company need the whole system to handle all of their hustle through their application.

1.2. Motivations and Challenges

There are many existing Apps like this which are based on e-commerce and selling products online. But only the ecommerce store is not the solution for the given system. The company need the whole system to handle all of their hustle. In the existing system we need payment method, inventory management, reporting systems

This application is being developing to resolve many issues that could be:

- If the consumer is not able to go out for shopping the consumer can get the product online what he wants for their house hold products.

-
- The application will also be working for the water distribution. May consumers demand for good and clean water with good taste? Normally they bring this water on their own. They have to bring water every time when they needed maybe 2-3 times a week depending on the use.
 - Big organizations, small organizations or homes all of the needed the services of chlorine cleaning to protect their tank from germs Fungai.

1.3. Goals and Objectives

The goal is to provide a android application that will be providing

- An ecommerce store to handle the sale and purchase of the products proposed by the company to their consumers
 - This will give customers the access to order house products according to their need.
- A services section in which anyone on the app can acquire the service for themselves.
- In the distribution system customer will enter the form to avail the service the admin will receive the query and contact with the customer.

1.4. Literature Review/Existing Solutions

There is not any well existing solution right now. There are many apps that are working based on e-commerce and selling product online. But their inventory management and reporting systems are not enough good. The main concern is the distribution system and HRM systems in which most of the system gets failed.

1.5. Gap Analysis

Table 1 Gap Analysis

	Helpful	Harmful
Internal	<p>Strengths</p> <ul style="list-style-type: none"> • Standardized Quality • Boundary less access in the whole country • Ease to cell products and services • Time saving transaction through internet • No time constraints • User friendly • Everything is managing on the application • 	<p>Weakness</p> <ul style="list-style-type: none"> • Need Dashboard to handle everything • Security • Disgrace of Fake App • • Delivery Time • Customer Satisfaction • Limited Advertising
External	<p>Opportunities</p> <ul style="list-style-type: none"> • Increase Customer Conversions • Changing Trends will be easy • Increase management efficiency • Fulfilling the customer needs • Wide Growth • 24/7 Availability 	<p>Threads</p> <ul style="list-style-type: none"> • Competitors • Environmental Changes • Innovations in Technologies • Privacy Concern • No Direct Interactions • Fraud

1.6. Proposed Solution

The proposed solution includes a mobile application and an android application that includes following features.

1. Admin Dashboard
2. User Panel
3. HRM System (Human Resource Management System)
 - Asset manager
 - To-do Task Module
 - Notification
 - Workflow
 - Inventory Management System
 - Reports Generation
 - Accounting
 - Customer support Center
4. Ecommerce Mobile Application
 - Payment Method
 - Product Listing
 - Elegant Design
 - Beautiful Logo

1.7. Project Plan

This project will be helpful for making the management system much strong, reliable and much efficient. By using this site, both the company and the customer would have all the information about the orders. The company would have all the information about the order, that when it has been placed, what are the requirements of the customers and then he needs the service. The customer will also have all the information that when the order has been placed, when the shipment is done and when will he get the order. This will benefit the company in many ways as the company would have to manage the system with less effort and it would have more time to manage the company needs, requirements, and this will take the company toward high rank. The time consumption will be less, the owner would have more time to enhance the company and to make

the people focus toward his company. It will also benefit him to have a good marketing and much publicity of the company.

1.7.1. Work Breakdown Structure

The Work Breakdown Structure is going to divide into three members of a team.

- Mushahid Ali
- Rahmeen Asim

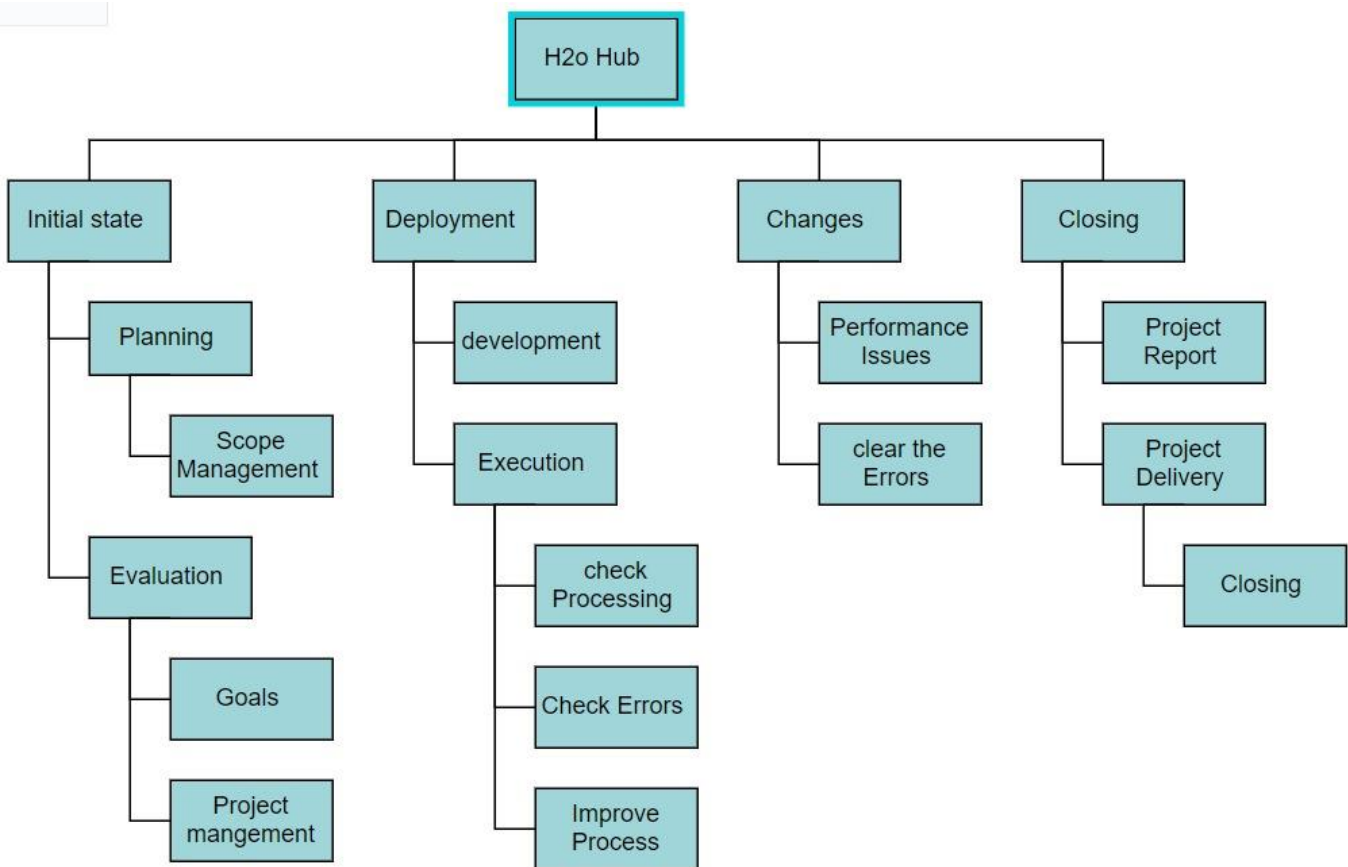


Figure 1 Word Breakdown Structure

1.7.2. Roles & Responsibility Matrix

Table 2 Roles and Responsibility

WBS	WBS Deliverable	Predecessor Activity #	Duration (# of Days)	Responsible Team Member(s) & Role(s)
1	User Observations	None	4	Mushahid Ali
1	User Stories	None	6	Rahmeen Asim
1	Stakeholders Meetings	1	2	Mushahid Ali
1	Requirement Document	2	11	Mushahid Ali, Rahmeen Asim
1	SRS Document	3	20	Rahmeen Asim
2	Analyze Requirements	4	2	Rahmeen Asim, Mushahid Ali
2	Refine Requirements	5	4	Mushahid Ali
2	Validate	6	2	Mushahid Ali
3	User Interface	7	30	Mushahid Ali, Rahmeen Asim
3	Server Selection	8	1	Mushahid
3	Coding	9	70	Mushahid Ali, Rahmeen Asim
4	Testing 1	10	3	Mushahid Ali, Rahmeen Asim
4	Testing 2	11	4	Mushahid Ali, Rahmeen Asim
4	Testing 3	12	3	Mushahid Ali, Rahmeen Asim
5	Deployment	13	10	Mushahid Ali, Rahmeen Asim

1.7.3. Gantt Chart

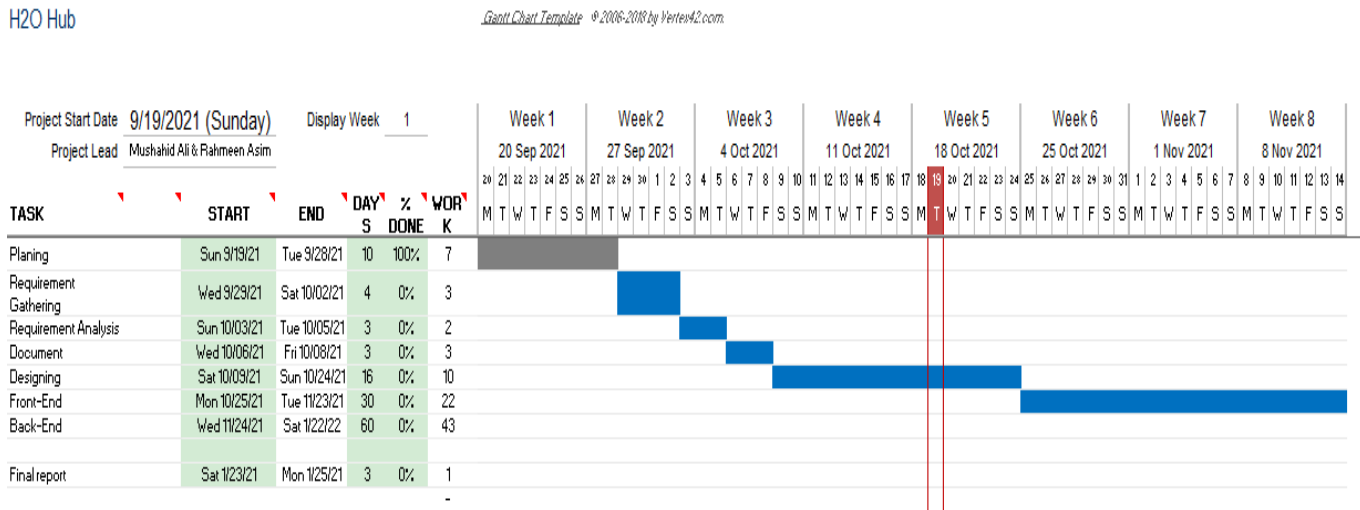


Figure 2 Gantt Chart

1.8. Report Outline

This site will help user or customer to get access to it easily as it is user friendly. On the other hand, there will be an admin panel where only admin would have the access. The admin can check all the things such as what the products in the stock are, what are not in stock, and what the orders are. He can also check the reviews of the customers that his customers are satisfied or not. The customer can order product or can use water service anytime and he can also check that what will be the time duration of the order delivery and where the order is right now. The customer will also have this opportunity to pay online such as through Jazz Cash, Credit cards, etc. The customer can easily use this application because the site will be user friendly.

Chapter 2

Software Requirement Specifications

Chapter 2: Software Requirement Specifications

2.1. Introduction

2.1.1. Purpose

The main purpose of this project is to make the client get better in their delivery of services and management of the business. In this way, they will provide customer better services due to which they can satisfy their customers.

After going online, the client will have maximum customer conversions and he can target all of the locations he wants. Moreover, the distribution will have much better way of managing records of order with full information due to which there will not any misplacement or delay in providing service, this will help to perform services better and will be convenient. This will be useful and helpful for both (the customer and for the distribution). As the customer would not need to go to the store for purchasing anything or for water service, they will get these all things by using application. And also, the client can keep the records maintained about how many products has been sold and how many orders they get in a day, and all the services purchased by the consumer will be seen by the admin and can be fulfilled. When the burden will be reduced, the organization would be able to enhance the quality, working and services of it.

2.1.2. Document Conventions

In this SRS, font style is Calibri. And the size of font is 12. Every requirement in this SRS has its own value, that could not be denied.

2.1.3. Intended Audience and Reading Suggestions

The intended audience for this project is developers, projects manager, project testers, users, and local public. As it is a site which has households and water distribution system, so everyone can use it. It is designed in such a way, that a person who is connected to the technology a little bit, can use this app very easily, and can get advantage from it.

2.1.4. Product Scope

Due to the useful modules of this application, it would have a wide scope of audience toward it.

This app will help customers to buy products that are the need in house hold and often people can't go outside for shopping of household product as they are the basic need and many people don't have this facility to go out easily for shopping. Also, the person who need the services related to water like the distribution supply of water to their door step, or the chlorine service will be the intended audience for the product.

2.2. Overall Description

2.2.1. Product Perspective

There are many android applications that are being used for selling products, but this application is the enhanced version of those. Also, has much more features that are being making it more enhanced and better from other sites. Such as:

Table 3 Roles and Responsibility

New Feature	Description
Admin Report Dashboard	The admin can check the daily report of the employees, products sales and orders, also the behavior of their clients.
Online Payment Integration	The customer can pay online through different available banks
Location Detection	The location will be detected through the system where is the pin location.
Chatbot Auto System	The Chatbot will automatically answer the customer queries and book services.

2.2.2. Product Functions

The major functions of the product are

Functionality of the product is given below:

Stimulus: User register himself

Response: System register the user and make his account.

Stimulus: user buy products

Response: system add the product to the user cart

Stimulus: user can checkout

Response: system check the details and approve checkout if valid

Stimulus: user buy services

Response: system add the details to the system

Stimulus: user can chat with the support team

Response: system will inform to the chat support team

Stimulus: User can give feedback or rate the things according to quality and his satisfaction.

Response: System, see the feedback and take any action if required.

2.2.3. User Classes and Characteristics

As this application is providing services and ecommerce at a time the user will be admin and the consumer.

Qualification -> Have enough Qualification that they could easily understand the commands of the mobile app.

Technical Knowledge -> *No technical knowledge required*

2.2.4. Operating Environment

The software will be operating on Mobile Phones and Tablets.

2.2.5. Design and Implementation Constraints

You need to be able to identify the constraints involved in designing an android app before diving into the few basic principles in page design that are common to most effective sites. The most fundamental of those constraints is that you can't fix where objects will appear on a viewer's screen. However, people see app screen in different viewports — that is, different-sized screens. And so, you have to design screen that will appear in mobile phones and maybe even Project Report. Another constraint of mobile application design is that unlike print designs, where the viewing area of any design is fixed, app users can (and do) zoom in or out as they interact with app, changing the size of text and images. And, by the way, different browsing environments handle zoom differently — some enlarge images as text is enlarged, and other times enlarging text doesn't affect other page elements.

2.2.6. User Documentation

The product will be included with user manual in which a brief overview will be provided about the product to the user, that will include complete configuration of the software, technical details, backup procedures and contact information which will include email address. There will be no online help for the product at this moment. The product is compatible with the internet Explorer 8.0 and higher.

2.2.7. Assumptions and Dependencies

1. The system should be user-friendly.
2. The system should have more capacity and provide fast access to the database
3. The system should provide search facility and support quick transactions
4. The system is running 24 hours a day
5. User may access from any computer that has internet browsing capabilities and an internet connection
6. User must have correct information about usernames and password to enter into their online accounts and do actions.

The dependencies are

1. The specific hardware and software due to which the product will be run
2. On the basis of listing requirements and specification the project will be develop and run
3. The end users (admin) should have the general report store

The information of all user must be stored in a database that is accessible by the software

2.3. External Interface Requirements

2.3.1. User Interfaces

For User Interface we used user dashboard in which he can see what product or services he purchased, how much money he spent on the app, He can contact to the admin for any query. On the app, he can purchase new products and new services.

Admin can view edit and and services.

User can view products, purchase service and also view

delete inventory, order, employee

purchase products, contact admin, services

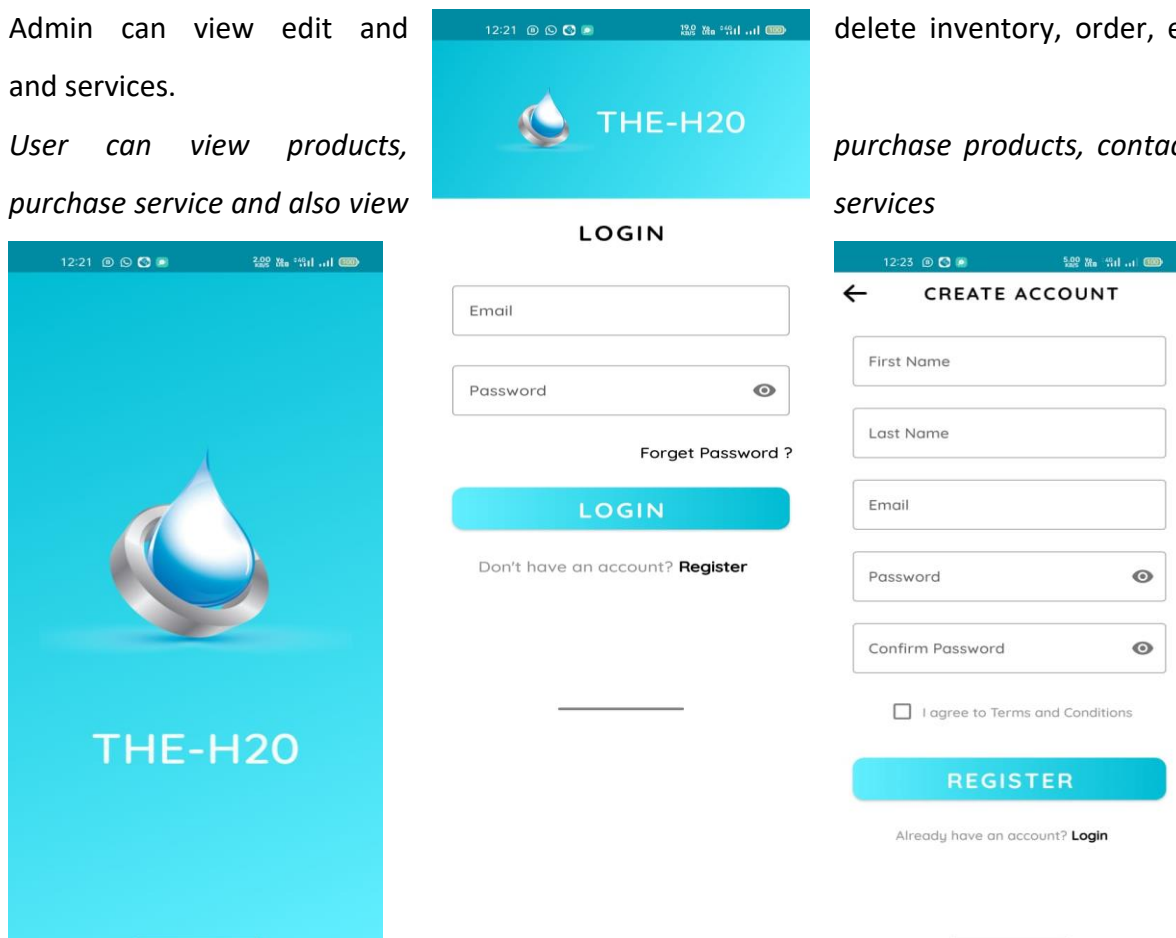


Figure 3 User Interfaces

2.3.2. Hardware Interfaces

The application will be working on server side. Write an interface and do all the commands on the server side, passing any output back to the browser.

Table 4 Hardware Specification

Hardware	Minimum Requirements
Android mobile or above	4
Memory (RAM)	At least 1GB
Hard disk space	At least 40MB

2.3.3. Software Interfaces

- The product will be available on internet
- The operating system should be minimum lollipop or above
- The database for the application will be Firebase

2.3.4. Communications Interfaces

Users can connect with the system using mobile phones and the internet. And communicate with each other.

2.4. System Features

- **Registration**
 - **Description and Priority**

This is to allow new users to get themselves registered in the App. This function then provides the user with a unique ID and password for further login purpose
 - **Stimulus/Response Sequences**

User enters into the registration form.

Provides the personal details

System saves the information and generates a Unique User ID and password which is sent to the registered contact number/address
 - **Functional Requirements**

REQ-SF1-1: User enter username password and other required details

REQ-SF1-2: The user can click forger password if he doesn't know his password
- **Login**
 - **Description and Priority**

This is to allow registered users to login into the App.
 - **Stimulus/Response Sequences**
 - User enters his User ID
 - checks if it is a valid User ID
 - Enter password to login
 - checks if valid password.
 - Opens the profile window of the user for further actions.
 - **Functional Requirements**

REQ-SF2-1: User can enter the username and password

REQ-SF2-2: If the one thing is wrong wither username or password the user can't login

REQ-SF2-3: The user can click forger password if he doesn't know his password

- **Home Module**

- **Description and Priority**

Home where user will be able to check the, products, check for the service, customer feedback, order details. They can compare section wise reports and evaluate them of the bases of their work.

- **Stimulus/Response Sequences**

Customer can use the available options in his app

- **Functional Requirements**

REQ-SF3-1: Customer can order products

REQ-SF3-2: Customer can order service

REQ-SF3-3: Customer can check products he ordered

REQ-SF3-4: Customer can check which services he acquired

REQ-SF3-5: Customer can contact to the admin for any query

REQ-SF3-6: Customer can give feedback to the products

- **Make Payment**

- **Description and Priority**

This is for the payment which will be needed when the customer will buy some product or service from the app and will be helpful in making payment for the employee.

- **Stimulus/Response Sequences**

Customer will buy the product and pay the price and can buy any service pay for that. The admin can pay the salary of the driver also.

- **Functional Requirements**

REQ-SF5-1: Customer can go for online payment to buy the products.

REQ-SF5-2: Receives a statement for successful transaction made

- **Buy Service**
 - **Description and Priority**
This is to allow the logged-in users to acquired service he wants.
 - **Stimulus/Response Sequences**
User log into his profile
The service is acquired
Submit the reserved service
Direct contact with admin
Log out
 - **Functional Requirements**
REQ-SF5-1: User can buy service he wants
REQ-SF5-2: User can see what service he purchased
REQ-SF5-2: User can cancel his service anytime
REQ-SF5-2: User can avail more services

2.5. Other Nonfunctional Requirements

- **Performance Requirements**

The App would be functional for 24 hours a day to enable user interaction at any point of time.

- **Security Requirements**

The Administrator password must be highly confidential.

The User ID must be confidential.

- **Software Quality Attributes**

Adaptability – New changes can be easily accommodated

Availability – 24/7 availability of services

Interoperability – Each Interface makes use of information provided by the other

Flexibility – Provides highly flexible services to the users

Portability – Not depend on any specific OS

Chapter 3

Use Case Analysis

Chapter 3: System Analysis

3.1. Use Case Model

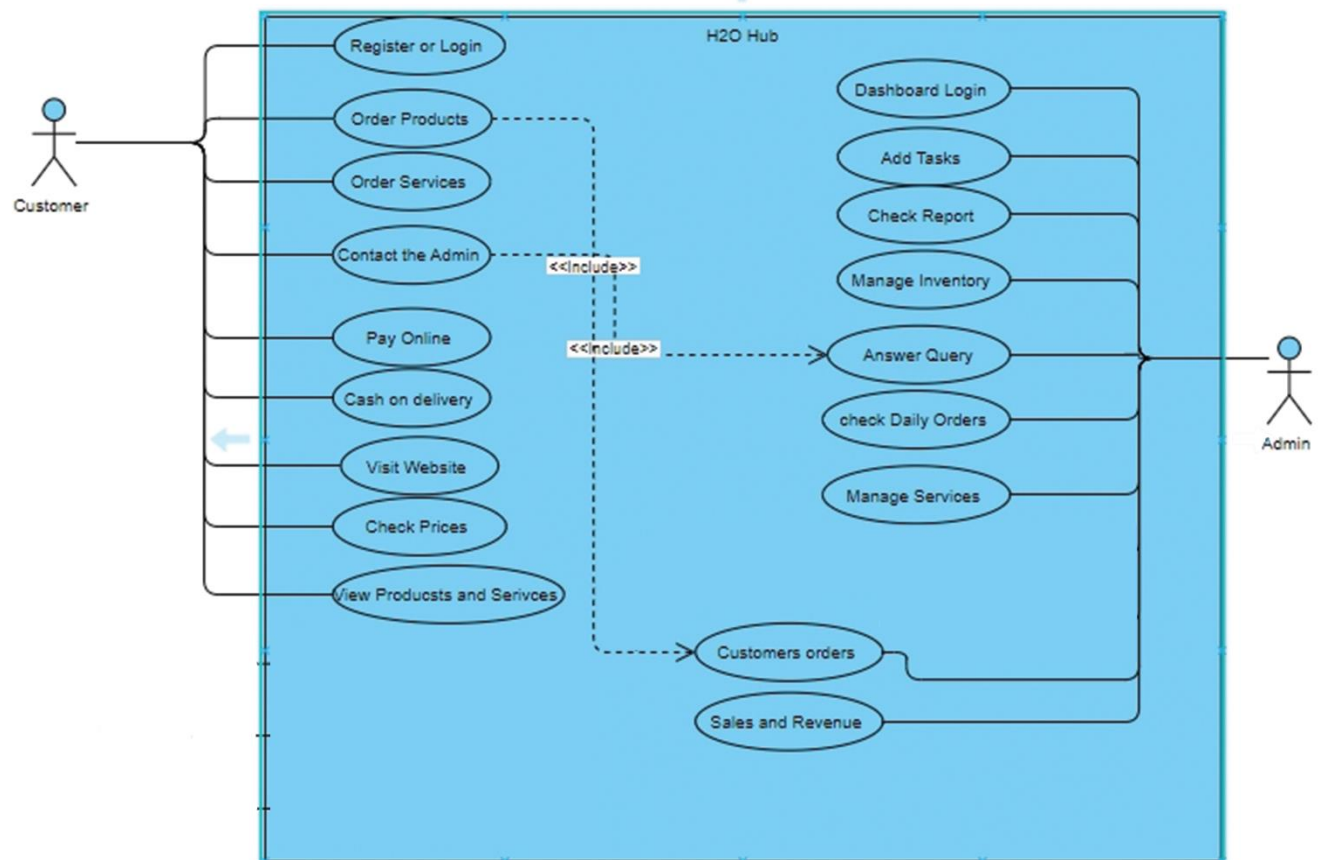


Figure 4 Use Case Diagram

3.2. Use Case Descriptions

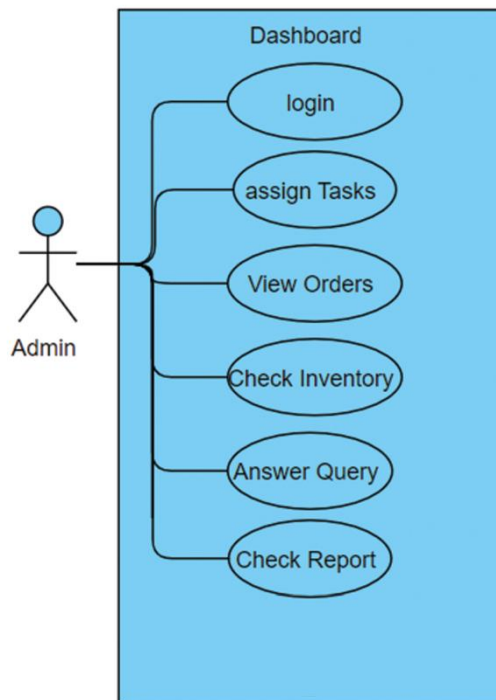


Figure 5 Admin Use Case Description

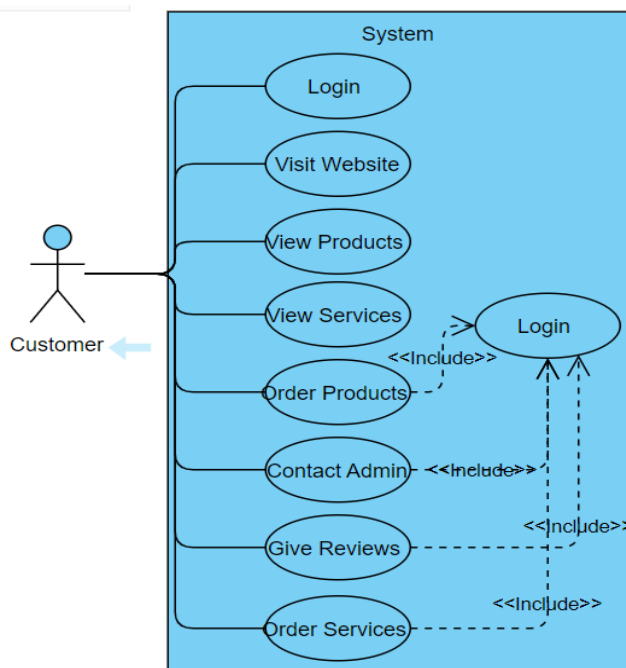


Figure 6 Customer Use case Description

Fully Dressed Use Cases

For create profile:

Table 5 Fully dressed use case for account creation

Number	2	
Name	Create Account	
Summary	the user must have to create an account to use the app.	
Priority	2	
Pre-condition	Users must have to install the app to create an account.	
Post-condition	Users have to enter his credentials to login.	
Primary Actor	User	
Secondary Actor	secondary actor	
Trigger	ck on register account	
Main Scenario	Step	Action
	1	Users open the app.
	2	Users select the register account option.
	3	User have to enter valid email and password.
	4	User verifies his mail through mobile no and an account is created.
Extensions	Step	User Action
	5(a)	User enter invalid entry
	6(a)	User email is not verified.

For manage account:

Table 6 Fully dressed use case for account management

Number	2	
Name	Manage account	
Summary	User manage his own account by adding his basic information pictures and the social media platforms.	
Priority		
Pre-condition	Users must have to create an account to manage it.	
Post-condition	Users have to save their information after adding it.	
Primary Actor	User	
Secondary Actor	secondary actor	
Trigger	Click on Edit profile	
Main Scenario	Step	Action
	1	User login to the app.
	2	Users select the edit profile option.
	3	User enters his basic information which he wants to add.
	4	User select his p[profile picture, add his social platforms and save it.
Extensions	Step	User Action
	5(a)	Users enter invalid username in their platform.
	6(a)	User did not save the added information.

For view profile:**Table 7 Fully dressed use case for view profile**

Number	2	
Name	View profile	
Summary	User view the profile of another user to connect with him and share data and information.	
Priority		
Pre-condition	Users must have to login into the app.	
Post-condition	Users have to connect to the other user.	
Primary Actor	User	
Secondary Actor	secondary actor	
Trigger	Click on the search profile.	
Main Scenario	Step	Action
	1	Users have to login first.
	2	Users select the search profile option.
	3	User have to enter the user name of other user to search him.
	4	Users view this profile and connect it .
Extensions	Step	User Action
	5(a)	User enter invalid username
	6(a)	Users don't connect to the profile.

For chat:**Table 8 Fully dressed use case for chat**

Number		
Name	Chat	
Summary	User send and receive the messages from or to the connected users. .	
Priority		
Pre-condition	User must have to connect with the other user to chat with him.	
Post-condition	Users must close the chat to chat with another.	
Primary Actor	User	
Secondary Actor	secondary actor	
Trigger	Click on chat button	
Main Scenario	Step	Action
	1	User login to the app.
	2	Users select the chat option.
	3	In the chat box he have the connected users.
	4	User click on any user to send and receive messages.
Extensions	Step	User Action
	5(a)	Users open the chat without connecting to any user.
	6(a)	Users login the app.

Chapter 4

System Design

Chapter 4: System Design

System design is the process of designing the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through that system. For assessing user requirements, an SRS (Software Requirement Specification) document is created whereas for coding and implementation, there is a need of more specific and detailed requirements in software terms. The output of this process can directly be used into implementation in programming languages.

Software design is the first step in SDLC (Software Design Life Cycle), which moves the concentration from problem domain to solution domain. It tries to specify how to fulfill the requirements mentioned in SRS.

4.1. Architecture Diagram

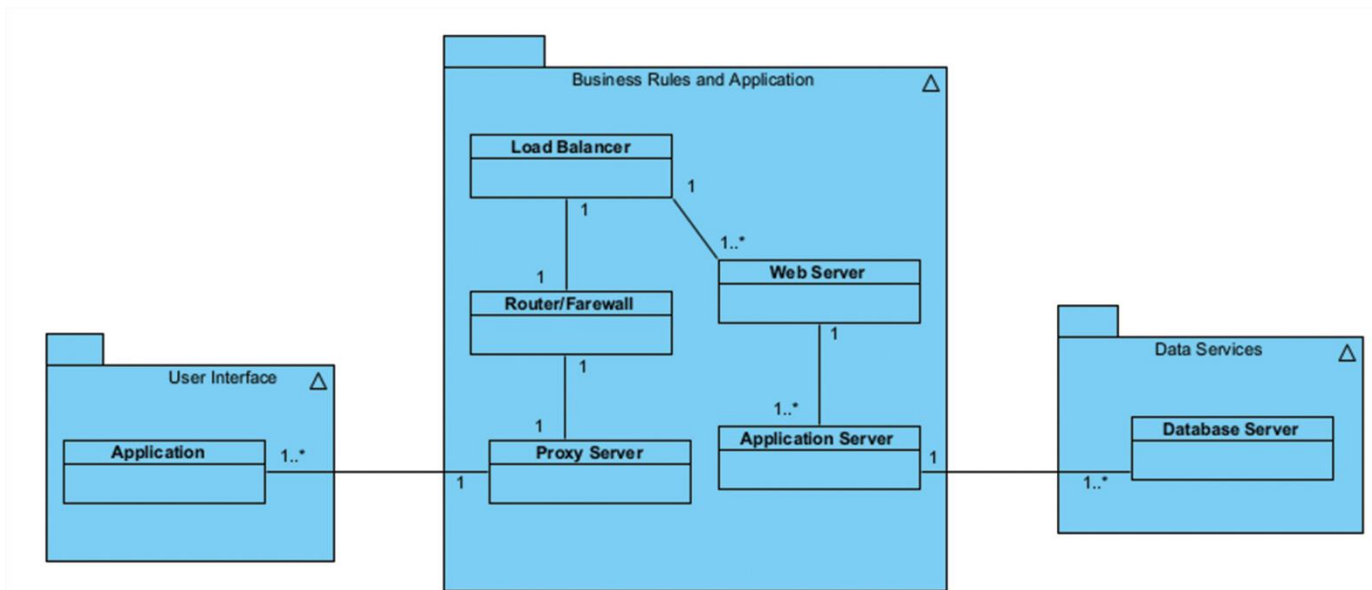


Figure 7 Architecture Diagram

4.2. Domain Model

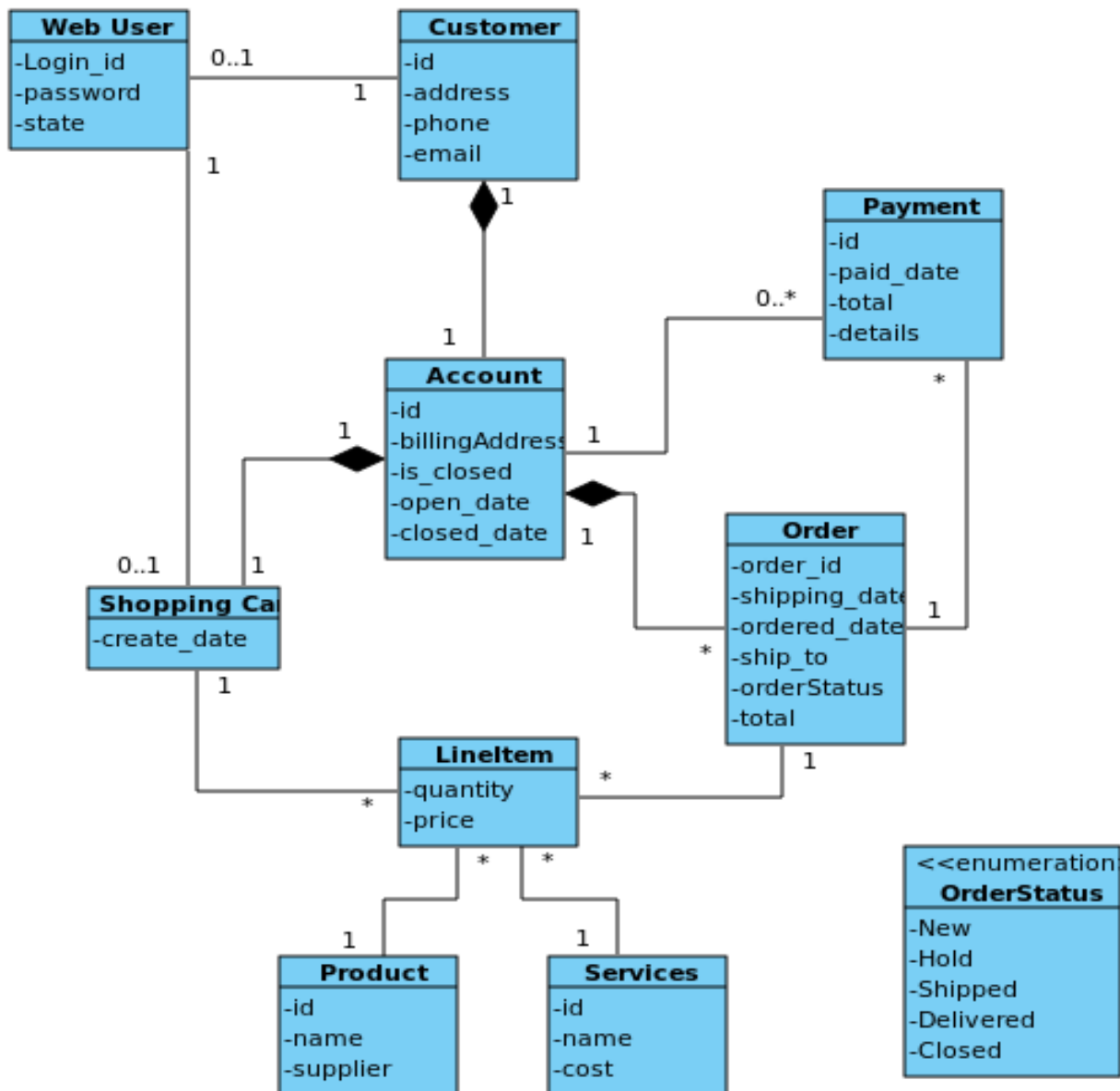


Figure 8 Domain Model

4.3. Entity Relationship Diagram with data dictionary

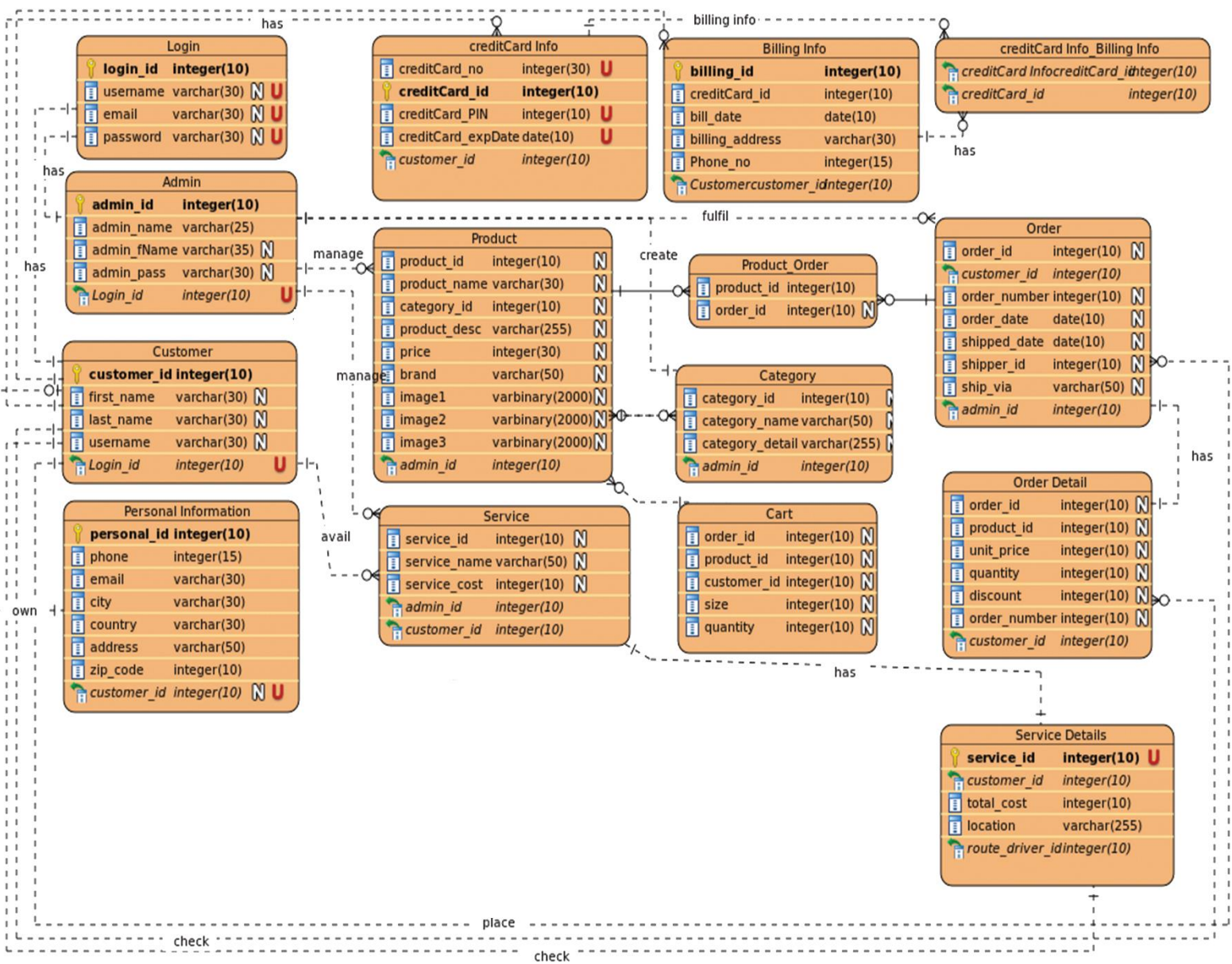


Figure 9 Entity Relationship Diagram

4.4. Class Diagram

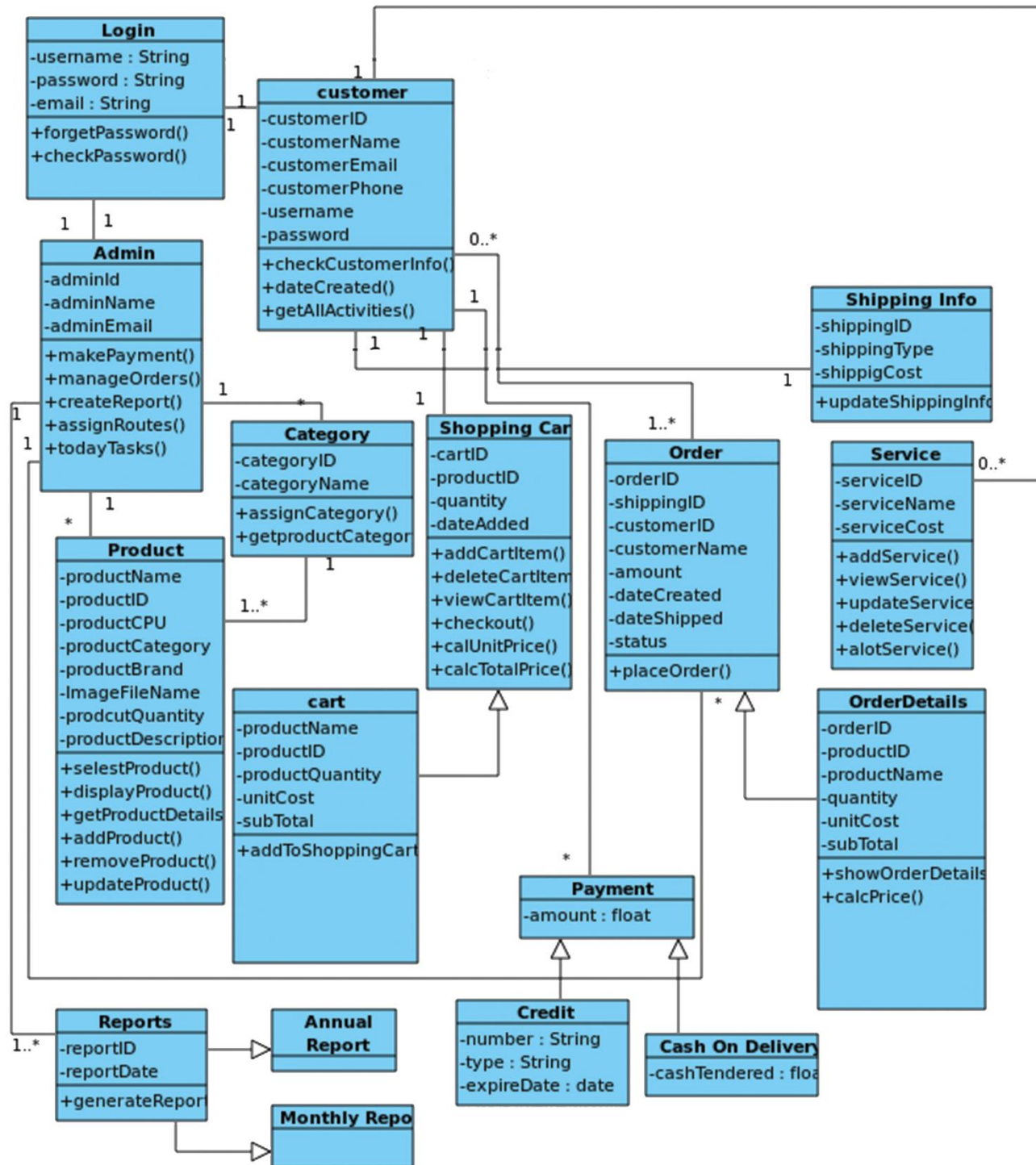


Figure 10 Class Diagram

4.5. Sequence / Collaboration Diagram

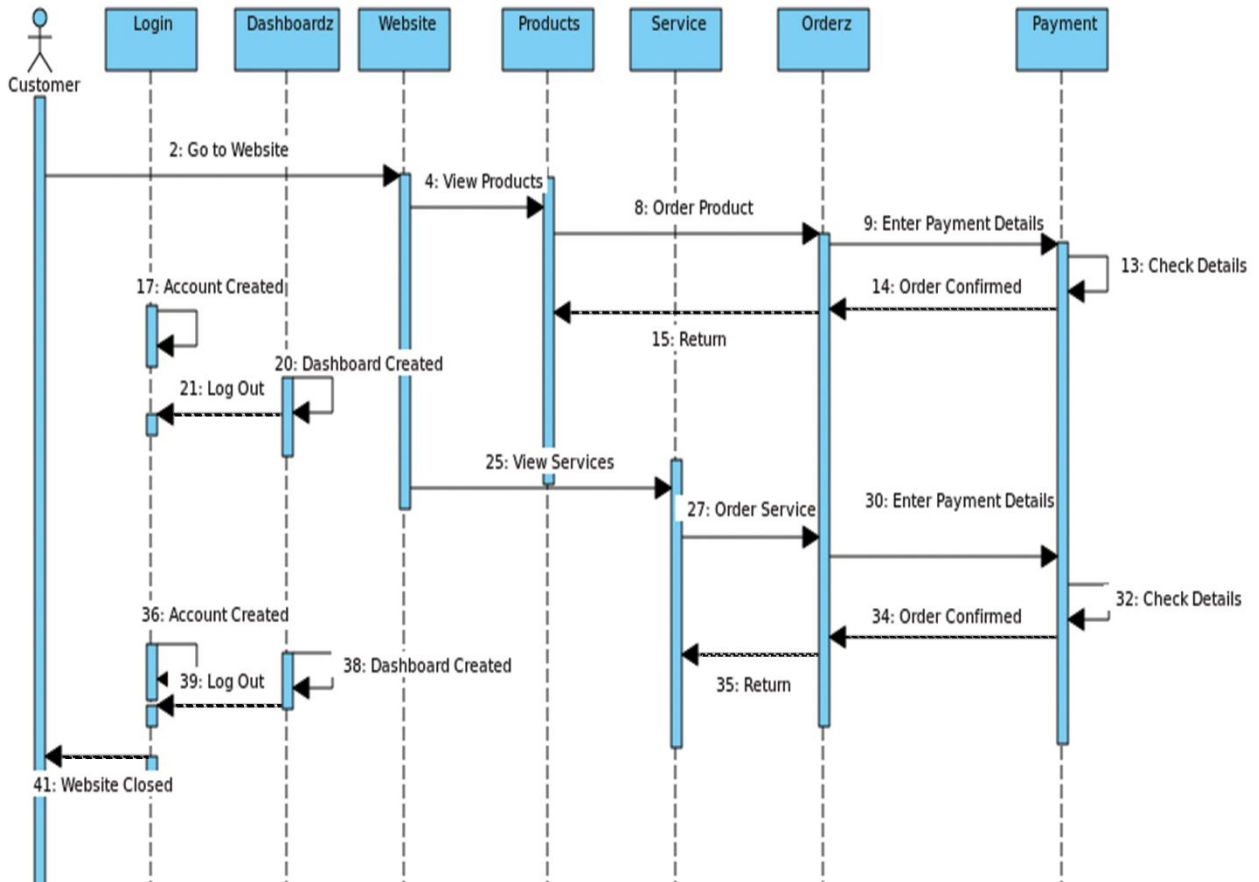


Figure 11 Sequence Diagram

4.6. Operation contracts

Project-based agreements can vary depending on the parameters of the work and how much of it has already been planned. Common types of agreements include:

- Fixed fee contract: When the company and contractor agree on a fee for the entire project.
- Cost-plus contract: When the contract includes payments for labor and materials, as well as a percentage for overheads.

Incentive-based contract: When payments are tied to the project achieving specified goals.

4.7. Activity Diagram

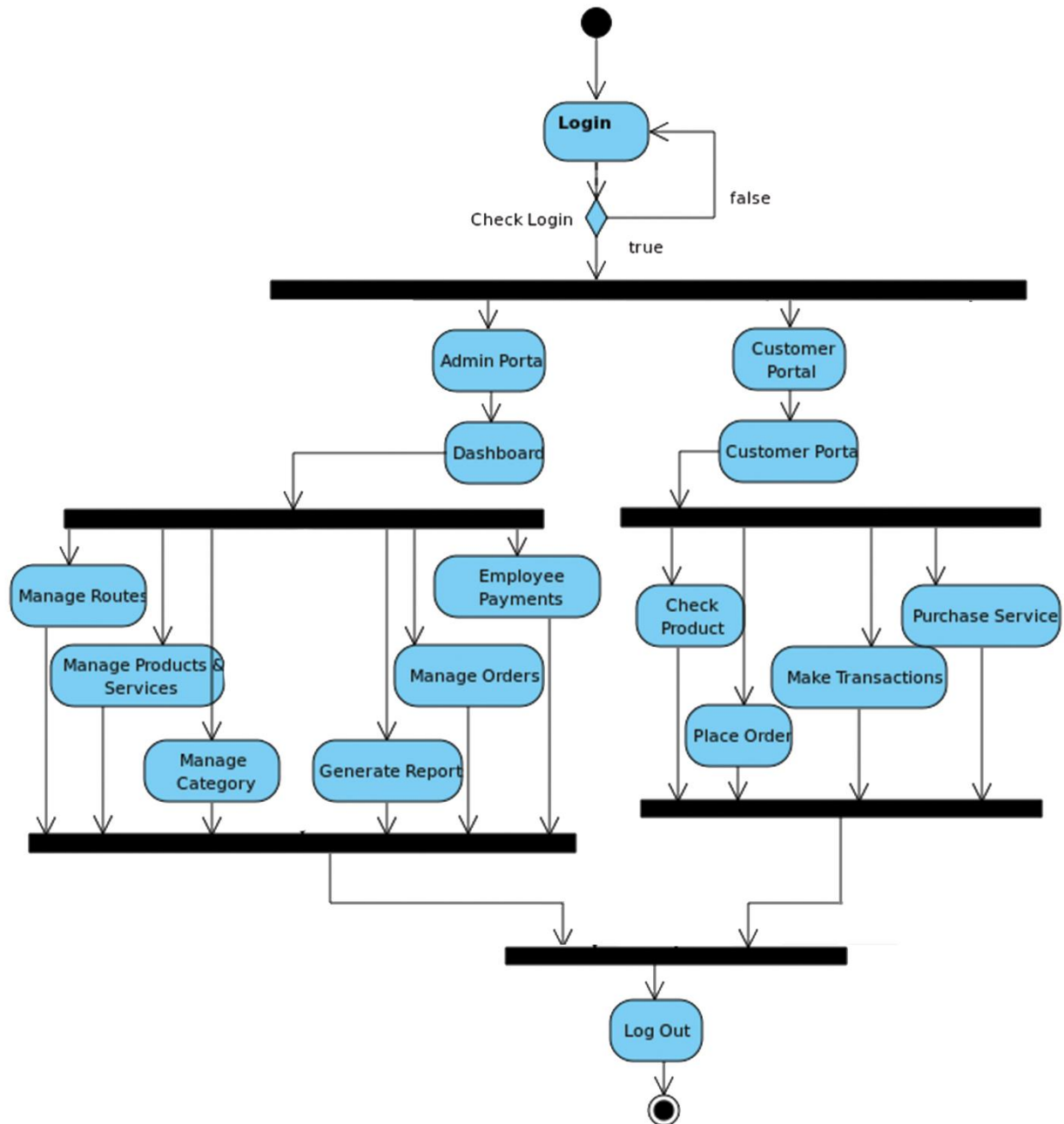


Figure 12 Activity Diagram

4.8. State Transition Diagram

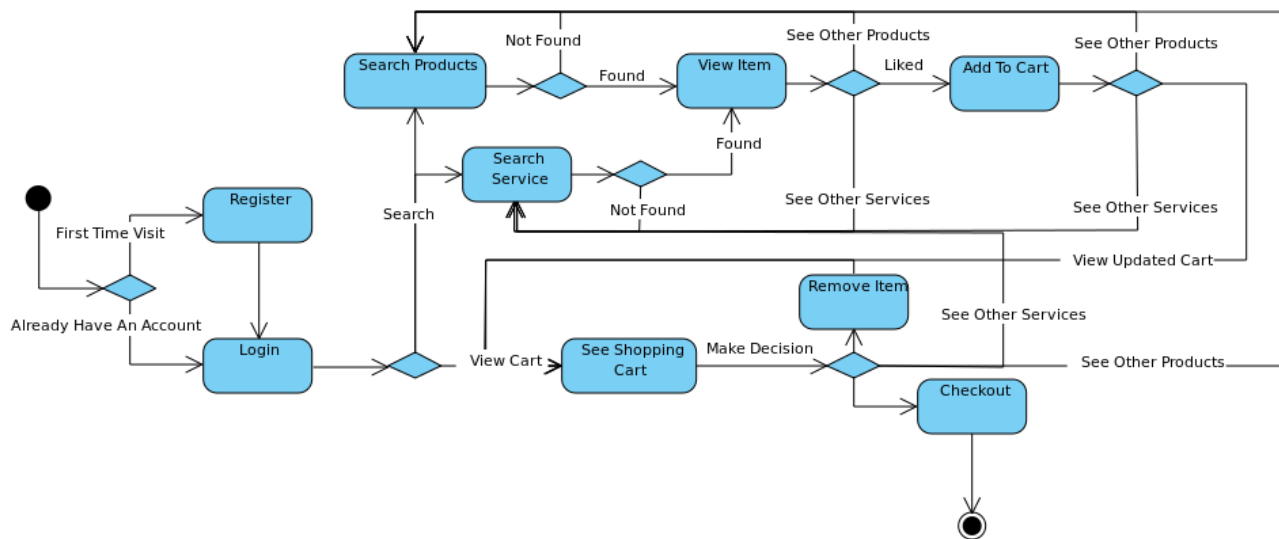


Figure 13 State Transition Diagram

4.9. Component Diagram

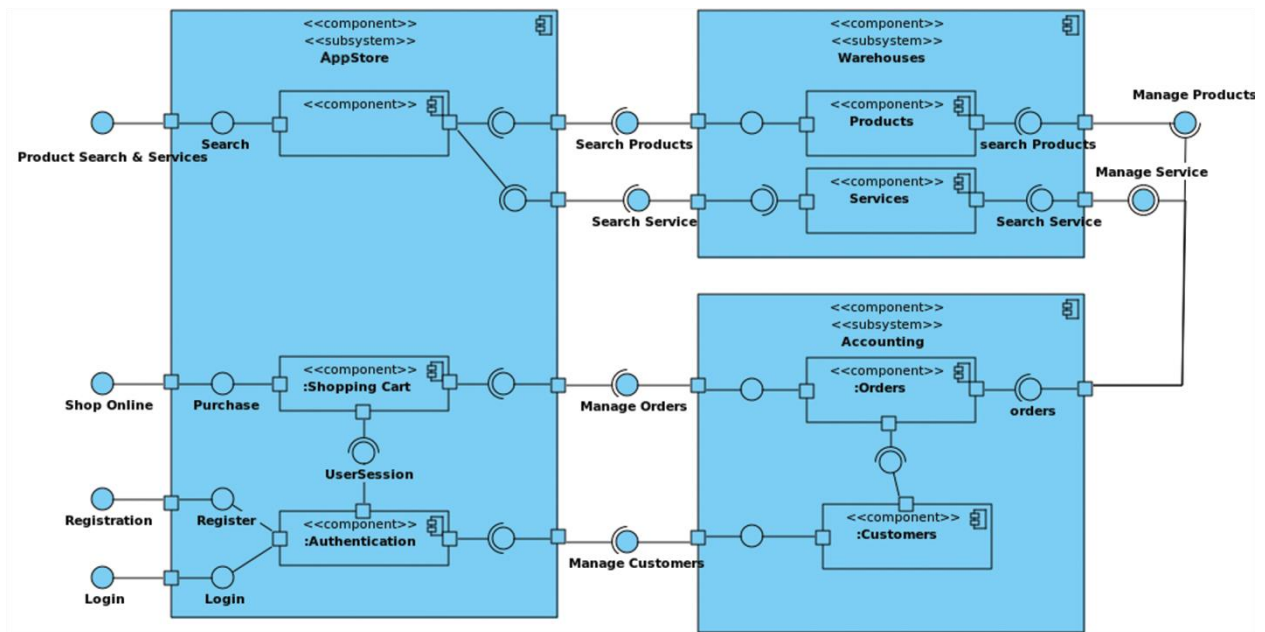


Figure 14 Component Diagram

4.10. Deployment Diagram

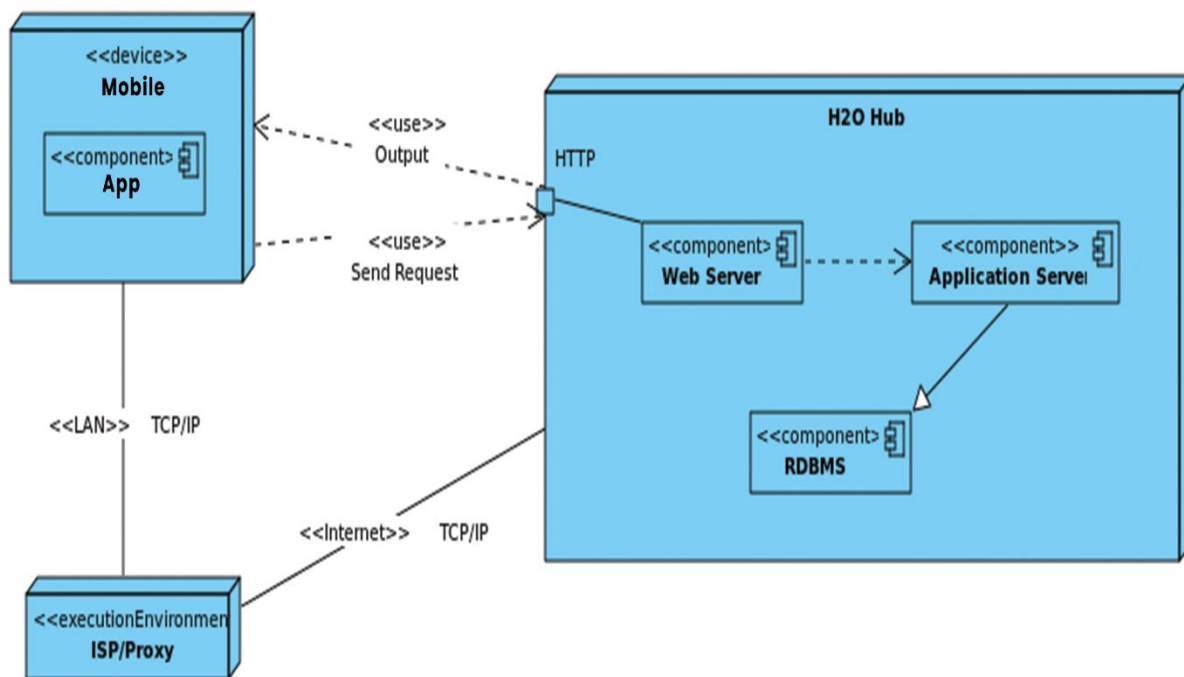


Figure 15 Deployment Diagram

4.11. Data Flow diagram [only if structured approach is used - Level 0 and 1]

Admin

Level 0

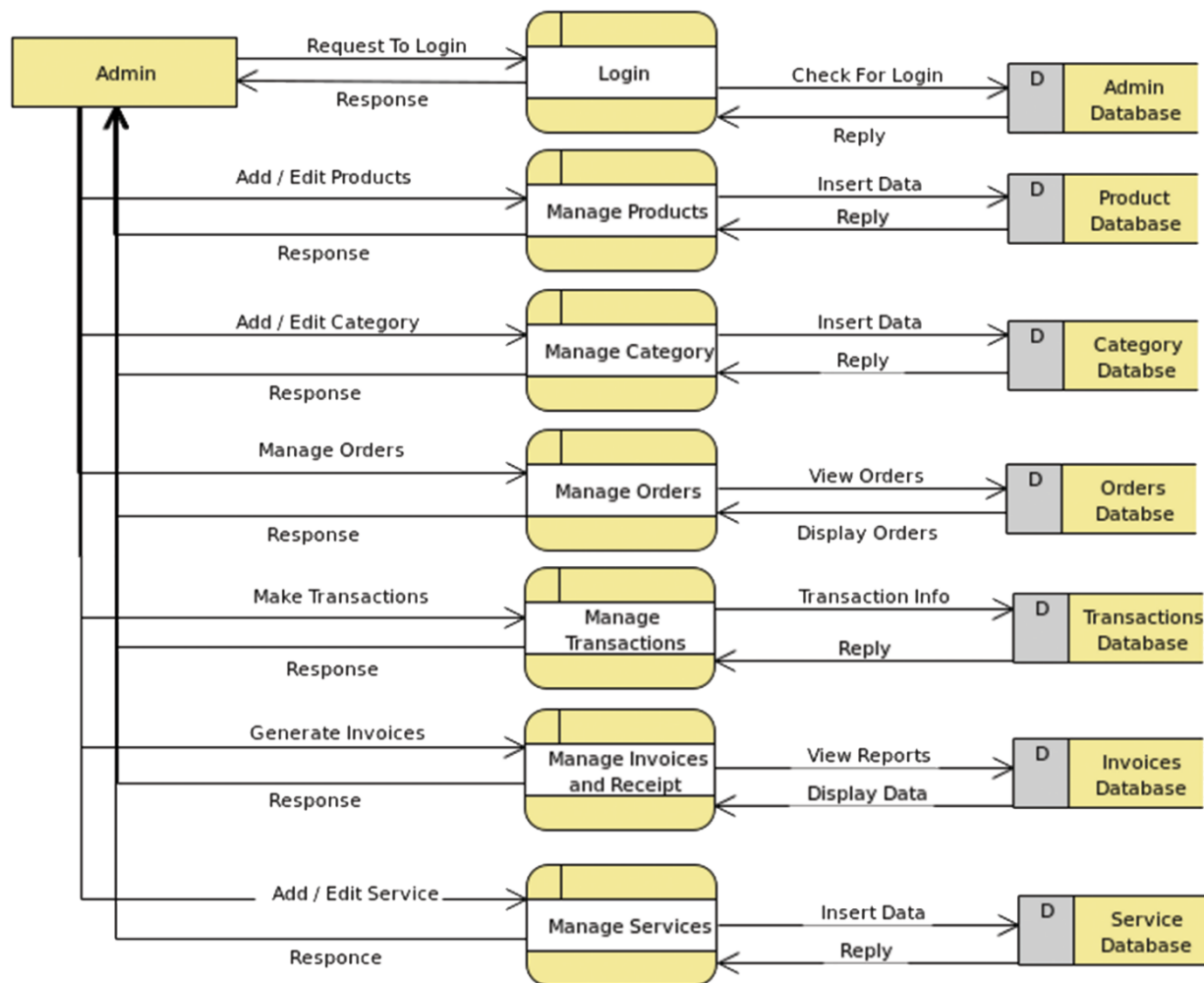
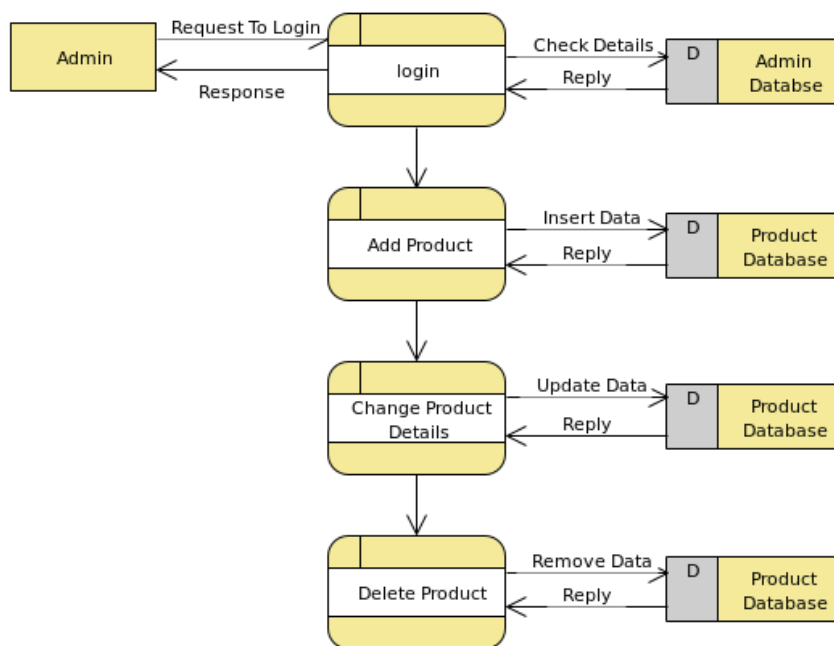


Figure 16 Dataflow Admin 0 Diagram



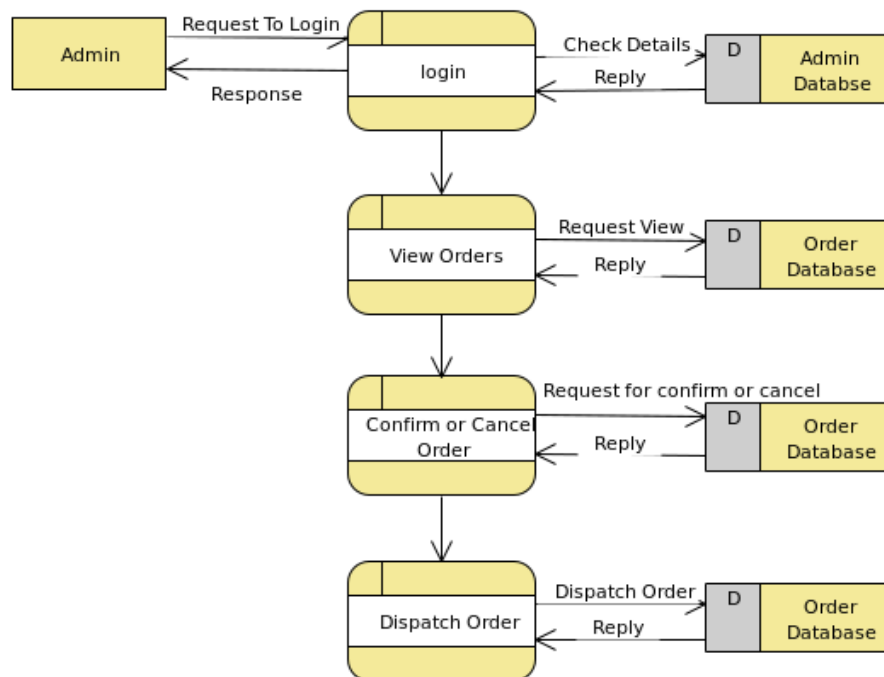
Level 1 : 1.1

Figure 17 Admin Level 1 1.1

Level 1 : 1.2

Level 1 : 1.3

Figure 18 Admin Level 1 1.2



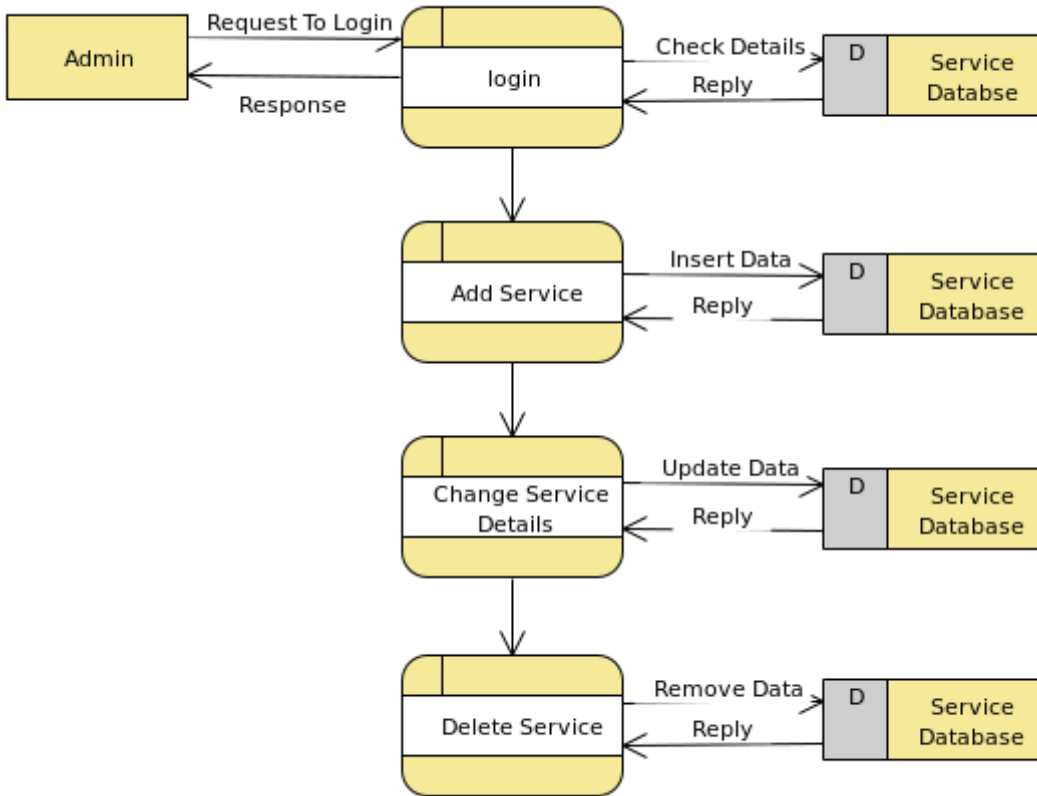


Figure 19 Admin Level 1 1.3

Customer

Level 0

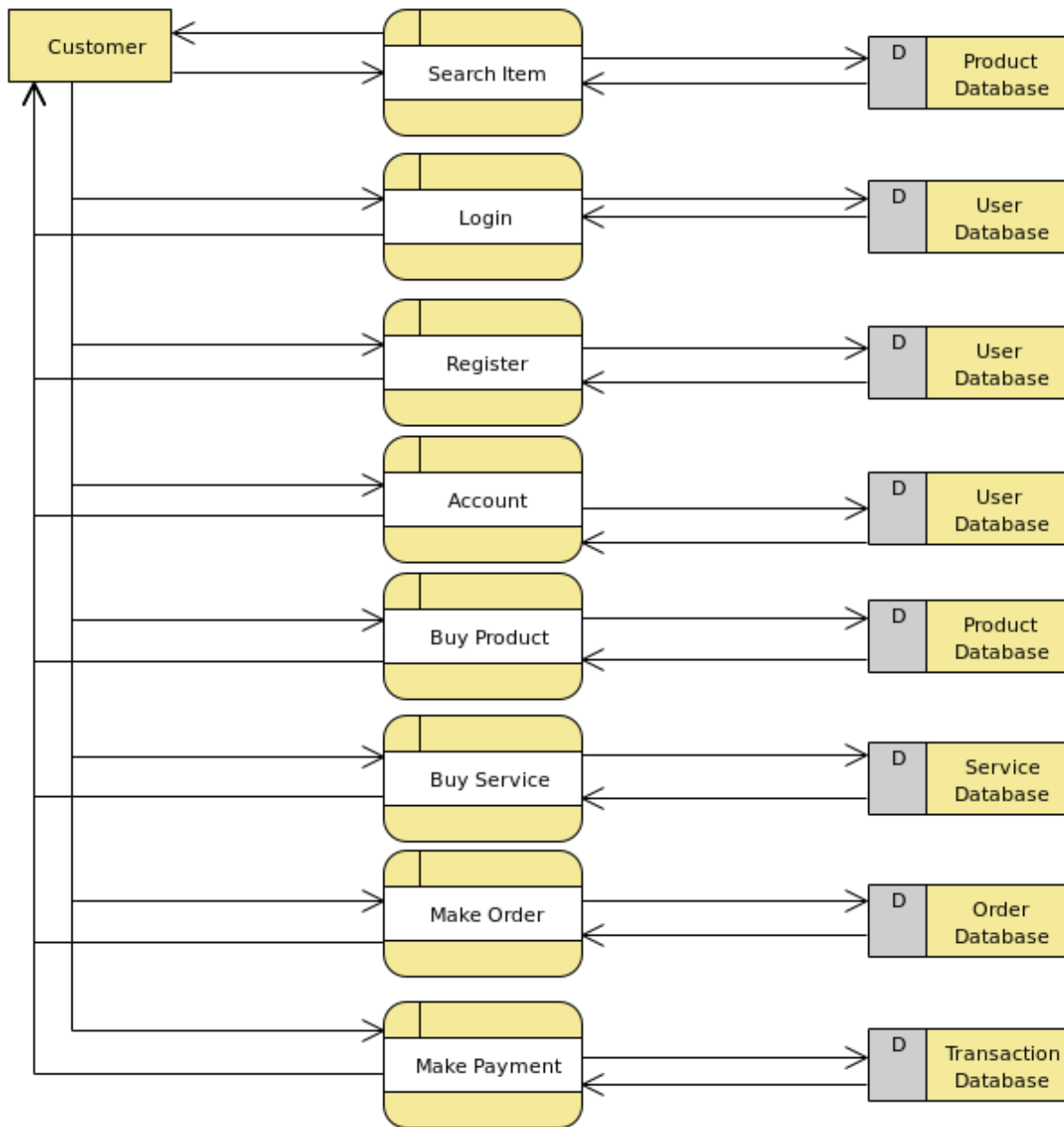
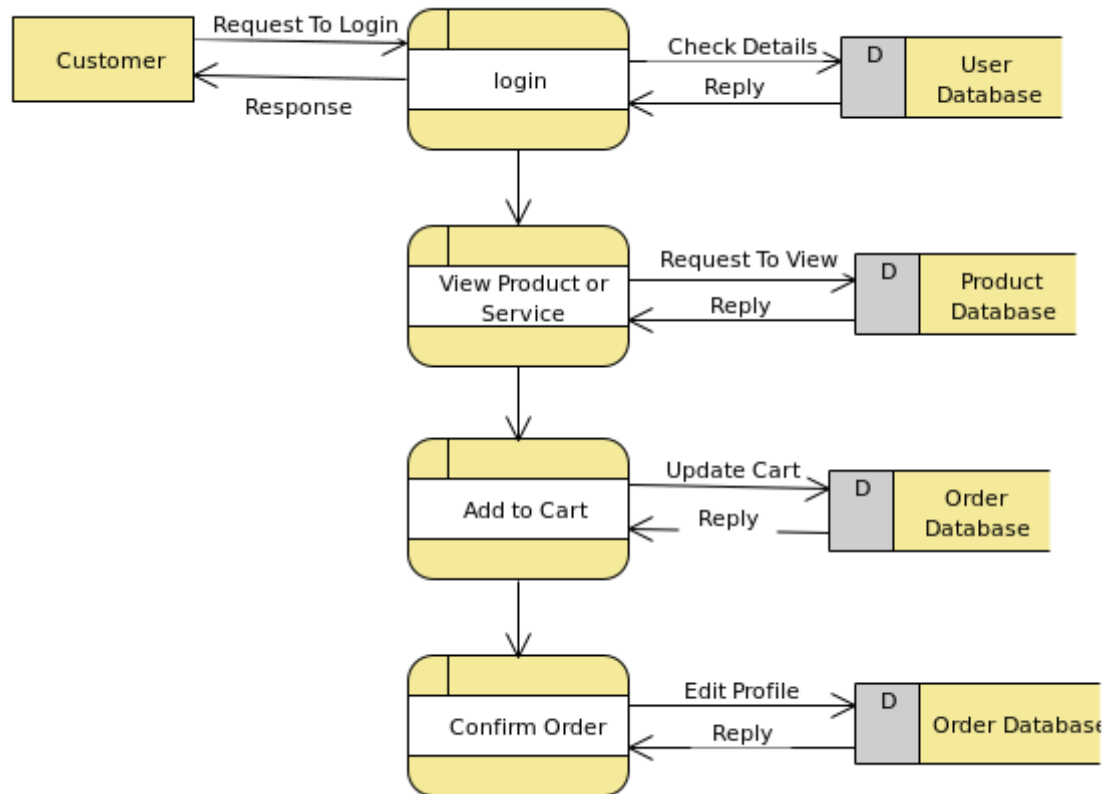


Figure 20 Customer level 0

Level 1

**Figure 21 Customer Level 1**

Chapter 5

Implementation

Chapter 5: Implementation

Planning for H2O Hub takes a lot of time and effort. You have to create an engaging driving question to focus the inquiry. You need to select and plan for products and authentic audiences while being mindful of voice and choice. You have to plan a great project launch. You must align the project to standards. And the list goes on and on.

Implementation phase is the process of converting a system specification into an executable system. A software design is a description of the structure of the software to be implemented, data models, interfaces between system components, and maybe the algorithms used.

Software implementation begins with the effort of software fabrication. Fabrication is an act of making something. Software fabrication involves programmatic design, source code editing or programming, and testing of each software unit. This series of technical tasks represents how software procedures, routines, modules, objects, or graphical models are produced. The result of software fabrication should be a documented unit of source code that has been tested against its structural unit specification. This source code (software unit) is then available to be assembled, integrated, and compiled with other fabricated software elements to craft larger software components.

5.1. Important Flow Control/Pseudo codes

There are three types of flow of control

- Sequential flow
- Selection or Conditional flow
- Iterative flow

Selection or Conditional Flow

Selection flow are of three types

- Single Alternative
- Double Alternative
- Multiple Alternative

Iterative Flow

Iterative flow are of three types

- for loop
- while loop
- do-while loop

5.2. Components, Libraries, Web Services and stubs

- Android Studio
- Kotlin
- Firebase
- Places APIs for address
- OCLC

5.3. Deployment Environment

The development environment of the H2O Hub is a mobile application which is deployed at a local server. The backend system is deployed on firebase till now but in future it will be connected with hosting through APIs and application is on play store.

A console for the data center may be made available to allow the personnel to monitor on the sites which were cleared for hosting during a particular period

5.4. Tools and Techniques

H2O Hub is a Mobile application which is developed using the latest tools and technologies. To implement these features in our Mobile application, we will use Android studio 4.1.3 beta and 13 SDK. For back-end functionality, we use a live database and backend system which is based on PHP and we integrate both systems by using Rest APIs. The database will be designed on Microsoft SQL SERVER 2017.

5.5. Best Practices / Coding Standards

- A coding standard gives a uniform appearance to the codes written by different engineers.
 - It improves readability, and maintainability of the code and it reduces complexity also.
 - It helps in code reuse and helps to detect error easily.
 - It promotes sound programming practices and increases efficiency of the programmers.
- Software requirement
- Life cycle
 - Design
 - Architecture

As listed near the end of coding conventions there are different conventions for different programming languages, so it may be counterproductive to apply the same conventions across different languages. It is important to note that there is no one particular coding convention for

any programming language. Every organization has a custom coding standard for each type of software project. It is therefore imperative that the programmer chooses or makes up a particular set of coding guidelines before the software project commences. Some coding conventions are generic which may not apply for every software project written with a particular programming language.

The use of coding conventions is particularly important when a project involves more than one programmer (there have been projects with thousands of programmers). It is much easier for a programmer to read code written by someone else if all code follows the same conventions.

5.6. Version Control

Version control server security issues are discussed in the manner of implementation aspects of the proposed model. One of possible model implementations is evaluated in respect of cooperation on the test group of 21 customers. Implementation details are presented and compared with other approaches. Mentoring and the development by implementing proposed model with specific model settings introduces controlled cooperation with high clarity in evaluation of individual students work.

Using open-source version control software on Linux platform, with web interface package, we implemented a low-cost support for project-based learning.

Chapter 6

Testing and Evaluation

Chapter 6: Testing and Evaluation

Testing and evaluating is the process in which the software is being compared with all the requirements and specifications that are being described for it. It would help to find out the results that what are the requirements that are still not fulfilled and what are being fulfilled. Testing helps to check that the system is working well or not. It also may identify which functionalities are not working well. The testing and process of evaluation is important for the verification because after the development of the software, when it is being used by the end user, then it is important to provide them the software with perfection and without any error.

6.1. Use Case Testing

Use Case Testing is defined as a software testing technique that helps identify test cases that cover the entire system, on a transaction-by-transaction basis from start to the finishing point. Use case Testing is type of black box testing where we check whether our app is working in predefined manner or not and performing intended functionalities and that helps testers to identify test scenarios that exercise the whole system on each transaction basis from start to finish. Use Cases capture the interactions between 'actors' and the 'system'. 'Actors' represents user and their interactions that each user takes part into. Test cases based on use cases and are referred as scenarios

Table 9 use case scenarios and test cases

Test case no	Test case name	purpose	Pre-condition	Test steps	Expected result
01	Registration	To verify registration function	none	Enter user name password	Admin /user registration
02	Log in	To verify authorized admin/user	registration	Enter user name password	Admin/user logged in to the system

03	Add Product	To verify add item	login	Item name, item prize	Add successfully	
04	Delete Item	To verify the item removal	Search the product to delete	Select Item and click delete button	Deleted successfully	
05	Avail Service	To verify services form is working correctly	Click the service you want to avail	Fill the form and click submit	Query received successfully	
06	Updated item	To verify updated item	Add item	Select item click on update button Popped up dialogue box Want to updated data press yes	Updated successfully	
07	Product Order Processing	For delivering the product to right address	Click checkout button after adding address info	User can order as many products as he want	Order delivered	

08	Checkout	To receive payment	Enter the payment details	User will pay the amount of the products he bought	Payment successful	
09	Log out	To logout	Login	Can log out to the system and perform action	logout	

6.2. Equivalence partitioning

There are a lot of models that can be derived from the meta-models, whereas the models with different values of attributes are considered as distinct models. For example, a name is an attribute that is string type may have finite values and assigning each value of that name creates a different model. The common problem while transforming testing is the difficulty of selecting a finite set of these models. So, the equivalence partitioning is used for solving this problem.

6.3. Data flow testing

The relation between one entity and another while performing a specific task in during data flow. Such as the relation between the customer and the admin. Customer specifies his requirement and admin manages the system according to customer demand.

6.4. Unit testing

In unit testing, the team tests the components of the software individually by performing each task and then execute them individually. In this way all the components of the software is being tested and it has been specified if any issue occurs or all the things are perfect.

Using Unit testing frameworks, we write unit tests quickly and easily. Most of the programming languages do not support unit testing with the inbuilt compiler. Third party open source and commercial tools can be used to make unit testing even more fun.

List of famous unit testing tools are

C++ frame work, unit test++, google c++ NET framework

Table 10 Unit testing

	atomic	Uniquely identify	Complete	consistent	traceable	Prioritize	testable
Req 1	Yes	yes	Yes	yes	Yes	yes	Yes
Req 2	Yes	Yes	Yes	Yes	Yes	Yes	No
Req 3	Yes	Yes	Yes	Yes	No	Yes	Yes
Req 4	Yes	No	No	No	Yes	Yes	Yes
Req 5	Yes	Yes	No	Yes	Yes	Yes	Yes
Req 6	Yes	Yes	Yes	Yes	Yes	Yes	yes
Req 7	yes	No	yes	Yes	yes	Yes	yes

```
class EmailValidatorTest {
    @Test fun emailValidator_CorrectEmailSimple_ReturnsTrue() {
        assertTrue(EmailValidator.isValidEmail("name@email.com"))
    }
}
```

6.5. Integration testing

We feel that Integration testing is complex and requires some development and logical skill 6.6. That's true! Then what is the purpose of integrating this testing into our mobile App testing strategy?

- In the real world, when online mobile application is developed, it is broken down into smaller modules and individual developers are assigned 1 module. The logic implemented by one developer is quite different than another developer, so it becomes important to

check whether the logic implemented by a developer is as per the expectations and depiction the correct value in accordance with the set standards.

- Travels from one Many a time the face or the structure of data changes when module to another. Some values are appended or removed, which causes issues in the later modules.
- A very common problem in testing frequent requirement change. Many a time developer deploys the changes without unit testing it. Integration testing becomes important at that time

Here we should understand that Integration testing does not happen at the end of the cycle, rather it is conducted simultaneously with the development.

So, in most of the times, all the modules are not actually available to test and here is what the challenge comes to test something which does not exist! The main function or goal of this testing is to test the interfaces between the units/modules.

6.6. Performance testing

Table 11 Performance Testing

Stores	Performance evaluation
Android 8	Absolutely great performance with no error and no crashing used at least 20 mins
Android 9	Absolutely great performance with no error and no crashing used at least 20 mins
Android 11	Good performance with some small bugs error and crashes few times.
Android 12	Most of the NFC Sensors doesn't work

6.7. Stress Testing

Stress testing is used to test the stability & reliability of the system. This test mainly determines the system on its robustness and error handling under extremely heavy load conditions. Most Prominent use of stress testing is to determine the limit, at which the system or software or hardware breaks. Stress testing executes a system in a manner that demands resources in abnormal

quantity, frequency, or volume. Special tests may be designed that generate ten interrupts per second, when one or two is the average rate input data rates may be increased by an order of magnitude to determine how input functions will respond, Test cases that require maximum memory or other resources are executed, Test cases that may cause thrashing in a virtual operating system are designed, Test cases that may cause excessive hunting for disk resident data are created. Essentially, the tester attempts to break the program. Variation of stress testing is a technique called sensitivity testing

Chapter 7

Summary, Conclusion and Future Enhancements

Chapter 7: Summary, Conclusion & Future Enhancements

7.1. Project Summary

H2O Hub is an Android ecommerce-based Application that is also providing the services of water distribution and chlorine cleansing. In the ecommerce part the product includes house cleansing (like detergents, mop etc.) products and water bottles of different sizes. Customer can visit the store buy anything he want. There will be some services that also will be provided to the customer. These services include water distribution services and chlorine cleaning services. The customer can avail his required services through the App. For the service customer will the form in the App. The admin will get the data and will contact with the customer for the confirmation of the service. admin can handle everything including products, orders, reports. There are two payments option for the customer he can pay online and also, he can use the option of cash on delivery.

7.2. Achievements and Improvements

While doing this project we are successfully able to implement different type of functionalities of mobile-app programming and we are able to learn about the different terms in mobile programming. As well as during the development of this project we achieve skill to develop the mobile applications and improve the skills. We improve the development skill, software architecture design, Project management skill, UML modeling, documentation skills and programming skills also we are able to work in the team.

7.3. Critical Review

The critical point of this project is that we had to make it enough simple so that it can be easily understandable to the user and it may be much user friendly. We tried our best to make it understandable easily so the common user can use it without any hurdle.

7.4. Lessons Learnt

This was a great experience, as we have learnt a lot of lesson from it. We learnt

Programing: a lot of new techniques.

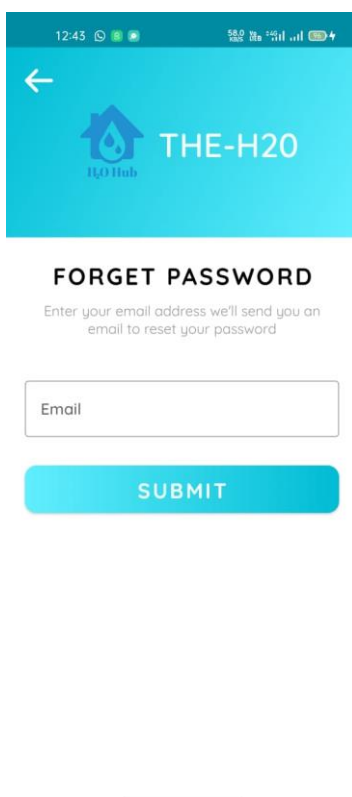
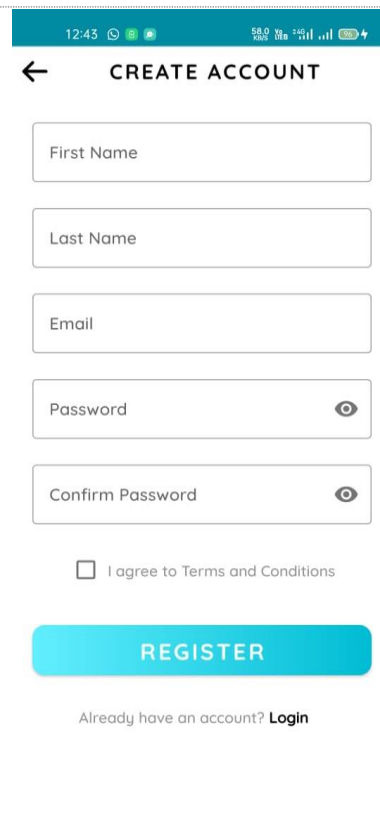
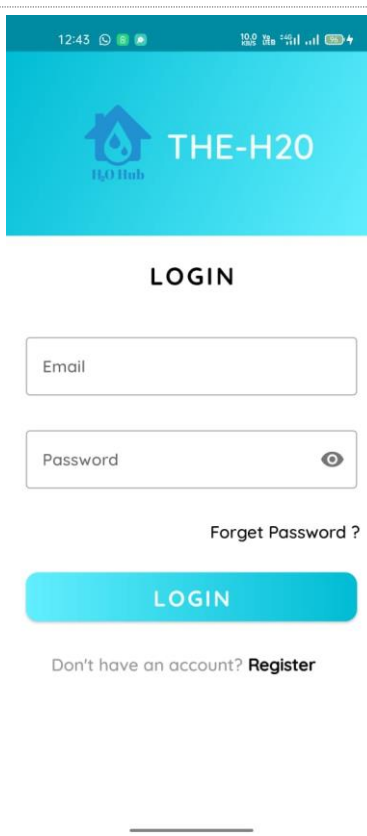
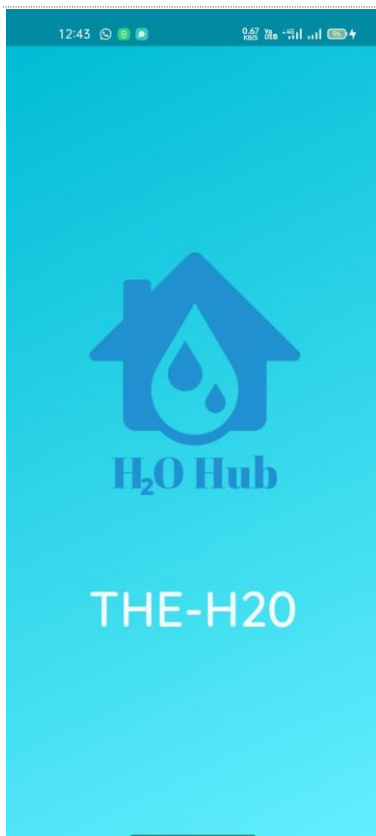
Project Management

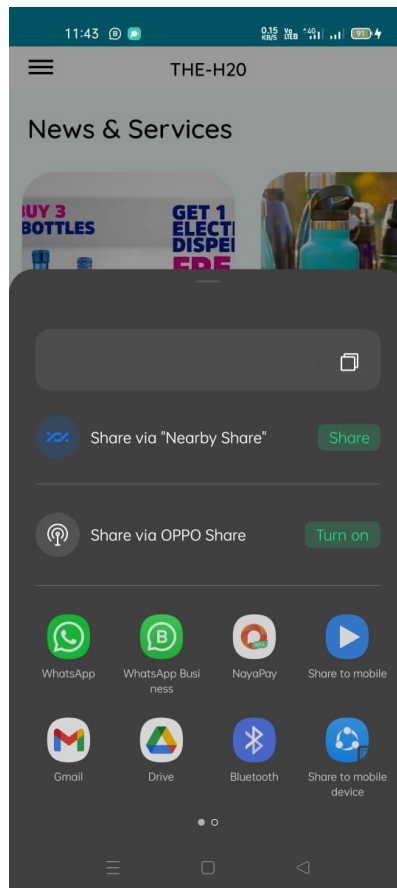
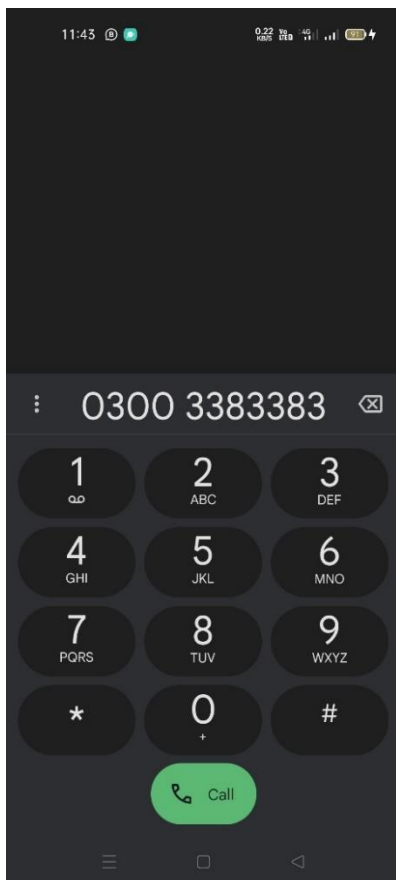
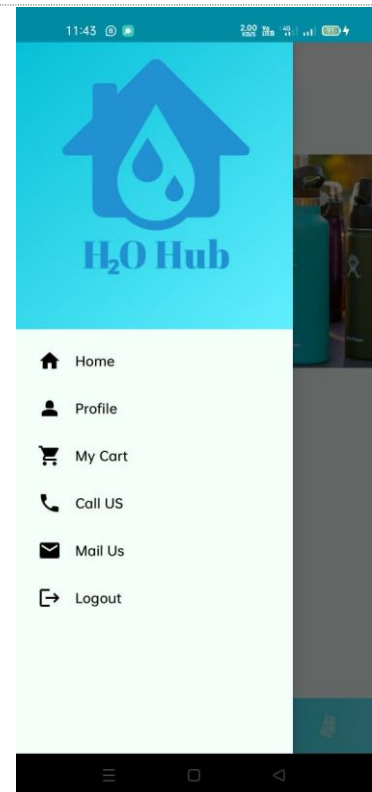
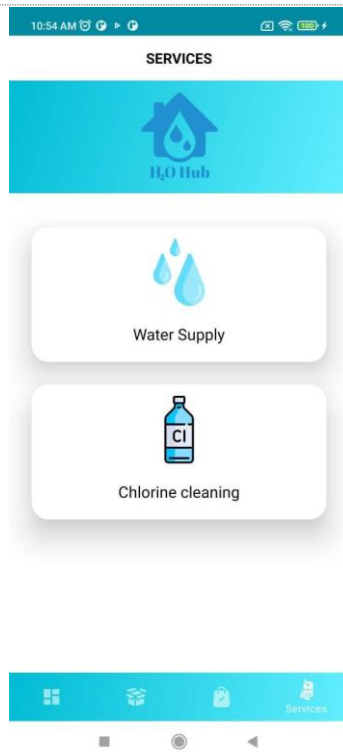
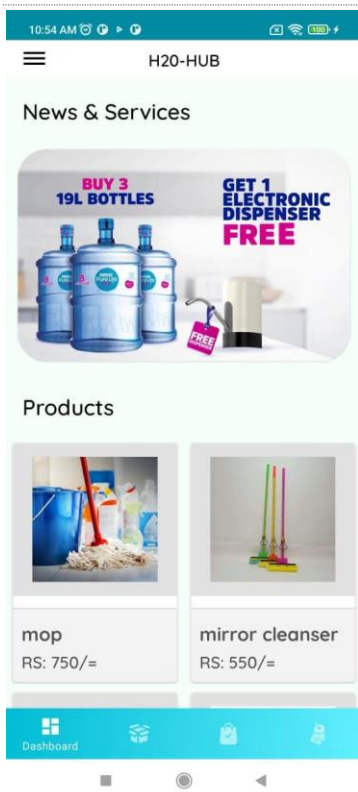
how to manage the work. We also learn to do work in a team and also how to give owner to other team member's perspective. We learnt to manage the task in a stressed routine. And the most important lesson we got is about our project tenure in which we observed that a huge amount of knowledge is required to deploy a system and to solve the problem while working on a project.

7.5. Future Enhancements/Recommendations

It doesn't matter how much we learn. There would always be a space for learning new things and for further improvement.

First of all, the database will connect through APIs after the web application will be completed This future enhancement may require scalability, accessibility and maintenance. Moreover, the feedbacks and reviews of the users may also be considered for better performance in future while accomplishing new projects. In the next version 2.0 design enhancement will also be considered.





Appendices

Appendix A: User Manual

In the appendix section we will describe the different phase of user interface and also described how user can use our project. Secondly, we describe our promotional plan and promotional material broacher, banner, standee and other marketing material. We also describe another interface of the project.

A1. Broacher

A2. Banner

A3. Standee

Reference and Bibliography

Reference and Bibliography

- [1] Deaton, M. (2003). The elements of user experience. *Interactions*, 10(5), 49–51. <https://doi.org/10.1145/889692.889709>
- [2] Gellersen, H. W., & Gaedke, M. (1999). Object-oriented Web application development. *IEEE Internet Computing*, 3(1), 60–68. <https://doi.org/10.1109/4236.747323>
- [3] Jazayeri, M. (2007). Some Trends in Web Application Development. *Future of Software Engineering (FOSE '07)*. <https://doi.org/10.1109/fose.2007.26>
- [4] Lee, K. (2011). Beyond Blueprints and Basics: A Service Design Conference Report. *Design Issues*, 27(4), 95–100. https://doi.org/10.1162/desi_r_00108
- [5] Mistry, J. J. (2004). Comparison of the Balanced Scorecard Perspectives for eCommerce Companies. *The Journal of Cost Analysis & Management*, 6(2), 79–99. <https://doi.org/10.1080/15411656.2004.10462424>
- [6] Mistry, J. J., & Nandram, B. (2005). The Relevance of the Balanced Scorecard on Assessing Firm Performance of eCommerce Companies. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.773105>
- [7] Molla, A., & Licker, P. S. (2005). eCommerce adoption in developing countries: a model and instrument. *Information & Management*, 42(6), 877–899. <https://doi.org/10.1016/j.im.2004.09.002>
- [8] WU, J. B., & Lü, G. (2009). Trust and reputation evaluation for Web services based on user experience. *Journal of Computer Applications*, 29(8), 2291–2292. <https://doi.org/10.3724/sp.j.1087.2009.02291>
- [9] Zhu, J. Q., Ban, Y. L., Xu, R. M., Lian, J. W., Sim, C. Y. D., Zhang, Y., & Nie, Z. (2019). A Useful Methodology to Convert the Smartphone Metal Cover Into an Antenna Booster for NFC Applications. *IEEE Transactions on Antennas and Propagation*, 67(7), 4463–4473. <https://doi.org/10.1109/tap.2019.2911364>

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H2O HUB

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