Term Paper

Course ID: CSE307

Section: 3 , 5

Instructor: Sabrina Alam

Name	ID	Section
Shatabde Debnath	2020552	5
Elma Salam	2021165	3
Sheikh Mehenaz Rahman	2021261	3
Al Rawnak Shafin	2030543	5
Tohfa Nure Zannat	2020678	3

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Section 1:

1. Abstract:

The "hungryIUBIAN" system is a full-featured solution made to improve and expedite the IUBIAN institution's canteen administration procedure. Using cutting-edge technology, this system seeks to completely transform the way that canteen operations are now conducted. Efficient order processing, inventory control, and better user experience for clients and canteen employees are the main goals.

This system makes ordering and payment procedures easy for users by providing an intuitive user interface that can be accessed through online and mobile applications. It provides real-time inventory tracking, reducing inconsistencies and improving stock management through the use of a centralized database. "hungryIUBIAN" provides canteen administrators with insightful data using data analytics, facilitating decision-making related to resource allocation, menu improvement, and supply restocking.

The system also puts security and scalability first, using strong authentication procedures and a flexible design to support future additions and technological developments. "hungryIUBIAN" represents a paradigm-shifting change in canteen management approaches that promotes effectiveness, openness, and client happiness throughout the IUBIAN canteen network.

2. Introduction:

Introducing "hungryIUBIAN" - a cutting-edge solution revolutionizing the way canteens operate and cater to their clients. This innovative canteen management system redefines efficiency, convenience, and personalization, aiming to create a seamless and satisfying experience for both canteen operators and customers. Through a blend of state-of-the-art technology and intuitive interfaces, "hungryIUBIAN" simplifies the complexities of canteen management while enhancing the dining experience for users. Let's explore how this groundbreaking system is set to transform the landscape of IUB campus dining and streamline the way people interact with their favorite eateries.

3. History leading to project request:

Canteen management systems have evolved significantly over the years. In the past, canteens relied on manual methods, including paper-based stock tracking, cash counters, menu management, and order preparation. These processes often resulted in long queues, leading to inefficiencies. To address these issues, the concept of a Canteen Management System was introduced. The initial electronic canteen management systems emerged in the 1980s and 1990s, employing basic software and hardware like barcode scanners and inventory tracking. They were primarily used in large institutions like schools, universities, and hospitals. With the advent of the internet and web-based technologies, canteen management systems have become more advanced and user-friendly. However, the complete automation of canteen operations remains a challenge. The core objective of a Canteen Management System is to automate and streamline canteen processes, reducing manual work, improving efficiency, and enhancing the customer experience. This evolution continues to enhance canteen management practices and address the inefficiencies of the past.

4. Identify Problem, solutions and opportunity:

Problem and Solution:

Problem	Solution
1. **Long Waiting Times:** Queues and wait times at canteens and dining halls can be extensive during peak hours, leading to frustration and time wastage for the university community.	1. **Implement a Canteen Management System (CMS):** Introduce a technologically advanced CMS to minimize waiting times by enabling pre-ordering, online payments, and efficient order processing.

2. **Inaccurate Orders:** Manual order processing can result in errors and discrepancies in meal preparation, causing dissatisfaction among customers.	2. **Automation of Order Processing:** Utilize automated order processing systems to reduce human errors and improve order accuracy, ensuring customers receive the correct meals.
3. **Limited Payment Options:** Many canteens may not offer cashless payment methods or meal plan integration, making it inconvenient for users to settle their bills.	3. **Diverse Payment Options:** Offer various payment methods such as cashless transactions, meal plan integration, and mobile payments, providing convenience and flexibility to users.
4. **Inefficient Inventory Management:** Managing food inventory is often done manually, leading to food wastage and shortages of popular menu items.	4. **Efficient Inventory Management:** Use the CMS to assist canteen staff in tracking inventory, restocking items, and reducing food wastage, ensuring popular menu items are consistently available.
5. **Lack of Feedback Mechanism:** There is often no structured way for customers to provide feedback or suggestions for improving food quality, menu offerings, or service.	5. **Feedback Mechanism:** Integrate a feedback mechanism into the CMS, allowing users to provide comments and suggestions in real-time. This data can be invaluable for making continuous

	improvements in food quality and services.

Opportunities:

The proposed automated food forum Management System will allow further improvement on the current system:

1. **User-Friendly Interface:** Develop an intuitive and user-friendly interface that allows users to easily navigate and interact with the forum, ensuring a pleasant user experience.
2. **Mobile-Friendly:** Optimize the system for mobile devices to cater to users who access the forum on smartphones or tablets.
3. **Content Categorization:** Implement a robust categorization system to help users find specific food-related topics, recipes, or discussions quickly.
4. **User Profiles:** Create user profiles with customizable avatars, personal details, and the ability to track their activity, such as posts, recipes, and followers.
5. **Recipe Management:** Allow users to submit, edit, and rate recipes. Implement a rating and review system for recipes to help users find the best ones.
6. **Search and Filter:** Develop advanced search and filtering options so users can search for specific recipes or discussions based on ingredients, cuisine, difficulty level, or dietary preferences.
7. **Community Engagement:** Incorporate features like comments, likes, and shares to encourage user engagement and interaction on the platform.
8. **Notification System:** Implement a notification system to keep users informed about comments on their posts, new recipes, and forum activity.

9. **Monetization:** Explore revenue opportunities through advertisements, premium memberships, or sponsored content from food-related businesses.
10. **Data Analytics:** Gather and analyze user data to understand their preferences, behavior, and trends. This can help tailor content and improve the user experience.

Also ,

.The management will be able to cater according to the customers' demand.

. From the user's data they will be able to predict when there will be a rush of customers and give the management a heads up to prepare.

. Will be able to recognize the regular customer and offer them loyalty rewards/offers.

. Home delivery system will spread the business and increase profit.

. Increased number of customers.

And this system will provide easy payment mathods also with easy process.

5. Project goal and objectives:

In a dynamic and bustling university environment, the efficient management of a canteen or cafeteria is of paramount importance. The canteen serves as a hub for students, faculty, and staff to refuel, socialize, and relax during their busy academic days. However, traditional canteen operations often face challenges in providing a seamless and convenient experience to the university community. Long queues, inaccurate order processing, and limited payment options can lead to frustration and wasted time.

To address these issues and enhance the overall canteen experience, we propose the implementation of a modern Canteen Management System (CMS). This system leverages cutting-edge technology to streamline canteen operations, improve service quality, and enhance customer satisfaction. By integrating various features and functions, the CMS will

revolutionize the way the university community interacts with the canteen, making it a more efficient, convenient, and enjoyable place to dine.

Goal:

The goal of the Canteen Management System is to create a seamless dining experience by reducing waiting times, improving order accuracy, offering diverse payment options, optimizing inventory management, and facilitating real-time feedback for the university community.

The **objectives** of implementing the Canteen Management System (CMS) in the university are as follows:

- **Efficiency Enhancement:** Streamline canteen operations to reduce waiting times, enabling quick and efficient service for all customers.
- **Accuracy Improvement:** Minimize order errors and discrepancies in food preparation to enhance customer satisfaction and trust in the canteen's services.
- **Payment Flexibility:** Offer diverse payment options, including cashless transactions, meal plan integration, and mobile payments, to cater to the diverse financial preferences of the university community.
- **Inventory Management:** Optimize inventory control to reduce food wastage, ensure the availability of popular menu items, and maintain cost-effectiveness.
- **Customer Feedback:** Implement a feedback mechanism to collect customer comments and suggestions, allowing for continuous improvement in service quality and menu offerings.
- **User-Friendly Interface:** Develop an intuitive, user-friendly interface for both customers and canteen staff to ensure easy adoption and efficient utilization of the system.
- **Promotion:** Offer promotions, discounts, or special items to customers
- **Pre-order and Schedule Pickup:** Enable users to pre-order meals and schedule a pickup time to avoid queues and wait times. The system could send a notification when the order is ready for pickup.

Section 2:

6. Literature Review:

The paper[1] discusses mobile applications for college cafeterias. Mobiles will help students order food faster during busy times. This app allows students to order, pay, and see when their food is ready by using a unique code for each order. It's neat because it saves paper and keeps all the information online. The goal is to make lunchtime easier, help restaurant staff, and work faster during busier times.

The report[2] suggests an idea for ordering food using QR codes during the pandemic. This helps keep distance, saves time, and makes lines shorter in the cafeteria. With a special website, orders go straight to the kitchen using fancy tech like HTML5, JavaScript, and other tech stuff. You can even order early and pay with cash or apps. It's all about making the cafeteria cleaner, and faster and giving students and staff an easy way to get their food.

The paper[3] has an idea to make waiting shorter in college canteens during breaks. The canteen management wants to send orders straight to the kitchen and let people pay with e-wallets before they get to the counter. This way, waiting times will be less, and people can manage their time better. They're focused on making things faster and safer with secure e-wallets.

The paper[4] explores a Canteen Management System (CMS) for canteens using web stuff and special ID cards. It wants to replace the old way of doing things with new tech. This system helps pay without cash, organize info better, show menus, make coupons, and track staff attendance. It's all to make the canteen work better during busy times, like lunch breaks. This system is great for big schools or companies.

The article[5] presents the idea of optimizing the canteen system through the use of basic technologies such as RFID and CAN buses. It eliminates problems like slow scanning and insufficient privacy. This new system will make restaurants and cafeterias smarter and more efficient for RFID card holders and managers, making operations easier and safer.

The paper[6] talks about how college dining halls struggle because they use old methods. It is suggested to use a special app called WeChat to look at the problems in a positive way. It says that old control methods are not great and presents a new way to make things better by using new technology. The goal is to make cafeterias more efficient with new technology and improve campus overall.

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Section 3:

7. Product Description :

a. Product Summary:

"The Food Management System" offers a user-friendly, technology-driven approach to food service, transforming the dining experience, and enhancing customer satisfaction within the university community. It optimizes operations, reduces waste, and promotes sustainability while maintaining a strong focus on meeting the diverse needs and preferences of all users.

Our platform offers a myriad of benefits:

The Food Management System offers a wide range of benefits for universities and educational institutions looking to enhance their food service operations:

I. **Enhanced Customer Satisfaction:** By reducing waiting times, enhancing order accuracy, and providing convenient payment options, the system significantly improves overall customer satisfaction.

II. **Real-time Feedback Mechanism:** Users can provide immediate feedback, enabling the canteen to make real-time adjustments, enhance food quality, and improve services based on customer preferences.

III. **Cost Reduction:** Efficient inventory management and reduced food wastage result in cost savings for the canteen, which can lead to lower operational expenses.

IV. **Data-Driven Decision Making:** The system collects valuable data on customer preferences and dining trends, empowering the canteen to make informed decisions regarding menu offerings and operational improvements.

V. **Adaptability and Scalability:** The system can adapt to changing needs and can scale to accommodate potential growth in the university community.

In summary, the Food Management System enhances the overall dining experience, from ordering to payment and feedback collection.

b. Product Stakeholders:

1. **Product Manager:** The person responsible for defining the product vision, strategy, and roadmap. They are often considered the primary stakeholder.
2. **Customers/Users:** The end-users or customers who will use the product. Their needs and feedback are crucial.

3. **Development Team:** This includes software engineers, designers, and other technical staff responsible for building the product.

4. **Employee:** They deal with customer issues and feedback post-launch.

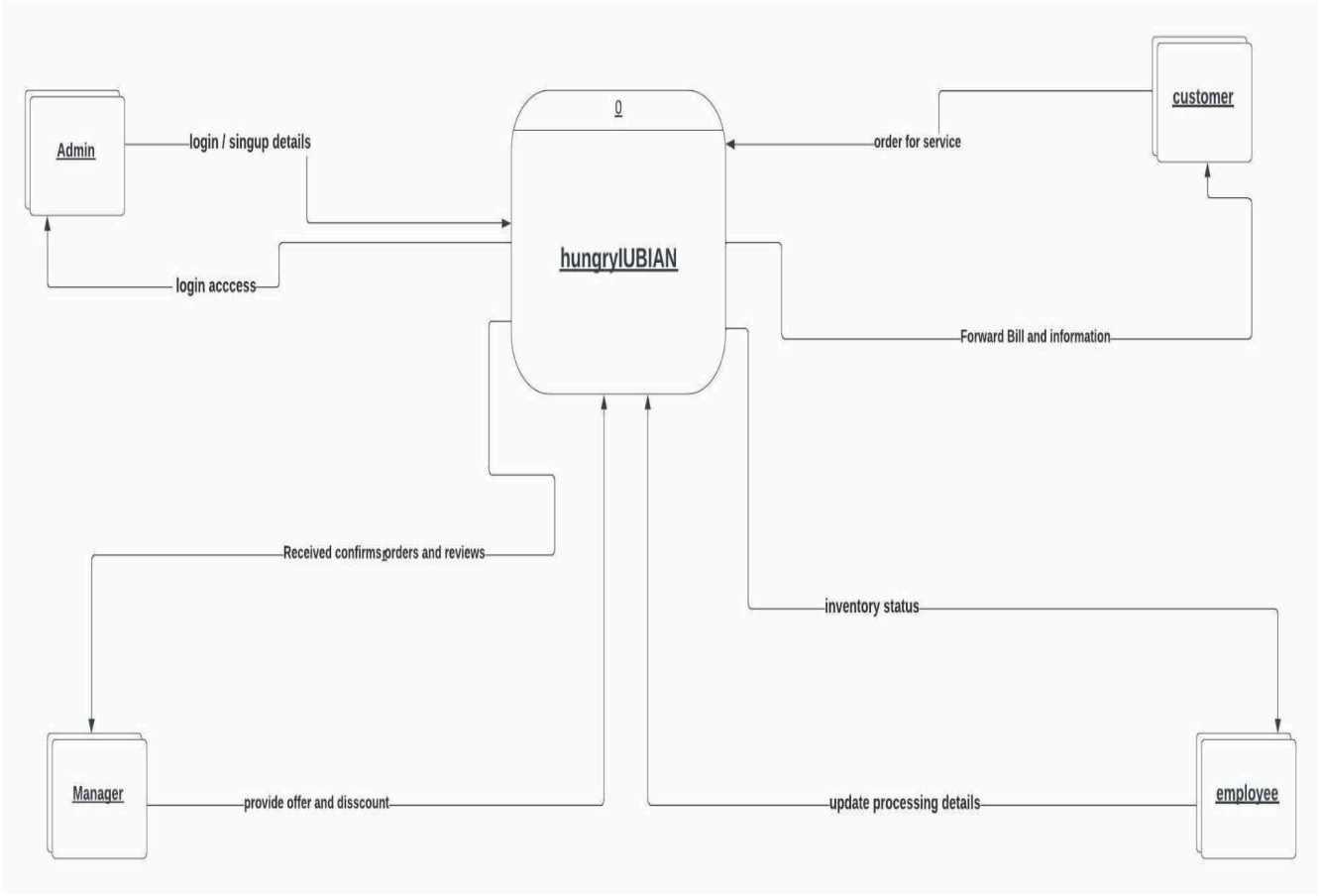
5. **Premium user :** Those who are paying more money to get premium servive.

6. **Sales Team:** The team that sells the product and often provides valuable feedback from customers.

7. **Executives/admin:** Company leadership who provide direction and resources for

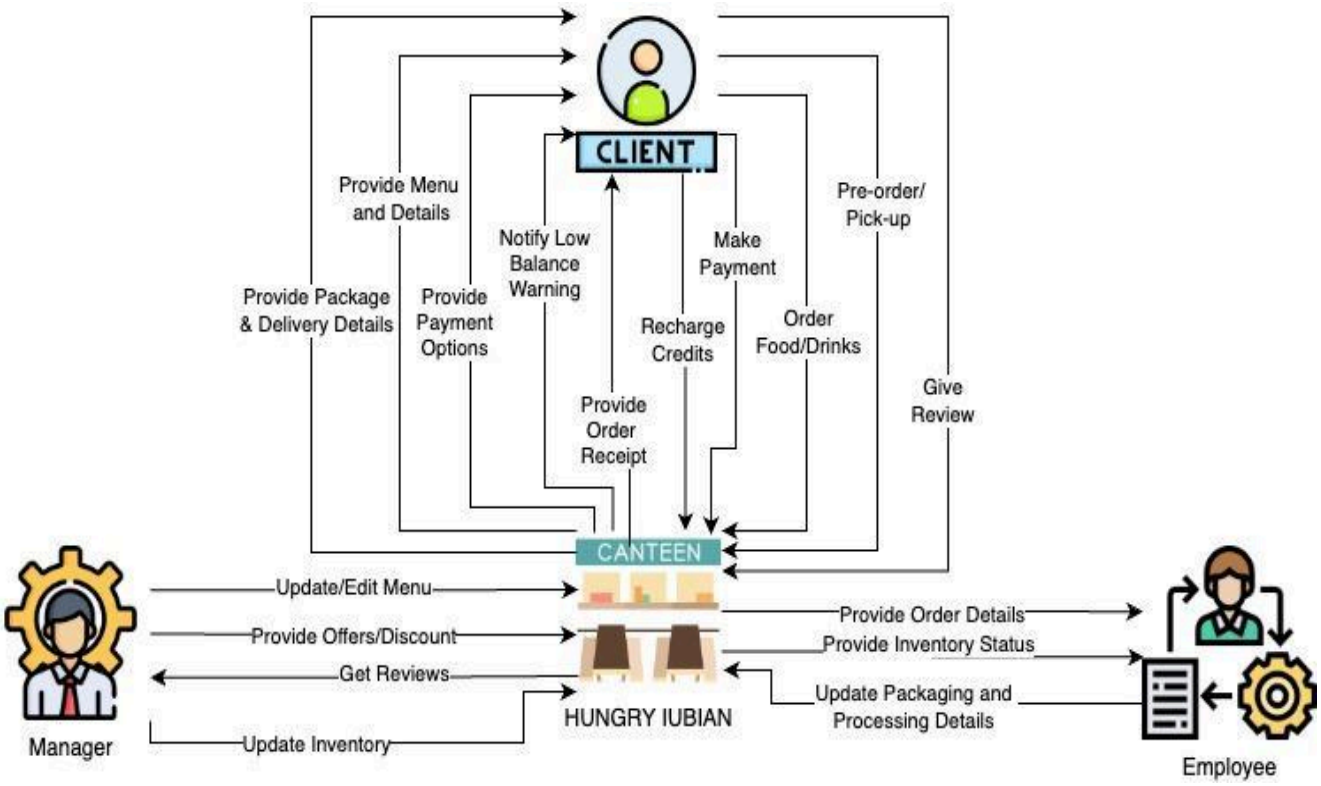
product development.

8. System Context Diagram:



9. Harware Details :

Rich picture:



10. Key Technical Features of Software :

I. The system should offer a user-friendly ordering interface, allowing orders to be placed conveniently, whether it's in person or online. Clients can also pre-order their foods.

II. The system should facilitate the straightforward management of user accounts, encompassing client accounts, employee accounts(canteen staff), and inventory personnel accounts.
III. Easy management of the canteen's menu items including their prices, descriptions, and availability as well as packages and delivery details also update packaging and processing details.
IV. Secure and efficient processing of payments, surrounding cash, credit/debit cards, and digital wallets.
V. Capable of integration with RFID technology and mobile devices, enabling customers to both order and make payments.
VI. Users can provide review(rating) insight for the management about their items and the overall service.
VII. System also informs clients of low balance warnings.
VIII. View processing details/status of the ordered menu.

Section 4:

11. Product Description :

Data collection is vital for developing software that meets its objectives. To gather the necessary information for our system, we will implement three methods: stories, interviews, and questionnaires to collect data. These approaches will enable us to collect diverse perspectives and understand users' requirements better.

Stories:

Story-1

In a recent conversation with a student, Asif Imtiaz, he told us that an issue he and other students faced while trying to order food in the morning before his class at IUB, not only in the morning time before every class had a long line for ordering food and taking food. Therefore for the maximum time they couldn't have eaten anything. If he wanted to eat which is why he might have missed attendance. Also he mentioned one thing about food quality, a few times complained about food quality but they didn't take any action. I asked him if he would be interested in having an online canteen service, and he expressed this desire to

have both an online system and an RFID payment system incorporated into it. Also he responded that he would like a rating system.

Findings from the story

- We need a platform that can connect students with the canteen's online payment method.
- The platform should enable customers to place food orders from anywhere.
- It should also include a feature that allows users to view the menu and browse through the list of available items.
- The platform should enable customers to take customers feedback and food rating.

Story-2

During a conversation with Mr. Riyad Hossain, an employee of the IUB Canteen, mentioned that he has been experiencing a significant workload recently. When I inquired further, he shared that he has been responsible for processing all the payment transactions and creating reports of the earnings for each hour. Additionally, he mentioned the challenge of managing food availability and informing customers when certain items are not in stock. He expressed frustration about having to repeatedly contact various individuals to gather this information and inform customers about the unavailability of certain food items. He also said that maximum time in the canteen has a very long line because of the ordering process and receiving food which is also difficult to maintain.

Finding from the story

- To streamline the ordering process, it is essential to have a platform that provides up-to-date information on the available menu items.
- Additionally, having a feature that allows customers to download their bill receipt would enhance the overall customer experience.

Interviews: We conducted interviews with stakeholders to understand their needs better. In the interviews, we explained the features of our app and asked a combination of open-ended and closed-ended questions. Open-ended questions helped us gain insights into the challenges they

face when getting and ordering food manually. We utilized the Pyramid method to organize the questions. This allowed us to identify our target users and their interest in using the “Hungry IUBian”(name of canteen management system). The interviews helped us understand individual preferences and expectations from our system.

Let's determine our target users and their level of interest in using the canteen management system.

By engaging in meaningful conversations with potential users, we can better understand their specific needs and expectations from our system.

Selected Interviewee: Canteen User

1. How often do you go to the canteen for meals or snacks?
2. What do you find most convenient about the way the canteen currently operates?
3. Can you describe what it's like when you order and pay for food at the canteen?
4. Are there any specific challenges or problems you face when using the canteen services?
5. How would you rate the variety and quality of the food options available in the canteen?
6. Would you be interested in using an online ordering system to place food orders ahead of time? Why or why not?
7. What payment methods do you prefer to use when making purchases at the canteen?
8. Are there any additional features or services you would like to see implemented in the canteen to improve your experience?
9. What kind of service does the vendor provide? Is it good or bad?
10. Do you have any concerns about the security of your personal information when using digital ordering and payment systems in the canteen?
11. If there is any app for canteen what would it be like for them?

Selected interviewee: Canteen Employee

1. Can you tell me about your role and responsibilities in the canteen?

2. If there is any app for canteen management what would it like for them?

3. How do you currently handle customer orders and payments?
4. What challenges do you face when managing customer orders, especially during busy times? 5. How do you make sure that orders are processed accurately and efficiently in terms of both preparation and billing?
6. Are there any specific problems or obstacles you encounter with the current system for managing the canteen?

7. How do you think a Canteen Management System could improve your daily tasks and overall experience?
8. What specific features or functionalities would be most beneficial for canteen employees in the system?
9. How do you envision the system enhancing communication and coordination among canteen staff?
10. What kind of training or support would you require to effectively use the new system?
11. How do you currently monitor and track inventory levels for ingredients and supplies?

Selected interviewee: Administrator (Canteen Manager)

1. How do you currently manage the canteen's day-to-day operations, such as handling menus, coordinating staff, and tracking finances?
2. What are the main challenges you face in running the canteen smoothly and satisfying your customers?
3. How do you think implementing a canteen management system (Hungry IUBians) can help overcome these challenges and improve overall operations?
4. What specific functionalities or features do you think are crucial for the successful implementation of such a system?
5. How do you plan to integrate the new system with your existing processes and workflows in the canteen?
6. What kind of data and analytics would be most valuable to you as an administrator in making informed decisions?
7. What are your thoughts on maintaining data security and privacy when it comes to customer information and financial data within the system?
8. How do you envision the system assisting with inventory management and controlling stock levels?
9. How would you ensure a smooth transition to the new system and provide adequate training for the canteen staff?
10. Are there any specific budgetary constraints or limitations that need to be considered when implementing the system?

11. What are your thoughts on integrating the system with cashless payment methods, such as mobile wallets or contactless cards?

Questionnaires

Selected Stakeholder: Canteen User

1. **How often do you eat meals on campus, including breakfast, lunch, and dinner?**

a) Daily
b) Almost daily (5-6 days a week)

c) Frequently (3-4 days a week)

d) Occasionally (1-2 days a week)

e) Rarely (once a month)

f) Never

2. **Are you satisfied with the variety of food options available in the campus cafeteria? on a scale of 1 to 5? (Very disappointed = 1, very satisfied = 5)**
   1 2 3 4 5

3. **How would you rate the quality of food served in the campus cafeteria on a scale of 1 to 5, with 5 being the highest? (Very disappointed = 1, very satisfied = 5)**

   1 2 3 4 5
4. **Are you satisfied with the pricing of food on campus, or do you feel it's too expensive?**
   a) Yes
   b) No

5. **Are you aware of any special promotions or discounts offered for students in the cafeteria?**
   a) Yes
   b) No

6. **How do you prefer to provide feedback about your dining experience – through an app, suggestion box, or other means?**
   - ☐ Mobile app or website
   - ☐ Suggestion box located in the cafeteria Social media or
   - ☐ cafeteria's social media accounts
   - ☐ others (please specify)

7. **How often do you use the online food ordering and delivery system on campus?**
   a)Daily
   b) Almost daily (5-6 days a week)

   c) Frequently (3-4 days a week)

d) Occasionally (1-2 days a week)

e) Rarely (once a month)

f) Never

8. **What types of cuisines or dishes would you like to see added to the menu in the cafeteria?**
   a) Healthy and low-calorie choices

   b) Breakfast and brunch items

   c) Vegetarian or vegan options

   d) Ethnic fusion cuisine

   e) Desserts and sweets

   f) Others

9. **What improvements would you suggest to make the food ordering and delivery process more convenient for students?**
   Open ended
10. **How would you rate the cleanliness and ambiance of the cafeteria and dining areas?**
    a) Poor
    b) Fair

    c) Average

    d) Good

    e) Excellent

11. **Do you have any specific feedback on the portion sizes of the food items available?**

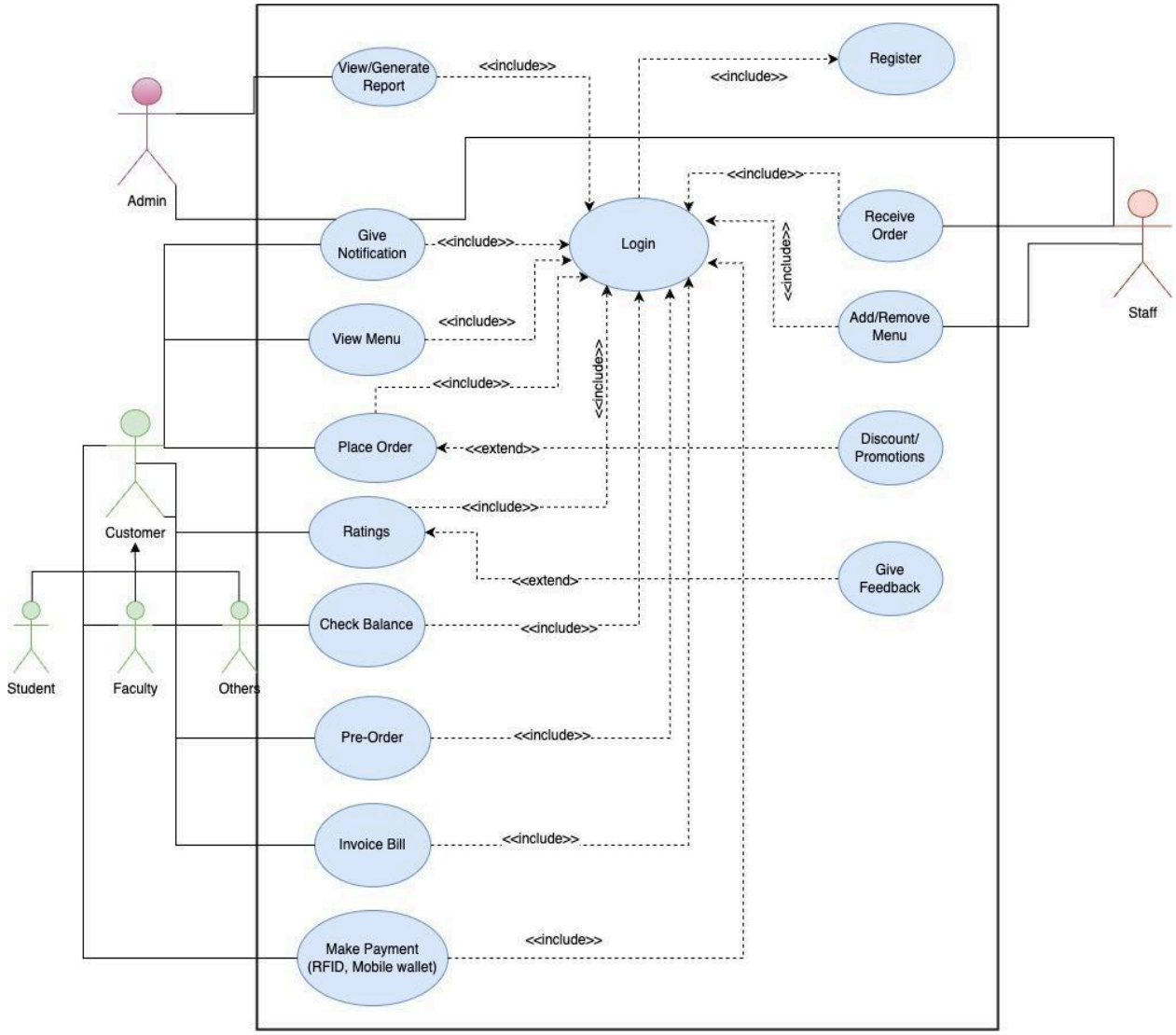
- ☐ Portion sizes are too small.
- ☐ Portion sizes are too large.
- ☐ Portion sizes are just right.
- ☐ Some items have small portions, while others are large.
- ☐ Portion sizes vary but generally meet my expectations.
- ☐ I have no preference regarding portion sizes.

12.Major functionalities offered by the system :

The Canteen Management System offers several major functionalities to enhance canteen operations and customer experience:

1. **Order Management:** The system allows customers to place orders conveniently through RFID cards or a mobile app. This reduces waiting times and provides a smooth order placement process.
2. **Menu Management:** The system keeps track of the canteen's menu items, their descriptions, prices, and availability. This helps customers make informed choices and ensures accurate menu presentation.
3. **Payment Processing:** Cashless methods like RFID cards, credit/debit cards, and mobile wallets. Customers now have easy payment options, and transactions are simpler.
4. **Inventory Tracking:** The software tracks the amount of stock in real-time and helps with effective supply management by the canteen employees. Better resource management results from preventing overstocking and running out of popular items.
5. **Reporting and Analytics:** The technology enables canteen administrators to make data driven decisions by producing reports on sales, stock levels, and customer behavior. This improves strategic planning and overall operations.
6. **Customer Profiles**: The system maintains customer profiles that include order histories, preferences, and feedback. Customer engagement and happiness are increased by this unique approach.
7. **Feedback System:** Customers can share their experiences and comments through the system's built-in feedback mechanism. This encourages changes that are customer focused and ongoing improvement.
8. **Integration with Payment Systems:** By cooperation with payment service providers, many payment methods can be easily included, resulting in transactions that are quick and secure.
9. **Automated Processes:** The software automates lots of processes, including order processing and billing, which reduces manual errors and improves productivity.
10. **Personalized Recommendations:** The software can provide customized menu recommendations based on previous order data and customer tastes, improving the overall eating experience.
11. **Enhanced Customer Experience:** The software aims to give customers a better and more convenient meal through faster processes, quicker service, correct orders, and safe payments.
12. **Notification System:** Implement a notification system to alert users about promotions, new menu items, balance or other important announcements.

13. Use Case Diagram:



14.Normal & Alternate scenarios:

Normal Scenarios:

Use case name:	Login	**UniqueID: HI001**
Area:	Login web page	
Actor(s):	Customer	
Stakeholder: Customer, CMS Administrator, Product Manager, Canteen Staff, UI/UX Designer, Developer, Supplier, Stakeholder/Business Owner		
Description:	Allow the customer to login to their account via a secure web site.	
Triggering Event: Customer goes to the login page, enters RFID (user ID) and password, clicks on the login button.		
Trigger Type:	External	
Steps Performed (Main Path)		**Information for Steps**
1. The user opens the system's login page, which may be a website, mobile app, or other user interface.		Browser,Website address
2. The system presents a login form with fields for the user to enter their credentials, typically including a "Username" or "Email" field and a "Password" field.		User ID, password. Login web page
3. The user enters their valid username or email and password in the respective fields.		Customer Data, Session Data, User ID
4. The user clicks the "Login" button or submits the form to initiate the login process.		Customer Data, Session Data
Alternate Scenario:		
1. Customer goes to the secure login web page.		Browser, Website address
2. Customer logins puts credentials and clicks login.		User ID, password. Login web page
3. Customer RFID and password is verified from the server.		Customer Data, Session Data, User ID
4. Unable to login due to internal server error.		Login web page
Preconditions:	Customer already registered and has a user account.	
Post condition:	Customer has successfully logged in.	

Assumptions:	Customer has a browser, internet connection and valid UserID and Password.
Success Guarantee:	Customers were able to login and view all their information.
Minimum Guarantee: Customer was able to login.	
Requirements Met: Allow the customer to login to their account via a secure web site.	
Outstanding Issues: If Customer forgets their user ID or password, how should it be handled?	
Priority: High	
Risk: High	

Normal Scenarios:		
Use case name:	Make payment	**UniqueID: HI002**
Area:	Login web page	
Actor(s):	Customer , Merchant (optional).	
Stakeholder: Customer, CMS Administrator, Product Manager, Canteen Staff, UI/UX Designer, Developer, Supplier, Stakeholder/Business Owner.		
Description:	Allow the customer to login to their account via a secure web site.	
Triggering Event: Customer goes to the payment page , enters RFID (user ID) and password, clicks on the pay button.		
Trigger Type:	External	
Steps Performed (Main Path)		**Information for Steps**
1. The customer navigates to the merchant's website or application and selects the items or services they want to purchase.		Browser, Website address
2. The customer proceeds to the checkout page and reviews the selected items or services.		User ID,Website
3. The customer clicks on the "Pay" or "Checkout" button to initiate the payment process.		Customer Data, Session Data,
4. The system redirects the customer to the payment gateway's secure payment page.		Customer Data, Session Data
Alternate Scenario:		
1. Invalid Payment Details.		Browser, Website address
2. If the payment details provided by the customer are invalid or incomplete, the payment gateway will display an error message and prompt the customer to correct the information.		User ID, password. Login web page
3. Insufficient Funds.		Customer Data, Session Data, User ID
4. Unable to login due to internal server error.		Error Message

Preconditions:	Customer already registered and has a user account.
Post condition:	• The customer's payment is successfully processed. • The customer receives a confirmation of the payment. • The merchant (if applicable) is notified of the payment.
Assumptions:	Customer has a browser, internet connection and valid user ID and password.
Success Guarantee:	Customers were able to login and view all their information.

Normal scenarios:	
Use Case Name: Add/Remove Menu	**UniqueID: HI003**
Area: Employee Dashboard	
Actor(s): Employee	
Stakeholders: Product Manager, Administrator, Investor, Software Developer	
Description: An Employee can Add/Remove any item or multiple items from the menu for the day.	
Triggering Event: After login with email and password, the employee able to update according to the inventories and add/remove item from menu.	
Trigger Type: External	
Step Performed(Main Path):	**Information Required for Steps:**
1. Participant login using the secure web server	Email, Password
2. Click on the Menu option	User must be login to the account

3. System displays a list of menu items with checkboxes.	User Input Data
4. User selects the item(s) to be add or removed.	User Input Data
5. System confirms the selection and update the selected item(s).	User Input Data
6. System updates the menu list successfully.	Output page
Alternative Scenario:	
1. Participant login using the secure web server.	Email, Password
2. Click on the Menu option.	User must be login to the account
3. System displays a list of menu items with checkboxes.	User Input Data
4. User selects the item(s) to be add or removed.	User Input Data
5. System confirms the selection and update the selected item(s).	User Input Data
6. System can not updates the menu list successfully due to difficulties in authorization.	Error Message
Pre-conditions: Authorization required to change menu	
Post-conditions: Menu will be displayed successfully when the customer enters the system	
Assumption: User is already authenticated and logged into the system with the necessary permissions to add or remove menu items. This assumes that user authentication and access control mechanisms are in place.	
Success Guarantee: The system will add a new menu item to the menu list or remove a selected menu item from the menu list within 10 seconds, and the added or remove item will be immediately visible or excluded in the menu.	
Minimum Guarantee: The system will add a new menu item to the menu list or remove a selected menu item from the menu list within 30 seconds, and the added or remove item will be visible or excluded in the menu within 2 minutes.	

Outstanding Issues: • Are there strict data validation rules in place to ensure that menu items are added or removed with accurate and consistent information? • What happens when invalid or incomplete data is provided?
Priority: **High**
Risk: **High**

Normal Scenarios:	
Use Case Name: Check Balance	**UniqueID: HI004**
Area: Customer Dashboard	
Actor(s): Customer	
Stakeholders: Product Manager, Administrator, Investor, Software Developer	
Description: Allows a customer to check their account balance	
Triggering Event: After login with email and password, the customer able to check the account balance is remaining.	
Trigger Type: External	
Step Performed(Main Path):	**Information Required for Steps:**
1. Participant login using the secure web server.	Email, Password
2. Click on the "Profile" button.	User must be login to the account
3. User selects the "Check Balance" option on the system for their account balance.	User must be connected with internet network.

4. The system retrieves the account balance associated with the customer's account.	User Input Data
5. The system displays the account balance to the user.	Output page
Alternative Scenario:	
1. Participant login using the secure web server.	Email, Password
2. Click on the “Profile” button.	User must be login to the account
3. User selects the "Check Balance" option on the system for their account balance.	User must be connected with internet network.
4. The system retrieves the account balance associated with the customer's account.	User Input Data
5. The system cannot displays the account balance to the user due to technical difficulties.	Error Message
Pre-conditions: Customer already registered and has a user account.	
Post-conditions: Customer has successfully checked their account balance successfully.	
Assumption: The system maintains accurate and complete transaction records that are used to calculate and display the account balance to the customer.	
Success Guarantee: The system assures that the account balance information provided to the customer is accurate and up-to-date at the time of the request.	
Minimum Guarantee: If inaccuracies are identified, the system will work to correct them promptly and provide the correct balance information to the customer.	
Outstanding Issues: If account balance information is Inaccurate?	
Priority: High	
Risk: Medium	

Normal scenarios:	
Use case name: View Menu	**UniqueID: HI005**
Area: Webpage	
Actor(s): Customers/Users	
Stakeholders: Customers/Users , Product Manager, Development Team, Executives/admin, Premium user, Employee, Sales Team.	
Description: After logging in to the web page will redirect Customers to menu page where they will be Allowed view full menu and to select what they wants to order.	
Triggering Event: The user has successfully logged in through RFID (user ID) and password.	
Triggering Type: External.	
Steps Performed (Main flow):	**Information for steps:**
1. Customer logs in to system.	UserID/Username, Password, Login page
2. The user lands on the system's home/dashboard screen after logging in.	Home web page
3. The user selects the "View Menu" option from the available features or navigates to the menu section.	Menu web page
4. The system identifies the user's access level and authenticates the request for menu viewing.	Customer Data
5. The system retrieves the current date and time for menu selection.	Menu page
6. The system connects to the database and fetches the menu data according to the selected date and time.	Canteen Data, Customer data, Menu page
7. The menu items are categorized (e.g., breakfast, lunch, dinner) and presented in an organized manner.	Menu page

8. Each menu category displays a list of available items with their names, prices, descriptions, and images (if available).	Menu web page
9. The user explores the menu, views various food items, and can select individual items for detailed information.	Menu web page
10. If needed, the user can filter the menu based on preferences like vegetarian, non-vegetarian, or dietary restrictions.	Menu web page, Customer data
11. The user is provided with options to add selected items to a cart or proceed to place an order.	Menu web page, Cart web page
12. The user finishes the process by either placing an order or navigating back to other system features.	Home web page
Alternate Scenarios:	
1. After logging in The user navigates to the "View Menu" section.	Username/UserID, Password, Cutomer data, Menu web page.
2. The system attempts to retrieve the menu for the current date and time.	Customer data, Menu web page
3. The system encounters a technical issue or an unavailable network connection.	Menu web page
4. The system prompts an error message, notifying the user about the temporary unavailability of the menu data.	Menu web page
5. The user is presented with options to retry fetching the menu or check the system status for maintenance details.	Menu web page
6. If the issue persists, the user is advised to contact system support or try accessing the menu at a later time.	Menu web page
Pre Conditions: The customer is logged into their account in the system.	

Post Conditions: The customer faces a temporary inability to access menu due to technical difficulties and is guided with steps to manage the situation.
Assumptions: Customer has a browser, internet connection.
Success Guarantee: Customers were able see menu all correct items.
Minimum Guarantee: Customer was able to view full menu to place an order.
Requirements Met: Allow the customer to select his desired meal/food for orders from the webpage.
Risk: High.

Normal scenarios:	
Use case name: View Discount	**UniqueID: HI006**
Area: Webpage	
Actor(s): Customers/Users	
Stakeholders: Customers/Users , Product Manager, Development Team, Executives/admin, Premium user, Employee, Sales Team.	
Description: After logging in to the web page will redirect Customers to discount where they will be allowed to view menu with discounts or any additional discount for specific customers (if included).	
Triggering Event: The user has successfully logged in and pressed the 'Discount' section.	
Triggering Type: External.	
Steps Performed (Main flow):	**Information for steps:**
1. Customer logs in to system.	UserID/Username, Password, Login page

1. The customer accesses the "View Discounts" or "Offers" section within their account dashboard or navigates from the main menu bar.	Home web page
2. The system validates the user's login credentials and grants access to the discount section.	Customer data, Discount web page
3. The system displays various discount categories, such as "Seasonal Offers", "Promotions", "Loyalty Rewards/Personal Discounts" or “Ongoing discounts/offers”.	Customer, Discount web page
4. The customer selects a specific category to explore available discounts or ongoing promotions.	Discount web page
5. The system presents a detailed list of currently active discounts under the chosen category.	Discount web page
6. Each discount entry includes a title, description, applicable products or services, validity period, and the discount value (expressed in percentage or currency).	Discount web page
7. The customer browses through the available discounts to find a suitable offer matching their preferences or purchase.	Discount web page
8. Upon selection, the system applies the chosen discount to the customer's ongoing shopping cart or order during checkout.	Discount page, Cart web page
Alternate Scenarios:	
1. After logging in the customer attempts to access the "View Discounts" or "Offers" section within their account dashboard or through the main menu.	Username, Password/UserID, Cutomer data, Discount web page.
2. The system processes the customer's request for discount information and authentication.	Customer data, Discount web page
3. The system encounters a technical issue, server unavailability, or a lack of active discounts at that moment.	Discount web page

4. The system notifies the customer about the temporary unavailability of discount information due to a technical problem.	Discount web page
5. The customer is provided with options to retry accessing the discounts or to check the system status for maintenance or technical issues.	Discount web page
6. In the case of prolonged unavailability, the customer is encouraged to continue the purchase without the discount or contact customer support for further guidance.	Discount web page
Pre Conditions: The customer is logged into their account in the system.	
Post Conditions: The customer faces a temporary inability to access or utilize discounts due to technical difficulties and is guided with steps to manage the situation.	
Assumptions: Customer has a browser, internet connection.	
Success Guarantee: Customers were able see to discounts and receive all correct discounted/offered items.	
Minimum Guarantee: Customer was able to view discounts to place order.	
Requirements Met: Allow the customer to select his desired discounts/offers for orders from the webpage.	
Risk: Low.	

Normal scenarios:	
Use case name: Pre order	**UniqueID: HI007**
Area: Webpage	
Actor(s): Customers/Users	

Stakeholders: Customers/Users , Product Manager, Development Team, Executives/admin, Premium user, Employee, Sales Team.	
Description: After logging in to the web page will redirect Customers to pre order page where they will be Allowed view full menu and to select what they wants to order.	
Triggering Event: The user has successfully logged in through RFID (user ID) and password.	
Steps Performed (Main flow):	**Information for steps:**
1. Customer logs in to system.	Customer data, UserID/Username, Password, Login page
2. The user lands on the system's home/dashboard screen after logging in.	Home web page
3. The system displays the "View Menu" with available food and beverage options.	Menu web page
4. The customer selects the items they want to pre-order.	Menu web page
5. They can customize their order by selecting options or specifying any preferences.	Menu web page
6. The system calculates the total bill and displays it to customer.	,Menu web page
7. The customer review their order details and confirm their pre-order.	Menu web page
8. They choose a pickup time based on their preferred availability.	Menu web page
9. The system generates a unique order number and sends a confirmation email or notification to the customer.	Menu web page
10. The pre-order is saved in the system and staff is notified of the upcoming order.	Menu web page, Customer data

11. The user finishes the process by either placing an order or navigating back to other system features.	Home web page
Alternate Scenarios:	
1. After logging in The user navigates to the "View Menu" section.	Username/UserID, Password, Cutomer data, Menu web page.
2. The system attempts to retrieve the menu for the current date and time.	Customer data, Menu web page
3. The system encounters a technical issue or an unavailable network connection.	Menu web page
4. The system prompts an error message, notifying the user about the temporary unavailability of the menu data.	Menu web page
5. The user is presented with options to retry fetching the menu or order failed.	Menu web page
6. If the issue persists, the user is advised to contact system support or try later.	Menu web page
Pre Conditions: The customer is logged into their account in the system.	
Post Conditions: The customer faces a temporary inability to access menu due to technical difficulties and is guided with steps to manage the situation.	
Assumptions: Customer has a browser, internet connection.	
Success Guarantee: Customers were able see menu and order all available items.	
Minimum Guarantee: Customer was able to view full menu to place pre-order.	
Requirements Met: Allow the customer to select his desired meal/food for orders from the webpage.	
Risk: High.	

User case name:	Place Order	UniqueID: HI008
Area:	Cart webpage	
Actor(s):	Customer	
Stakeholder:	Customer, CMS Administrator, Product Manager, Canteen, Supplier, Stakeholder/Business Owner	
Description: webpage.	Allow the customer to place selected orders from the	
Triggering Event: (user ID) and password,	Customer goes to the login page, logins in via RFID	
Trigger Type:	External	
Steps Performed (Main Path)		**Information for Steps**
1. Customer logs in using the secure login web page.		User ID, Password
2. Customer data is retrieved from the server and verified.		Customer Data, User ID, Password
3. From the home page select Menu in the upper navigation bar.		Home Web Page
4. Customer adds the menu item(s) and their quantities to the cart.		Menu Web Page

5. Customer clicks on the cart and clicks on the checkout option then clicks the payment method and then confirms.	Cart Web Page
6. Order Log it created.	Cart Web Page
7. Order data, Session data and Customer Data is updated	Cart Web Page, Customer Data, Session Data, Order Data
8. Successful order placement notification is displayed to the Customer.	Cart Web Page
Alternate Scenario:	
1. The customer logs into their account on the e-commerce website.	Username, Password
2. The customer navigates to their order history.	Dashboard, Session Data
3. The customer selects a specific order they want to cancel.	Dashboard, Session Data
4. The system displays the order details, including the order items, total price, and delivery information.	Dashboard, Session Data
5. The customer initiates the cancelation process by clicking a "Cancel Order" button.	Dashboard, Session Data
6. The system prompts the customer to provide a reason for canceling the order.	Dashboard, Session Data

Preconditions:	Customer already registered and has a user account.
Post condition:	The order is marked as "Pending Cancelation."The customer receives an email confirmation of the cancelation request.
Assumptions: user ID and password.	Customer has a browser, internet connection and valid
Success Guarantee: ordered items.	Customers were able to order and receive all correct
Minimum Guarantee:	Customer was able to place order.
Requirements Met: webpage.	Allow the customer to place selected orders from the
Outstanding Issues :	How would a rejected credit card be handled?
Priority:	High
Risk:	High

Normal scenarios:	
Use case name: Ratings	**UniqueID: HI009**
Area: Menu web page	
Actor(s): Customers/Users	
Stakeholders: Customers/Users , Product Manager, Development Team, Executives/admin, Premium user, Employee, Sales Team.	
Description: This use case allows customers to provide feedback on their dining experience with the canteen's service and food quality. It helps the canteen to understand customer preferences and areas that require improvement.	
Triggering Event: The customer selects a completed order from their order history and chooses to rate and review it.	
Steps Performed (Main flow):	**Information for steps:**
1. The customer must first log in or register an account on the university canteen food management app if they haven't already.	Customer data, UserID/Password, Username, Log in page
2. The customer places their food order through the app.	Menu web page
3. Selects the items they want, and confirms the order.	Menu web page
4. After placing the order, the customer receives a confirmation of their order with details such as estimated delivery time or pick-up time.	Menu web page
5. After receiving the order, customers receives a “Rate us” message.	Menu web page
6. Customer can rate the app and give review of their service.	Menu web page
7. The app confirms that the review and rating have been submitted successfully.	Menu web page

Alternate Scenarios:	
1. After logging in the user navigates to the "Menu web page".	Username, Password/UserID, Customer data, Menu web page.
2. Place an order.	Menu web page
3. After placing the order, the customer receives a confirmation of their order with details such as estimated delivery time or pick-up time.	Menu web page
4. After receiving the order, customers receives a “Rate us” message.	Menu web page
5. Customer can rate the app and give review of their service.	Menu web page
6. Clicking the submit button, the system will prompt “There was an error, please try again” to the customer.	Menu web page
Pre Conditions: The customer must log into their account in the system.	
Post Conditions: The review has been submitted successfully.	
Assumptions: Customer has a browser, internet connection.	
Success Guarantee: Customers were able to rate and review successfully.	
Minimum Guarantee: Customer was able to rate and review for foods for an order.	
Requirements Met: Allow the customer to rate and review for foods from the menu page.	
Risk: Low.	

Normal scenarios:	
Use case name: Generate Report	**UniqueID: HI010**
Area: Generate Report page	
Actor(s): Canteen Manager	
Stakeholders: Canteen Manager, Customers/Users, Product Manager, Development Team, Executives/admin, Premium user, Employee, Sales Team.	
Description: The canteen manager uses the app to generate and analyze sales, inventory, and tomorrow's requirement reports for informed decision-making.	
Triggering Event: The canteen manager can generate, view and download the report.	
Steps Performed (Main flow):	**Information for steps:**
1. The canteen manager logs into the app using their credentials to access the manager's dashboard.	Username and password
2. Upon logging in, the manager is presented with a dashboard that includes various options, such as sales, inventory, and reports.	Dashboard
3. The manager navigates to the menu or sidebar and selects the "Generate Report" option.	Report web page
4. The system prompts the manager to choose the date range for the report.	Report web page
5. The manager selects a date range for sales and inventory.	Report web page
6. After reviewing and confirming the reports, the manager has the option to save or export them in a preferred format, such as PDF or Excel, for further analysis or sharing with relevant stakeholders.	Report web page
7. The manager exits the report generation menu and returns to the main dashboard or other relevant sections of the app.	Dashboard

Alternate Scenarios:	
1. The manager logs into the canteen food management app using valid credentials.	Username and password
2. The manager is presented with a dashboard showing various options, including "Generate Report."	Dashboard
3. The manager navigates to the "Generate Report" option within the app.	Report web page
4. The manager selects the "Generate Report" option, but due to a system error or connectivity issue, the report fails to generate.	Report web page
Pre Conditions: The canteen manager must log into their account in the system.	
Post Conditions: The canteen manager has generated and reviewed reports for today's sale, inventory, and tomorrow's requirement.	
Assumptions: The canteen manager has a browser, internet connection.	
Success Guarantee: The canteen manager able to generate and review reports.	
Minimum Guarantee:	
Requirements Met: Allow the canteen manager able to generate and review reports from the generate report page.	
Risk: High.	

15. Functional Requirements:

A university canteen management system is a critical component of campus operations that helps efficiently manage and provide food services to students, faculty, and staff. Below are some functional requirements for such a system:

1. Order Management: User-friendly interface for placing food orders online. Real-time availability and item quantity tracking to prevent over-ordering . Integration with payment gateways for online payment options. Order history and order tracking features for users.

2. Menu Management: The system keeps track of the canteen's menu items, including their descriptions, prices, and availability. This helps customers make informed choices and ensures accurate menu presentation.

3. Payment Processing: Various cashless methods, such as RFID cards, credit/debit cards, and mobile wallets, are available for customers, making payment options easy and transactions simple.

4. Inventory Tracking: The software monitors real-time stock levels, assisting canteen employees in efficient supply management. This prevents overstocking and ensures popular items don't run out, leading to better resource management.

5. Reporting and Analytics: This technology empowers canteen administrators to make data-driven decisions by generating reports on sales, stock levels, and customer behavior. This enhances strategic planning and overall operations.

6. Customer Profiles: The system maintains customer profiles that include customer information, order histories, preferences, and feedback, ultimately increasing customer engagement and satisfaction.

7. Feedback System: Customers can provide their experiences and comments through the system's built-in feedback mechanism, fostering customer-centric changes and continuous improvement.

8. Integration with Payment Systems: Through collaboration with payment service providers, the system can easily incorporate a variety of payment methods, ensuring quick and secure transactions.

9. Personalized Recommendations: The software can offer tailored menu suggestions based on previous order data and customer preferences, enhancing the overall dining experience.

10. Improved Customer Experience: The software aims to enhance the dining experience by streamlining processes, providing faster service, ensuring accurate orders, and securing payments.

11. Dietary Preferences and Allergies: Ability for users to specify dietary preferences and allergies in their profiles. System alerts and notifications for food items that may contain allergens. Customization of menu items based on dietary restrictions.

12. Mobile Accessibility: Support for mobile apps to facilitate on-the-go food ordering and management. Mobile payment options and QR code scanning for quick access to menus and orders.

16.Non-Functional Requirements:

1. **Efficiency:** There should be no failures or slowdowns when handling a large number of requests and transactions by the system. There should be minimal delays and faster system response times.
2. **Reliability:** There should be little downtime and consistent system operation. In addition, the system needs to recover from errors or failures quickly.
3. **Flexibility:** The system must be able to handle growing volumes of users, transactions, and data without sacrificing its dependability or efficiency.
4. **User Interface:** The system should be easy to use and intuitive, with a user-friendly interface and clear instructions. The system should also be accessible to users who are having issues.
5. **Security:** A few of the system's robust security features include data encoding, access control, and monitoring. In addition, the system needs to follow all applicable privacy laws.
6. **Maintainability:** The system should be easy to update and maintain with well-organized documentation and a structured architecture. The system should also allow version control and testing.

The **scalability** of a Food Management System (FMS) project or our project 'hungryIUBIAN', like any other software system, depends on various factors. Here are some considerations regarding scalability in a Food Management System:

a) **User Load**: The system should handle a growing number of users, both customers and administrative staff, efficiently. Scalability involves managing an increasing load without compromising system performance.

b) **Traffic and Transactions**: A scalable FMS should accommodate a rise in traffic, especially during peak hours, and handle a surge in transaction volumes without slowdowns or crashes.

c) **Database Scalability**: The system's database should be designed to scale, ensuring it can store and retrieve data effectively as the volume of users and transactions grows.

d) **Elasticity**: The system should be elastic, allowing for easy expansion or reduction of resources based on demand. Cloud-based solutions often provide elasticity to scale resources up or down based on usage.

e) **Performance and Response Time**: As the user base grows, the system should maintain optimal performance and response times. Customers expect quick responses when browsing menus, making orders, or applying discounts.

f) **Modularity and Component Scalability**: The system's architecture should be modular, allowing scalability for individual components. For instance, the ability to add new modules or microservices to handle specific functionalities as the system expands.

g) **Caching and Load Balancing**: Implementing caching mechanisms and load balancing techniques can improve performance by distributing load across multiple servers and caching frequently accessed data.

h) **API Scalability**: If the FMS offers APIs for third-party integrations or mobile apps, ensuring that these APIs can handle increased traffic and support a growing number of clients is vital.

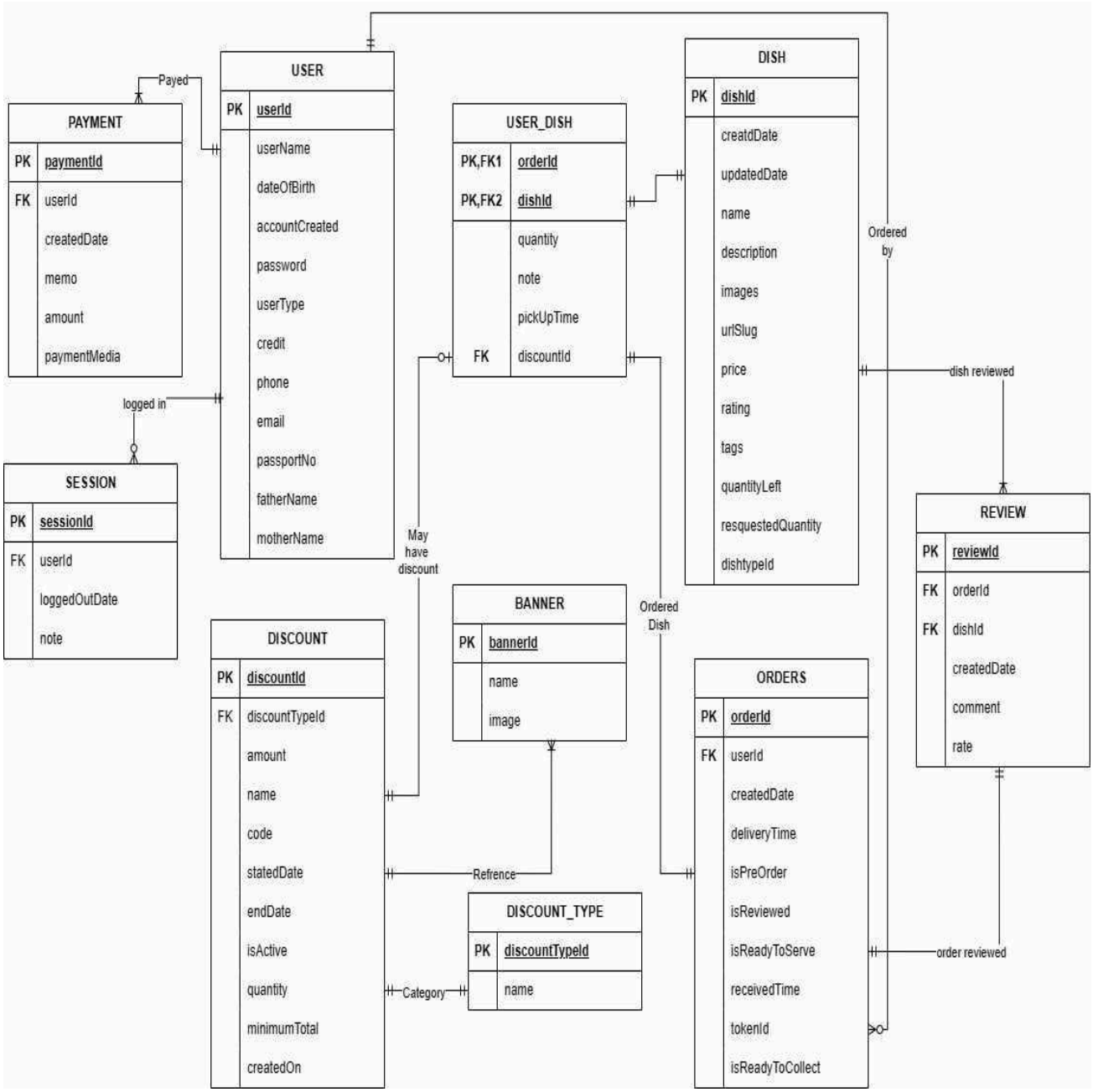
i) **Monitoring and Performance Optimization**: Regular monitoring of the system's performance helps identify bottlenecks or areas that require optimization for better scalability.

j) **Security and Compliance**: As the system scales, ensuring that security measures and compliance standards are maintained is crucial to safeguarding increased volumes of data and transactions.

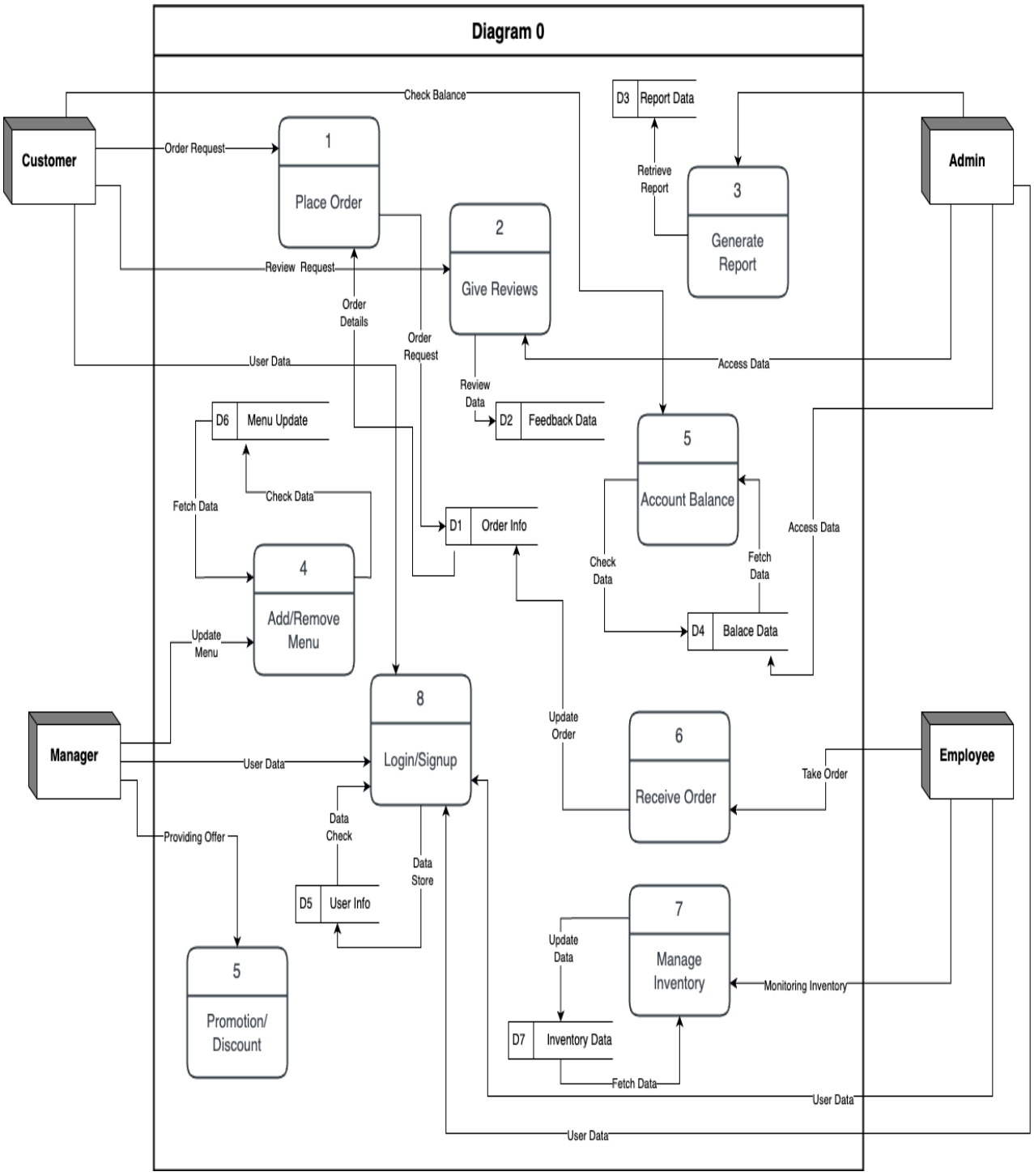
Scalability is crucial for a Food Management System, especially considering potential business growth, increased user demand, and the evolution of the system's functionalities over time. It involves careful planning, architecture design, and ongoing monitoring and adjustments to cater to growing needs efficiently.

Section 5:

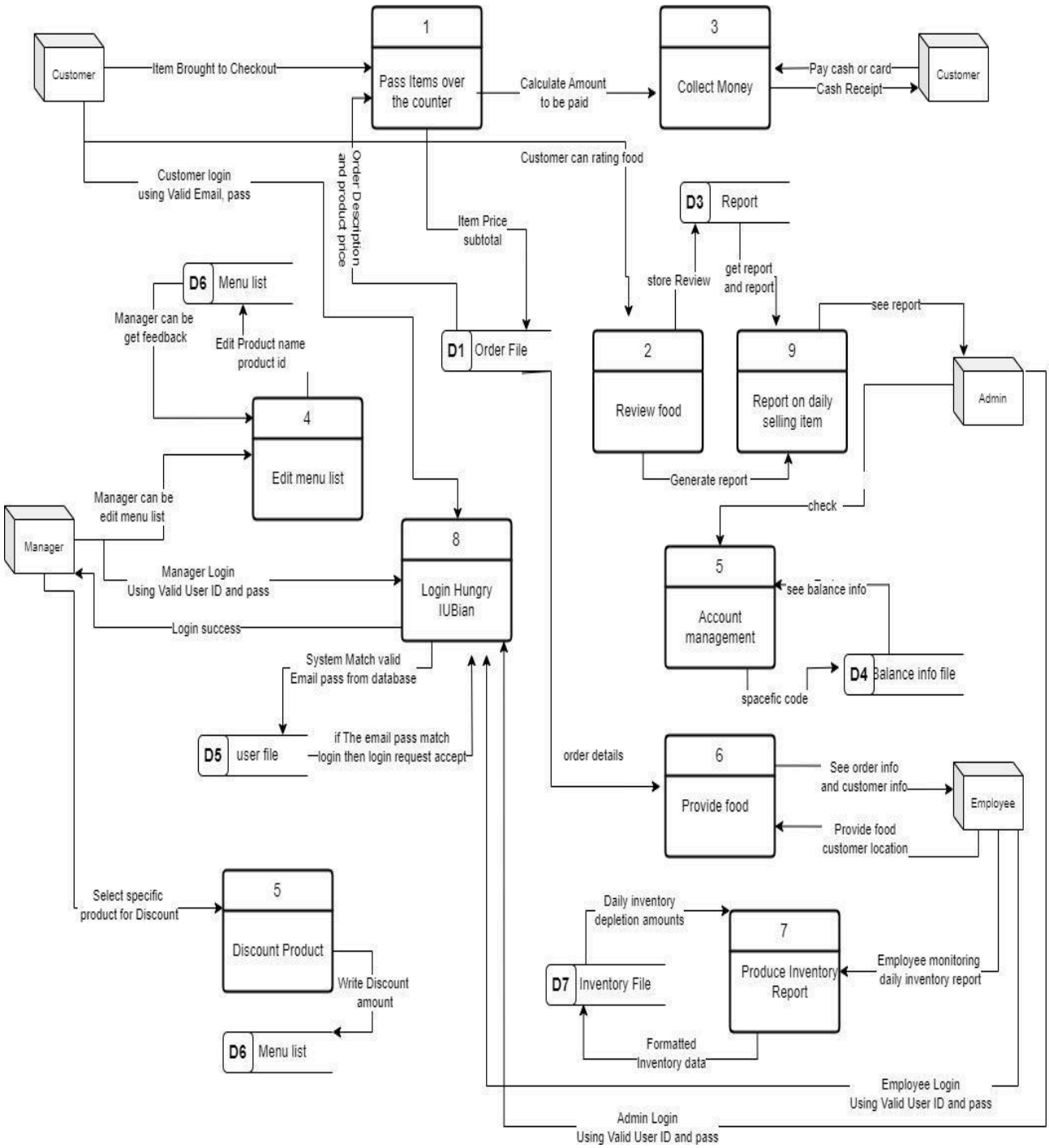
17.Entity Relationship Diagram :



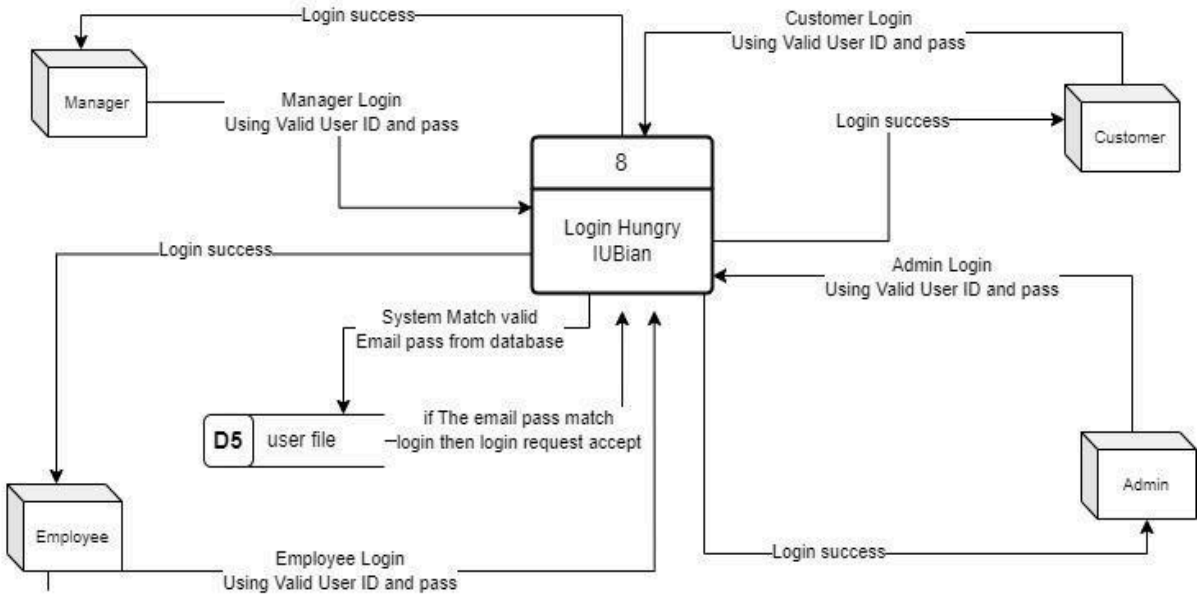
18.Logical Data Flow diagram :



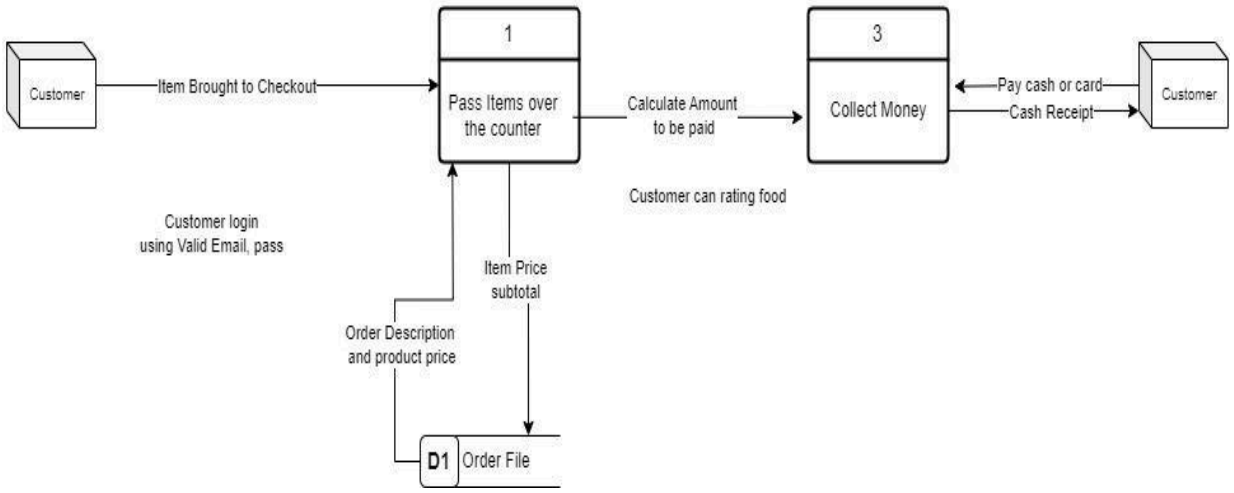
19.Physical Data Flow diagram :

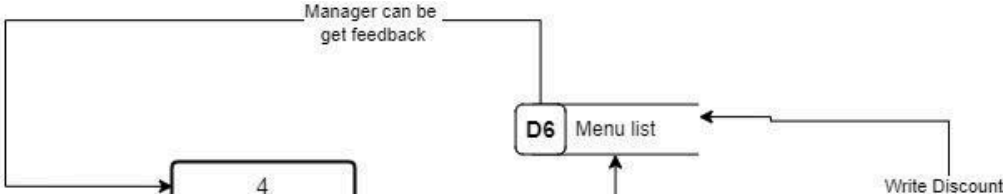


Login Process

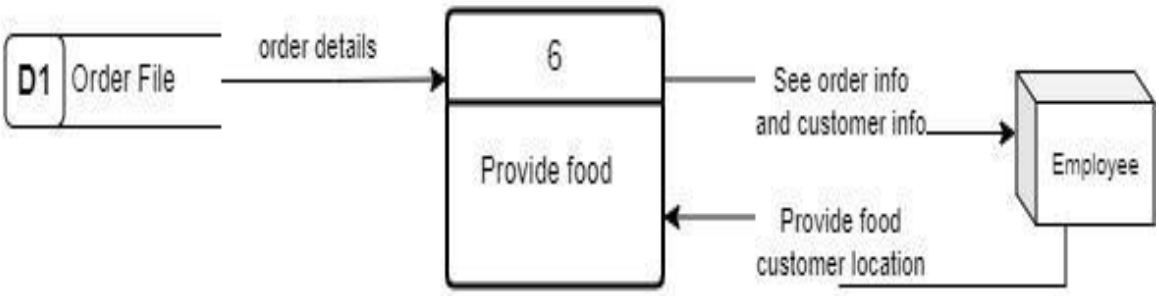


Customer Placing order



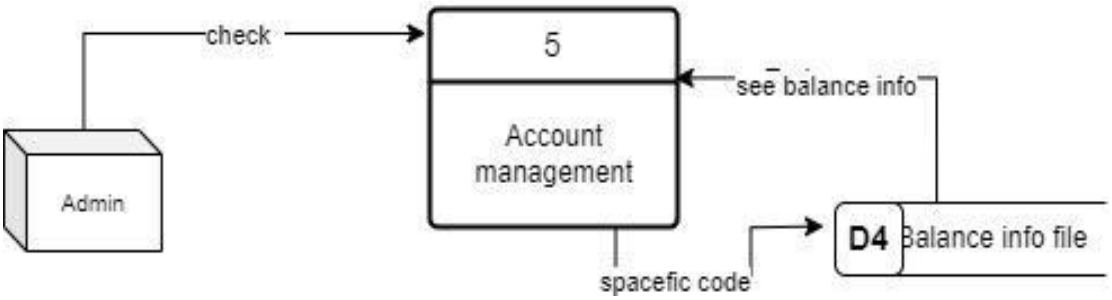


Delivery food

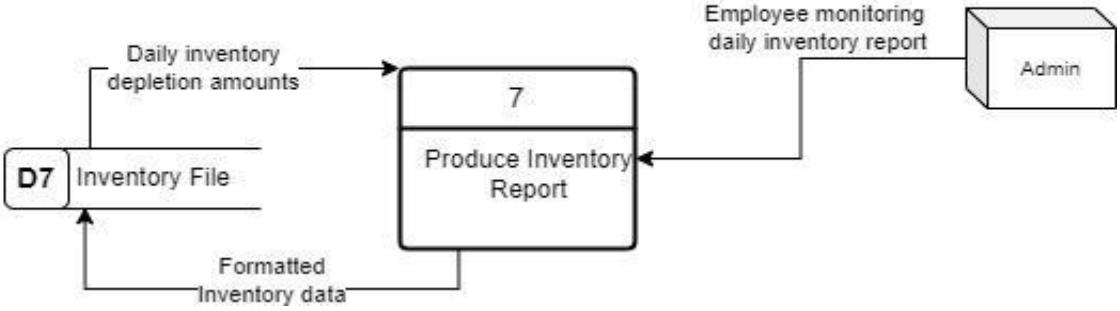


Rating Food

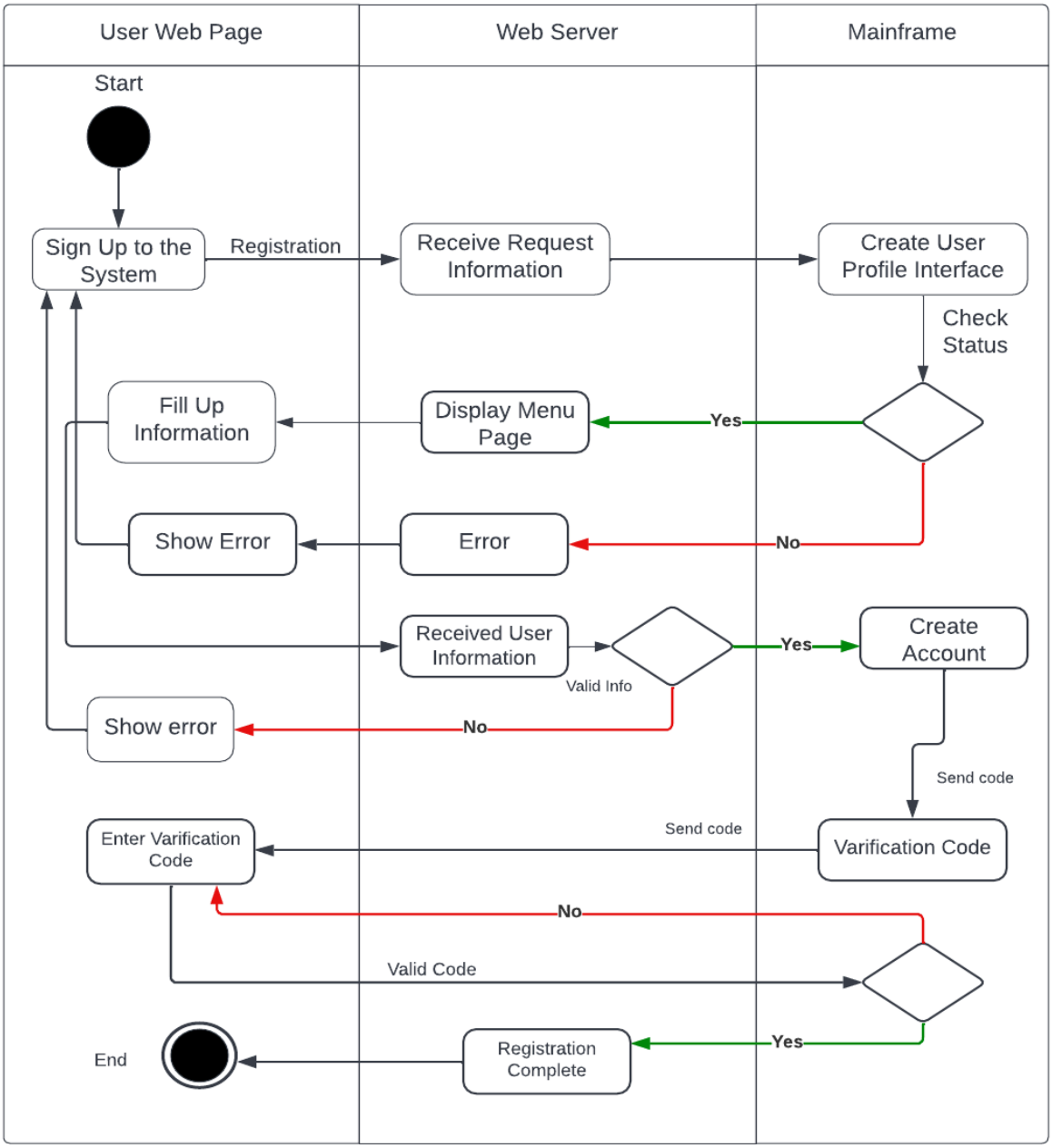
Balance Check



Inventory Report



20.Activity diagrams :



Activity Diagram In "Registration Process"

Fig: Registration

Activity Diagram For Update Menu

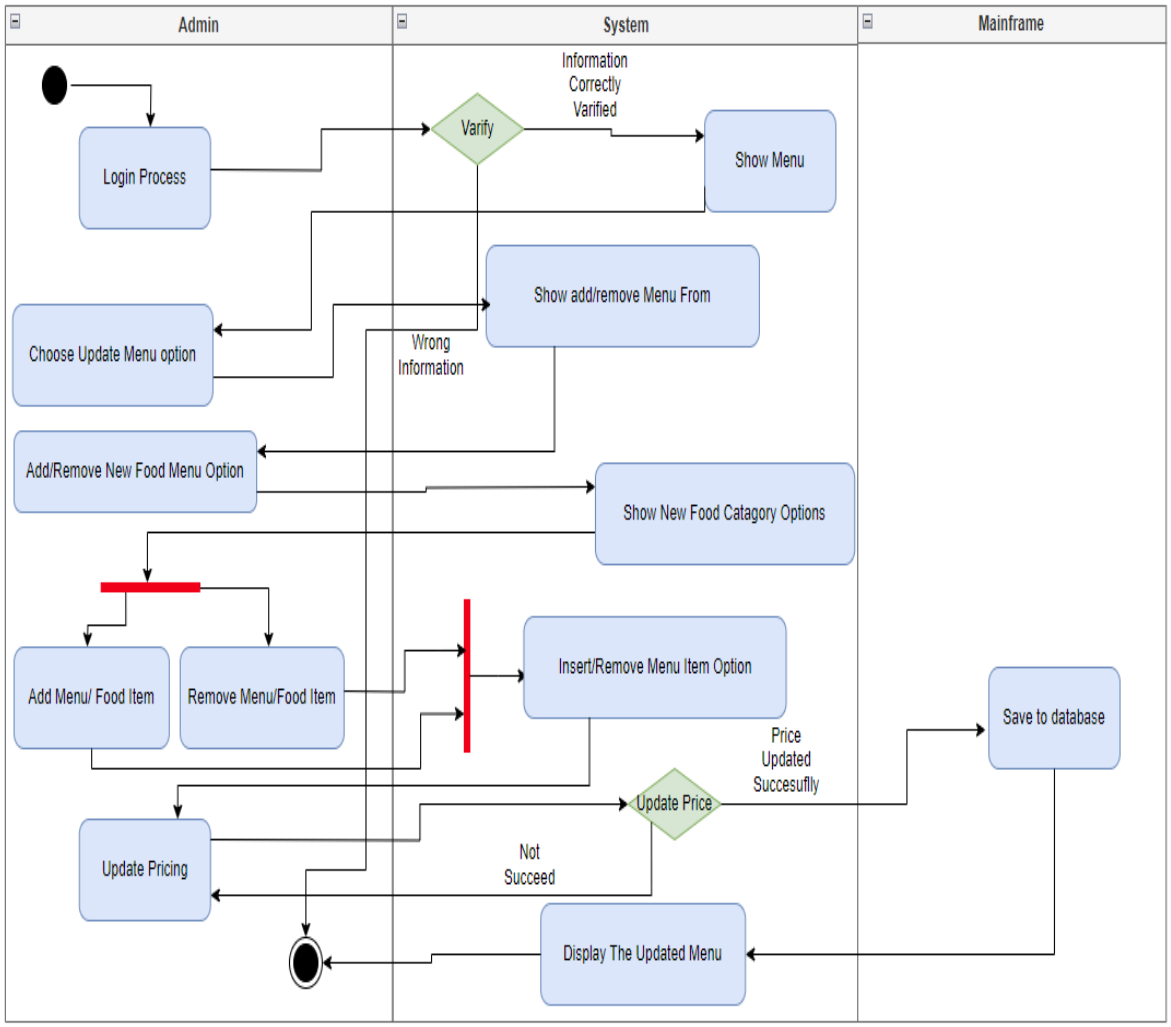


Fig:Update Menu

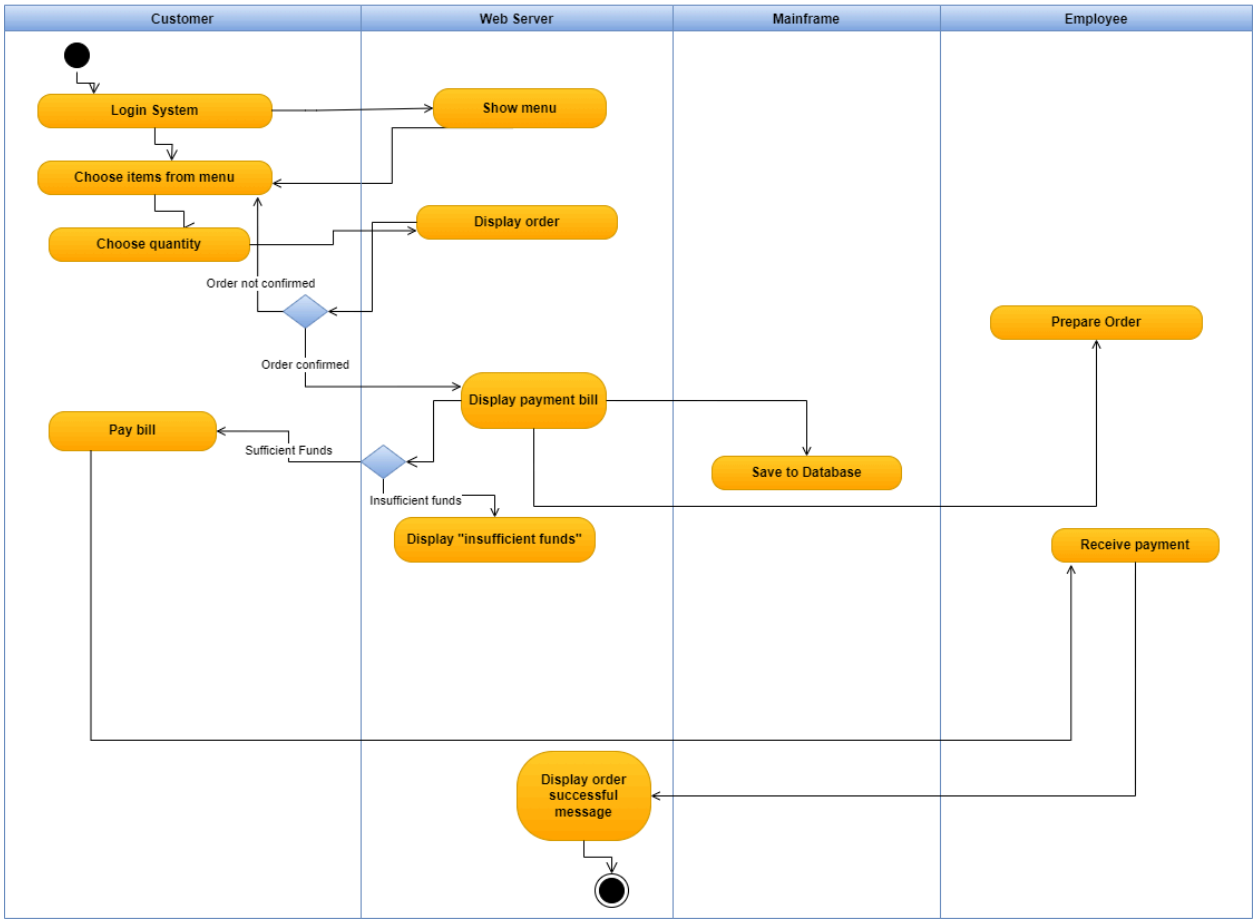


Fig:Order Process

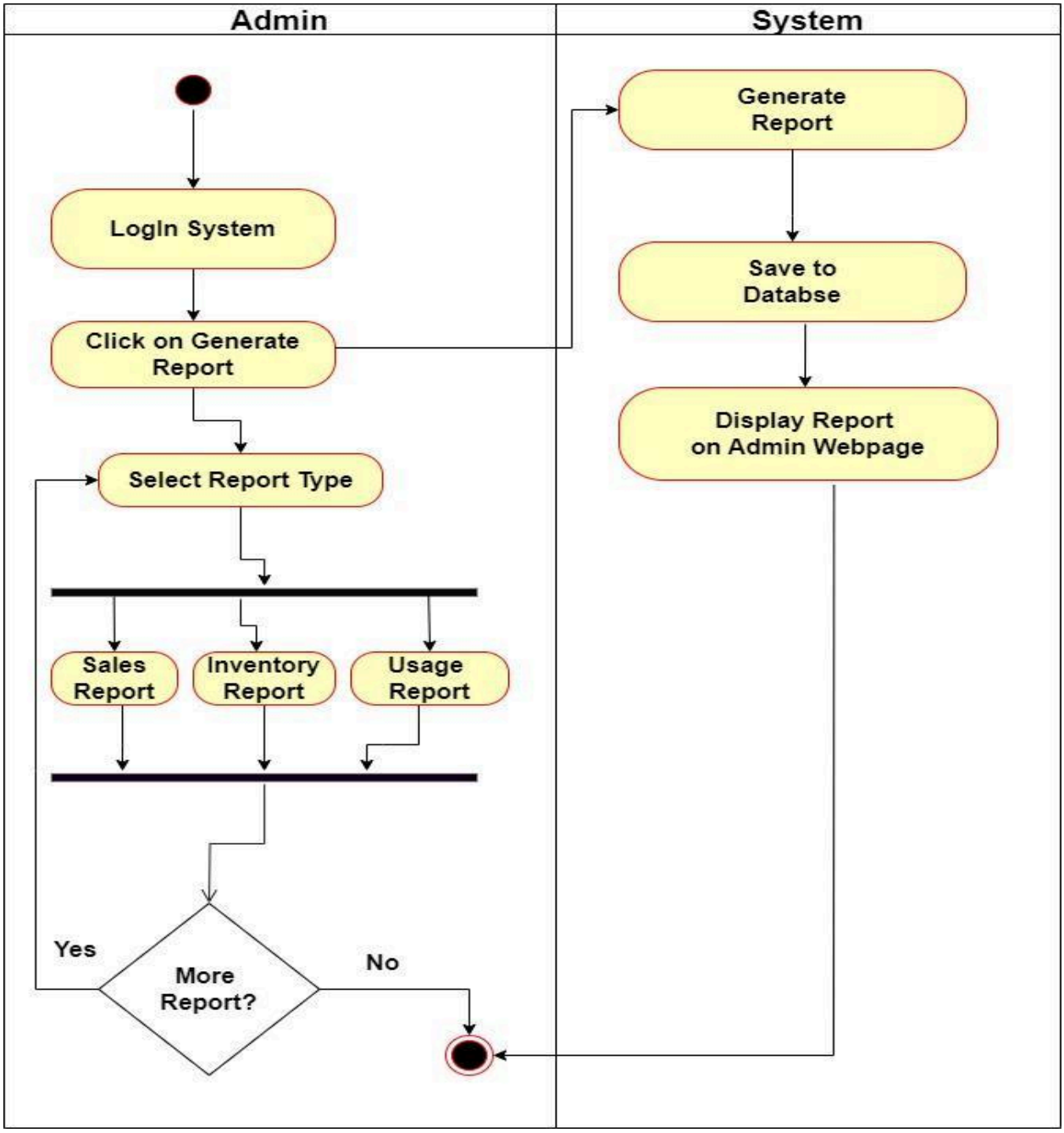


Fig:Generate Report

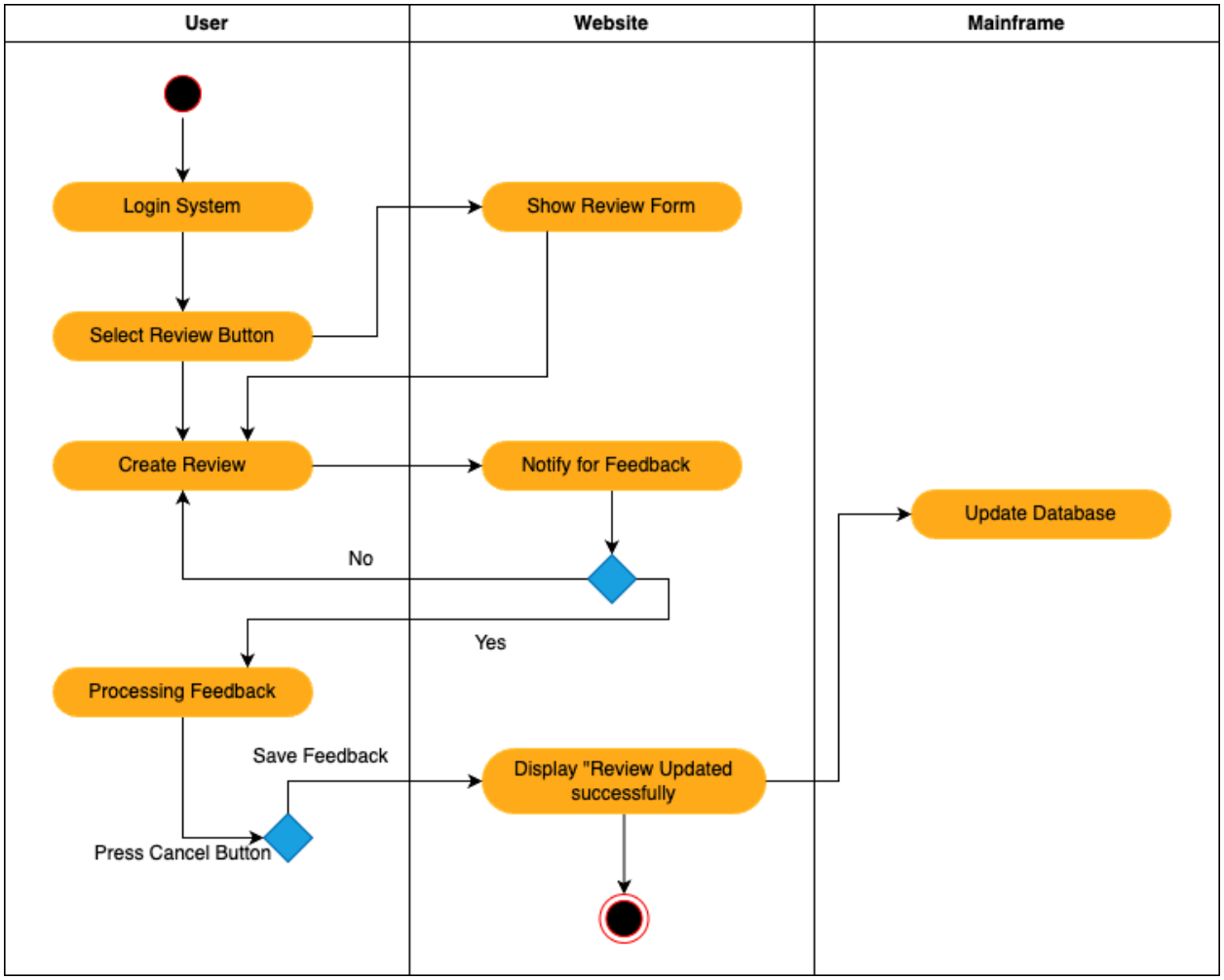
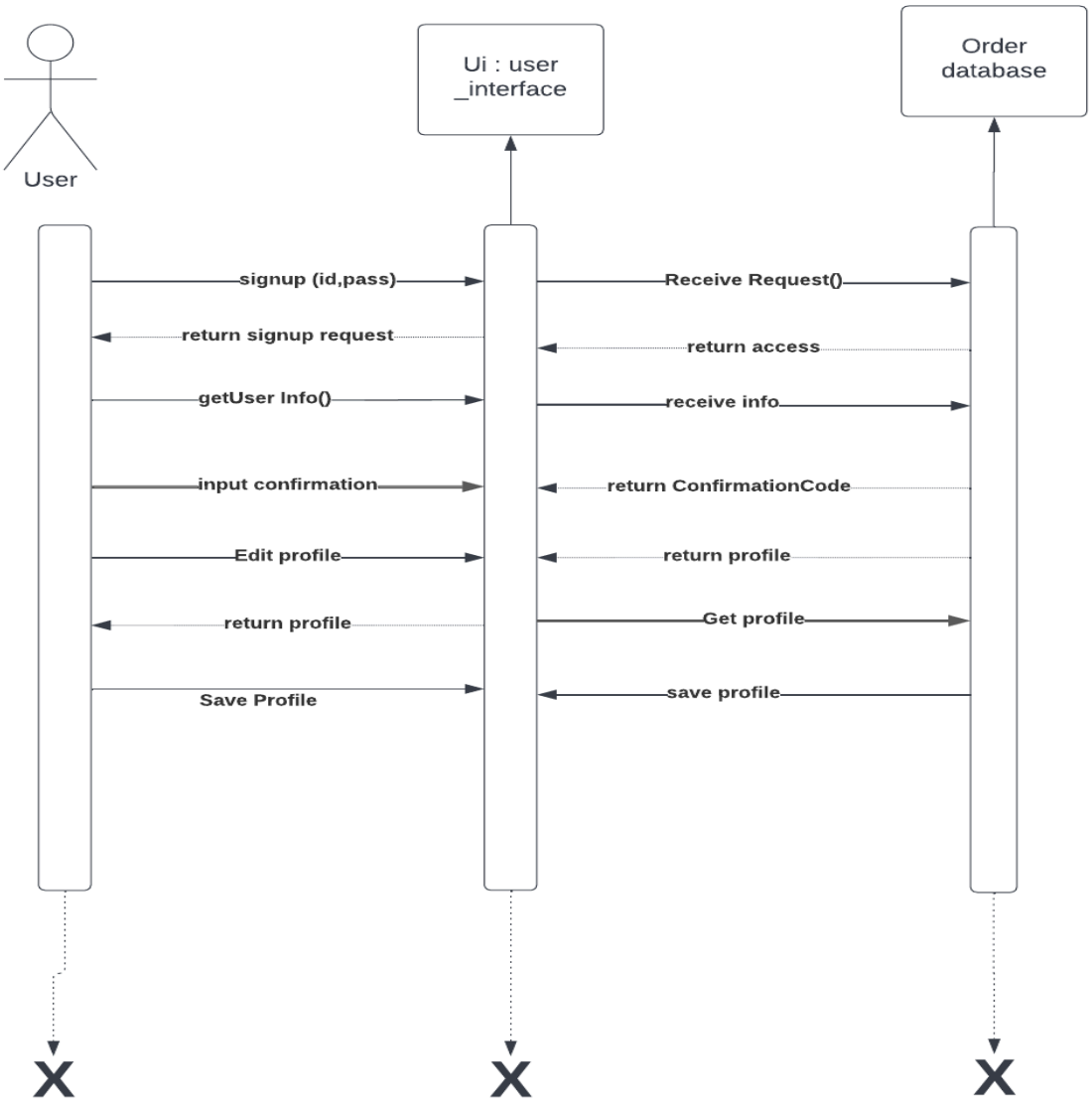

User
Website
Mainframe
Login System
Show Review Form
Select Review Button
Create Review
Notify for Feedback
Update Database
No
Yes
Processing Feedback
Save Feedback
Display "Review Updated successfully
Press Cancel Button

Fig:Review

21.Sequence diagrams :



Registration Process

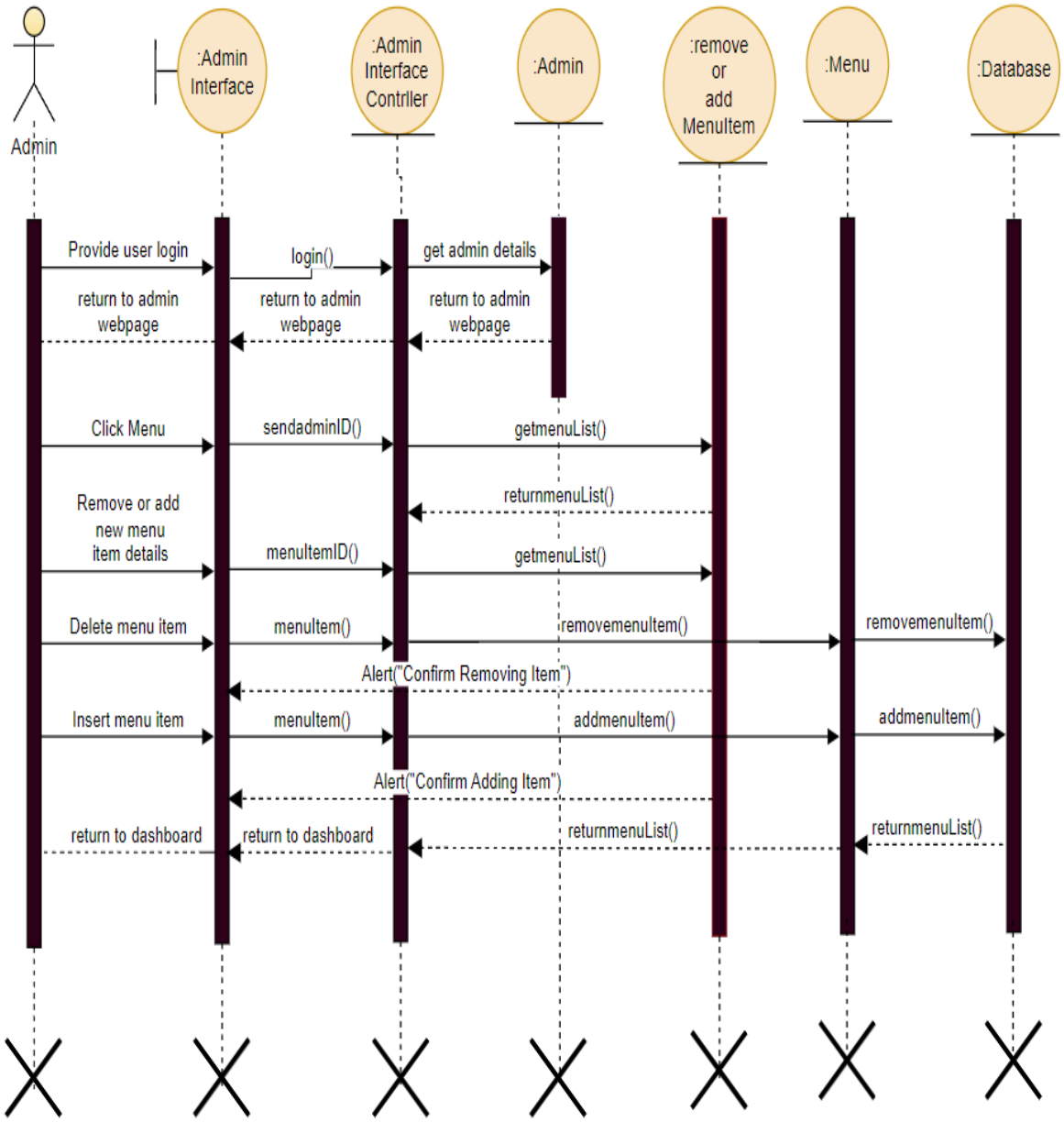
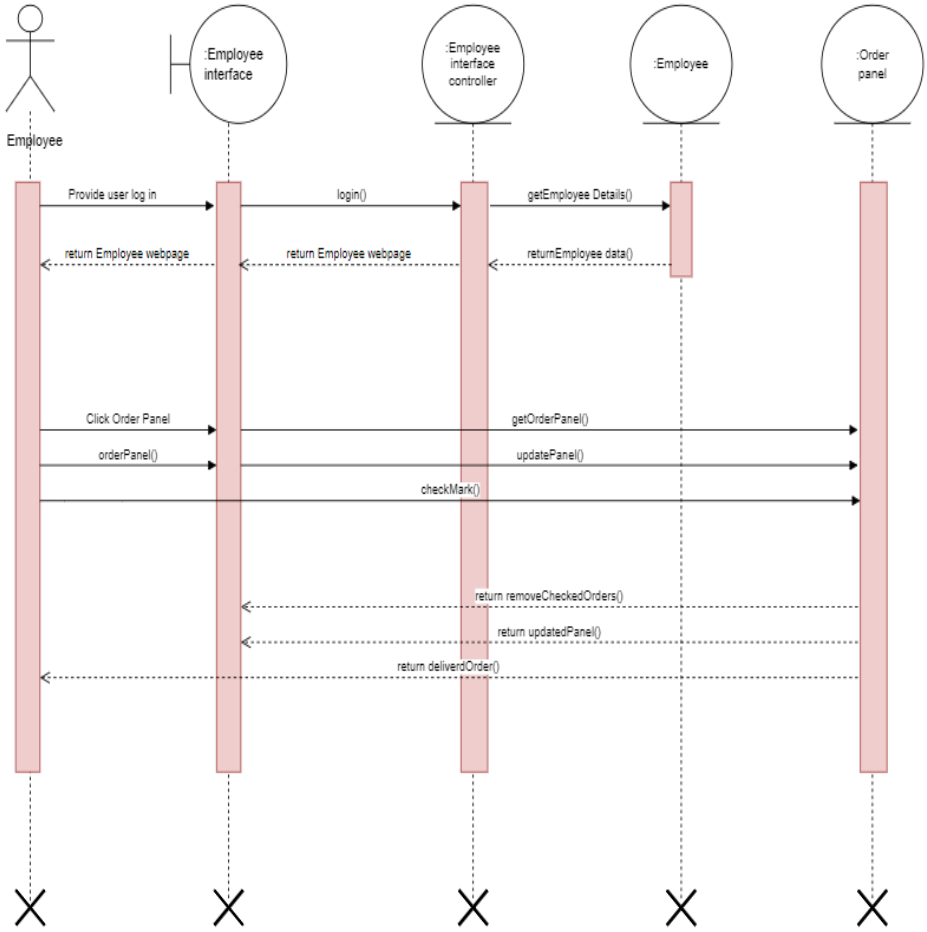


Fig: Update Menu



Order Process

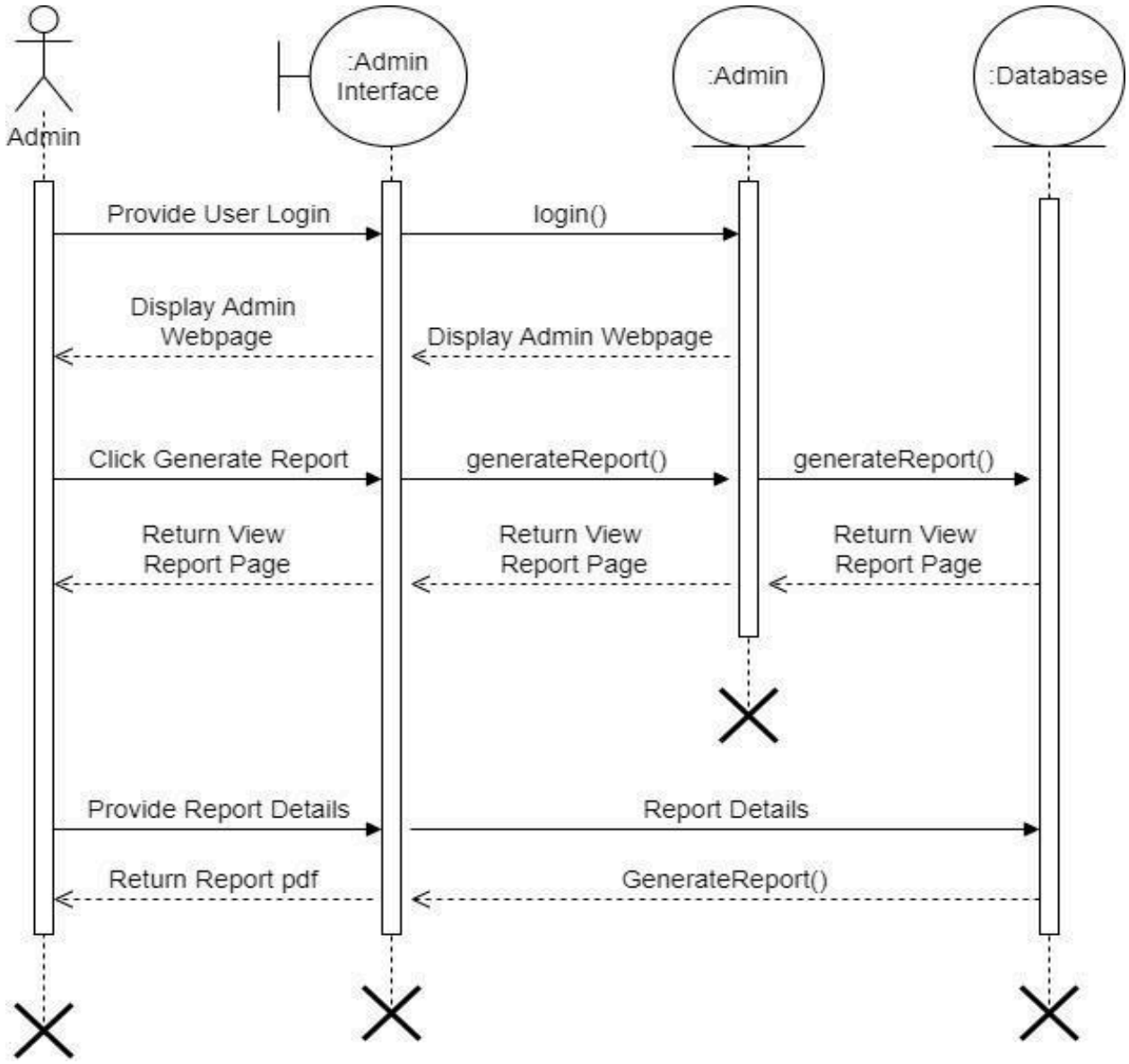


Fig: Generate Report

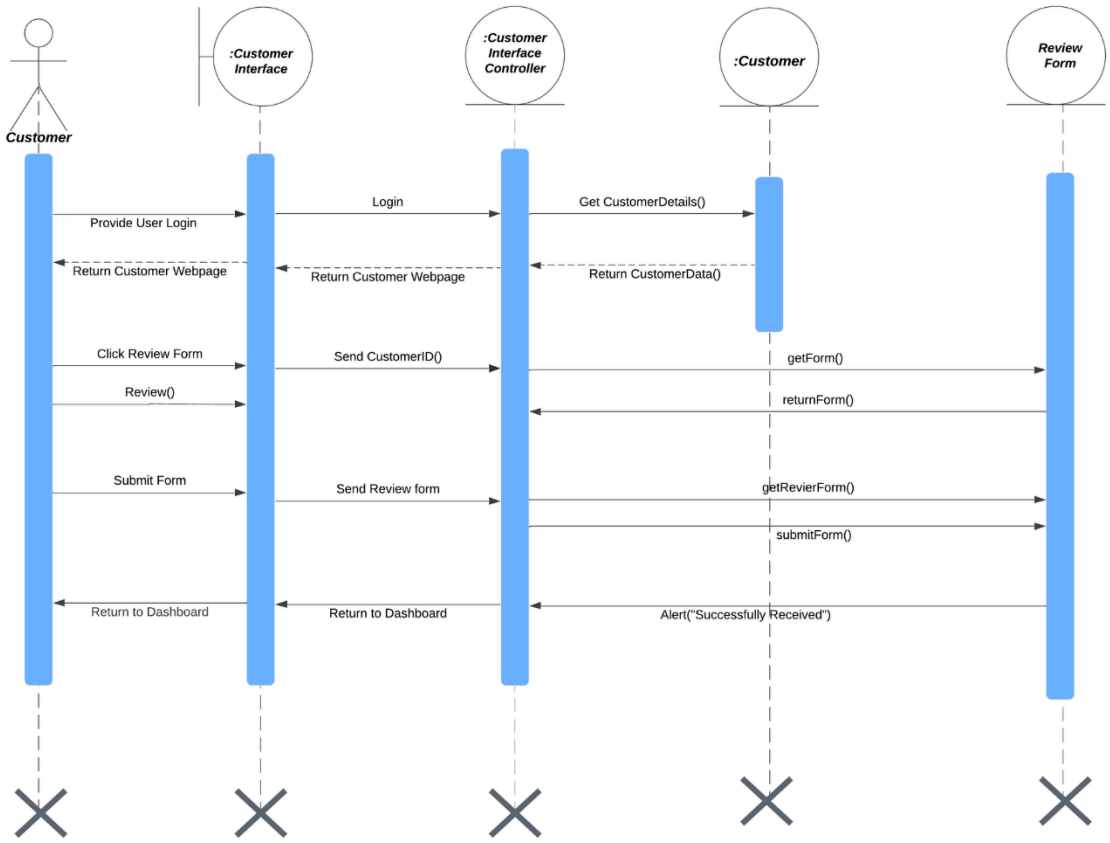

Customer
:Customer Interface
:Customer Interface Controller
:Customer
Review Form
Provide User Login
Login
Get CustomerDetails()
Return Customer Webpage
Return Customer Webpage
Return CustomerData()
Click Review Form
Send CustomerID()
getForm()
Review()
returnForm()
Submit Form
Send Review form
getRevierForm()
submitForm()
Return to Dashboard
Return to Dashboard
Alert("Successfully Received")

Fig: Review

22.Communication diagrams :

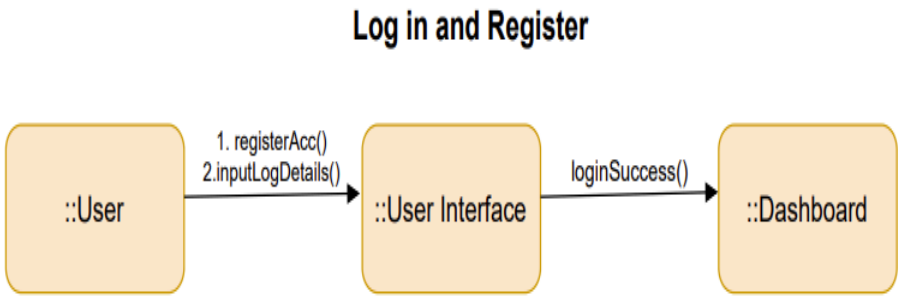


Fig: Login and Registration

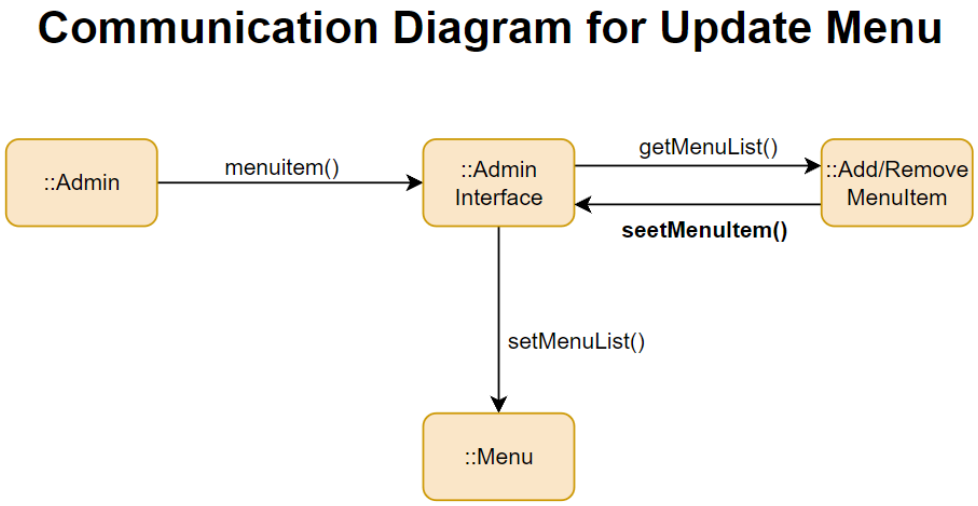


Fig: Update Menu

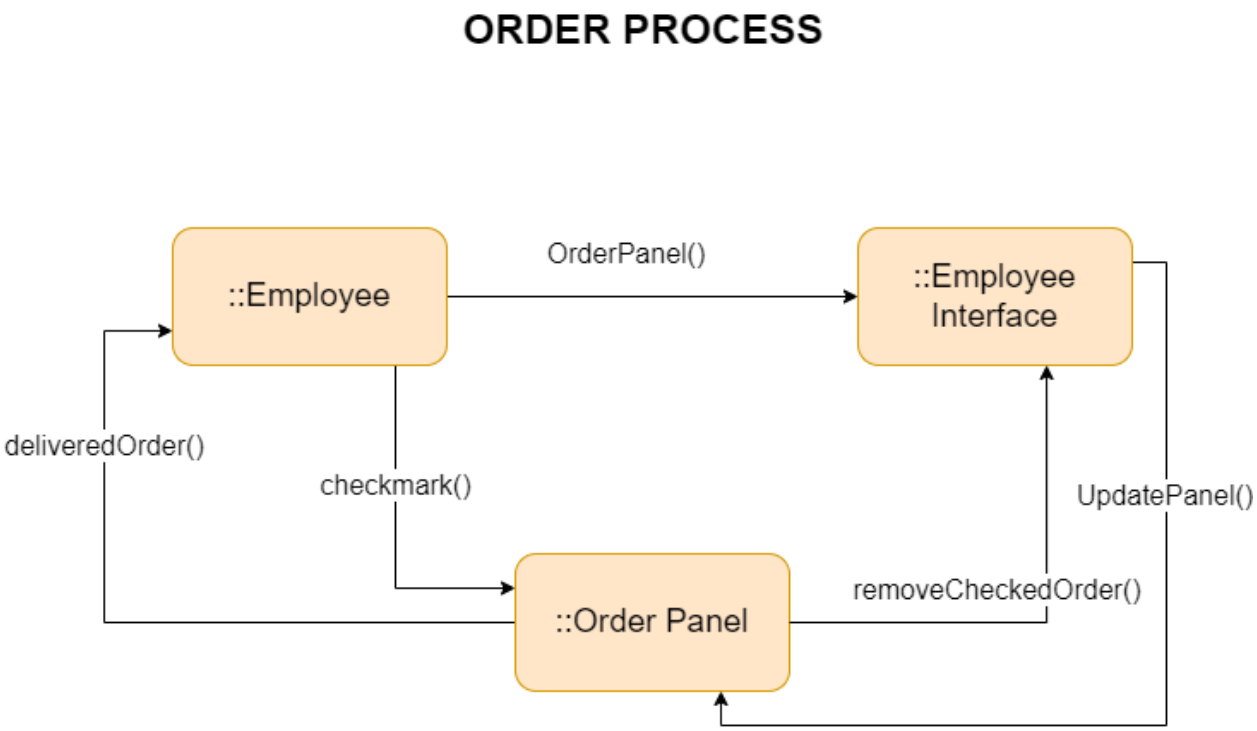


Fig: Order Process

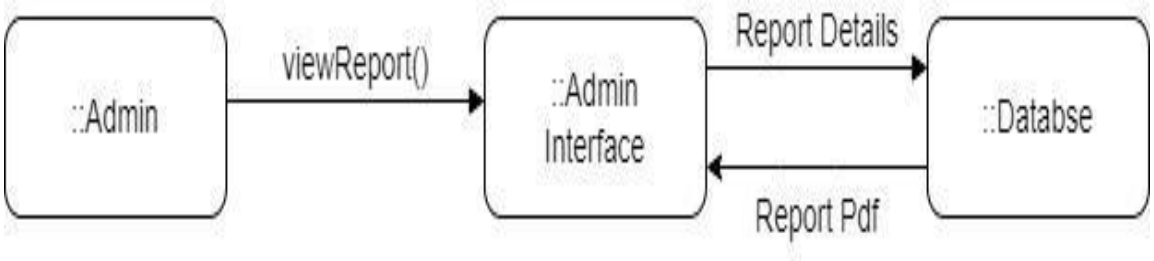
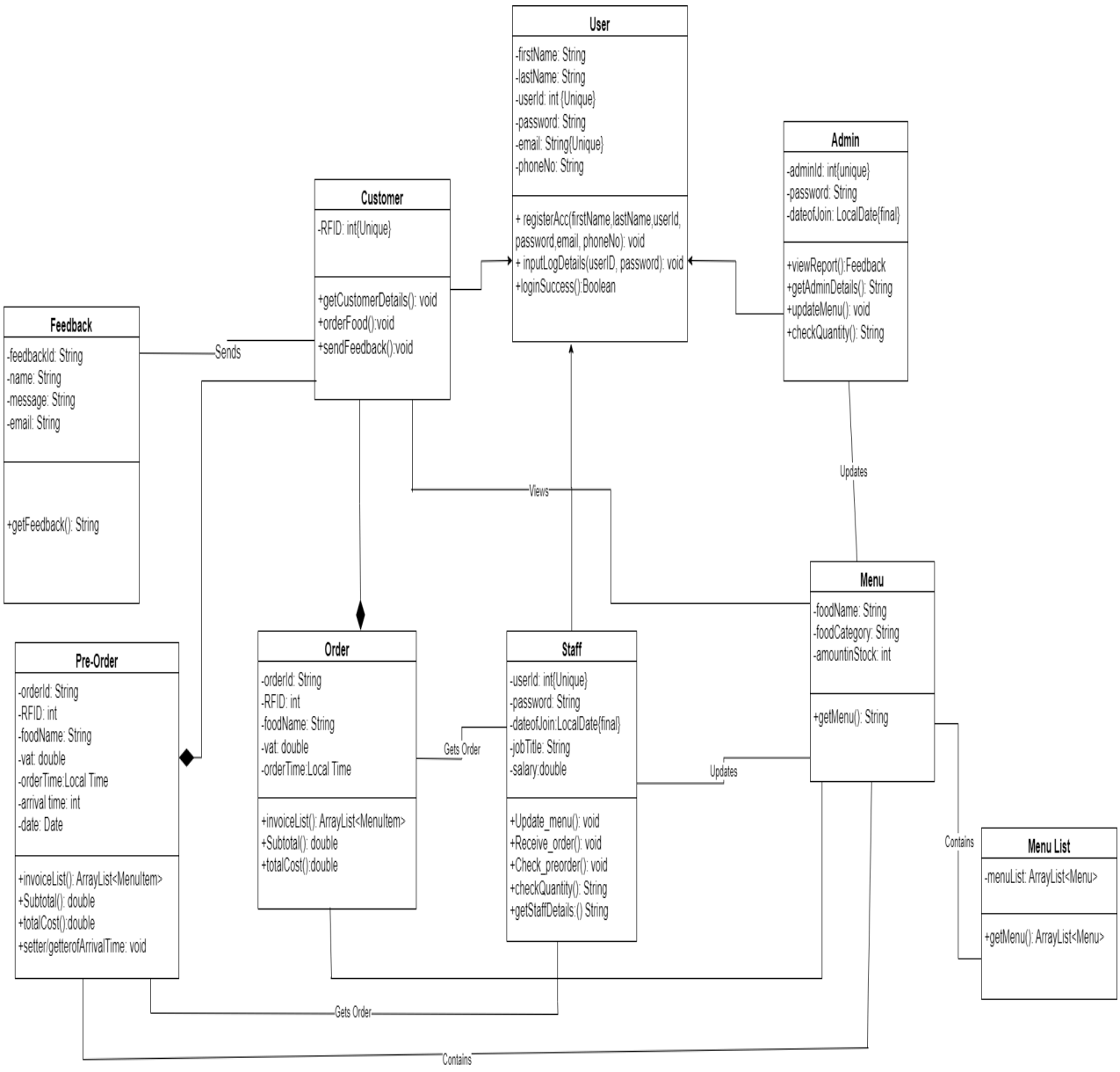


Fig: Generate Report

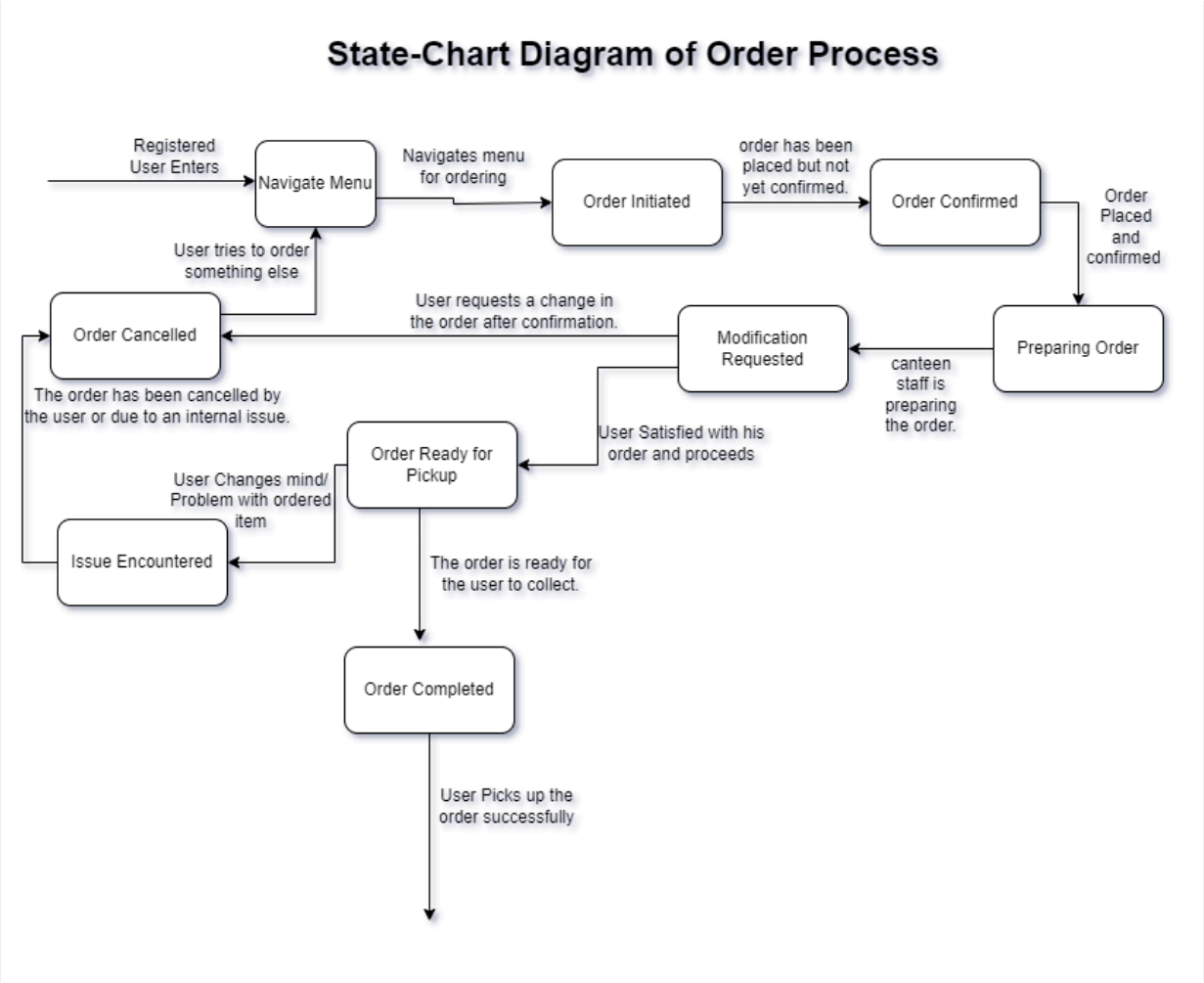

::Customer
Review()
::Customer Interface
submitForm()
alertForm()
::Review

Fig: Review

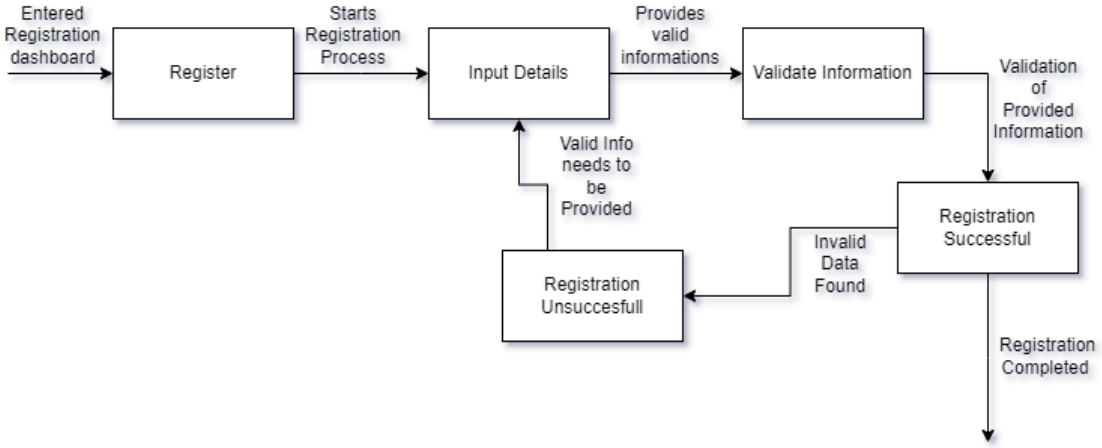
23.Class diagram :



24.State-chart diagrams :



State-Chart Diagram of Registration Process



25.CRUD matrix :

1. Activity	Admin	Customer	Staff
Register	C R U D	U	-
Generate Report	C R U D	-	R U
Give Notification	-	R	U
View Menu	R	R	-
Place Order	R U	R U	R U
Add/Remove Menu	C R U D	-	R U
Ratings	C R U D	R U	R
Check Balance	R	R	-
Make Payment	C R U D	R U	R

Section 6:

26.Prototype the user interface :