GN BUSINESS MANAGEMENT SYSTEM

Software Requirement Specification & Analysis [SE – 406]

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INTRODUCTION

This chapter is a part of our software requirement specification for the project 'GNWR business Management System'. In this chapter we will focus on the intended audience for this project.

PURPOSE

This document briefly describes the Software Requirement Analysis of Golam Nabi Wholesale and Business Management System. It contains the functional, non-functional and the supporting requirements and establishes a requirement's baseline for the development of the system. The requirements contained in the SRS are independent, uniquely numbered and organized by topics. The SRS serves as an official means of communicating user requirements to the developer and provides a common reference point for both the developer team and the stakeholder community. The SRS will evolve over time as users and developers work together to validate, clarify and expand its contents.

INTENDED AUDIENCE

- This SRS report is intended for audiences including the users(Employees), admin, project managers, developers and testers.
- The users and admin will use this SRS to verify that the developer team has created a product that is acceptable to the customer.
- The project managers of the developer team will use this SRS to plan milestones and a delivery date, and ensure that the developing team is on track during development of the system.
- The designers will use this SRS as a basis for creating the system's design. The designers will continually refer back to this SRS to

ensure that the system they are designing will fulfill the customer's needs.

- The developers will use this SRS as a basis for developing the system's functionality. The developers will link the requirements defined in this SRS to the software they create to ensure that they have created a software that will fulfill all of the customer's documented requirements.
- The testers will use this SRS to derive test plans and test cases for each documented requirement. When portions of the software are complete, the testers will run their tests on that software to ensure that the software fulfills the requirements documented in this SRS. The testers will again run their tests on the entire system when it is complete and ensure that all requirements documented in this SRS have been fulfilled.

CONCLUSION

This analysis of the audience helped us to focus on the users who will be using our analysis. This overall document will help each and every person related to this project to have a better idea about the project.

INCEPTION OF GNBMS

In this chapter, the inception part of the SRS will be discussed briefly.

INTRODUCTION

GNB is Golam Nabi Business which is a business firm situated in Meherpur. This is a wholesale and retail firm. The products supplied are Cement, Rod, Tin, Hardboard. The firm collects the products from the Suppliers and then sells it to the customers with a wholesale or retail price. The employees work under a manager(operator). All activities(buy, sell) are overviewed by the owner(admin). And there is also a warehouse manager to look after the inventory.

INCEPTION OF GN Enterprise Business Management System

At the beginning of our project, we entered the inception stage. This stage includes, how the project will be started and their scope and limitations. The
main goal of this phase is to identify the requirements, demand and
establish some sort of mutual understanding between the software team and
the stakeholders of the GN business firm. In order to make this phase effective we
took the following steps:

- Identifying the client of our project
- Icebreaking
- Identifying the stakeholders of the firm.
- Identifying the multiple viewpoints of stakeholders

IDENTIFY THE CLIENT OF OUR PROJECT

Admin of the GN business firm can be identified as a client of our project. Employees and customers can be viewed as the stakeholders.

ICEBREAKING

Icebreaking refers to the fact that to diminish the communication barrier between two persons. It is a crucial part since it denotes the acceptance of our proposal. We started this phase by talking with the stakeholders with context free languages. Their behavior, responding to our question, impacted the whole system.

IDENTIFYING THE STAKEHOLDERS OF THE GNBMS

Stakeholder refers to any person or group who will be affected directly or indirectly by the system. Stakeholders include end-users who interact with the system and everyone else in an organization who may be affected by its installation. The GN business firm has limited number of stakeholders. They are:

- Employees
    - Operator
    - Warehouse-officer
- Customers

IDENTIFYING THE MULTIPLE VIEWPOINTS OF THE STAKEHOLDER

Different stakeholders expect different benefits from the system as every person has his own point of view. So, we have to recognize the requirements from multiple viewpoints. Different viewpoints of the stakeholders about the expected software are given below:

GN Business firm's viewpoint:

- A user-friendly interface.
- Desktop based software.
- Provide a signal when an account is created.
- Store information about the employees, orders, transactions and customers.
- Report section to see the whole expenditure and profit of a time period
- Automated invoice generation.
- Store information about products, suppliers(suppliers).
- Store information about the inventory.

Users' Viewpoint:

- Easy and Fast Interface.
- Availability to order from web platforms.
- Getting information about the product delivery.
- Easy order system.

CONCLUSION

The primary goal of this project is to model and design software for the admin and operator of the business firm to ease employee, customer, order and transaction management systems. For these reasons. For this reason, the software needs to be simple. The software will be designed in such a way as it takes very little time to manage order, transaction. To make this software project successful, collaboration with stakeholders was a main

priority. And also clearing out facts about what they want, how the software will work, how it can be more convenient, how it will save time and energy, etcs.

ELICITATION OF GNBMS

We have seen Question and Answer (Q& A) approach in the previous chapter, where the inception phase of requirement engineering has been described. The main task of this phase is to combine the elements of problem solving, elaboration, negotiation and specification. The collaborative working approach of the stakeholders is required to elicit the requirements. We have finished the following tasks for eliciting requirements-

_ Collaborative Requirements Gathering
_ Quality Function Deployment
_ Usage Scenarios (Story)

COLLABORATIVE REQUIREMENTS GATHERING

We have met with many stakeholders in the Inception phase such as the manager, teachers and officers. These meetings created an indecisive state for us to elicit the requirements. To solve this problem, we have met with the stakeholders (who are acting a vital role in the whole process) few times to elicit the requirements.

Quality Function Deployment

Quality Function Deployment (QFD) is a process and set of tools used to effectively define customer requirements and convert them into detailed engineering specifications and plans to produce the products that fulfil those requirements. QFD is used to translate customer requirements i.e., Voice of the Customer (VOC) into measurable design targets and drive them from the assembly level down through the sub-assembly, component and production process levels. QFD methodology provides a defined set of matrices utilized to facilitate this progression.

Normal Requirements:

Normal requirements reflect objectives and goals stated for a product or system during meetings with the customer. Those are the basic requirements that fulfils client satisfaction. The Normal requirements we came up with are the following:

- Users are Customer, Employee (Warehouse Officer, Operator), Admin.
- Admin is given a predefined account with admin access.
- Users can login.
- Supplier signup is done by taking input of Supplier Name, Supplier ID, Location, supplied products, Contact info, Bank Info, Email, Image.
- Customer signup is done by Operator or the customer can sign up herself
- Customers' orders can be categorized based on 'Wholesale' and 'Retail' type.
- Name, NID, Address, Image, Phone number, Email, District, Trade Name, Account - (Due/Received) of customer is recorded. Customer ID is supplied by the system. Existing customer doesn't need to be signed up again.
- Customer monetary transactions are handled by the operator and then verified by the customer himself.

- Orders are placed based on Customer, Product, Quantity, Order type (whole/retail), Contact info, Delivery cost, Payment info, Payment status, Date. Order ID is generated by the system.
- Order is handled by the operator and admin. After an order is fully executed, inventory and customer accounts are updated.
- Invoice is generated after confirmation of order.
- Product is categorized by taking the Product Name, Product ID, Product Type, Product Brand, Supplier, Quality, Price per unit, Tags, Special Product Attributes.
- Inventory is categorized by Product, Amount, Arrival Date, Selling Date.
- Inventory is managed by operator and warehouse officer.
- Inventory products are updated in three ways. Firstly, through suppliers. Secondly, through purchase of product. Thirdly, through returned products by customers.
- Regular transaction data is stored in database.
- Returned products are taken into storage. Customer is given credit or exchanged products.
- Employee management – biodata, salary, attendance.
- Searching option is available
- Due payment in order section. Special option for next-payment date.
- Report generation – daily/ monthly / yearly.

Expected Requirements:

These requirements are so obvious that the customer need not explicitly state them. Their absence can create significant dissatisfaction. The expected requirements of our system are given below:

- Fluent user-friendly and interactive UI.
- System will be encrypted and secured.
- Employee attendance can be managed.

- Order is confirmed through OTP to customers.
- Digital invoice is supplied via email & SMS.
- Searching product, customer, supplier, order through name, tags and unique ID.
- Backup database can be restored in case of total system failure.
- Online payment option through ‘Bkash’, ‘Rocket’ and other mobile banking services.
- Monthly, Annual overview of sales.
- Report generation based on time, customer, product, year etc.

Exciting Requirements:

These requirements are beyond the user’s expectations. Following are the exciting requirements of our system:

- Customer can check order details through email or SMS.
- Cloud based backup of the database.
- Mobile based app for remote access to the system for admin.
- Visualization of reports based on statistics.
- Analysis on previous sales for upcoming sales projections.
- Top stakeholders can be identified and selected for special endeavours.

GN Business Management System

Usage Scenario

User Management:

Admin will have a pre-defined account from which he can create, edit, delete any User. Admin will have a pre-defined account through which he can create different Users. The user roles are: Admin, Customer, Operator, Warehouse Officer and Employee. Admin will need the following information of the user to create an account:

- Full Name
- Contact No.
- Temporary Address
- Permanent Address
- NID No.
- Photo
- Email Address
- Password

User can only view information of his account. He cannot make any changes to his profile. He can request a change to the admin if necessary. Operator can create a customer account.

Order Management:

Operator will generate an order for the customer by filling the following information:

- If the customer is new, then the operator will create customer account and then complete the order details.

- If the customer is already registered then, operator will fill up the order details (customer, order date, product, order type, quantity, delivery address, delivery charge, discount, total price).

The order type can be wholesale or retail. An invoice is generated by the software which is sent to the customer via email and SMS. The invoice will consist of: Operator Details, Order Details, Transaction details. The customer can verify the generated invoice with an OTP sent to their phone and make the payment by cash or digital payment system. The customer is notified about the order status by SMS/email e.g., Processing, Shipped and Delivered. If the customer cancels the order, the product and accounts are reset accordingly after the refund is done by the operator.

Transaction Management:

Customers can make payment by cash or digital payment system. Transaction ID is automatically generated after a transaction is recorded for a given order. The transaction of the customer's order is updated with received value, due value and clearance date. The transaction details and the last date for clearance is sent to the customer by SMS. The accounts and the inventory are updated every time when an order is placed.

Inventory Management:

A product will have Category, Brand, Price, Quantity and Supplier Details. A brand has an ID, name and quantity. A category has an ID, name and Quantity. The supplier would have an ID, name and supplied products.

When the order is placed, the inventory is updated by removing the specific product by the given quantity. Similarly, if an order is cancelled by the operator, the product is added back to the inventory. When a new order from the supplier arrives, the warehouse officer will update the inventory. The warehouse officer can create new Products, Brands, Categories and Suppliers when required.

Employee Management:

Employee account is created by the Admin. Attendance and Monthly salary of the employees shall be managed in this section. The total salary will be calculated based on the base salary, attendance and bonus given by the admin. Warehouse Officer and Operator are also employees.

Report Management:

Report section will be available for the admin to see the daily, monthly and annual updates of the business. Reports will have Users Details, Order Details, Transaction Details, Customer Details and Inventory Details. Admin can search for the report of a specific customer(wholesale/retail) and order. He can have the transaction history of the customer with the total received and due values within a given time interval. The inventory reports will help the admin observe the transaction details with a specific supplier. The reports on the sale of products and categories will also be available. An app consisting of all the real time orders and total report data shall be provided to the admin so that he can have remote access to the company's regular transactions. Top customers are identified by the software with the help of report analysis if the admin chooses to offer discount to them. A statistical analysis report of the business can be generated on a specific time interval which will help the admin to observe the growth of the company. All the data of the software shall be backed up to both the local PC and a cloud platform which will ensure the recovery of data if any unwanted situation occurs.

Use Case Diagram

DEFINITION OF USE CASE

A Use Case captures a contract that describes the system behavior under various conditions as the system responds to a request from one of its stakeholders. In essence, a Use Case tells a stylized story about how an end user interacts with the system under a specific set of circumstances. A Use Case diagram simply describes a story using corresponding actors who perform important roles in the story and makes the story understandable for the users. The first step in writing a Use Case is to define that set of "actors" that will be involved in the story. Actors are the different people that use the system or product within the context of the function and behavior that is to be described. Actors represent the roles that people play as the system operators. Every user has one or more goals when using system.

Primary Actor

Primary actors interact directly to achieve required system function and derive the intended benefit from the system. They work directly and frequently with the software.

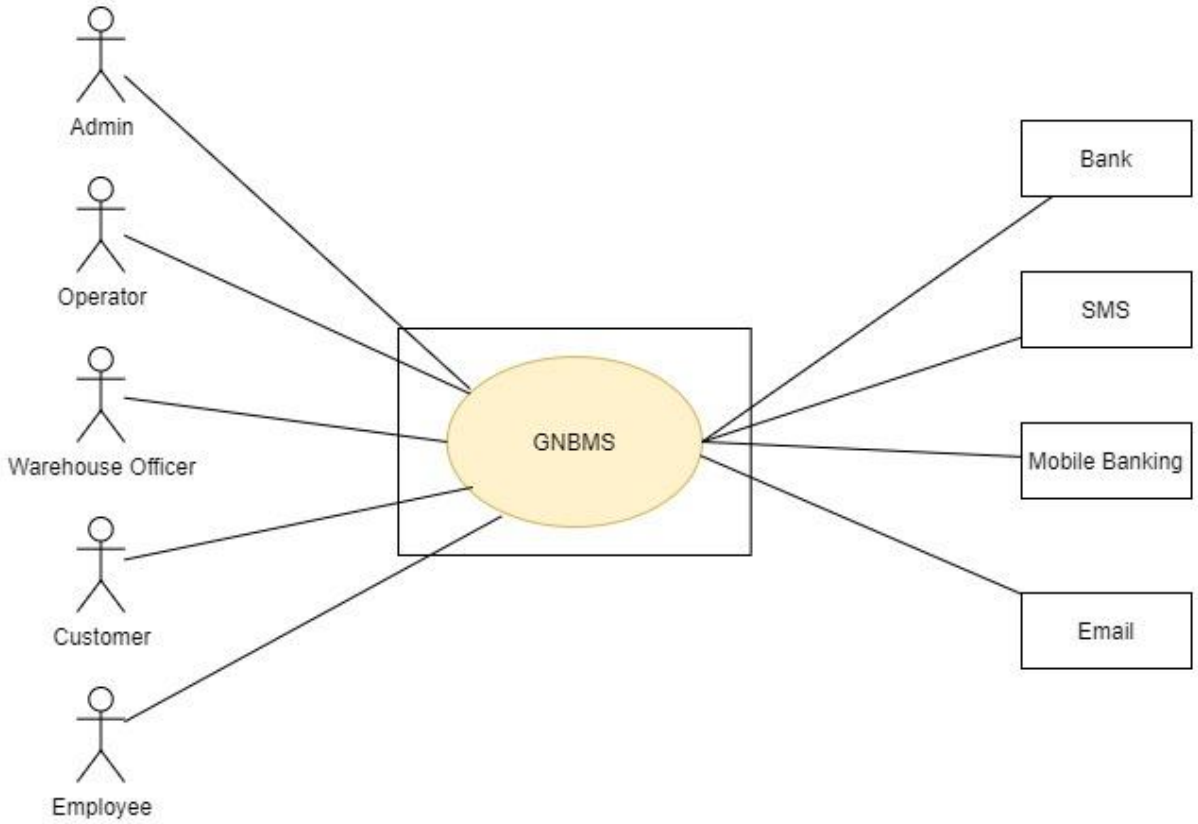
Secondary Actor

Secondary actors support the system so that primary actors can do their work. They either produce or consume information.

Use Case diagrams give the non-technical view of overall system

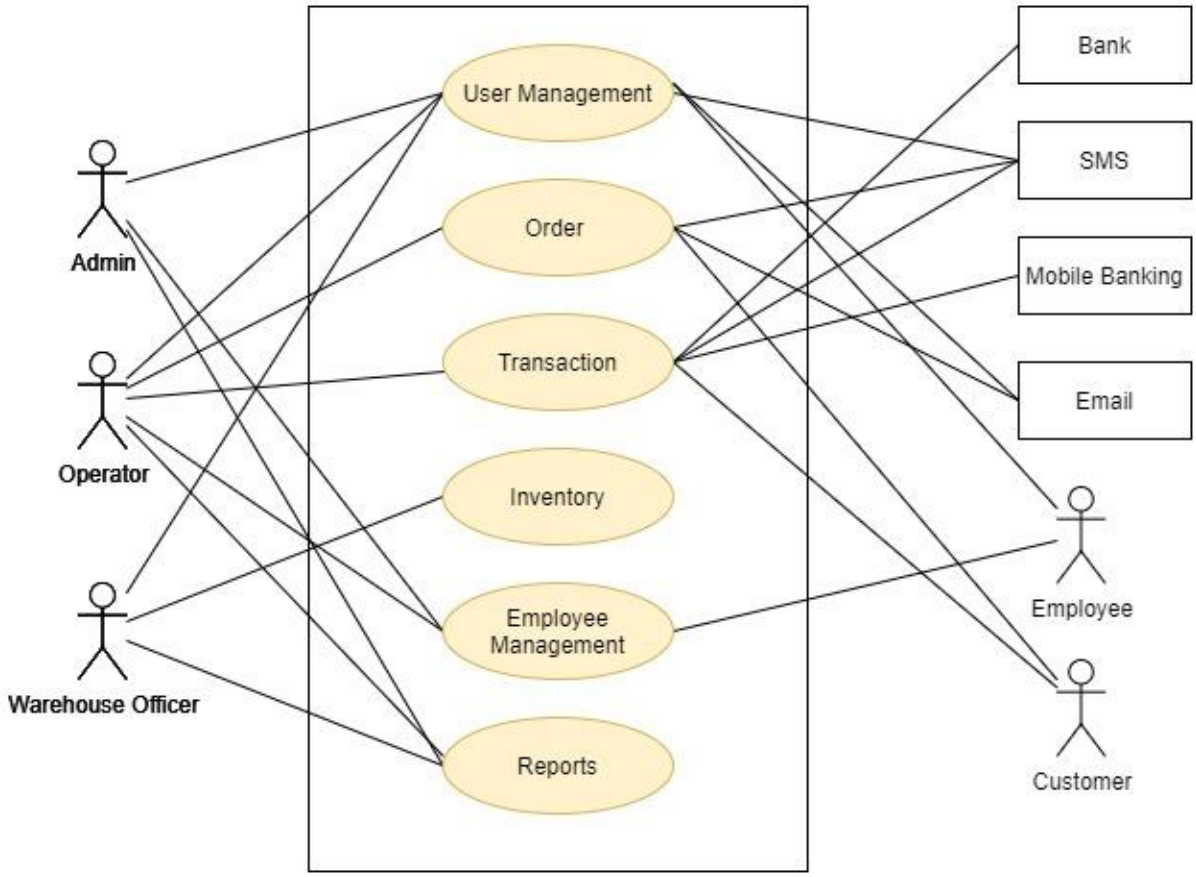
Level 0:

Primary Actor: Operator, Warehouse manager, Admin, Employee, Customer,
Secondary Actor: SMS, Mobile Banking, Bank, Email



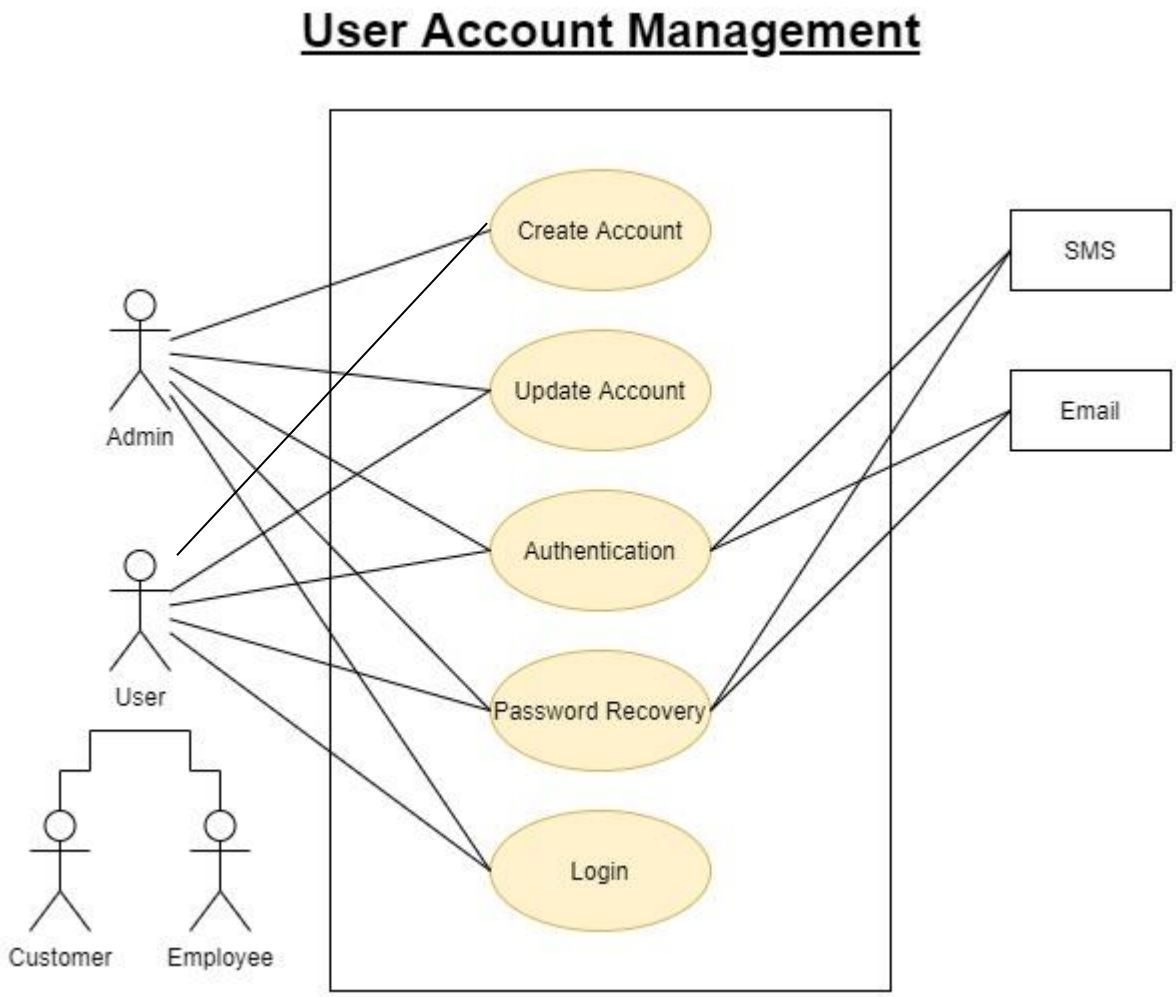
Level 1:

Primary Actor: Operator, Warehouse manager, Admin
Secondary Actor: Employee, Customer, SMS, Mobile Banking, Bank, Email



Level 1.1:

Name: User Management
Primary Actor: Admin, Operator/ Manager
Secondary Actor: Warehouse Manager, Employee, Customer, Email, SMS



Description:

1. Create Account:
Admin will be given a pre-defined account with username and password. Users can create their account. The user roles are Operator and Warehouse manager. User accounts can be created after providing the following credentials: Name, Phone Number, Email, Address, NID, username and password.

2. Update account:
The user can update her account (Email, Phone Number, Address and Password).
Admin can add, update and delete any user accounts in the software.

3. Verification:
The user must verify her identity using SMS/email for account updates and password recovery/change.

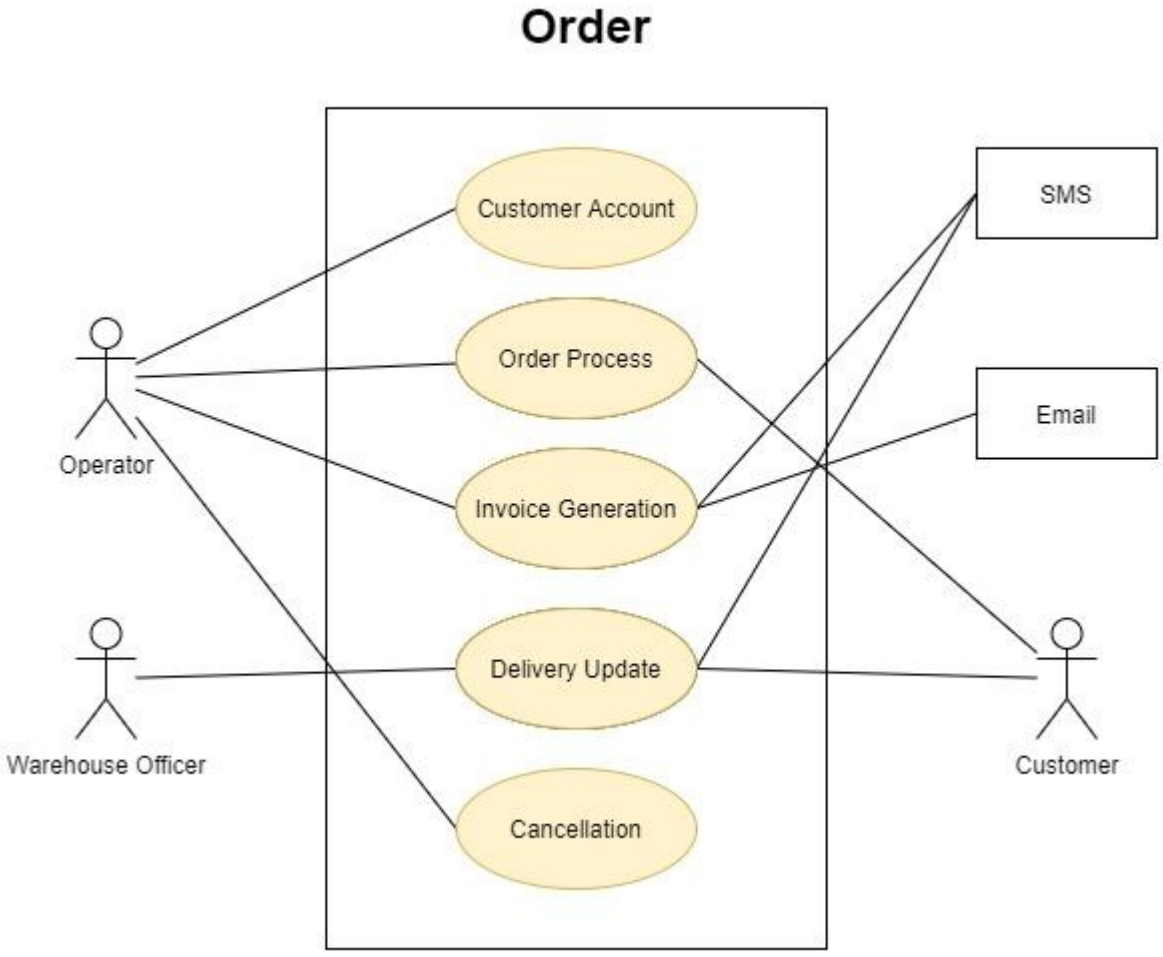
4. Password Recovery:
A user can recover or change her password after verification.

5. Log In:
A user can log into the software through the phone number linked with the account by verifying with an OTP sent to her number. She can also log in by the username and password.

6. Notification:
Admin will get notifications for any user account updates.

Level 1.2:

Name: Order Management
Primary Actor: Operator, Customer
Secondary Actor: SMS, Email, Employee, Warehouse Manager



Description:

1. **Customer Account:**

A customer account will be created by the operator for the new customers. Each customer account will contain the order and transaction details for that account. Each customer account will have a unique ID assigned to it by the software.

2. Order process:

An order can be categorized as a wholesale or retail order by the operator. The operator will fill up the order details which will include:

- Customer ID
- Order Category
- Product Name
- Brand Name
- Price of the product per unit
- Quantity of product
- Total Price
- Discount
- Received Amount
- Due Amount

3. Invoice Generation:

An invoice is generated by software after filling up the order details by the operator, which is sent to the customer via email and SMS. A customer can verify the generated invoice with an OTP sent to their number. The operator will input the OTP given by the customer and the order will be confirmed for processing

4. Delivery Update:

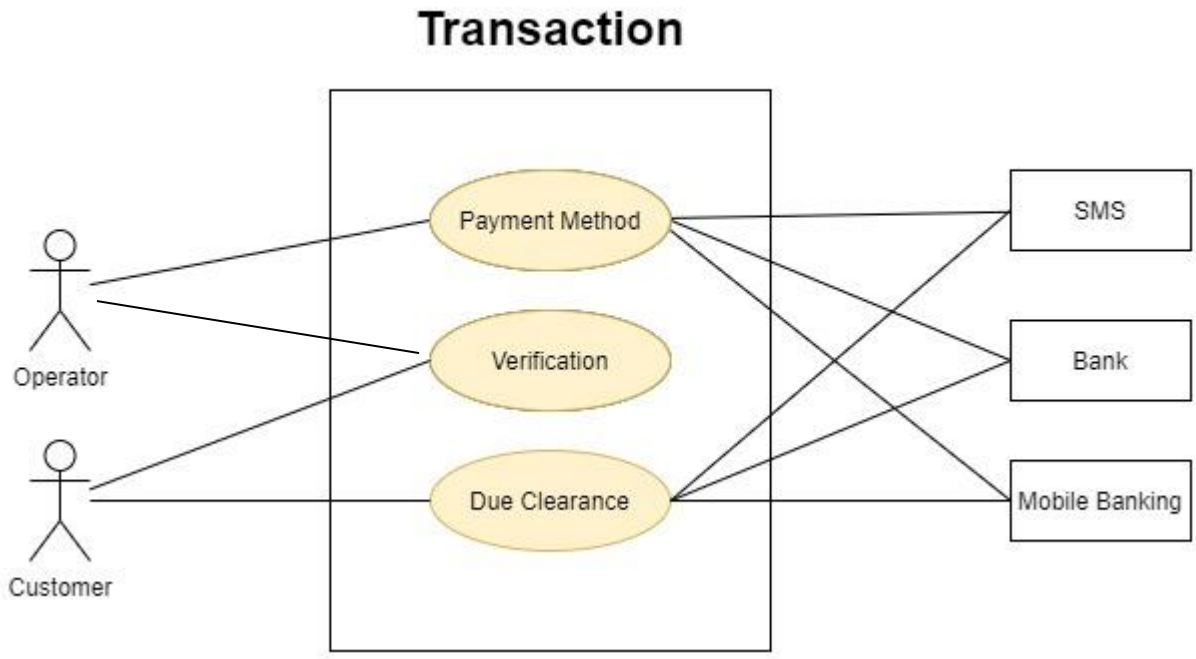
After the payment is done, the details are sent to the admin. The customers are notified about the delivery update by sms/email.

5. Cancellation:

If a customer cancels the order, the product and accounts are reset accordingly by the operator after the refund is done.

Level 1.3:

Transaction Management:
Primary Actor: Operator, Customer
Secondary Actor: Mobile Banking, Bank, SMS, Email



Description:

1. Payment Method:

For purchasing items, the customers need to pay manually or by Mobile Banking.

a. Mobile Banking: A customer can pay with an OTP sent to her number and make the payment using digital payment system.

b. Manual: A customer also can pay her due manually.

2. Verification:

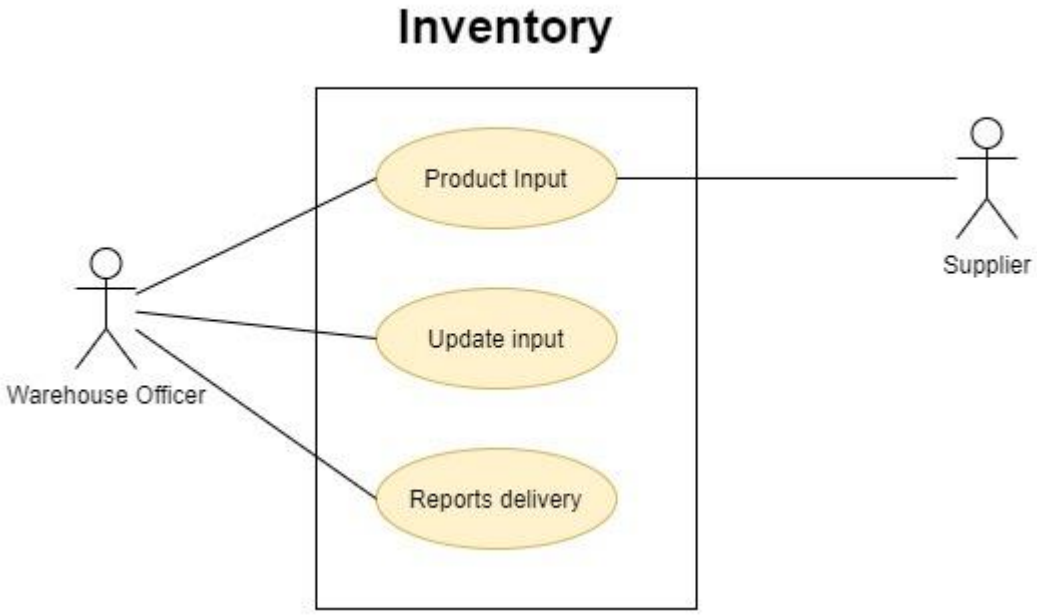
An order is generated after the transaction is completed. The operator will confirm the verification in the software.

3. Due Payment Method/Clearance:

A customer can pay an amount upfront or pay the remaining upon delivery. The amount due to be cleared and the last date for clearance is sent to the customer by SMS. When the due payment is cleared by the customer. The operator will manually confirm the due clearance for the specific order of that customer account in the software.

Level 1.4:

Inventory Management:
Primary Actor: Warehouse Manager
Secondary Actor: Supplier



Description:

1. **Product Input:**

Products are added to the inventory by the warehouse manager.
A product ID is generated by the software for the new products.
When a supplier sends the products to the firm, the following product details are provided by the warehouse manager to store them:

- Name of Supplier
- Product Name
- Brand
- Total Quantity
- Delivery Date

2. Update inventory:

The inventory is updated in three ways:

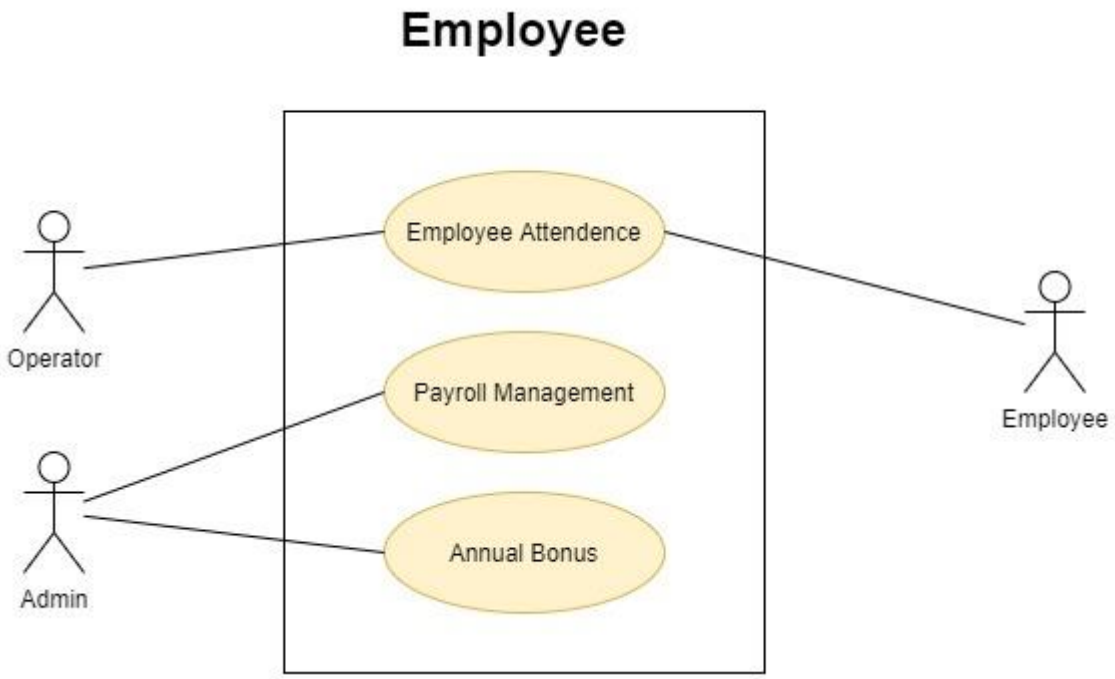
- When an order is placed, the given quantity of the product is deducted from the inventory after the confirmation of order
- When the owner buys the products from suppliers and it reaches the inventory, the warehouse manager updates the current stock by adding the received products
- When an order is cancelled, the returned product is updated back to the inventory by warehouse manager.

3. Reports Delivery:

The 'Warehouse Officer' sends an inventory stock report to the admin regularly if the inventory is updated. The Warehouse Officer and Admin has the access to modify inventory categories and products.

Level 1.5:

Employee Management:
Primary Actor: Operator, Admin
Secondary Actor: Employee



Description:

1. Employee Attendance:

Employees' attendance is maintained by the operator daily.

2. Payroll Management:

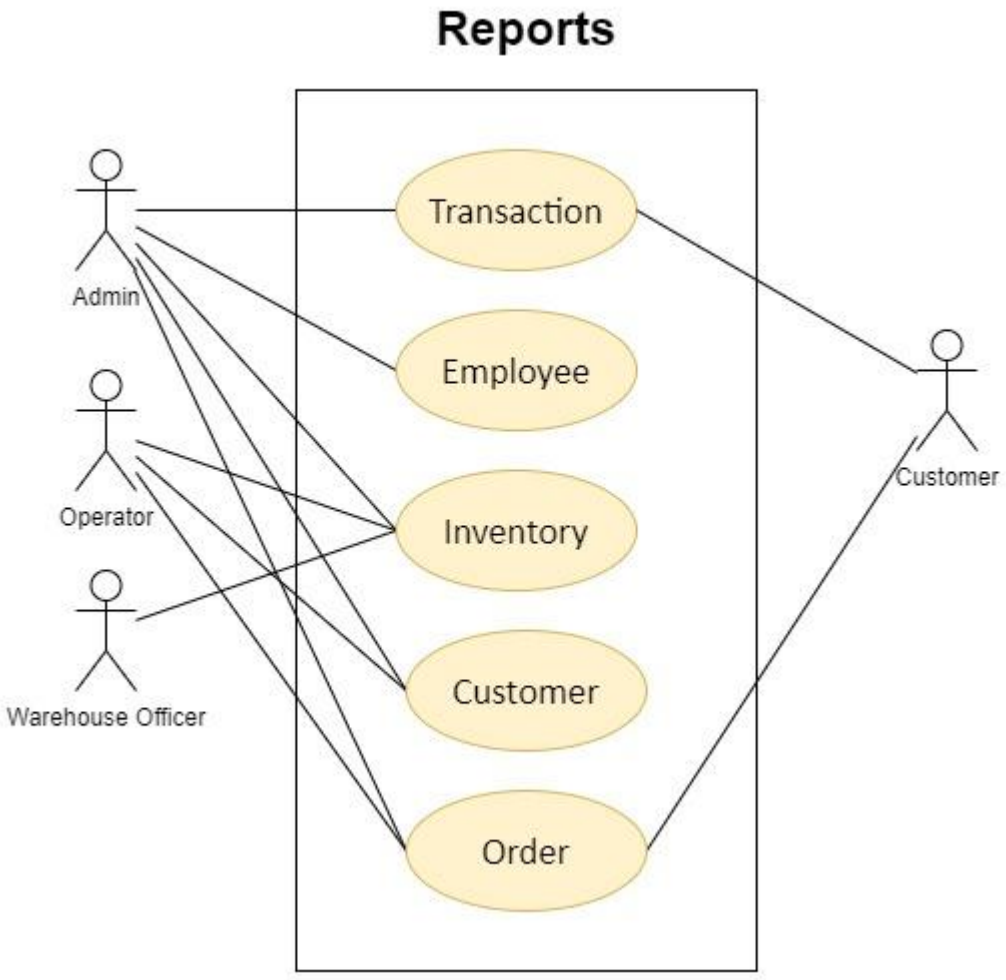
An employee's salary and bonuses are determined by her attendance and work. The admin can confirm the payment of the salaries in the software after it is given. Admin can modify the base salary, the amount to be deducted for absence, and the percentage of bonus for specific employees.

3. Annual Bonus:

Annual incrementation salary changes based on employee type that are maintained automatically. The software will automatically determine the percentage of bonus and salary incrementation by the annual performance of the employee. The admin can then modify the data if required.

Level 1.6:

Report Management:
Primary Actor: Operator, Admin and Warehouse Officer
Secondary Actor: Customer



Description:

1. **Transaction Reports:**

Admin will only have the access to the transaction reports section of the report delivery module. She can get the daily, monthly and annual transaction report of the whole firm and specific customers as well.

2. **Employee Reports:**

The employee reports will contain the following information of individual employees: Employee Details, monthly attendance, salary and bonus percentage. Only admin can has access to the employee reports module.

3. **Inventory Reports:**

The warehouse officer and admin has access to the inventory reports. It will contain the details of the products in the inventory.

4. **Order Reports:**

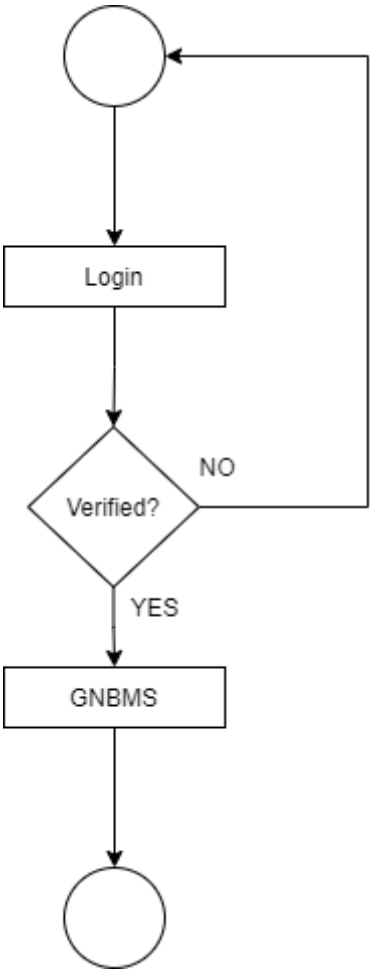
The operator and the admin has access to the order reports. The monthly and annual order details of the specific customers are generated in this section.

Activity Diagram

Definition of Activity Diagram:
Activity diagram is an important behavioral diagram in UML diagram to describe
dynamic aspects of the system. Activity diagram is essentially an advanced version of
flow chart that models the flow from one activity to another activity.

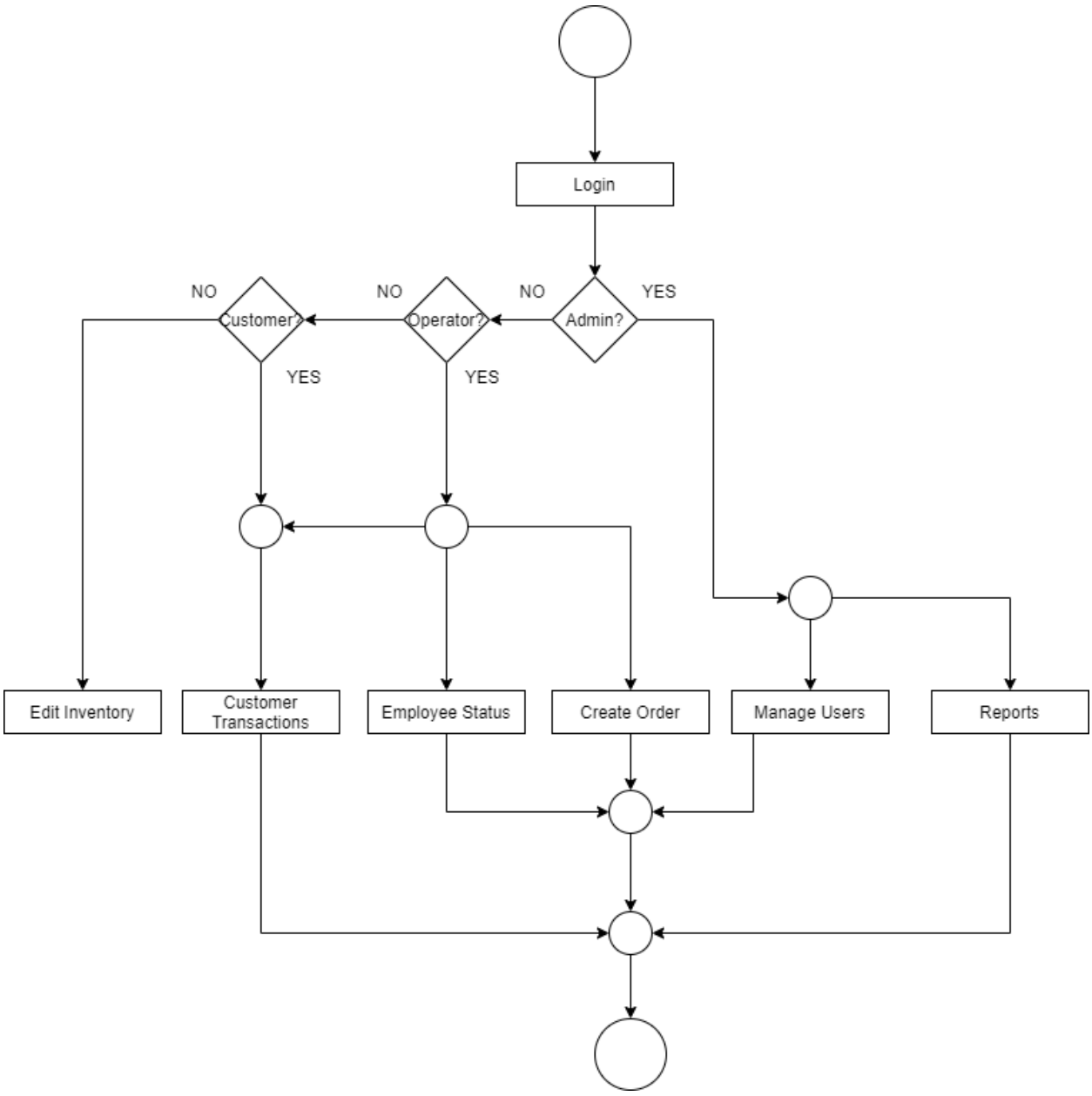
Level 0:

Reference: Use case diagram level – 0



Level 1:

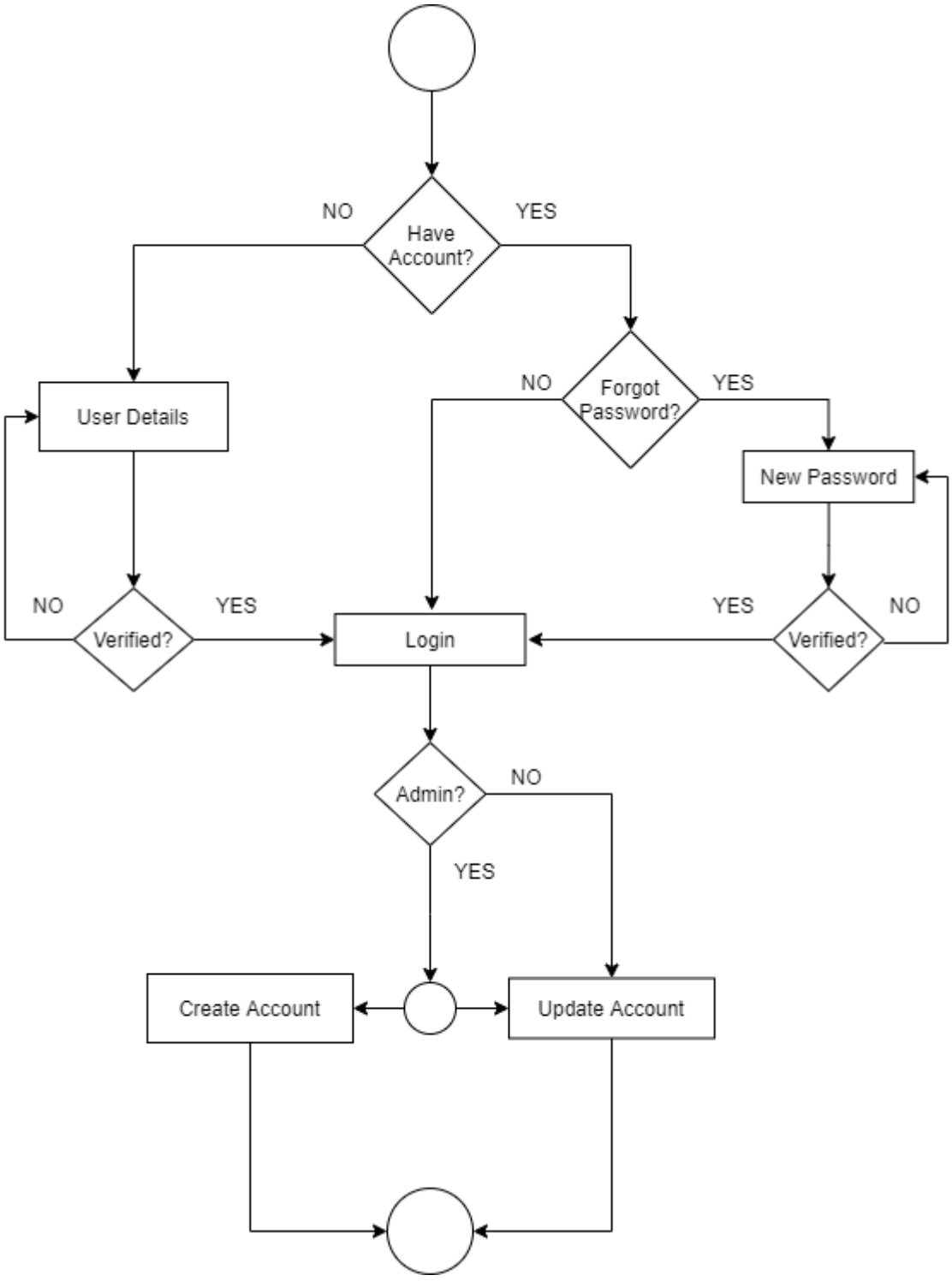
Reference: Use case diagram level – 1



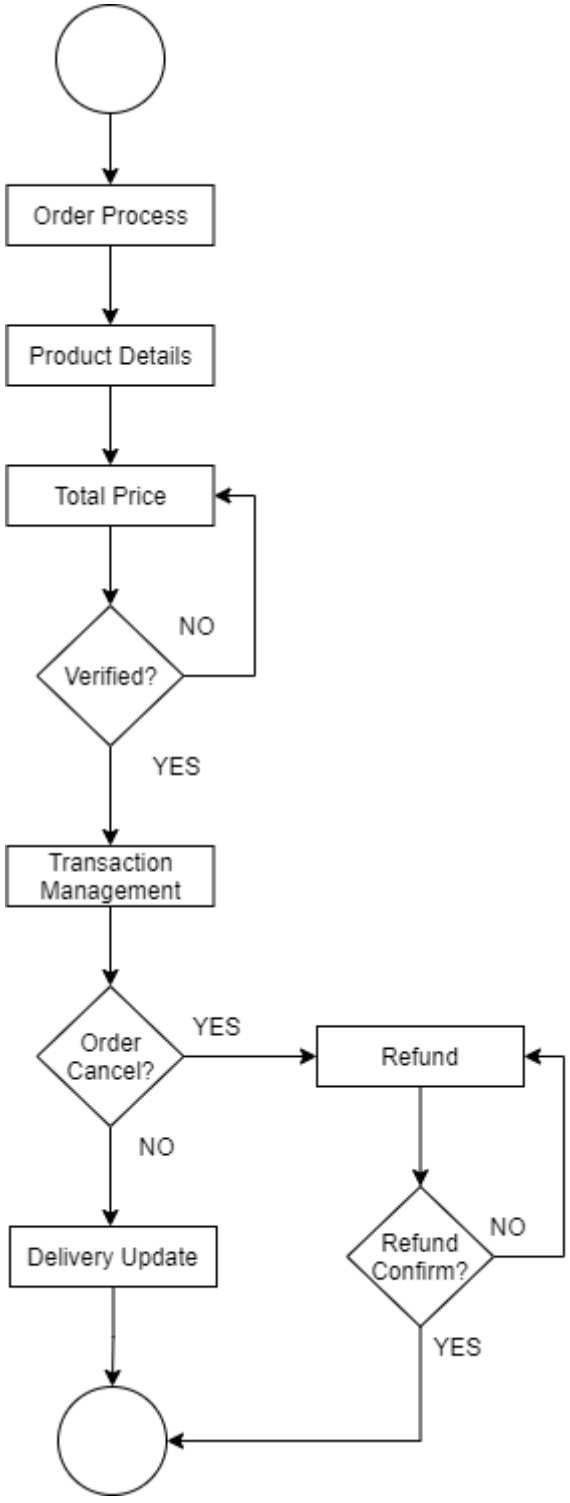
Level 1.1:

Name: User Management

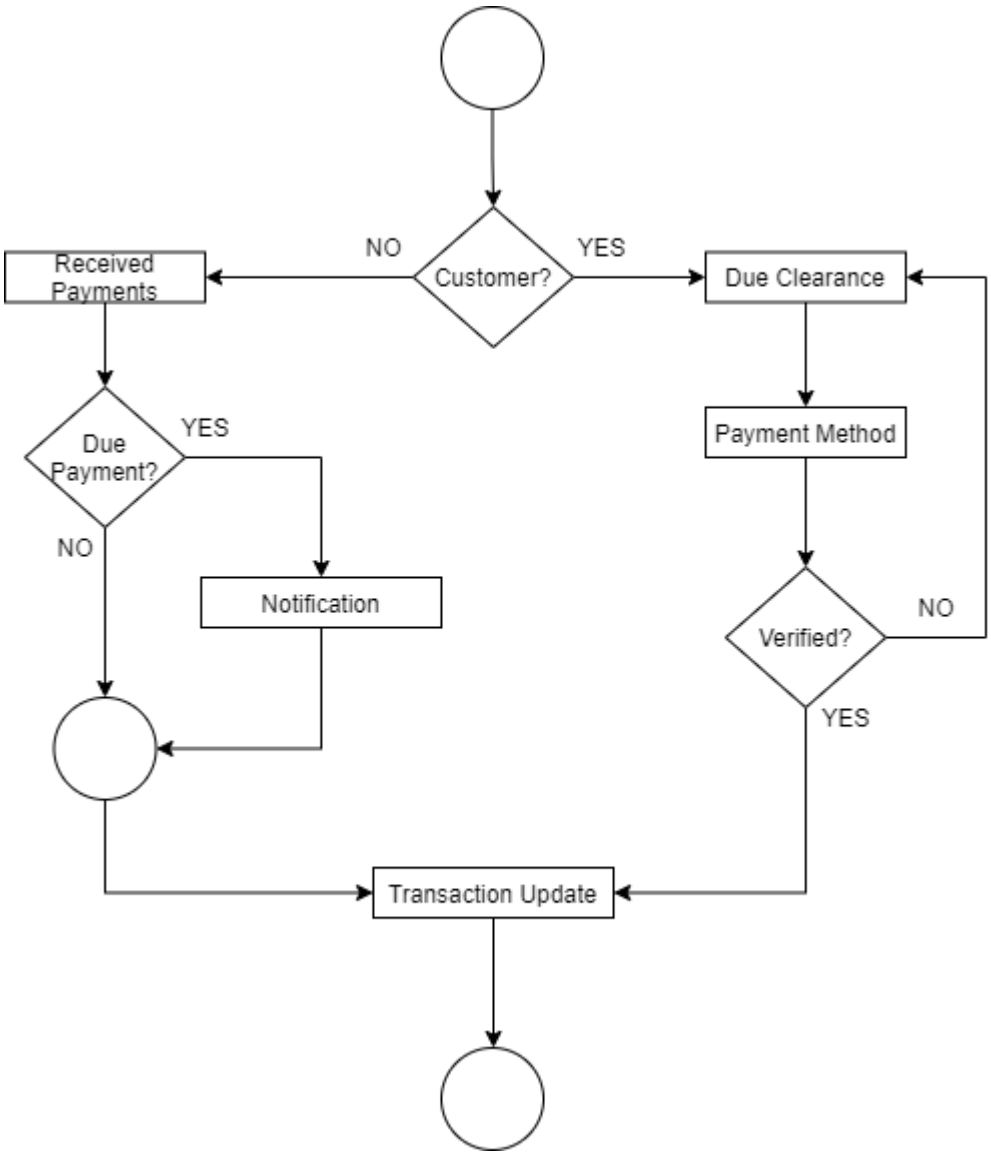
Reference: Use case diagram level – 1.1



Level 1.2:
Name: Order Management
Reference: Use case diagram level – 1.2



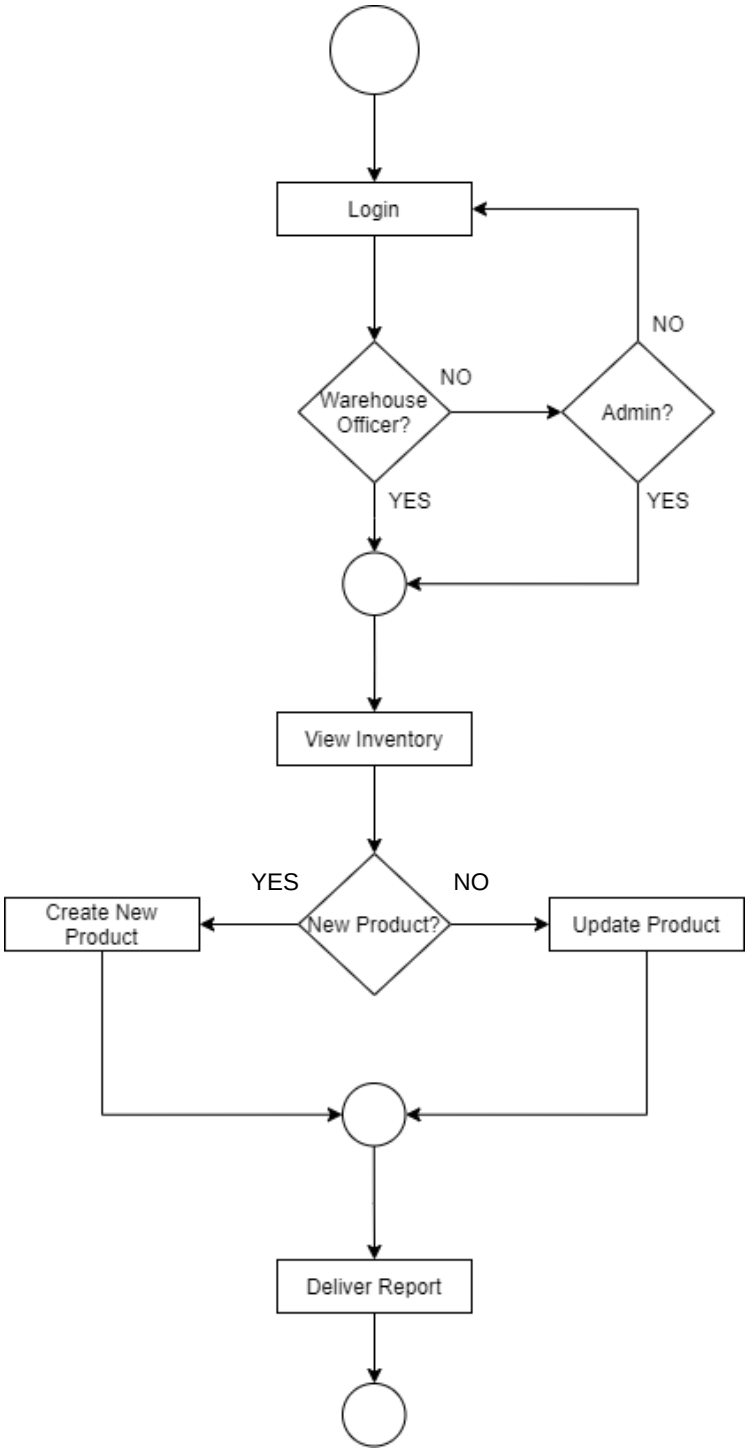
Level 1.3:
Name: Transaction Management
Reference: Use case diagram level – 1.3



Level 1.4:

Name: Inventory Management

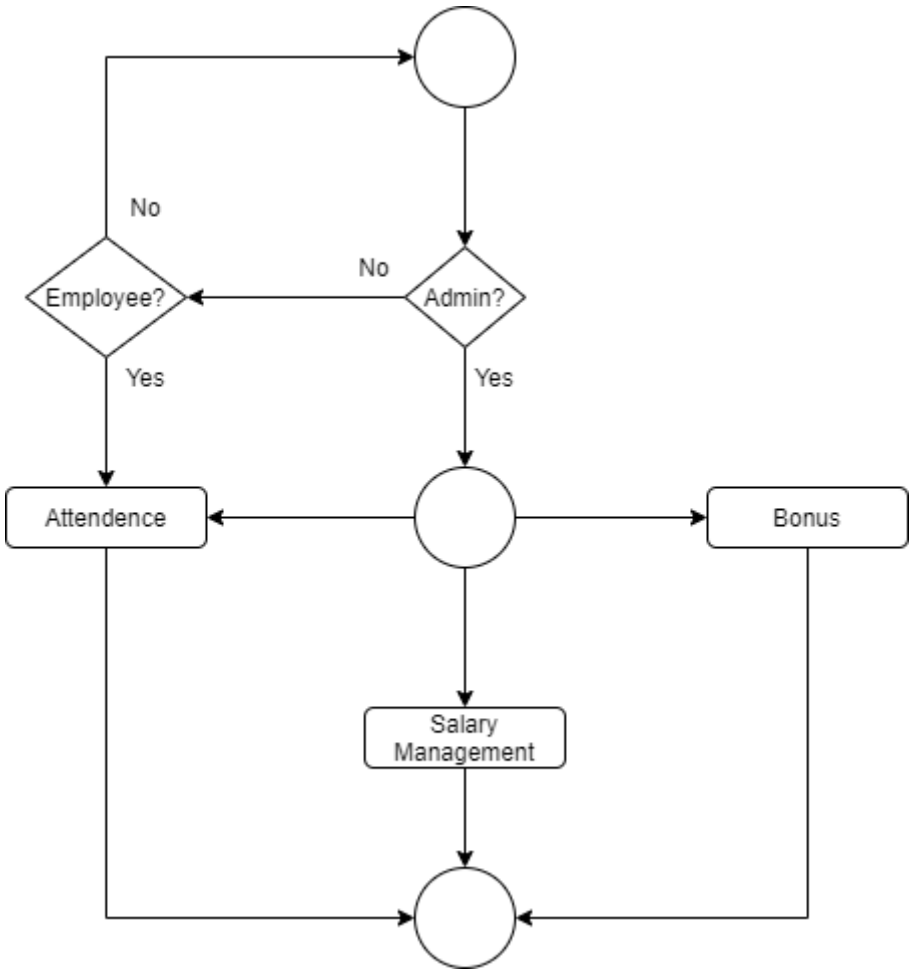
Reference: Use case diagram level – 1.4



Level 1.5:

Name: Employee Management

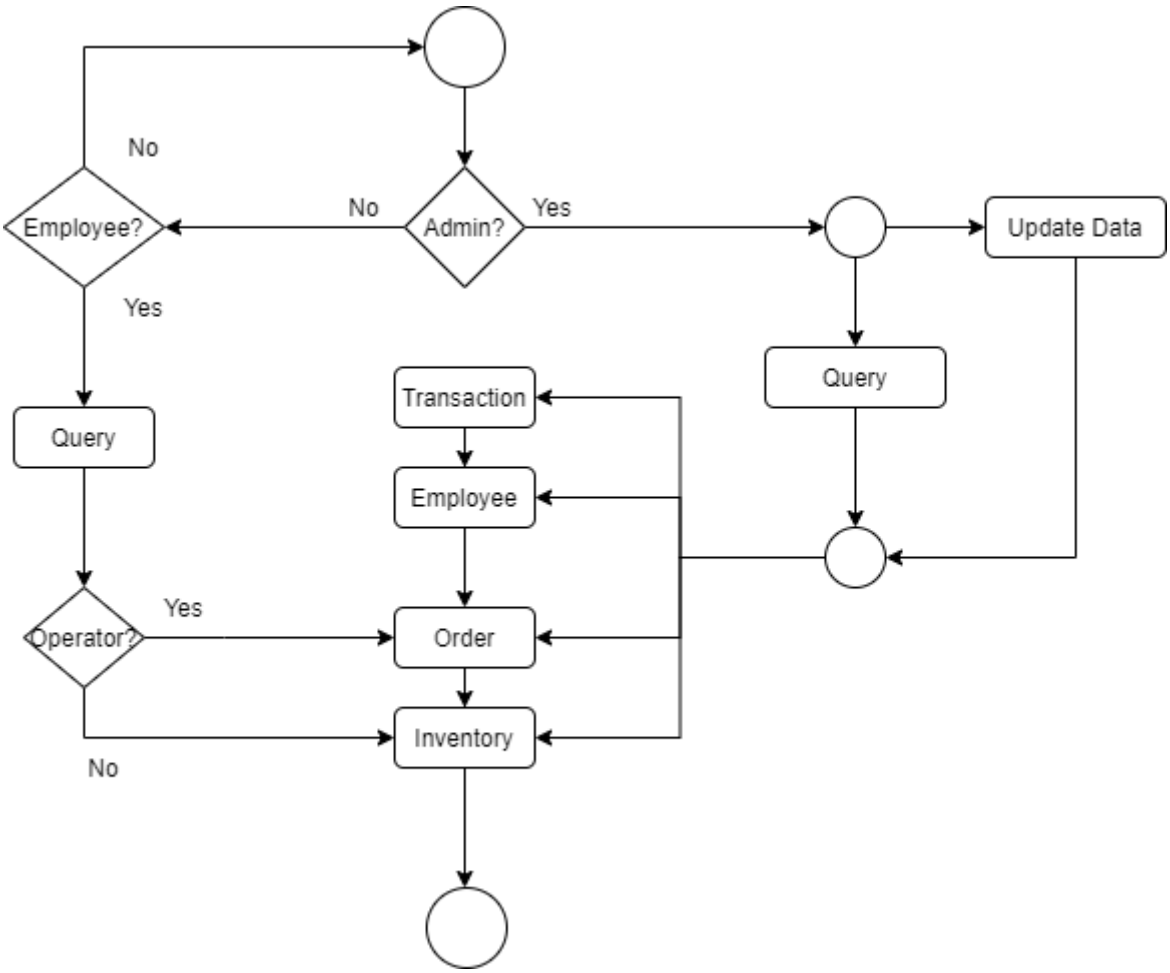
Reference: Use case diagram level – 1.5



Level 1.6:

Name: Report Management

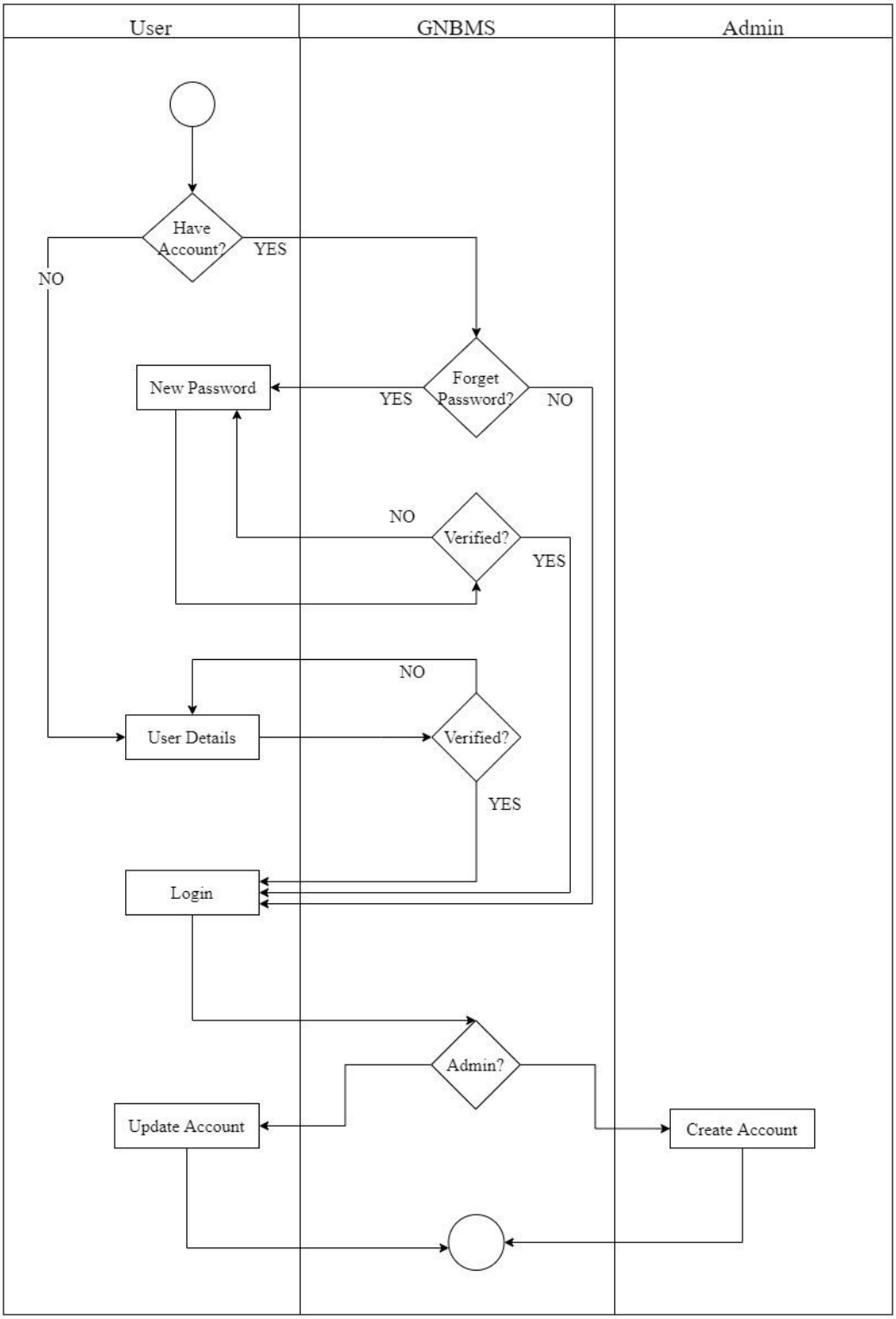
Reference: Use case diagram level – 1.6



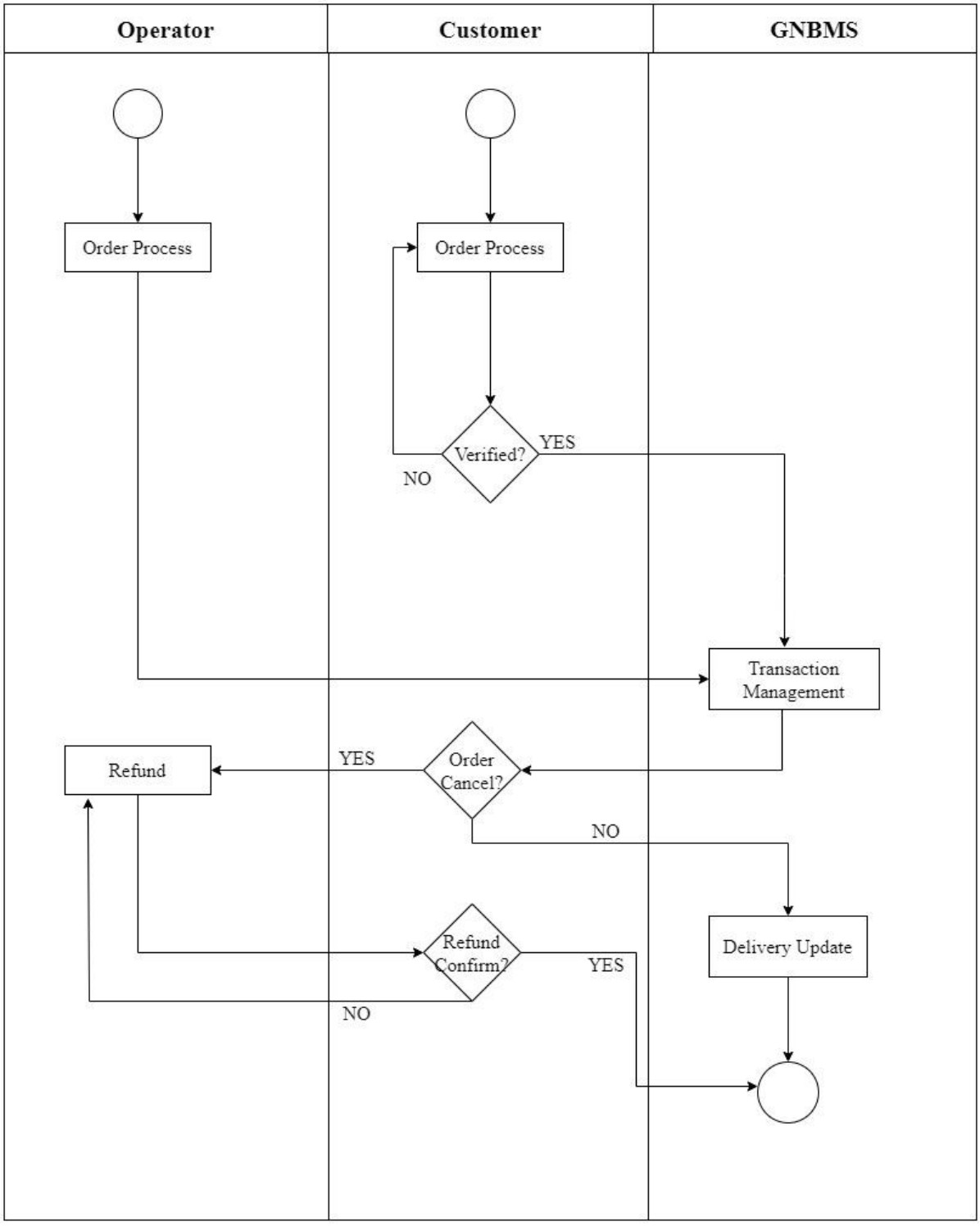
Swimlane Diagram

Definition:
A swimlane diagram is a type of flowchart that delineates who does what in a process. Using the metaphor of lanes in a pool, a swimlane diagram provides clarity and accountability by placing process steps within the horizontal or vertical “swimlanes” of a particular employee, workgroup, or department. It shows connections, communication and handoffs between these lanes, and it can serve to highlight waste, redundancy and inefficiency in a process.

SID (Swimlane ID): 1.1
Name: User Management
Reference: Use case & activity diagram level 1.1



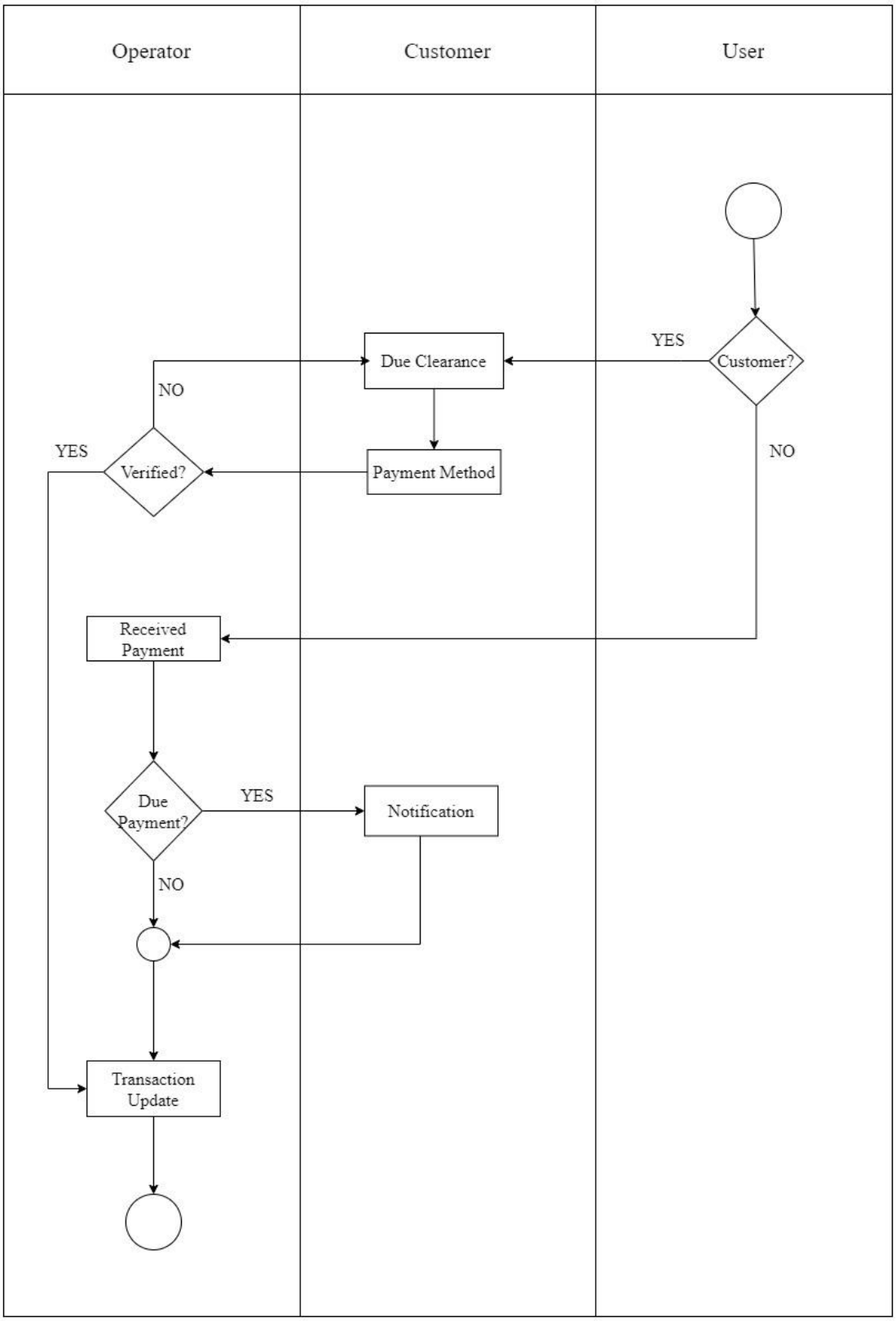
SID (Swimlane ID): 1.2
Name: Order Management
Reference: Use case & activity diagram level 1.2



SID (Swimlane ID): 1.3

Name: Transaction Management

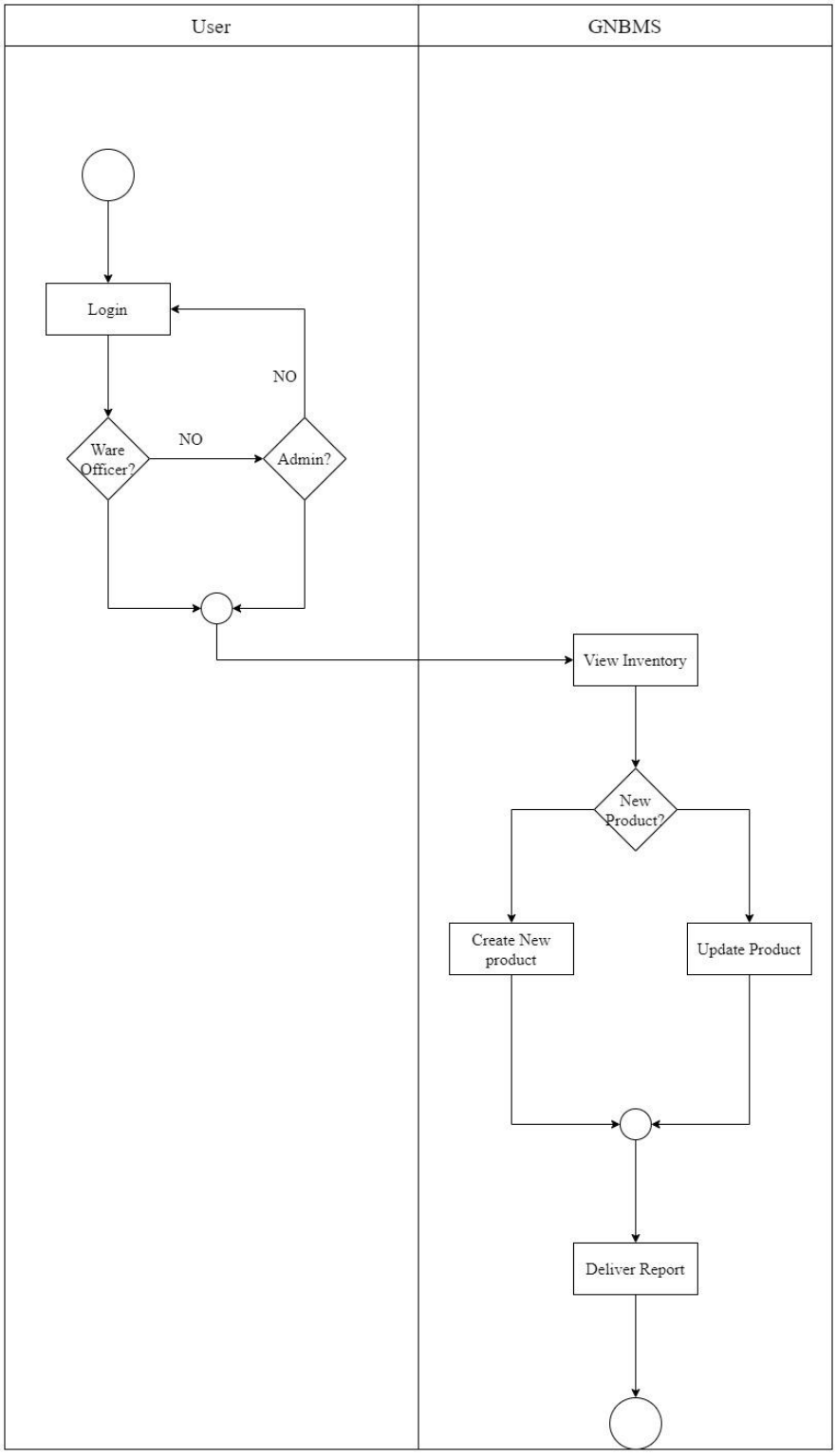
Reference: Use case & activity diagram level 1.3



SID (Swimlane ID): 1.4

Name: Inventory Management

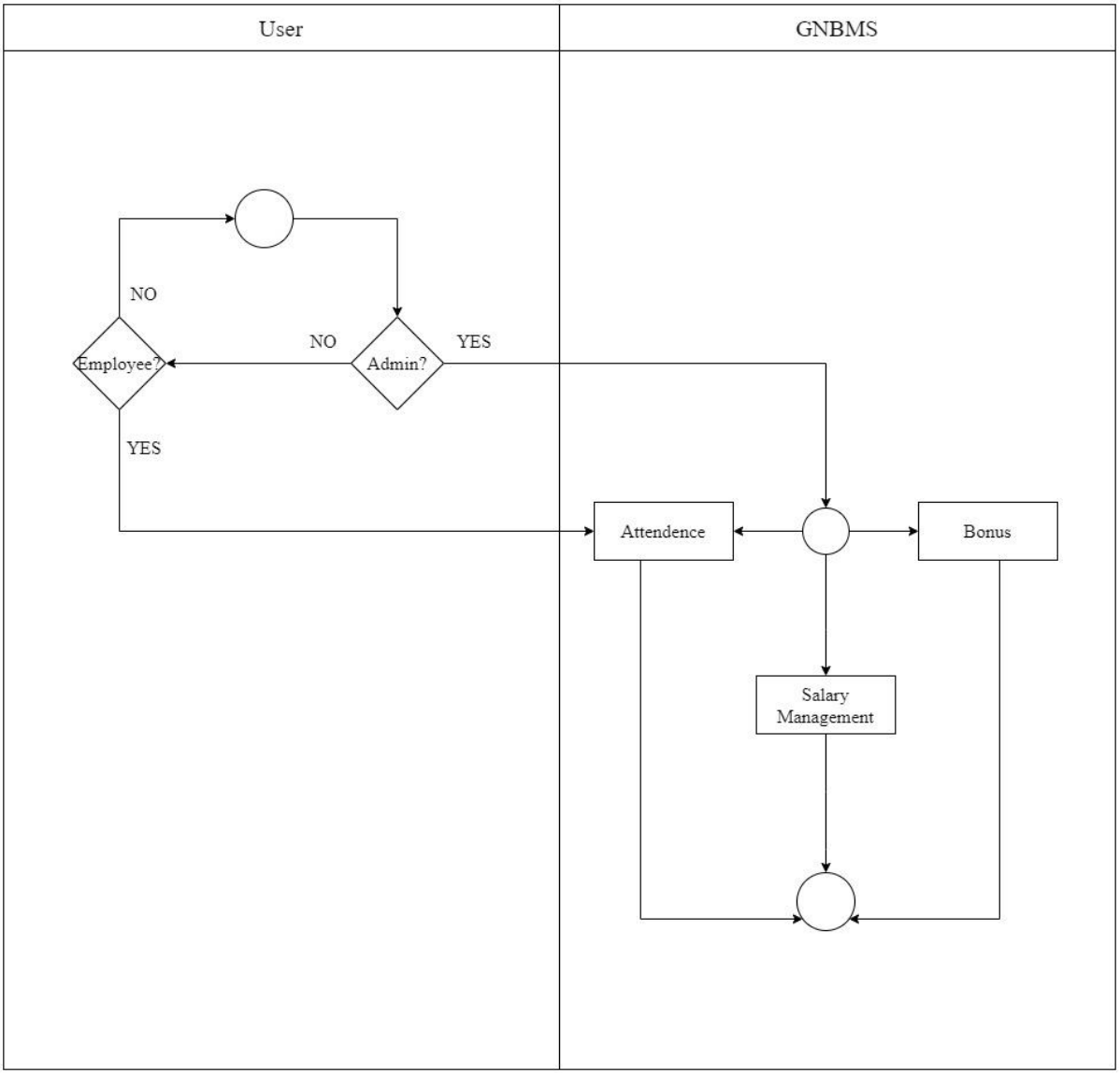
Reference: Use case & activity diagram level 1.4



SID (Swimlane ID): 1.5

Name: Employee Management

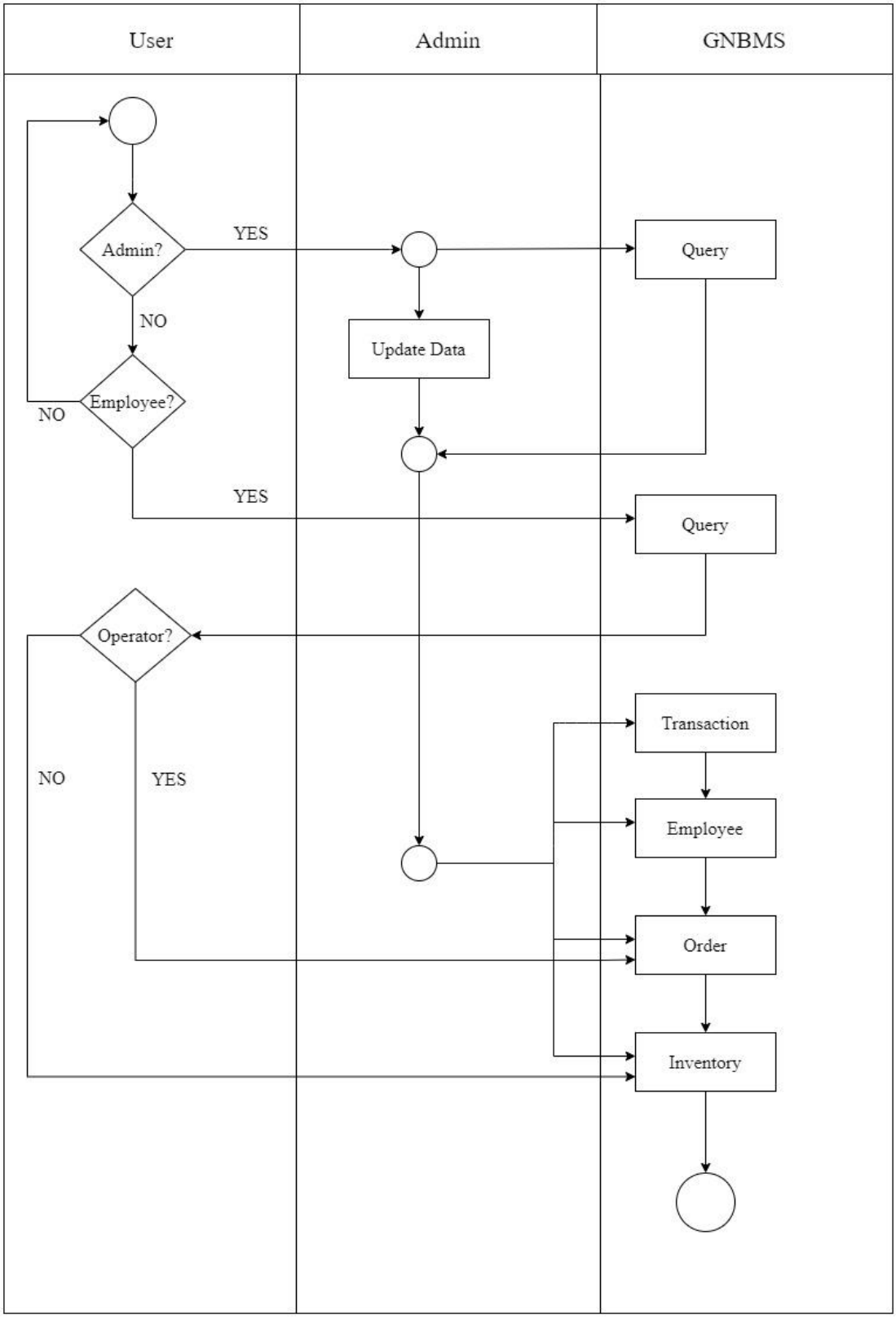
Reference: Use case & activity diagram level 1.5



SID (Swimlane ID): 1.6

Name: Report Management

Reference: Use case & activity diagram level 1.6



Data Based Modelling

Data modelling concept:

If software requirements include the necessity to create, extend or interact with a database or complex data structures need to be constructed and manipulated, then the software team chooses to create data models as part of overall requirements modelling. The entity relationship diagram (ERD) defines all data objects that are processed within the system, the relationships between the data objects and the information about how the data objects are entered, stored, transformed and produced within the system.

Data objects:

A data object is a representation of composite information that must be understood by the software. Here, composite information means information that has a number of different properties or attributes. A data object can be an external entity, a thing, an occurrence, a role, an organizational unit, a place or a structure.

Data Object Identification:

SL.	Nouns	Problem/ Solution Space	Attributes
1.	Admin	s	
2.	account	s	3,10,11,12,13,14,15,16,17,18,22, 25
3.	account-id	s	
4.	User	p	
5.	software	p	
6.	operator	s	3,10,11,12,13,14,15,16,17,18,22, 25
7.	Warehouse-officer	s	3,10,11,12,13,14,15,16,17,18,22, 25
8.	software management	p	
9.	information	p	
10.	user-roles	s	
11.	Full Name	s	
12.	Contact	s	
13.	Temporary Address	s	
14.	Permanent Address	s	

15.	NID No	s	
16.	Photo	s	
17.	Email Address	s	
18.	Password	s	
19.	profile	p	
20.	change	p	
21.	general -employee	s	3,10,11,12,13,14,15,16,17,18,22, 25
22.	username	s	
23.	Customer	s	3,11,12,13,14,15,16,17,18,22,25
24.	order-details	s	25,27,28,29,30,48, 56,58,70,92
25.	ID	s	
26.	details	p	
27.	product quantity	s	
28.	Order-type	s	
29.	delivery address	s	
30.	delivery charge	s	
31.	number	p	
32.	quantity	p	
33.	invoice	s	24, 35, 36, 37, 42, 47, 51, 52,53
34.	software	p	
35.	email	s	
36.	SMS	s	
37.	OTP	s	

38.	phone	p	
39.	payment	p	
40.	cash	s	
41.	digital payment system	s	
42.	order status	s	
43.	Pending	p	
44.	Confirmed	p	
45.	Ready for Shipping	p	
46.	Delivered	p	
47.	Date	s	
48.	Price	s	
49.	refund	s	
50.	website	p	
51.	Operator-name	s	
52.	account-id	s	
53.	Transaction-details	s	23, 47, 54, 55, 58
54.	Received value	s	
55.	Due value	s	
56.	Clearance date	s	
57.	Time	p	
58.	order -id	s	
59.	penalty	s	

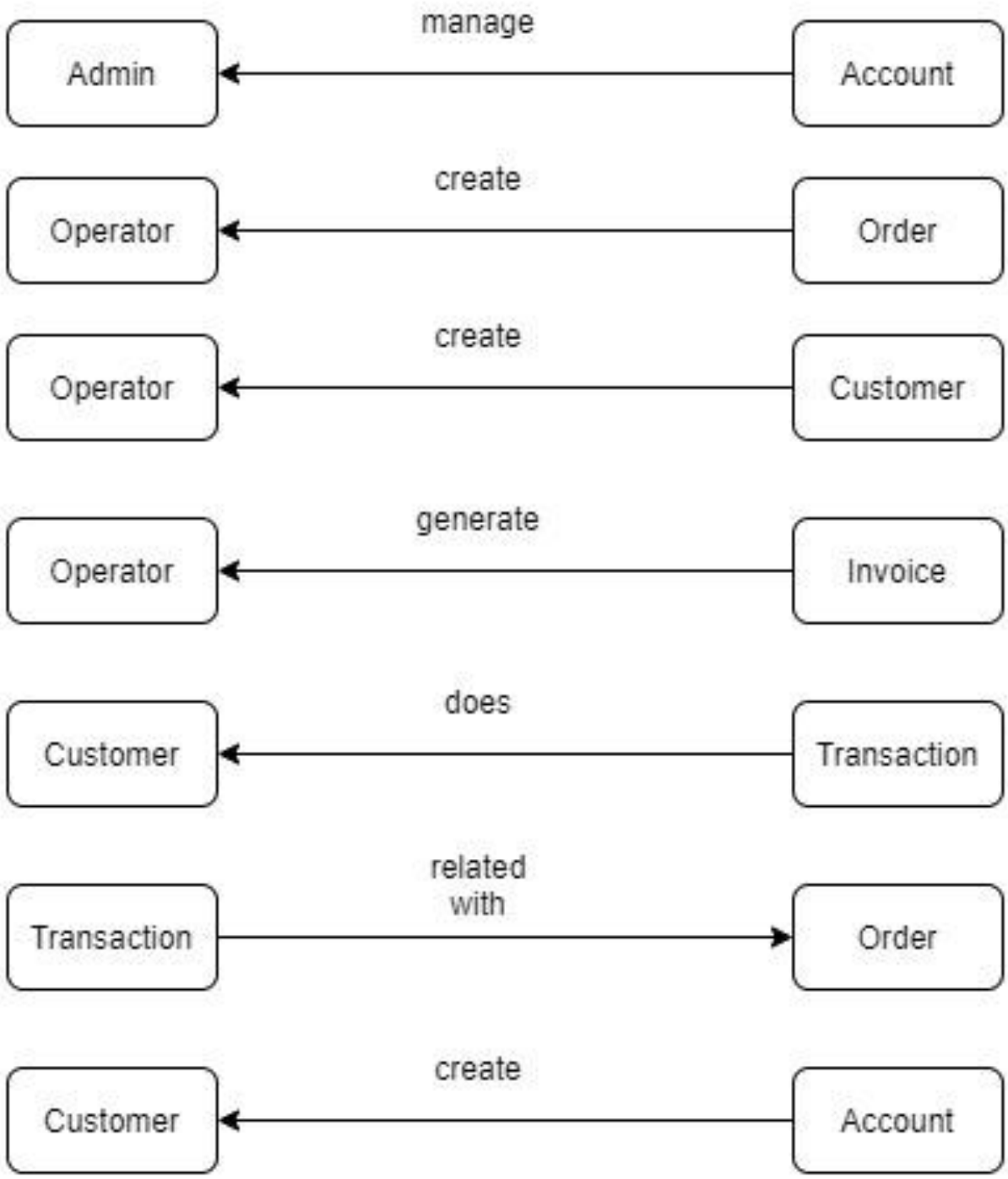
60.	Inventory	p	
61.	supplier-id	s	
62.	supplier-name	s	
63.	item	p	
64.	confirmation	p	
65.	Supplied-products	s	
66.	quantity(inventory)	s	
67.	Supplier	s	61,62, 65
68.	Product	s	48, 66, 67,69, 70
69.	Categories	s	
70.	Brand	s	
71.	employee	s	3,11,12,13,14,15,16,17,18
72.	employee-details	s	73, 74, 75
73.	Employee ID	s	
74.	attendance	s	
75.	salary	s	77,78
76.	section	p	
77.	bonus	s	
78.	Base-salary	s	
79.	report	s	2,24,53, 67, 69,
80.	updates	p	
81.	business	p	
82.	transaction history	s	

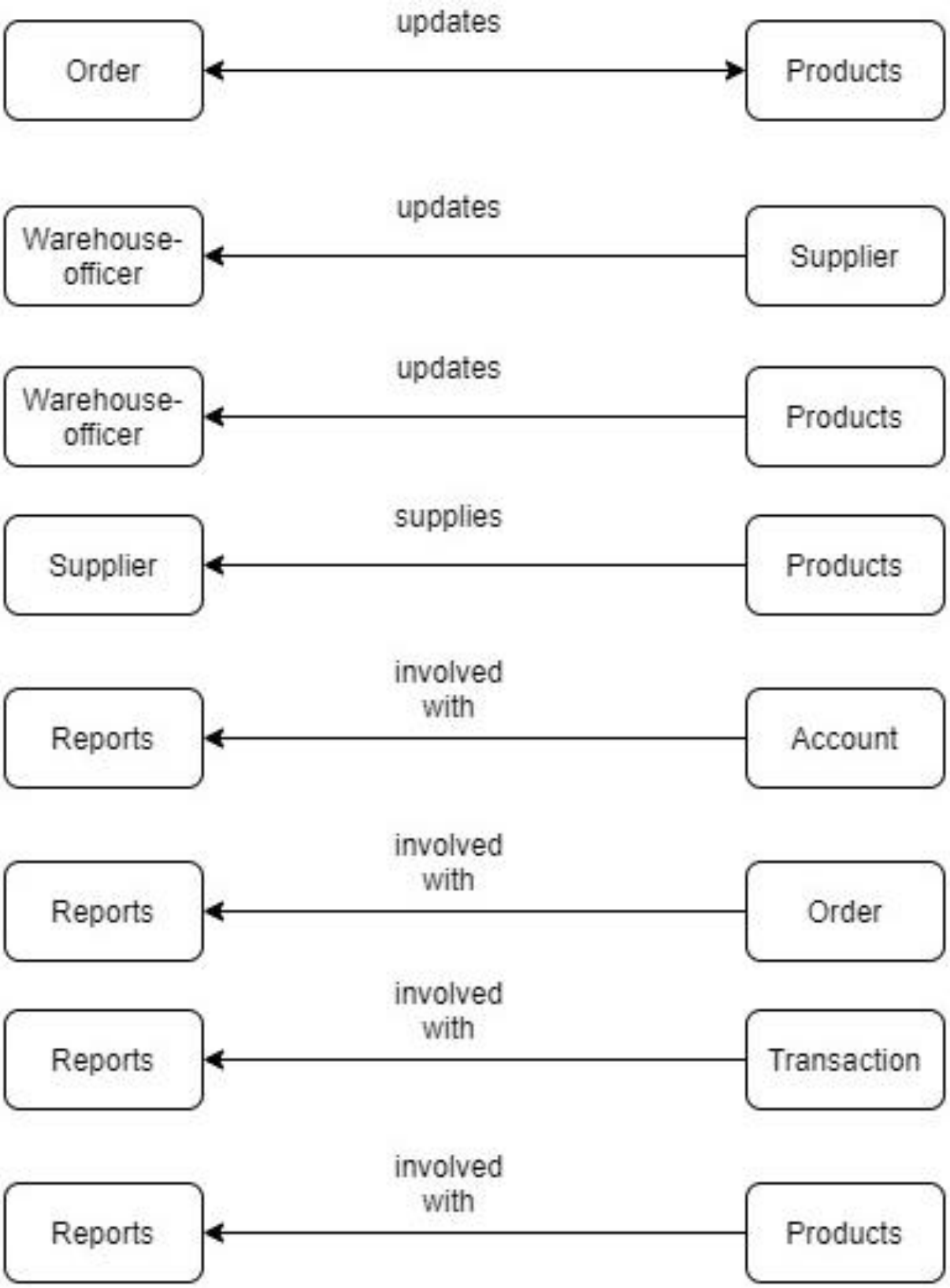
83.	sale	p	
84.	app	p	
85.	realtime order data	p	
86.	report data	p	
87.	access	p	
88.	access	p	
89.	company	p	
90.	stakeholders	p	
91.	analysis	p	
92.	discount	s	
93.	business	p	
94.	growth	p	
95.	data	p	
96.	Local PC	s	
97.	cloud platform	s	
98.	recovery	p	

Data Objects:

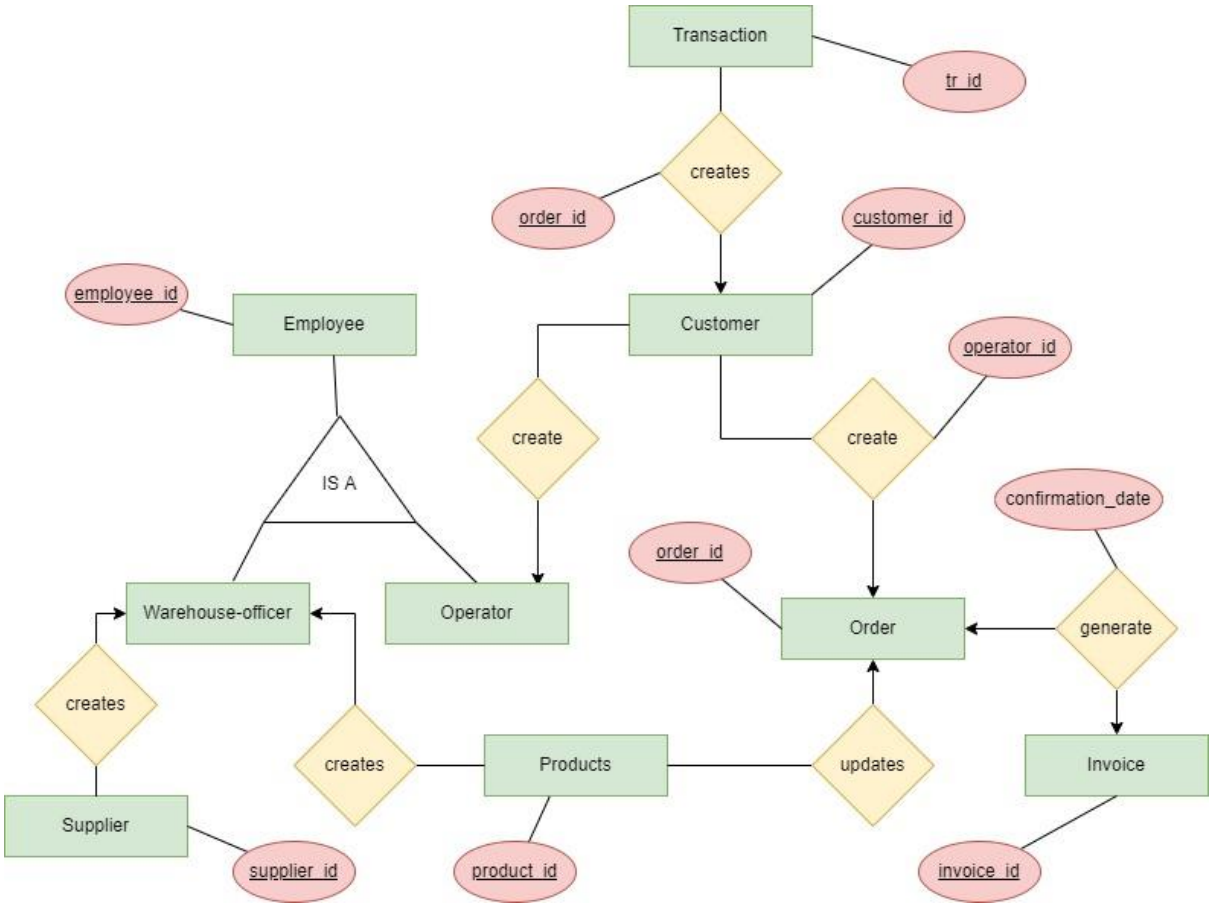
i. Admin
ii. Account
iii. Employee
iv. Operator
v. Warehouse-officer
vi. Customer
vii. Order
viii. Invoice
ix. Transaction
x. Supplier
xi. Product
xii. Reports

Data Object Relationship:




Order
updates
Products
Warehouse-officer
updates
Supplier
Warehouse-officer
updates
Products
Supplier
supplies
Products
Reports
involved with
Account
Reports
involved with
Order
Reports
involved with
Transaction
Reports
involved with
Products

ER Diagram:


Transaction
tr_id
creates
order_id
customer_id
employee_id
Employee
Customer
operator_id
create
create
IS A
confirmation_date
order_id
Warehouse-officer
Operator
Order
generate
creates
creates
Products
updates
Invoice
Supplier
supplier_id
product_id
invoice_id

Final Data Objects :

i. Employee

ii. Operator

iii. Warehouse-officer

iv. Customer

v. Order

vi. Invoice

vii. Transaction

viii. Supplier

ix. Product

Schema Diagram:

Data Object	Attribute	Type	Size
Employee	-account ID	Varchar	50
	-full name	Varchar	50
	-username	Varchar	50
	-email address	Varchar	50
	-phone number	Varchar	50
	-password	Text	50
	-address	Varchar	
	-photo	Varchar	50
	-NID	Varchar	50
	-user role	Varchar	50
	-attendance	Number	
	-salary	Number	
Operator	-account ID	Varchar	50
	-full name	Varchar	50
	-username	Varchar	50
	-email address	Varchar	50
	-phone number	Varchar	50
	-password	Varchar	50
	-address	Text	
	-photo	Varchar	50
	-NID	Varchar	50
	-attendance	Number	
	-salary	Number	
	-invoice list	List	
	-order list	List	
Warehouse-officer	-account ID	Varchar	50
	-full name	Varchar	50
	-username	Varchar	50
	-email address	Varchar	50
	-phone number	Varchar	50

	-password -address -photo -NID -attendance -salary -product list -supplier list	Varchar Text Varchar Varchar Number Number List List	50 50 50
Customer	-customer_ID -full name -username -email address -phone number -password -address -photo -NID -order list	Varchar Varchar Varchar Varchar Varchar Varchar Text Varchar Varchar List	50 50 50 50 50 50 50 50
Order	-order ID -customer ID -confirmation time -product ID -quantity -total price -order status -clearance date -delivery date -discount	Varchar Varchar Date & Time Varchar Number Number Varchar Date & Time Date & Time Number	50 50 50 50
Invoice	-invoice ID -order ID	Varchar Varchar	50 50

	-operator ID -customer ID -delivery date -confirmation time	Varchar Varchar Date Date & Time	50 50
Transaction	-transaction ID -customer ID -order ID -received value -due value -date	Varchar Varchar Varchar Number Number Date & Time	50 50 50
Supplier	-supplier ID -supplier name -location -contact number -product list	Varchar Varchar Varchar Number List	50 50 50
Product	-product ID -supplier ID -product name -product price -quantity -availability	Varchar Varchar Varchar Number Binary Varchar	50 50 50 50

CLASS-BASED MODELING

CLASS BASED MODELING CONCEPT:

Class-based modelling represents the objects that the system will manipulate, the operations that will be applied to the objects, relationships

between the objects and the collaborations that occur between the classes that are defined.

Potential Nouns to become a class

SL	Nouns	SL	Nouns
1.	**Admin**	2.	Order-type
3.	**account**	4.	delivery address
5.	account-id	6.	delivery charge
7.	**operator**	8.	**invoice**
9.	**Warehouse-officer**	10.	**email**
11.	user-roles	12.	**SMS**
13.	Full Name	14.	**OTP**
15.	Contact	16.	order status
17.	Temporary Address	18.	Date
19.	Permanent Address	20.	Price
21.	NID No	22.	Operator-name
23.	Photo	24.	account-id
25.	Email Address	26.	**Transaction-details**
27.	Password	28.	Received value
29.	**general -employee**	30.	Due value
31.	username	32.	Clearance date
33.	**Customer**	34.	order -id
35.	order-details	36.	supplier-id
37.	ID	38.	**quantity(inventory)**
39.	product quantity	40.	**Supplier**
41.	**Brand**	42.	**Product**

43.	**employee**	44.	**Categories**
45.	employee-details	46.	**attendance**
47.	Employee ID	48.	**salary**
49.	bonus	50.	**transaction history**
51.	Base-salary	52.	discount
53.	**report**	54.	**Local PC**
55.	**cloud platform**	56.	Cash
57.	**Digital Payment System**	58.	Notification

Verb List

1.	Manage account	2.	Create transaction
3.	Edit account	4.	Generate transaction ID
5.	Delete account	6.	Send transaction details
7.	Create account	8.	Add penalty
9.	Generate account ID	10.	Create supplier
11.	Create Order	12.	Create product
13.	Generate Order ID	14.	Update product

15.	Update Product Quantity	16.	Update supplier
17.	Generate Invoice	18.	Calculate salary
19.	**Send to customer**	**20.**	Generate report
21.	Verify invoice	22.	Search report
23.	Notify order status	24.	View report
25.	Cancel order	26.	View transaction history
27.	Product reset	28.	View order history
29.	Account reset	30.	Identify top customers
31.	Observe growth	32.	Recover data
33.	Backup data	34.	

General classification

Candidate classes were then characterized in seven general classes. The seven general characteristics are as follows:

1. External entities
2. Things
3. Events
4. Roles
5. Organizational units
6. Places
7. Structures

SL	Nouns	General Classification
1.	**Admin**	4,5,7
2.	**account**	5, 7
3.	account-id	2
4.	**operator**	4,5,7
5.	**Warehouse-officer**	4,5,7
6.	user-roles	2
7.	Full Name	2
8.	Contact	2
9.	Temporary Address	2
10.	Permanent Address	2
11.	NID No	2
12.	Photo	2
13.	Email Address	2
14.	Password	2
15.	**general -employee**	4,5,7
16.	username	2
17.	**Customer**	4,5,7
18.	order-details	2,7
19.	ID	2
20.	product quantity	2

21.	**Brand**	7
22.	**employee**	4,5,7
23.	employee-details	2
24.	Employee ID	2
25.	bonus	2
26.	Base-salary	2
27.	**report**	2,7
28.	**cloud platform**	1,2
29.	**Digital Payment System**	1.2
30.	Order-type	2
31.	delivery address	2
32.	delivery charge	2
33.	**invoice**	2,7
34.	email	1
35.	SMS	1
36.	**Notification**	1,2,7
37.	**OTP**	1
38.	order status	2
39.	Date	2
40.	Price	2
41.	Operator-name	2

42.	account-id	2
43.	**Transaction-details**	2,7
44.	Received value	2
45.	Due value	2
46.	Clearance date	2
47.	order -id	2
48.	supplier-id	2
49.	**quantity(inventory)**	2
50.	**Supplier**	4,5,7
51.	**Product**	4,5,7
52.	**Categories**	2
53.	**attendance**	2
54.	**salary**	2
55.	**transaction history**	2
56.	discount	2
57.	**Local PC**	1, 2
58.	Cash	2

Selection Criteria

The candidate classes are then selected as classes by six Selection Criteria. A candidate class generally becomes a class when it fulfills around three characteristics.

1. Retain information
2. Needed services
3. Multiple attributes
4. Common attributes
5. Common operations
6. Essential requirements

Potential general classified nouns to become a class after selection criteria:

SL	Nouns	Selection Criteria
1.	Admin	1,6 (selected)
2.	account	1,2,3,4,5,6 (selected)
3.	operator	1,2,3,4,5,6 (selected)
4.	Warehouse-officer	1,2,3,4,5,6 (selected)
5.	general -employee	3
6.	Customer	1,2,3,4,5,6 (selected)
7.	order	1,2,3,4,5,6 (selected)
8.	Brand	3
9.	employee	1,2,3,4,5,6 (selected)
10.	employee-details	3
11.	report	1,2,3,4,5,6 (selected)
12.	cloud platform	2
13.	Digital Payment System	2,6
14.	invoice	1,2,3,4,5,6 (selected)
15.	SMS	2,6

16.	OTP	6
17.	Transaction	1,2,3,4,5,6 (selected)
18.	Supplier	1,2, 3,5,6 (selected)
19.	Product	1,2,3,4,5,6 (selected)
20.	Categories	3
21.	salary	1,2,3,5,6(selected)
22.	Local PC	1
25.	email	2, 5, 6
26.	Notificaiton	1,2,3,4,5,6(Selected)

Selected Classes:

i. Admin
ii. Account
iii. Employee
iv. Operator
v. Warehouse-officer
vi. Customer
vii. Order
viii. Invoice
ix. Transaction
x. Supplier
xi. Product

xii. Reports
xiii. Salary
xiv. Notification

Attribute & Method Identification

SL no.	Class Name	Attribute	Method
1.	Admin	-Fullname -username -emailAddress -password -phoneNumber	+login() +create_account(ID) +edit_account(ID) +delete_account(ID) +backup_data() +recover_data()
2.	Account	-accountID -FullName -username -emailAddress -phoneNumber	+create_account() +view_account_info() +recover_password() -generate_ID()

		-password -address -photo -NID -Account type	+update_account()
3.	Employee	-user role -attendance -salary	+view_employee_info()
4.	Operator	-invoice list -order list	+create_customer_acc() +verify_transaction()
5.	Warehouse-officer	-product list -supplier list	+assign_delivery() +verify_supplied_products()
6.	Customer	-order list	+order_product() +pay() +request_refund()
7.	Order	-order ID -customer ID -confirmation time -product list -transaction list -quantity -total price -paid amount -order status -clearance date -delivery date -discount	+create_order() -generate_order_ID() +add_to_cart() +view_order_info() +view_ordered_product_list() -calculate_price() +check_order_status() +calculate_discount() +update_order() +update_delivery_date() +check_payment() +update_clearance_date() +view_transaction_list() +add_transaction() +cancel_order(orderID)

8.	Invoice	-invoice ID -order ID -operator ID -confirmation time -transaction ID	-generate_invoice_ID() +generate_invoice() +get_order_info() +print_invoice() +view_invoice_info() +get_transaction_info()
9.	Transaction	-transaction ID -order ID -received value -due value -date	-generate_transaction_ID() +create_transaction() +calculate_due() -send_invoice() +update_order() +payment()
10.	Supplier	-supplier ID -supplier name -location -contact number -product list	-generate_supplier_ID() +create_supplier() +view_supplier_info() +supply_product() +update_supplier() +delete_supplier()
11.	Product	-product ID -supplier ID -product name -product price -quantity -availability -brand name -category name	+create_product() -generate_product_ID() +view_product_info() +update_product() +check_availability() +delete_product() +check_price() +get_supplier_info() +add_brand() +add_category()
12.	Report	-report name -report ID -report time -order ID	+generate_report() +search() +view_employee_report()

		-transaction ID -account ID -product ID	+view_order_report() +view_transaction_report() +view_product_report() +view_supplier_report() +get_report(time interval) +print_report() +identify_top_customers() +observe_growth()
13.	Salary	-employee ID -monthly salary -bonus -base salary -attendance	-calculate_salary() +input_bonus() +get_salary() +update_base_salary() +update_salary()
14.	Notification	-email address -OTP	+send_invoice() +send_OTP()

CRC Card:

SL.	Class	Responsibility	Collaborator
1.	Admin	● Create employee accounts ● Updating employee salary ● Verifying refunds ● Creating backups	Account, Report, Transaction
2.	Account	● Creating user accounts ● Updating account	Admin

		information	
3.	Employee	• Create Employee ID • Get monthly salary • Get employee account	Admin, Account, Salary
4.	Operator	• Generate order for customer • Verify Transactions • Generate order invoice • Confirm order refund • Cancel Order	Account, Order, Transaction, Customer, Invoice, SMS, Email
5.	Warehouse-officer	• Assign delivery person • Update supplied products info • Add new suppliers • Add new products	Account, Product, Supplier
6.	Customer	• Create Account • Create Order • Cancel Order • View transaction history • View	Account, Order, Transaction, Invoice
7.	Order	• Create order • Calculate final price • Update delivery data • Update product stock • Add products lists to order	Transaction, Invoice, Customer, Product
8.	Invoice	• Generate Invoice according to the order ID • Generate invoice for	Customer, Operator, Transaction, Email

		customer transaction ● Print invoice of order	
9.	Transaction	● Create Transaction ID ● Calculate due values ● Update transaction history for an order ● Send invoice to customer ● Make Digital Payment ● Make Payment Manually	Order, Customer, Operator, SMS
10.	Supplier	● List of supplied products ● Information of supplier	Warehouse-officer, Product
11.	Product	● Create new products ● Update a product ● Check availability of a product	Warehouse-officer, Supplier
12.	Report	● Generate Transaction report ● Generate Order report ● Generate Employee report ● Generate Product Report ● Search a report ● Print a report	Account, Order, Product, Employee, Transaction, Admin
13.	Salary	● Calculate salary of an employee ● Add bonus ● Update the base salary	Employee, Admin, Account

14.	Notification	• Send order status to customer • Send verification codes • Send payment deadline • Send due amount update for an order • Send Order Status to the customer	Order, Transaction, Invoice

Class Cards

Admin	
Attribute	Method
-Fullname -username -emailAddress -password -phoneNumber	+login() +create_account(ID) +edit_account(ID) +delete_account(ID) +backup_data() +recover_data()
Responsibilities	Collaborator
● Create employee accounts ● Updating employee salary ● Verifying refunds ● Creating backups	Account, Report, Transaction

Account	
Attribute	Method
-accountID -FullName -username -emailAddress -phoneNumber -password -address -photo -NID -Account type	+create_account() +view_account_info() +recover_password() -generate_ID() +update_account()
Responsibilities	Collaborator
• Creating user accounts • Updating account information	Admin

Employee	
Attribute	Method
-user role -attendance -salary	+view_employee_info()
Responsibilities	Collaborator

• Create Employee ID • Get monthly salary • Get employee account	Admin, Account, Salary

Operator	
Attribute	Method
-invoice list -order list	+create_customer_acc() +verify_transaction()
Responsibilities	Collaborator
• Generate order for customer • Verify Transactions • Generate order invoice • Confirm order refund • Cancel Order	Account, Order, Transaction, Customer, Invoice, Notification

Warehouse-officer	
Attribute	Method
-product list -supplier list	+assign_delivery() +verify_supplied_products()
Responsibilities	Collaborator

• Assign delivery person • Update supplied products info • Add new suppliers • Add new products	Account, Product, Supplier

Customer	
Attribute	Method
-order list	+order_product() +pay() +request_refund()
Responsibilities	Collaborator
• Create Account • Create Order • Cancel Order • View transaction history • View invoice	Account, Order, Transaction, Invoice

<table>
<tr><th colspan="2">Order</th></tr>
<tr><td>Attribute</td><td>Method</td></tr>
<tr><td>-order ID
-customer ID
-confirmation time
-product list
-transaction list
-quantity
-total price
-paid amount
-order status
-clearance date
-delivery date
-discount</td><td>+create_order()
-generate_order_ID()
+add_to_cart()
+view_order_info()
+view_ordered_product_list()
-calculate_price()
+check_order_status()
+calculate_discount()
+update_order()
+update_delivery_date()
+check_payment()
+update_clearance_date()
+view_transaction_list()
+add_transaction()
+cancel_order(orderID)</td></tr>
<tr><td>Responsibilities</td><td>Collaborator</td></tr>
<tr><td>● Create order
● Calculate final price
● Update delivery data
● Update product stock
● Add products lists to order</td><td>Transaction, Invoice, Customer, Product</td></tr>
</table>

Invoice	
Attribute	Method
-invoice ID -order ID -operator ID -confirmation time -transaction ID	-generate_invoice_ID() +generate_invoice() +get_order_info() +print_invoice() +view_invoice_info() +get_transaction_info()
Responsibilities	Collaborator
• Generate Invoice according to the order ID • Generate invoice for customer transaction • Print invoice of order	Customer, Operator, Transaction, Email

Transaction	
Attribute	Method
-transaction ID -order ID -received value -due value -date	-generate_transaction_ID() +create_transaction() +calculate_due() -send_invoice() +update_order() +payment()
Responsibilities	Collaborator
• Create Transaction ID • Calculate due values • Update transaction history for an order • Send invoice to customer • Make Payment	Order, Customer, Operator, Notification

Supplier	
Attribute	Method
-supplier ID -supplier name -location -contact number -product list	-generate_supplier_ID() +create_supplier() +view_supplier_info() +supply_product() +update_supplier() +delete_supplier()
Responsibilities	Collaborator
● List of supplied products ● Information of supplier	Warehouse-officer, Product

Product	
Attribute	Method
-product ID -supplier ID -product name -product price -quantity -availability -brand name -category name	+create_product() -generate_product_ID() +view_product_info() +update_product() +check_availability() +delete_product() +check_price() +get_supplier_info() +add_brand() +add_category()
Responsibilities	Collaborator
● Create new product ● Update a product ● Check availability of a product	Warehouse-officer, Supplier

Report	
Attribute	Method
-report name -report ID -report time -order ID -transaction ID -account ID -product ID	+generate_report() +search() +view_employee_report() +view_order_report() +view_transaction_report() +view_product_report() +view_supplier_report() +get_report(time interval) +print_report() +identify_top_customers() +observe_growth()
Responsibilities	Collaborator
● Generate Transaction report ● Generate Order report ● Generate Employee report ● Generate Product Report ● Search a report ● Print a report	Account, Order, Product, Employee, Transaction, Admin

Salary	
Attribute	Method
-employee ID -monthly salary -bonus -base salary -attendance	-calculate_salary() +input_bonus() +get_salary() +update_base_salary() +update_salary()
Responsibilities	Collaborator
• Calculate salary of an employee • Add bonus • Update the base salary	Employee, Admin, Account

Notification	
Attribute	Method
-OTP -email	+send_OTP() +send_email()
Responsibilities	Collaborator
• Send order status to customer • Send verification codes • Send payment deadline • Send due amount update for an order • Send Invoice of the order • Send Notification via email	Order, Transaction

CRC Diagram

Diagram ID : 1

Name : Admin

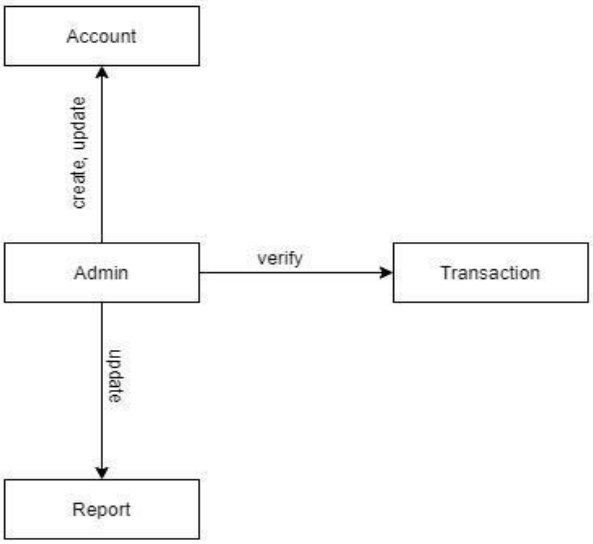


Diagram ID : 2

Name : Account

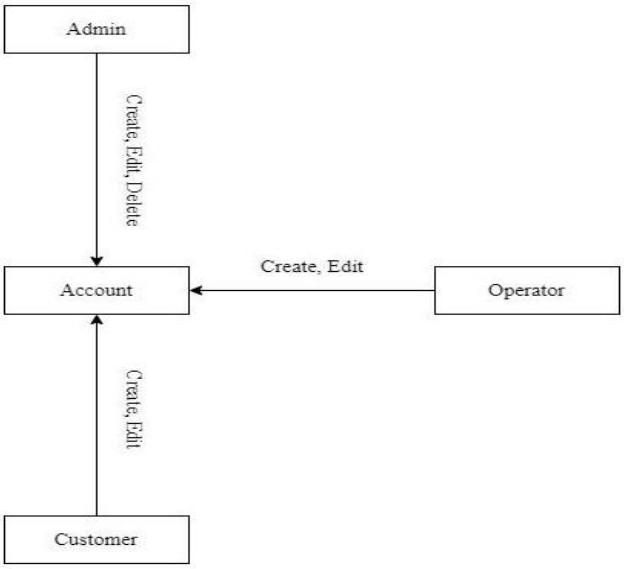


Diagram ID : 3

Name : Employee

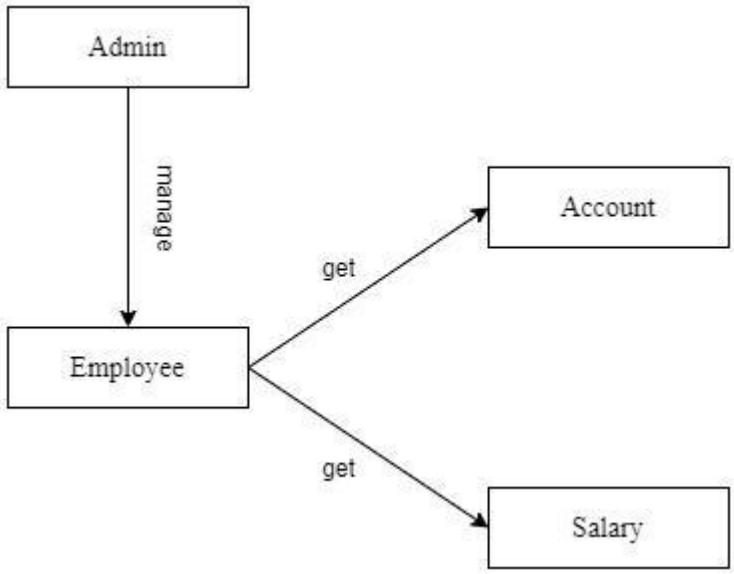


Diagram ID : 4

Name : Operator

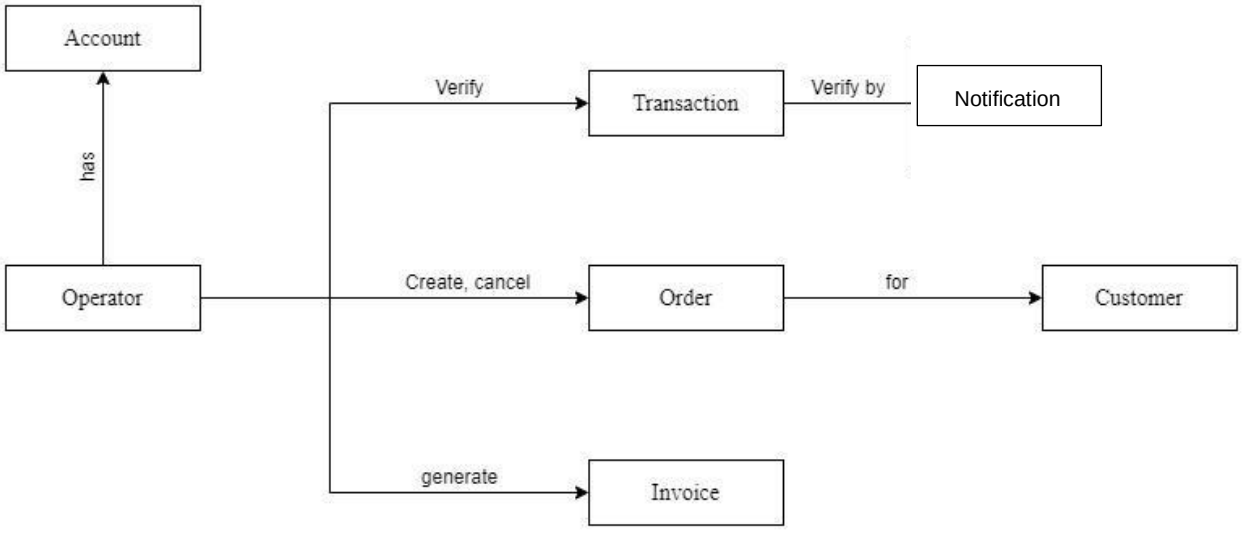


Diagram ID : 5

Name : Warehouse-officer

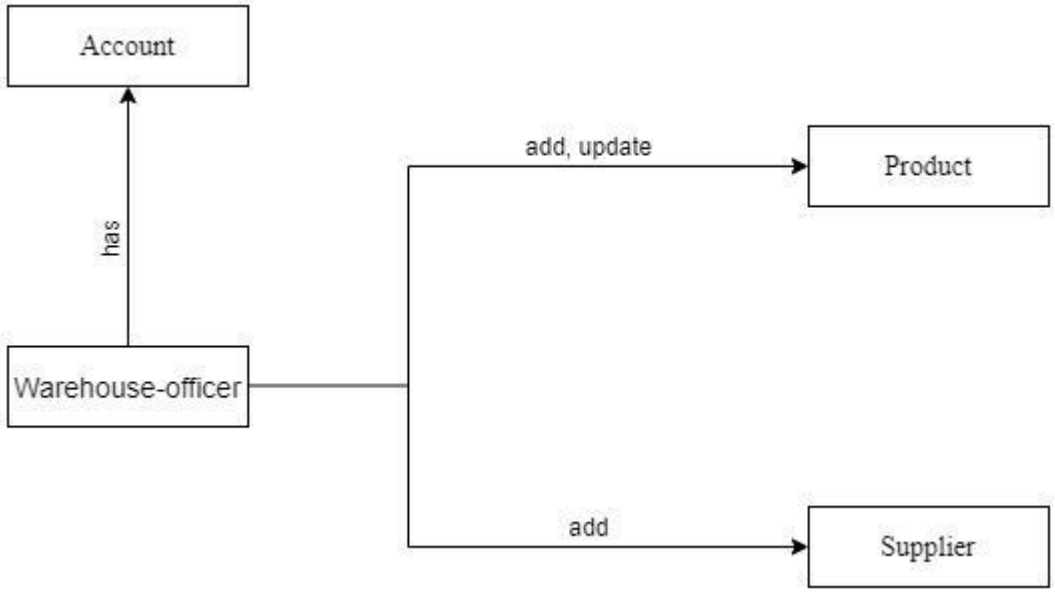


Diagram ID : 6

Name : Customer

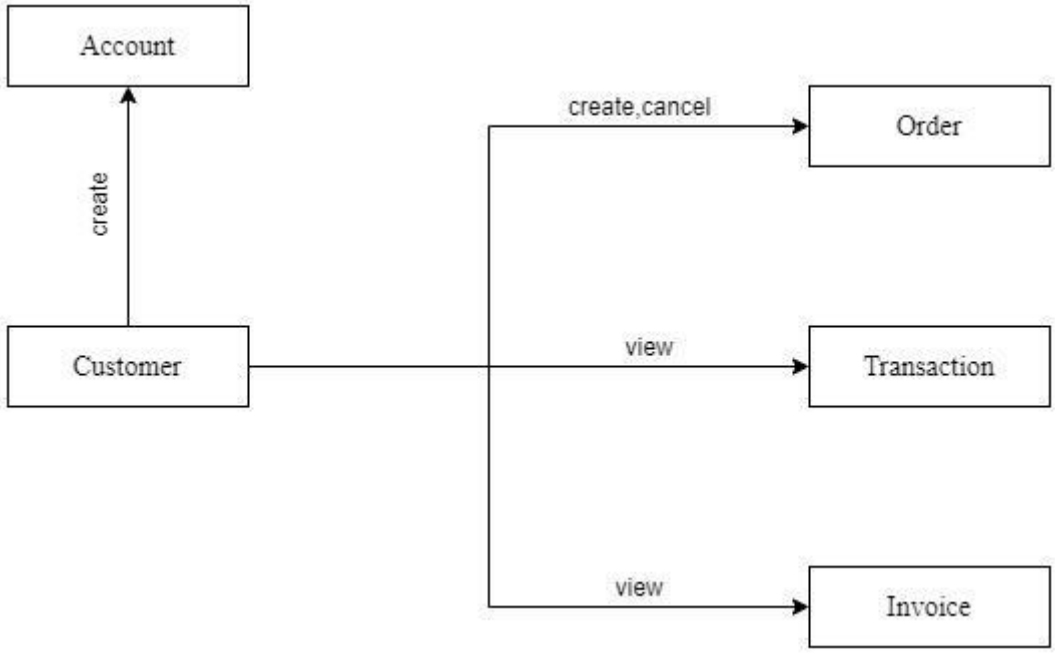


Diagram ID : 7

Name : Order

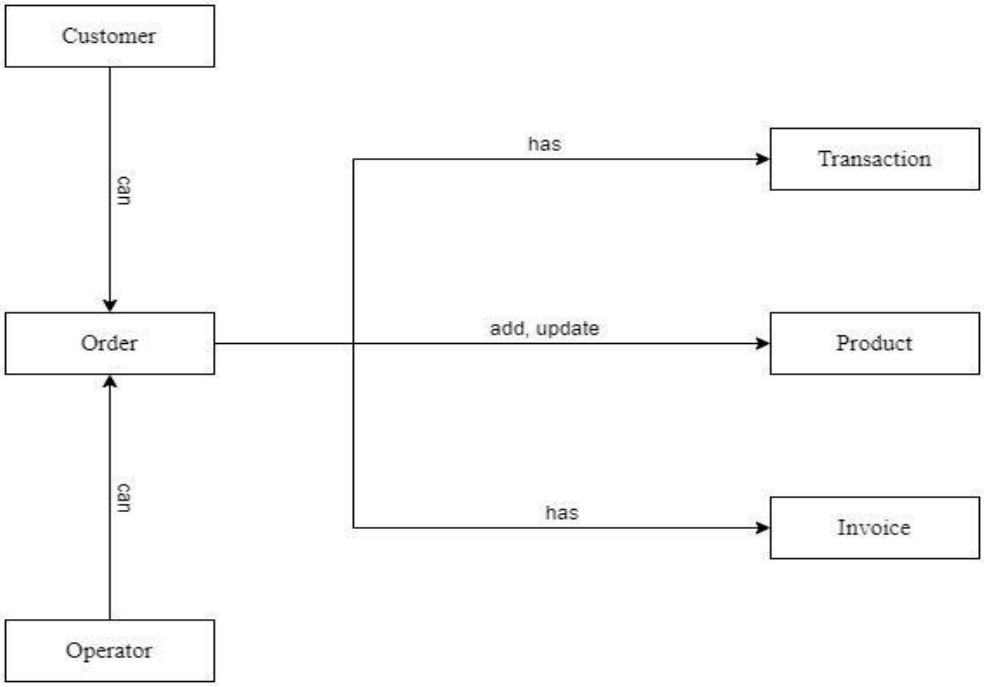


Diagram ID : 8

Name : Invoice

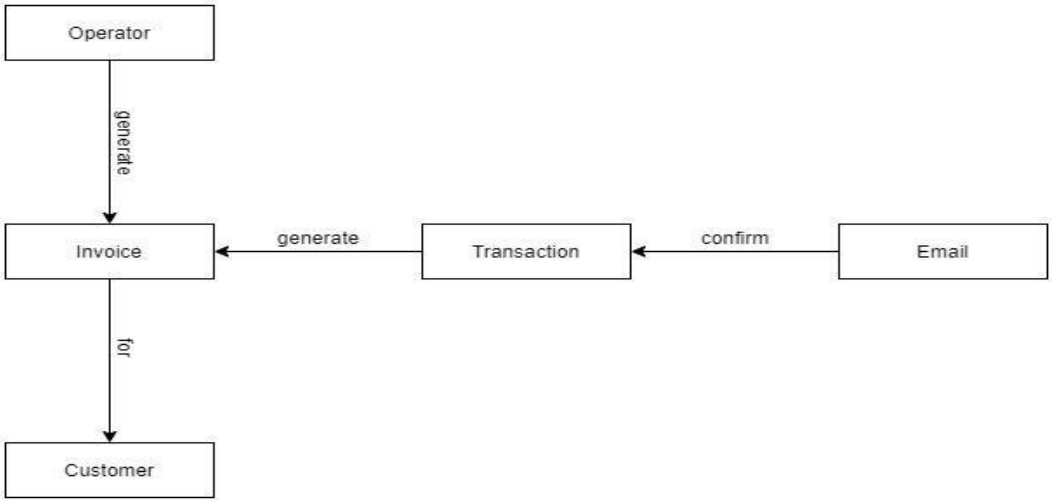


Diagram ID : 9

Name : Transaction

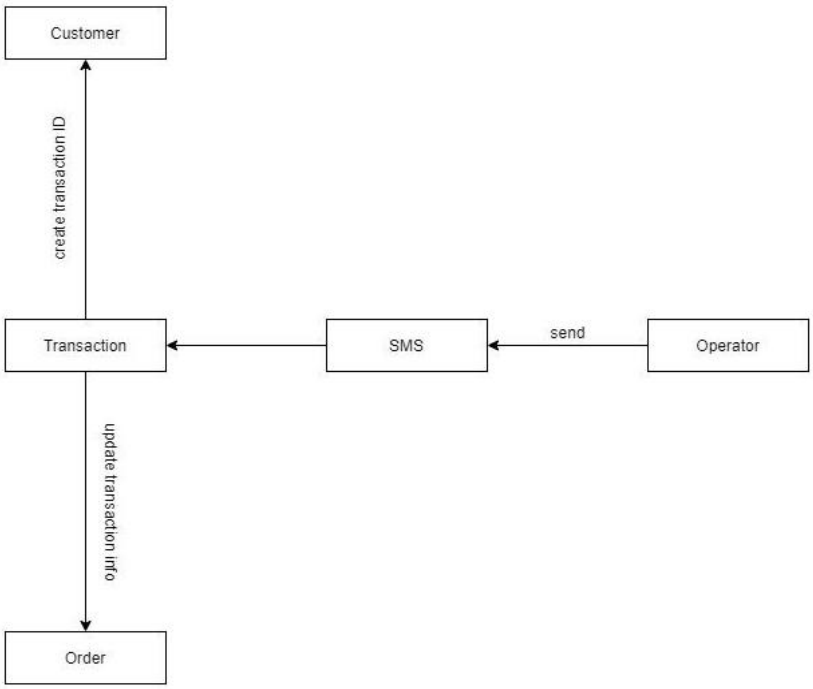


Diagram ID : 10

Name : Supplier

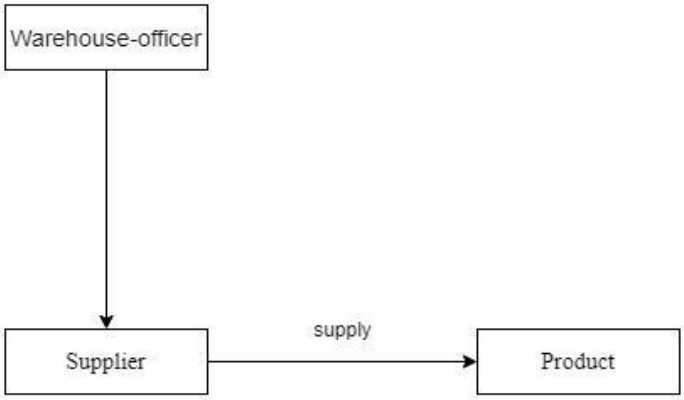


Diagram ID : 11

Name : Product

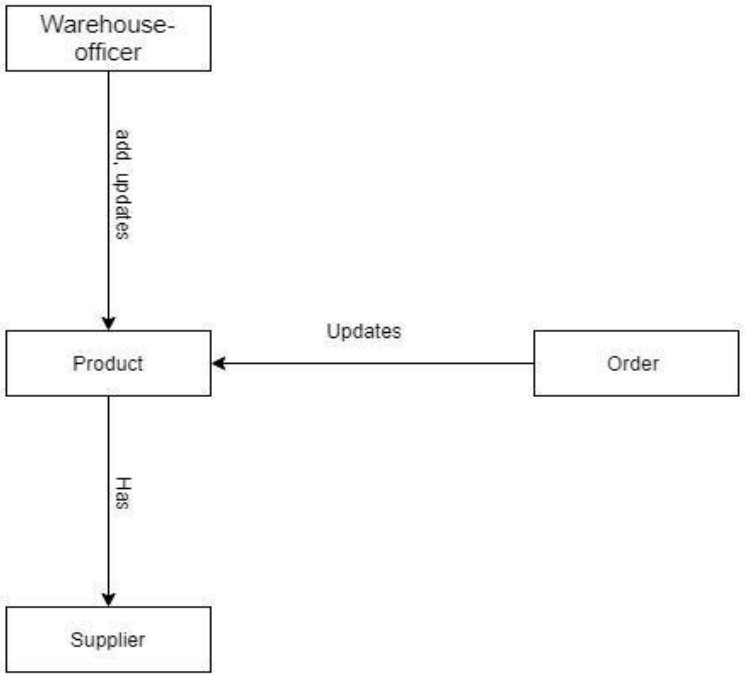


Diagram ID : 12

Name : Report

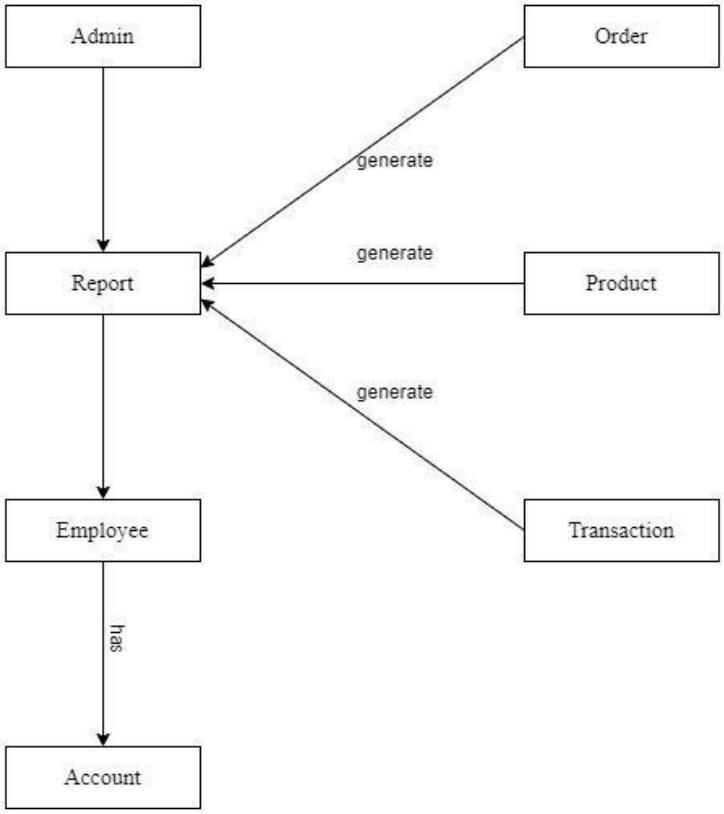


Diagram ID : 13

Name : Salary

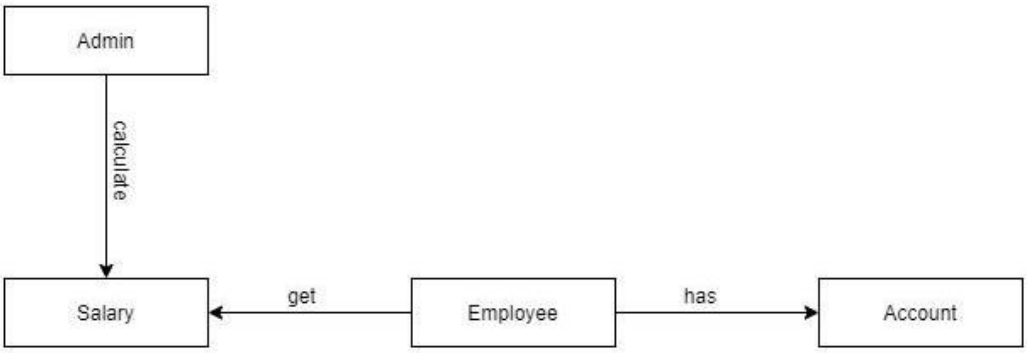
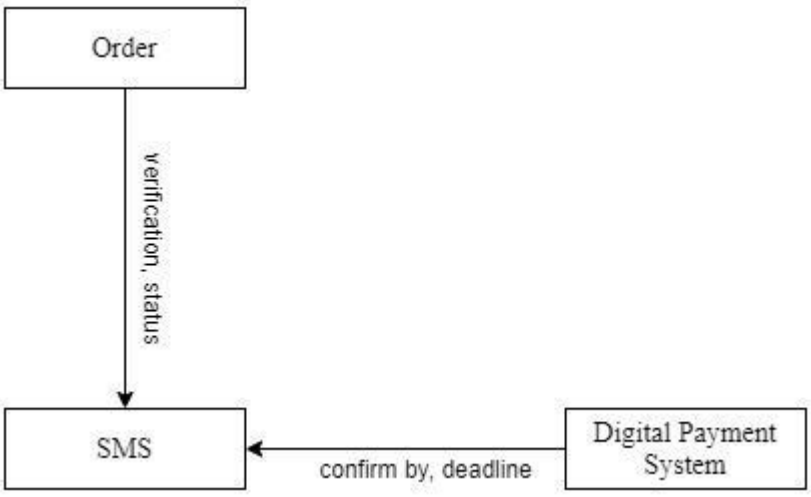


Diagram ID : 14

Name : Notification



Behavioral Modeling

Concept of Behavioral Modeling

The behavioral model indicates how software will respond to external events or stimuli. In the context of behavioral modeling, two different characterizations of states must be considered: (1) the state of each class as the system performs its function and (2) the state of the system as observed from the outside as the system performs its function.

Event Table

SL No.	Event	State Name	Initiate	Collaborator	Associated method
1.	Will create an account	create_account	Customer, Admin, Operator	Employee, Email, SMS	+create_account() +verify_info() +notify_user() +send_confirmation()
2.	Will be able to update information	Update_info	Customer, Employee	Admin, Employee	+update_info() +setFull_ name() +setMobile_ number() +setEmail_ address() +set_permanentAddress() +set_photo()
3.	Will be able to	Recover_password	Admin, Customer,	Notification	+recover_password()

	recover password		Employee		+send_otp() +send_link()
4.	Will create an order	Create_Order	Operator, Customer	Order, Product, Warehouse-officer	+create_order() +select_product() +select_quantity() +send_invoice()
5.	Will add to virtual cart	Add_to_cart	Customer, Operator	Order, Product	+create_order() +add_to_cart()
6.	Generate an invoice	Generate-invoice	Operator	Invoice, Notification	+create_order() +generate_invoice() +print_invoice()
7.	Will make a transaction	Make_transaction	Customer	Transaction, Operator	+make_transaction() +update_order() +generate_invoice()
8.	Will verify a transaction	Verify_transaction	Operator	Notification	+send_otp()
9.	Will receive notification	Receive_notification	Customer	Order, Operator	+send_noti()
10.	Can update an order	Update_order	Customer, Operator	Order, Product, Transaction	+update_order() +make_transaction()
11.	Can add product	Add_product	Warehouse-officer	Product	+add_product()
12.	Can update product	Update_product	Warehouse-officer	Product	+update_product() +update_product_qty()

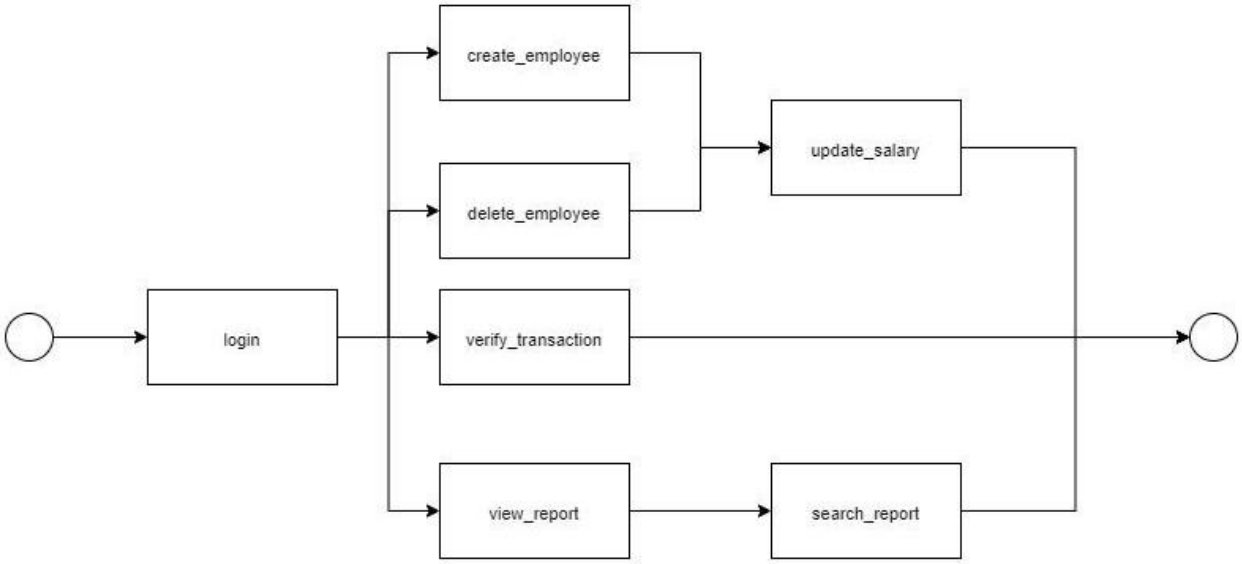
13.	Can add supplier	Add_supplier	Warehouse-officer	Supplier	+add_supplier()
14.	Can update supplier	Update_supplier	Warehouse-officer	Supplier	+update_supplier()
15.	Can update salary	Update_salary	Admin	Employee	+update_salary()
16.	Will view attendance and salary	View_info	Employee	Report	+view_info()
17.	Can view report	View_report	Admin, Employee	Report	+view_report()
18.	Will create backup	Backup_report	Operator, Admin	Report, Order, Employee, Customer Transaction	+backup_customer() +backup_order() +backup_employee() +backup_transaction()
19.	Will search for a report	Search_report	Operator, Admin	Report	+search_report()

State Transition Diagram

One component of a behavioral model is a UML state diagram that represents
active states for each class and the events (triggers) that cause changes between these active states.

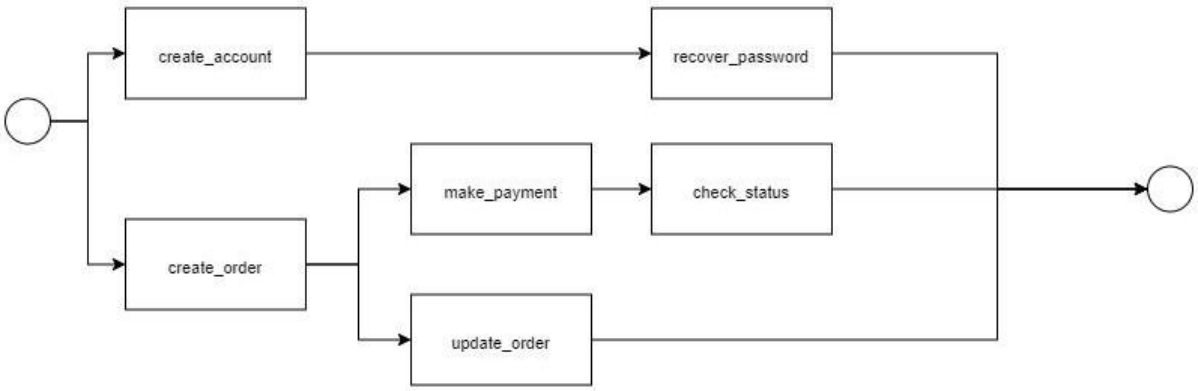
ID: 1

Name : Admin



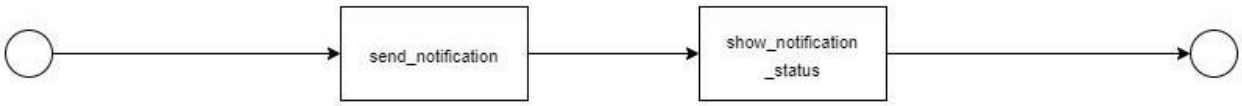
ID: 2

Name : Customer



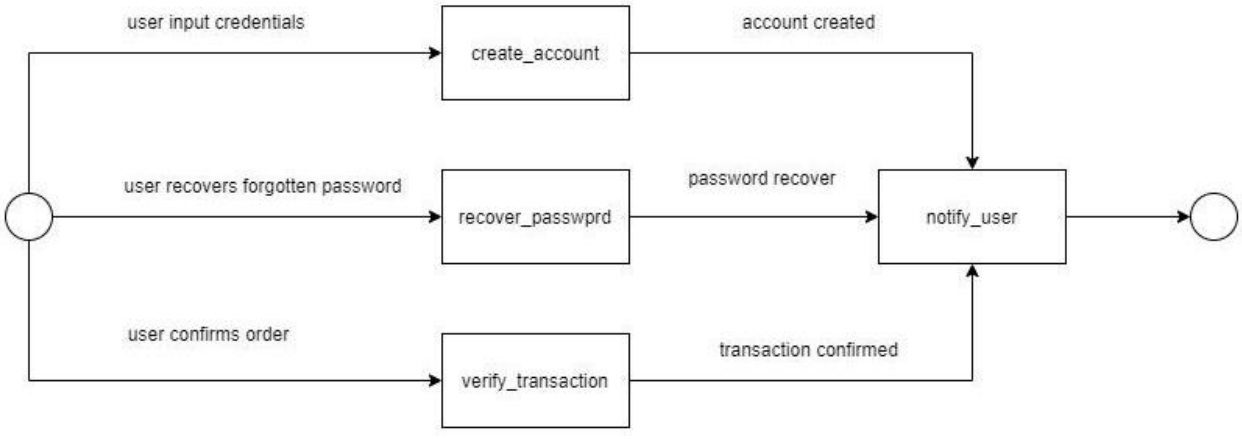
ID: 3

Name : Notification



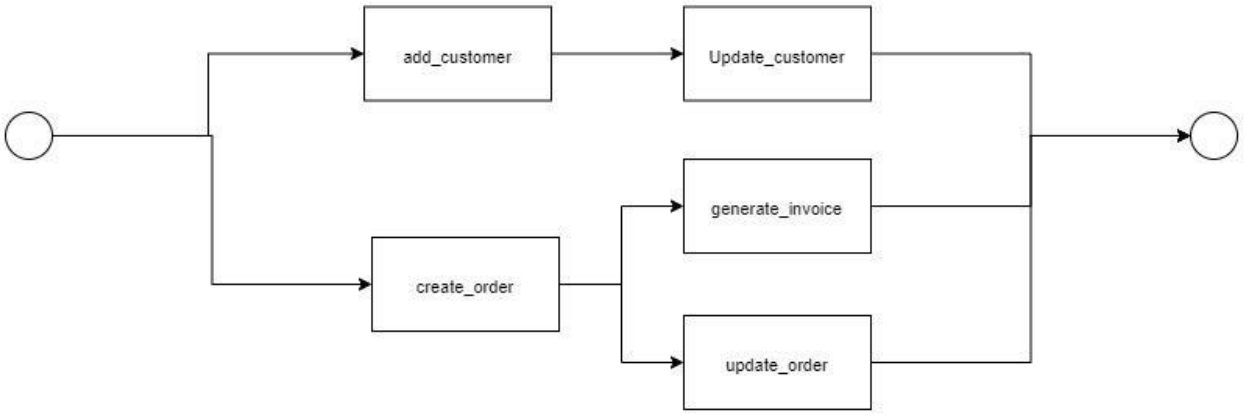
ID: 4

Name : Email/SMS



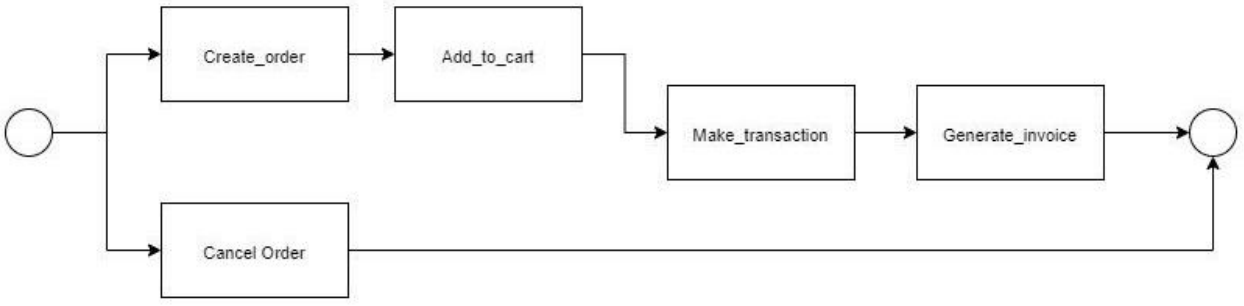
ID: 5

Name : Operator



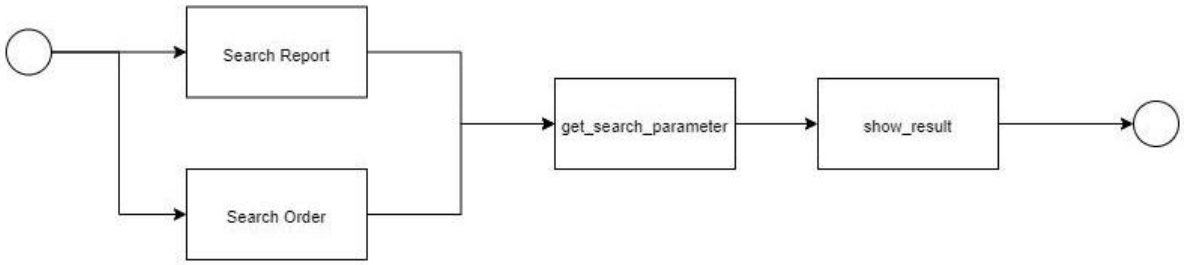
ID: 6

Name : Order



ID: 7

Name : Search

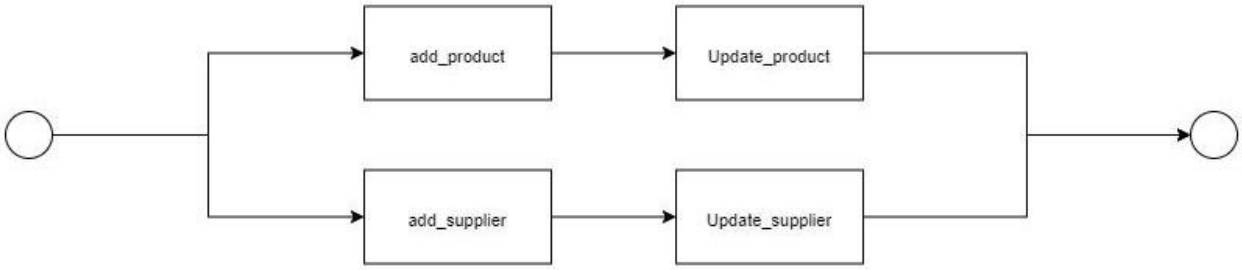


ID: 8

Name : Transaction

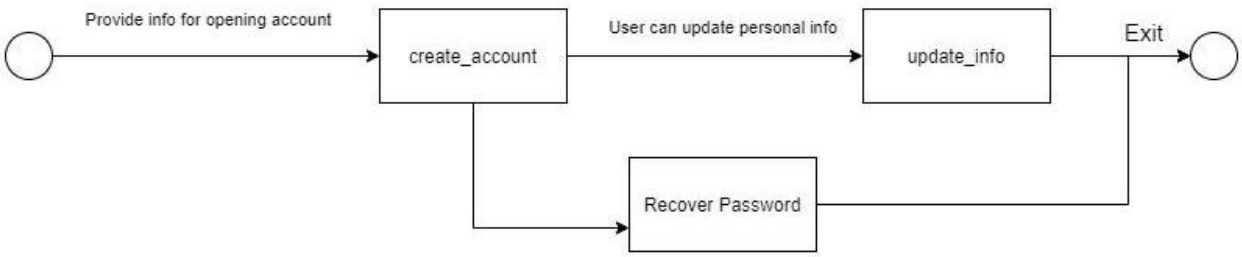
ID: 9

Name : Warehouse Officer



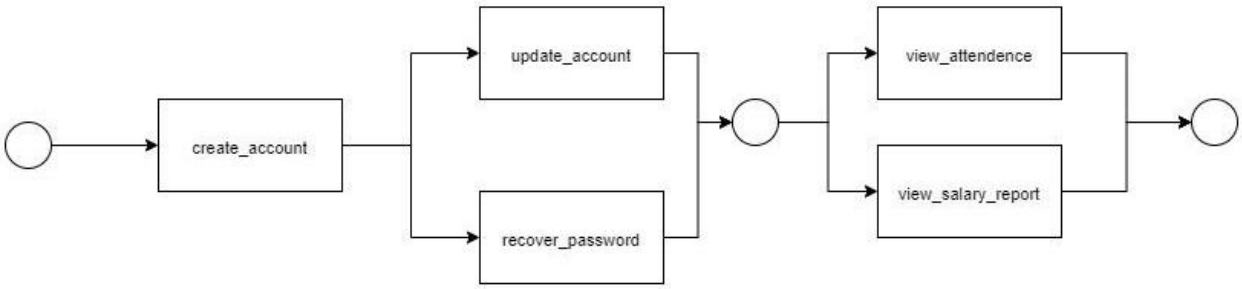
ID: 10

Name : User-account



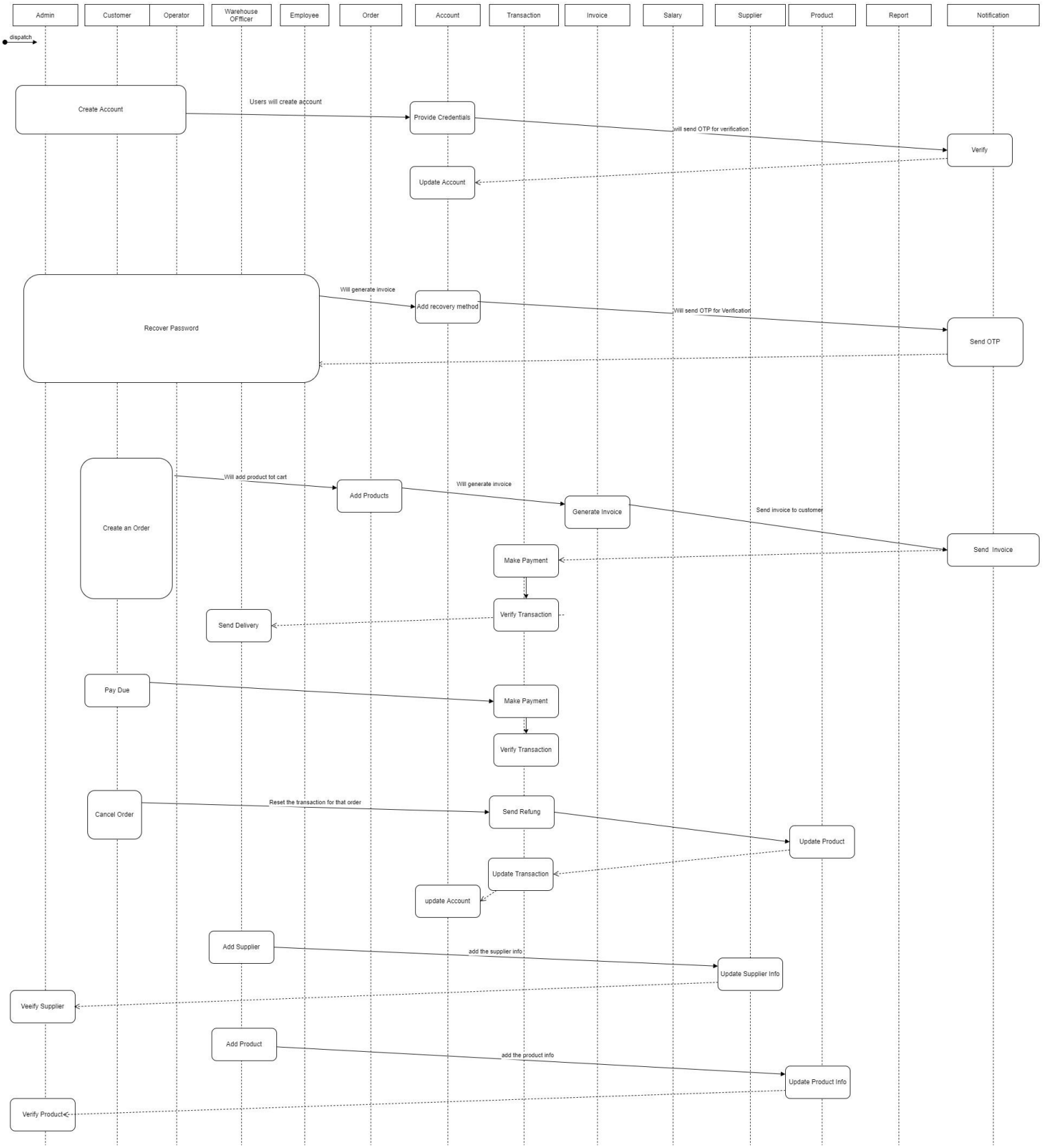
ID: 11

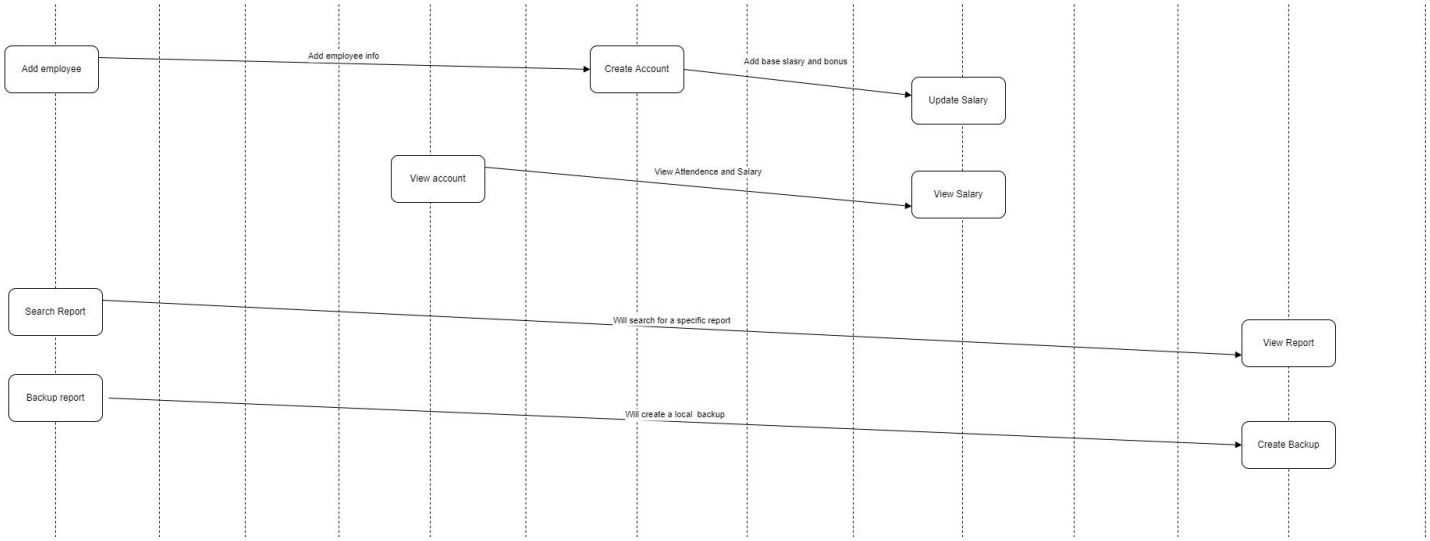
Name : Employee



Sequence Diagram:

A sequence diagram is a Unified Modeling Language (UML) diagram that illustrates the sequence of messages between objects in an interaction


Admin
Customer
Operator
Warehouse OFfficer
Employee
Order
Account
Transaction
Invoice
Salary
Supplier
Product
Report
Notification
dispatch
Create Account
Users will create account
Provide Credentials
will send OTP for verification
Verify
Update Account
Recover Password
Will generate invoice
Add recovery method
Will send OTP for Verification
Send OTP
Create an Order
Will add product tot cart
Add Products
Will generate invoice
Generate Invoice
Send invoice to customer
Send Invoice
Make Payment
Verify Transaction
Send Delivery
Pay Due
Make Payment
Verify Transaction
Cancel Order
Reset the transaction for that order
Send Refung
Update Product
Update Transaction
update Account
Add Supplier
add the supplier info
Update Supplier Info
Veeify Supplier
Add Product
add the product info
Update Product Info
Verify Product


Add employee
Add employee info
Create Account
Add base slasry and bonus
Update Salary
View account
View Attendence and Salary
View Salary
Search Report
Will search for a specific report
View Report
Backup report
Will create a local backup
Create Backup