Institute of Information Technology,
University of Dhaka

Tea Garden Management System
Software Requirement Specification and Analysis(SE-406)

Submitted by

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Introduction

This document is a part of our Software Requirement Specification(SRS) for the project “Tea Garden Management System” . In this project, we tried to make a documentation of a Tea Factory. We tried to make this insightful and understandable for our intended audiences

Purpose

This document briefly describes the Software Requirement Analysis of Tea Garden 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

1. This SRS report is intended for several audiences including the users(Employee) , admin, project managers, developers and testers.

2. The users and admin will use this SRS to verify that the developer team has created a product that is acceptable to the customer.

3. 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.

4. 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.

5. 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.

6. 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.

Story Behind Tea Garden Management System

This assignment is a part of our software requirement specification for the project "Tea Factory Supply Chain Management".

Supply chain management is the management of the flow of goods and services and includes all processes that transform raw materials into final products. It involves the active streamlining of a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace. There are 5 participants in every supply chain:

1. Supplier

2. Manufacture

3. Distributor

4. Retailer

5. Consumer

Tea has fully immersed itself into Bengali culture, and as a result, it is largely associated with Bangladesh. In this project, we are working on “Sultan Tea Factory” which is the brand name of processed tea of Green Field Tea industry. This is the first tea processing factory in Thakurgaon .

The supply chain process of tea leaves has 8 stages of production: growing, picking, withering, rolling, fermenting, drying, blending and packing. The whole supply chain is then developed further with transportation and retailers to help provide customers worldwide with this essential product.

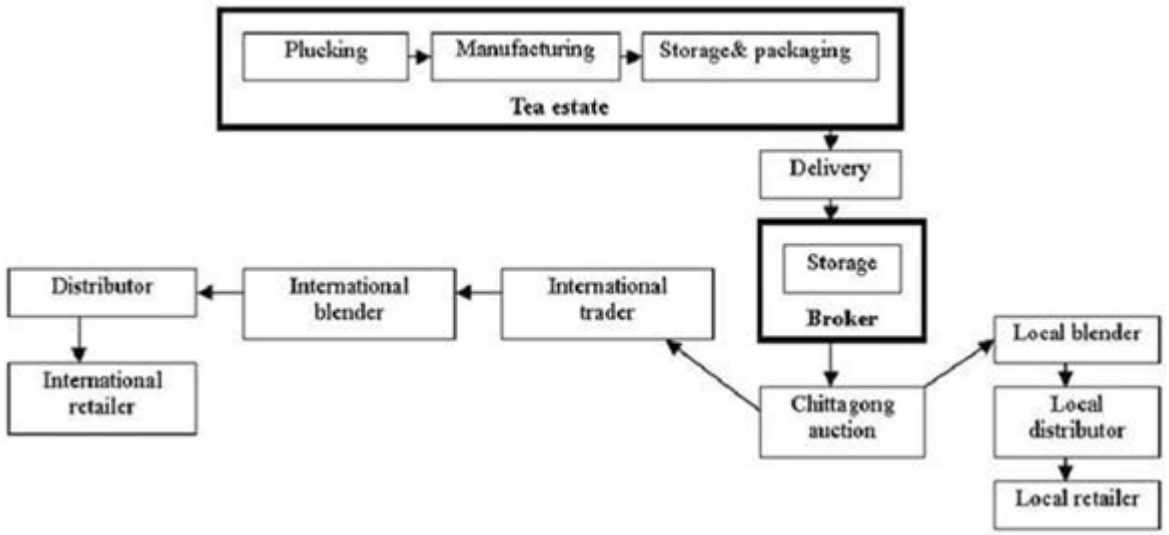


Figure: Basic supply chain of Tea

“Green Field Tea Industry” is located in Thakurgaon .This Factory produces approximately 6 lakhs kg tea every year. “Green Field Tea Industry office is run by MD, Manager, Assistant manager, Admin, Accountant, Leaf manager. In the weathering sector, there are 20 laborers and 4 staff. In the manufacturing sector, there are 15 lab workers and 13 staff. “Green Field Tea Industry” office

has 4 accountants, 1 admin,1 manager,2 office assistants, 4 Leaf manager and 2 electronics engineers .

Tea plants need almost 2 years to grow for plucking. Then tea leaves can be plucked from plants every 14 days. Normally, tea leaves can be plucked from March-December as tea leaves don't grow in winter.

"Green Field Tea Industry owns a tea garden near Bangladesh-India border which is almost 90 acres in area. The tea garden produces almost 20% of the total tea leaves demand for the "Green Field Tea Industry". Approximately 40 laborers work in the Tea garden. For the remaining 80% demand of tea leaves, "Green Field Tea Industry" contracts with 100 farmers who have proper lands for tea farming. They give them loans with zero interest and training on tea plantations. After 2 years , tea plants grow enough to produce tea leaves. Then the "Green Field Tea Industry" gets tea leaves and reduces the farmers' loan by 10% .

Factory employees transport tea leaves to the "Green Field Tea Industry" by 4 mini trucks. It takes almost 15-18 hours to process tea leaves into tea liquor . 6 kg of tea leaves are needed for 1 kg tea liquor. Tea Liquor then goes to the package unit, where 6 efficient people categorize tea into different brands according to the teas' quality. Among them, "Sultan Tea" is the premium brand of tea. Then comes "Shahbaz Sultan Tea" and "Nagor Valley Tea" in terms of quality.

"Green Field Tea Industry" has their own distribution center which is situated beside their factory. The distribution center keeps 15% of their best tea liquor to themselves and rebrands them as "Sultan Tea". The remaining 85% of the tea are sent to the "Chittagong auction" where 7 brokerage companies test the quality of tea and set a minimum price for them. Then different tea brands bid for the tea and the highest bidder gets the tea for sale.

Among all the teas which are rebranded as "Sultan Tea" are sold by "Green Field Tea Industry". Approximately "Green Field Tea Industry" sells 700 kg of tea daily.500 kgs of tea are sold to different parts of the country such as Chittagong, Dinajpur, Narayanganj .They are sold through middle man . 200 kgs of tea are sold in Thakurgaon via 11 sales representatives to retailers who sell

them to different stores in Thakurgaon and thus these teas reach their customers.

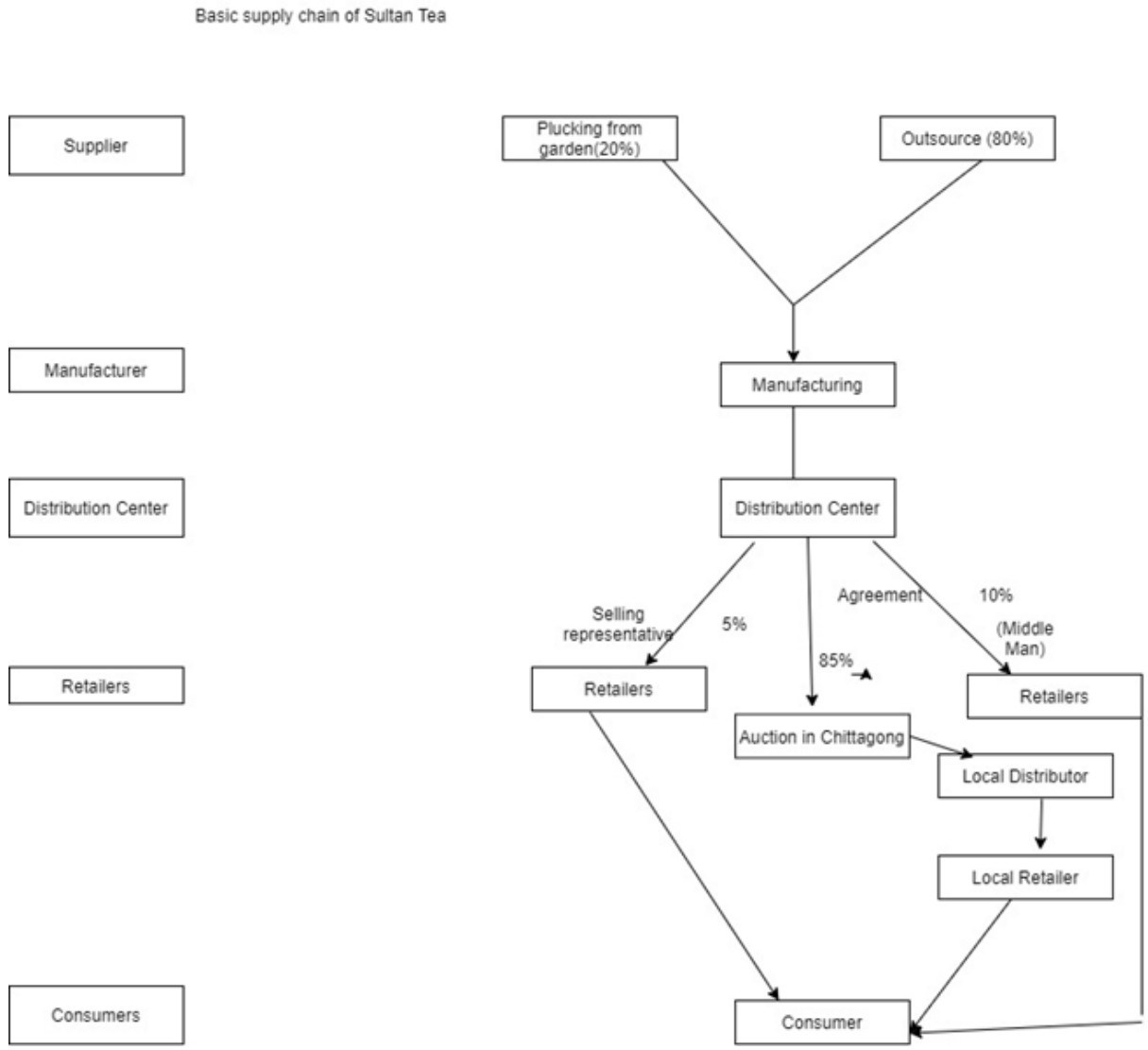


Figure: Basic supply chain of Sultan Tea Garden

"Green Field Tea Industry" is licensed by "Bangladesh Tea Board". So, if they sell "Sultan Tea" they have to give 18% vat on the sale and they have to give 15% vat if they sell tea which they buy back from Chittagong Auction.

Elicitation of Tea Garden Management System

Quality Function Deployment

Quality Function Deployment (QFD) is a technique that translates the needs of the customer into technical requirements for software. Ultimately the goal of QFD is to translate subjective quality criteria into objective ones that can be quantified and measured and which can then be used to design and manufacture the product. It is a methodology that concentrates on maximizing customer satisfaction from the software engineering process. So, we have followed this methodology to identify the requirements for the project. The requirements, which are given below, are identified successfully by the QFD.

Normal requirements :

Normal requirements are generally the objectives and goals that are stated for a product or system during meetings with the customer. The presence of these requirements fulfills customers' satisfaction. These are the normal requirements for our project.

1. Users (Farmers, Accountants, Factory Workers, Salespersons) will create an account providing information such as contact number, name, NID number.
2. A predefined account will be given to the system admin.
3. Admin will categorize users into 4 divisions (Farmers, Employees, Factory Workers, salesperson).
4. Farmers will have a loan section where they can see how much loan is remaining.
5. Employees will receive their salary, bonus in their contact number.
6. Factory workers' profiles will have NID, contact, salary.
7. Salespersons' profile will have name, NID, area which he will work on, sales target.
8. Admin will give employees salary to contact numbers by mobile banking.
9. System will add/remove farmers, accountants ,employee workers ,sales person

10. System will manage farmers' loans .Loans will be decreased after each installation of leaves plucking.

Expected Requirements:

These requirements are intrinsic to the system and may be so elementary that the user does not explicitly state them. Their absence will be a cause for significant dissatisfaction. Below the expected requirements for our project are briefly described:

- Making the system secure.
- Recording transaction history among farmers, employees, and salesperson6.
- In-transit status update.
- Leaf collecting scheduling.
- Interactive and attractive user interface.

Exciting Requirements :

These requirements are for features that go beyond the user's expectations and prove to be very satisfying when present. Following are some exciting requirements of our project:

- Visual supply chain map by keeping tracking of progress using gps.
- Using Barcode/QR code to maintain uniqueness of transactions.
- Top salesperson will get featured and they will get commission on sales.
- Cloud deployment system.

Usage Scenario

Tea garden management system

Tea has fully immersed itself into Bengali culture, and as a result, it is largely associated with Bangladesh. A tea factory has many aspects, such as tea garden, loan management system, payroll of employees, warehouse

management, transportation, and sales representatives .To run all of these features properly ,a tea garden management system is needed.

1.Account Management

Create account

User Perspective : A tea garden has different types of workers. They are employees, farmers ,and outsource workers. For every worker, they have to create an account.Users who are not registered are labelled as non-registered employees. To create the account he/she needs to provide the following information to create an account-

1. Full name
2. Mobile number
3. NID number
4. Employee ID number

After providing the information, an admin will manually verify these data and will send a confirmation code to the provided mobile number. By inputting this code, an account will be created.
Admin Perspective:
An account for the administrator will be given to the Tea Garden Management with a predefined username and password.

Update Account:

Users can update user's profile. He/she can change the user's following information-

- Mobile number
- Password

Admin can also delete a user's account.

Password Recovery:

A user can recover his/her password if forgotten, by using his/her mobile phone number. User can click on the "Forget Password" Button and choose "Recover Through Mobile Number"

Through Mobile: An OTP will also be sent to the user's mobile number if a user clicks on the "Recover Through Mobile" button. The user will have to input the OTP within 1 minute and then he/she will have to input a new password. His/her password will be updated in the Database.

Log in :

A user can log into the system by using his/her registered phone number and password.

2. Loan management

Users can apply for loans. To apply they have to provide the following documents -

- Full name
- Mobile number
- NID (photocopy)
- Employee ID (photocopy)
- Bank Statements

Loans will be provided after verifying all the documents submitted by the users. Garden managers will verify the loan application of the farmers.Admin will then upload the verified farmers information in the database.
When the company purchases products from users having loans to repay, the purchase cost will be deducted by a particular amount from the loan agreement. That amount would be considered as repayment of the loan money. After each partial repayment, the admin will update the user's status and an automated sms will be sent to the user about the repayment containing the amount , date, time, and current status.
Initially the admin will add the users' information to the "Current Loan" list. After the completion of the repayment, the admin will move users from "Current Loan" list to "Completed Loan" list.
Users can view their loan status in the "Loan Management" section. Admin can update the users' status.

Current loan:

Users yet to complete their repayment can find themselves in the “Current Loan” list. They can view all their loan information by selecting their names on the list.

Completed loan:

Users who completed their repayment can find themselves in the “Completed Loan” list. They can view all their loan information by selecting their names on the list. Users who completed their loan can also apply for further loan with the same process.

Failed Loan:

If a user fails to pay his installment, he will get extra time for his payment. If a user can't pay even then, the tea factory will sue him for the failed payment.

3. Payroll management

Employees:

Employees will get their salary at the end of a month according to their employee ID and money will be sent to their mobile number via mobile banking. Employees will get notified by text message on their mobile phone about salary and bonus. Employees sign a contract at the time of agreement.
Employees get 2 bonuses on two Eid Holidays.
They get 100% of their monthly salary as a bonus.

Employees can be divided into 4 parts:

There are 4 grades according to their employee status. They are:
Non-managerial employees, First line Managers, Middle Managers, Top Managers. When an employee wants an increment he will go into negotiation with top management and they will agree on an incremented salary.

Sales Representative(SR):

Sales representatives will have a sales target, phone number, employee ID in their profile.

Sales representatives will have a set target, which they will be notified of and if they can't sell 60% of the tea packet of their target, they will be alerted through a text message on their phone. They will also get commission if they can fulfill their target and sell an extra amount. They will be notified in their phone number and 10% of their salary will be added to their salary .

4. Warehouse Management

Info about incoming products:

System will input the count of the incoming tea packets. The tea garden factory has 3 types of tea liquor. They are: Sultan tea, Nagar Valley tea and Shahbag Sultan Tea. Sultan tea is for hotels , Shahbag Sultan tea is for orders and Nagar Valley tea is for tongs and various tea stalls. By this, he/she will be able to track which item is going to be stocked out or which item is abundantly stocked.

Info about outgoing products:

After every order is confirmed (Online/Offline) by SR's, the amount of stored inventory will be updated and the number of items confirmed will be deducted from the availability count. If an order is canceled, the availability of the inventory items will also be updated. System will update counts everyday and the admin will make a report including tea liquor types and how much tea packets are produced .

By using that data, the warehouse management part of the software will predict how much product can be ordered next month. Admin will input the count of inventory turnover throughout the year .Software will keep track of the inventory deviations.

5. Transportation

From tea garden to factory:

Garden manager manages the farmers and all other workers. He will approve the loan application of the farmers. He makes leaf production reports and workers daily reports. He will send the reports to the admin.

Farmers will collect tea leaves from the tea garden. After collecting, the garden manager will inform the transportation manager to send a driver. Manager can view the current location of all drivers using GPS. Then the manager will send the driver whom he wants to. Tea leaves are taken by truck drivers from the tea garden to the factory for manufacturing. After measurement, the amount of tea leaves will be stored in a database by admin.

From factory to selling representatives:

SRs will contact the warehouse admin to deliver products . Admin will send manufactured products via truck to SRs, according to the location of them and amount they want. Admin will store the amount of products that are sent to SR, after the delivery is confirmed by the driver.

6. Database

Employees' information will be stored in the database. If an employee updates his/her info, it will be updated in the database automatically. The quantity of tea leaves and the number of products will be stored in the Database. Even the amount of inventory with their category will be stored in the Database and it will be updated after every order fulfillment.

Every order from the SR's will be stored distinctly in the database which will include order date, liquor type, order quantity. Admin will be able to see the sum of the inventory amount stored and deducted from the warehouse. After every order fulfillment, the transaction detail will be added to the Database.

Farmers' information will also be stored here and the amount of loan granted for the farmers will also be stored. After every shipment of tea leaves from the farmers, the amount of remaining loan will also be updated then.

7. Additional features

1. Machine learning based forecasting :By using information from databases and analyzing those live data with applying machine learning algorithms, the software will predict future demand. It also calculates the profit rate, Parts per Million defectives(PPM) of each type of tea liquor.

2. After applying the algorithm, software will show a value stream mapping for the whole company for the whole year. Value-stream mapping, also known as "material- and information-flow mapping" ,is a lean-management method for analyzing the current state and designing a future state for the series of events that take a product or service from the beginning of the specific process until it reaches the customer.

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 the 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 the overall system.

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

Level-0 :

Name: TGMS
Primary Actor: Employee, Farmer, Sales Representatives, Admin, Driver
Secondary Actor: GPS, SMS, Mobile Banking,UI

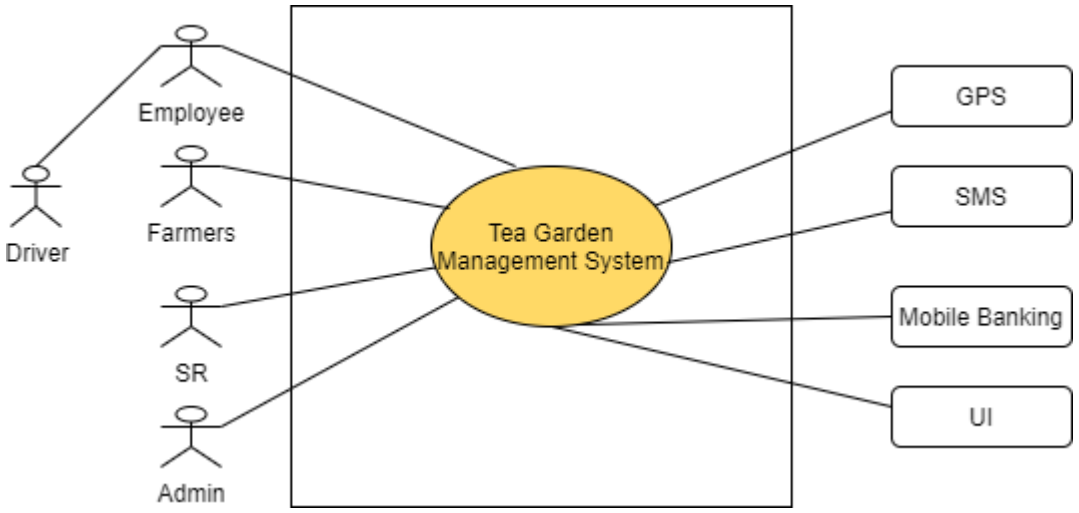


Figure : Use case Diagram of Level-0

Level-1 :

Name: TGMS
Primary Actor: Employee,Farmers,Sales Representative,Admin,Driver
Secondary Actor: GPS,SMS,Mobile Banking

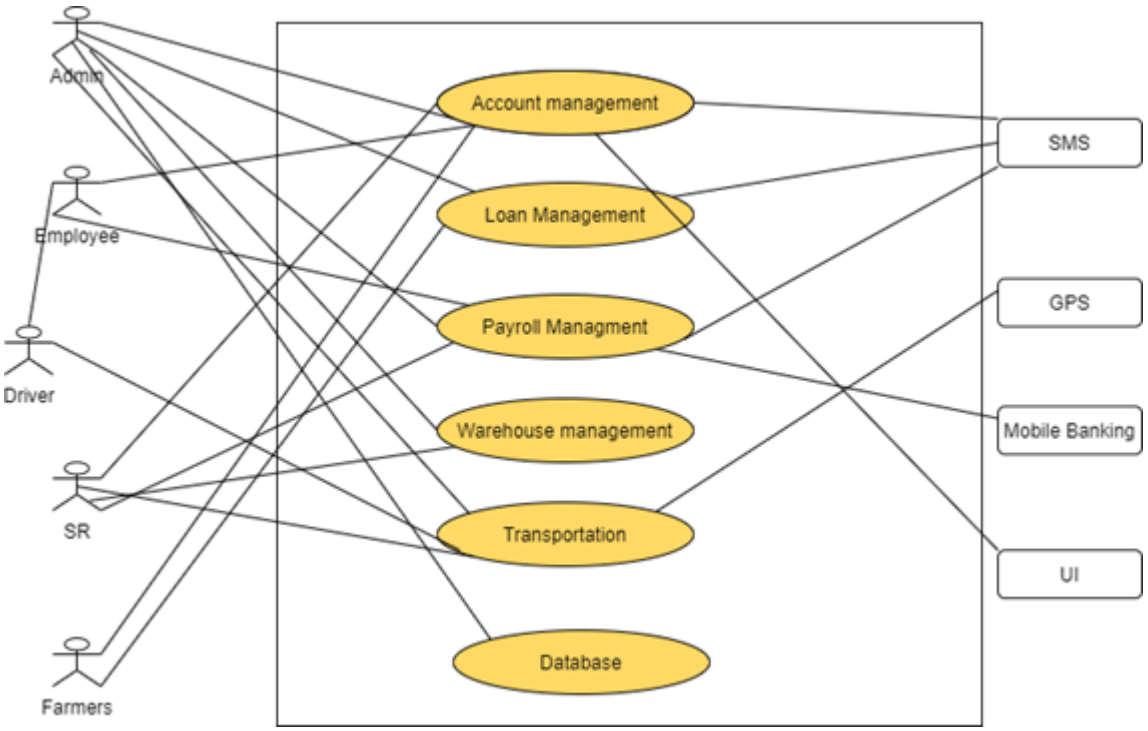


Figure : Use case Diagram of Level-1

Description of use case diagram level-1:

1. Account management: Users must create an account and then log into the system. He/she can update his/her profile, also can recover his password if forgotten. Admin will verify his/her provided credentials.

2. Loan Management: Farmers will apply for loans after giving their information, Admin will verify them and farmers will be categorized into 3 divisions.

3. Payroll Management: Employees will get their salary by mobile banking. SRs will get salary and commission ,also may get warning.

4. Warehouse Management: There will be info about incoming and outgoing products and the admin will make reports about it daily.

5. Transportation: There will be 2 types of transportation:

1. Farmer to factory
2. Factory to SRs.

6. Database: Employees' information, farmers' information, SR and products' information will be stored in the database.

Level 1.1:

Name: Account Management
Primary Actor: Employee, Farmer, Sales Representatives, Admin ,Driver
Secondary Actor: UI,SMS

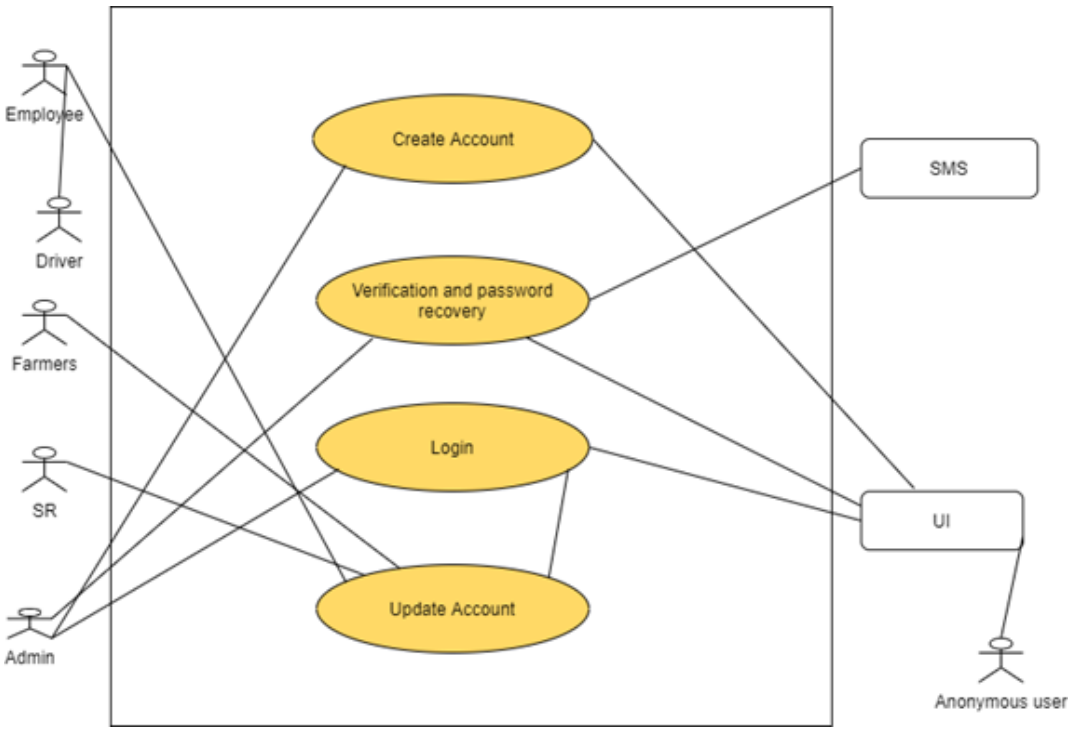


Figure : Use case Diagram of Level-1.1

Description of use case diagram level-1.1:

Create account : To create an account, users must provide following credentials: full name, mobile number, password, employee ID,NID Number. Admin will verify and send a confirmation code to the provided mobile number. By inputting this code, an account will be created.

Verification: Admin will verify the user's credentials and send him a code.

Update account: Users can update his/her mobile number, password .

Password recovery: A user can recover his/her password if forgotten, by using his/her phone number.

Log in: Users will log into the system by using his/her registered phone number and password.

Level 1.2:

Name: Loan Management
Primary Actor: Farmer, Admin
Secondary Actor: SMS

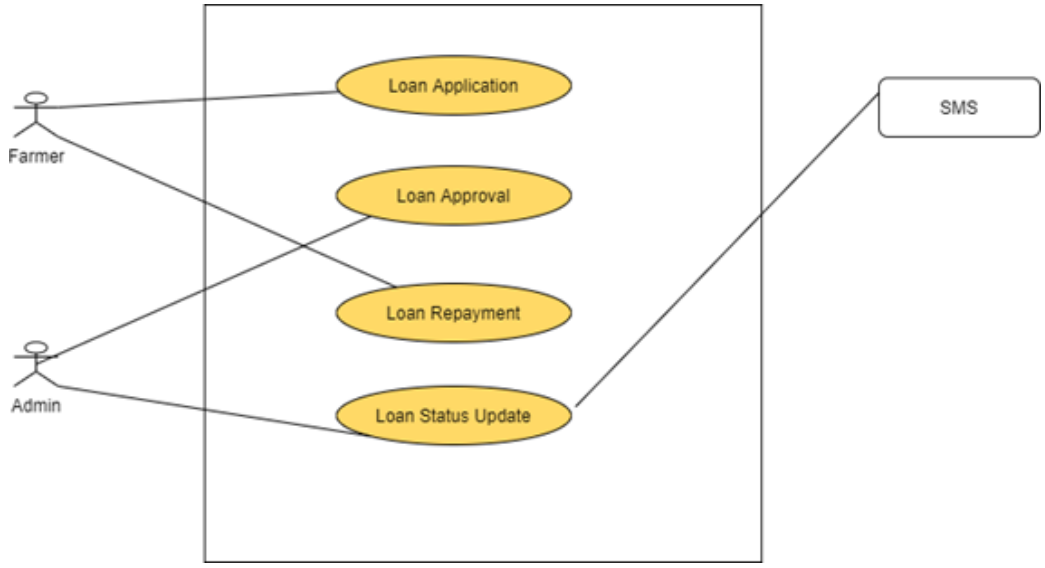


Figure : Use case Diagram of Level-1.2

Description of use case diagram level-1.2:

Loan Application: Users can apply for loans. To apply they have to provide the following documents: Full name, Mobile number ,NID (photocopy),Employee ID (photocopy), Bank Statements.

Loan Approval: Loans will be provided after verifying all the documents submitted by the users. Admin will then upload the information in the database.

Loan Repayment: When the company will purchase products from users having loans to repay, the purchase cost will be deducted by a particular amount from the loan agreement. That amount would be considered as repayment of the loan money.

Loan Status: Initially admin will add the users' information to the "Current Loan" list. After the completion of the repayment, the admin will move users from "Current Loan" list to "Completed Loan" list.

Level 1.3:

Name: Payroll Management
Primary Actor: Employee, Admin, SR
Secondary Actor: SMS, Mobile Banking

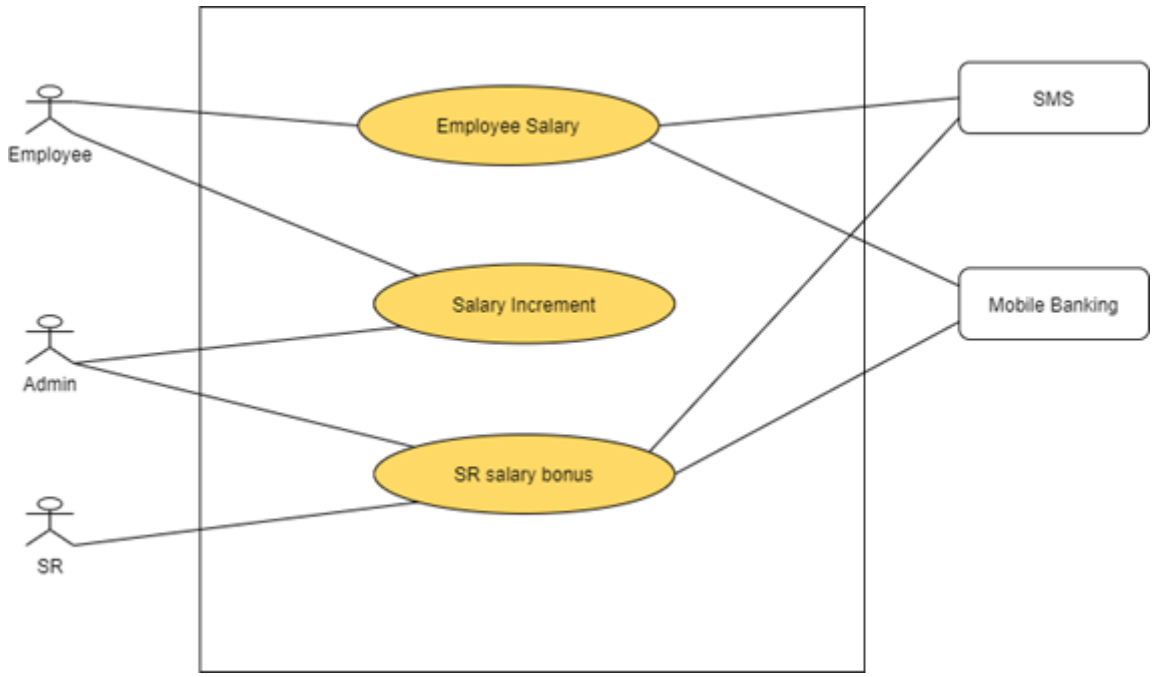


Figure : Use case Diagram of Level-1.3

Description of use case diagram Level-1.3:

Employee Salary: Employees will get their salary at the end of a month according to their employee ID and money will be sent to their mobile number via mobile banking.

Salary Increment: When an employee wants an increment he will go into negotiation with top management and they will agree on an incremented salary.

SR Salary Bonus: Sales representatives will have a set target, which they will be notified and if they can't sell 60% tea packet of their target, they will be alerted through a text message on their phone. They will also get commission if they can fulfill their target and sell an extra amount.

Level 1.4:

Name: Warehouse Management
Primary Actor: Admin, Sales Representative

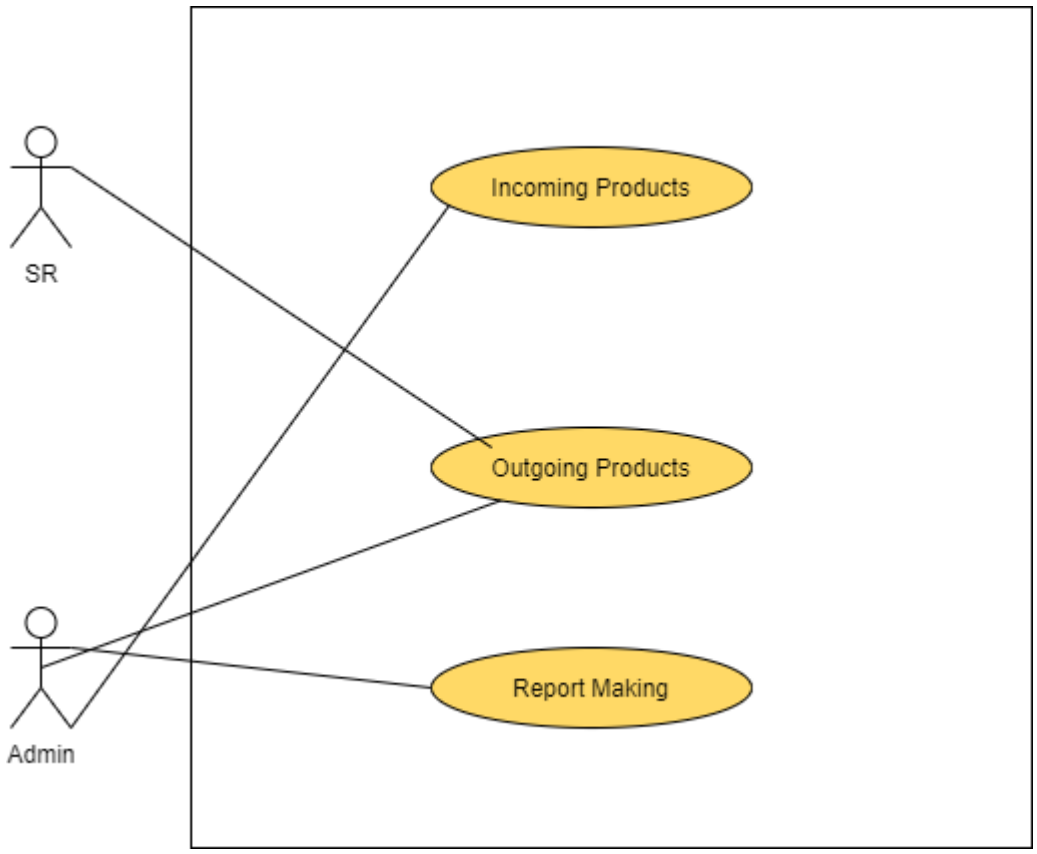


Figure : Use case Diagram of Level-1.4

Description of use case diagram level-1.4:

Incoming products: Input the count of the incoming tea packets of different kinds.

Outgoing products: Input information about outgoing products sold by SRs.

Report Making: Admin will make a daily report on sales and the software will predict how much product can be ordered in next month.

Level 1.5:

Name: Transportation
Primary Actor: Driver, Admin, Sales Representative
Secondary Actor: GPS

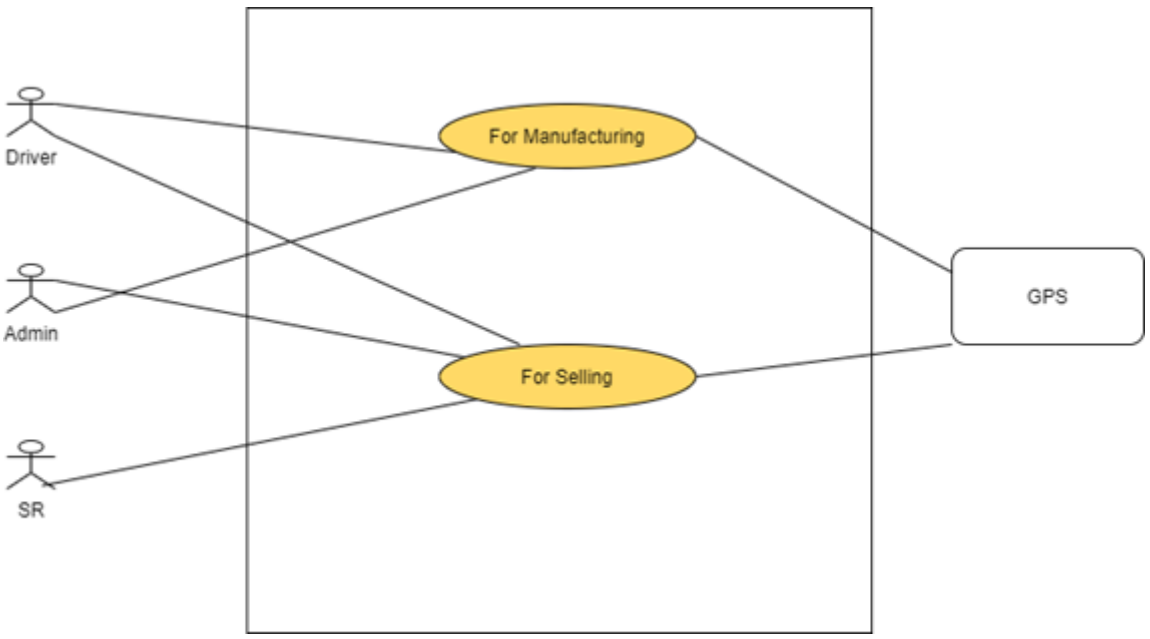


Figure : Use case Diagram of Level-1.5

Description of use case diagram level-1.5:

For manufacturing: Tea leaves are taken by truck drivers from the tea garden to the factory for manufacturing.

For selling: SRs will contact Admin for product and Admin will store the amount of products that are sent to SR.

Level 1.6

Name: Database

Primary Actor: Admin

Figure : Use case Diagram of Level-1.6

Description of use case diagram level-1.6 :

Transaction Management: Every order from the SR's will be stored distinctly in the database which will include order date, liquor type, order quantity.

Storing Employee Info: Employees' information will be stored in the database. If an employee updates his/her info, it will be updated in the database automatically.

Storing Loan Info: The amount of loan granted for the farmers will also be stored . After every shipment of tea leaves from the farmers, the amount of remaining loan will also be updated then.

Storing Farmers' Info: Farmers' information will also be stored here and the amount of loan granted for the farmers will also be stored.

Storing Warehouse Data: The quantity of tea leaves and the number of products will be stored in the Database. Even the amount of inventory with their category will be stored in the Database and it will be updated after every order fulfillment. Every order from the SR's will be stored distinctly in the database which will include order date, liquor type, order quantity. Admin will be able to see the sum of the inventory amount stored and deducted from the warehouse.

Supervising System: Admin will supervise the system.

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 flowchart that models the flow from one activity to another activity.

Tea Garden Management system

Level 1:

Name: Tea Garden Management system

Reference: Use case Diagram level-1

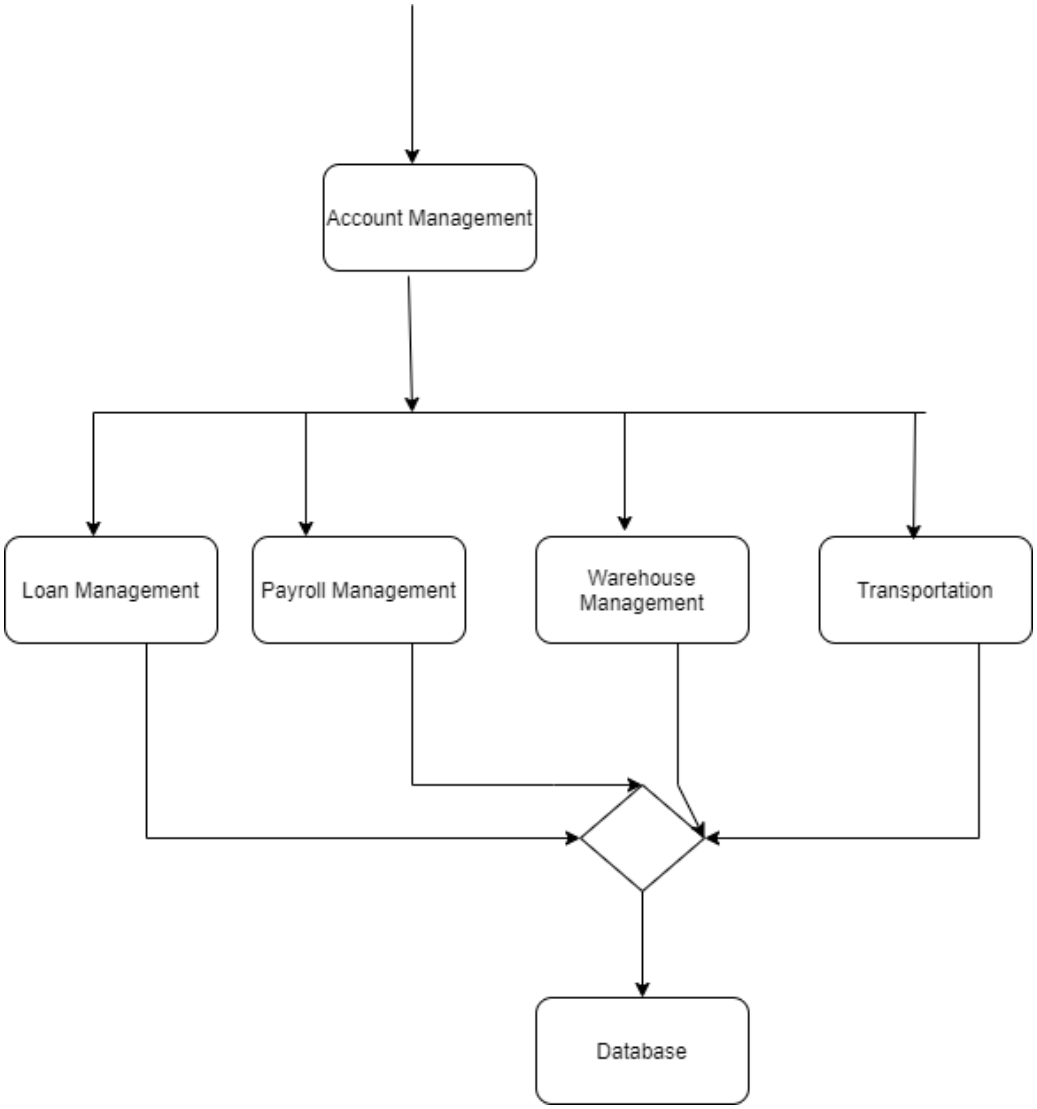


Figure : Tea Garden Management system

Account Management

Level 1.1:

Name: Account Management

Reference: Use case Diagram level-1.1

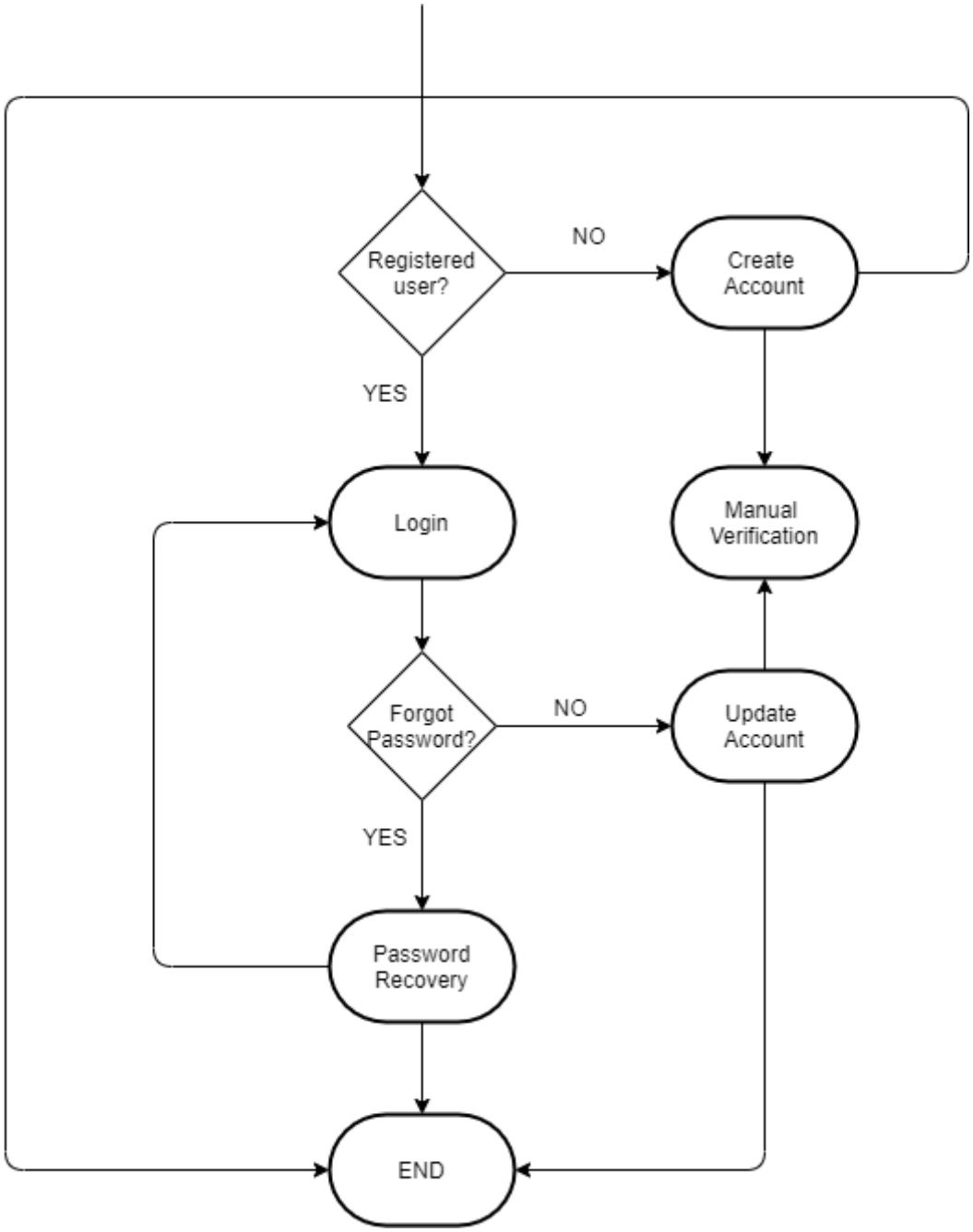


Figure : Account Management

Loan Management

Level 1.2:

Name: Loan Management

Reference: Use case Diagram level-1.2

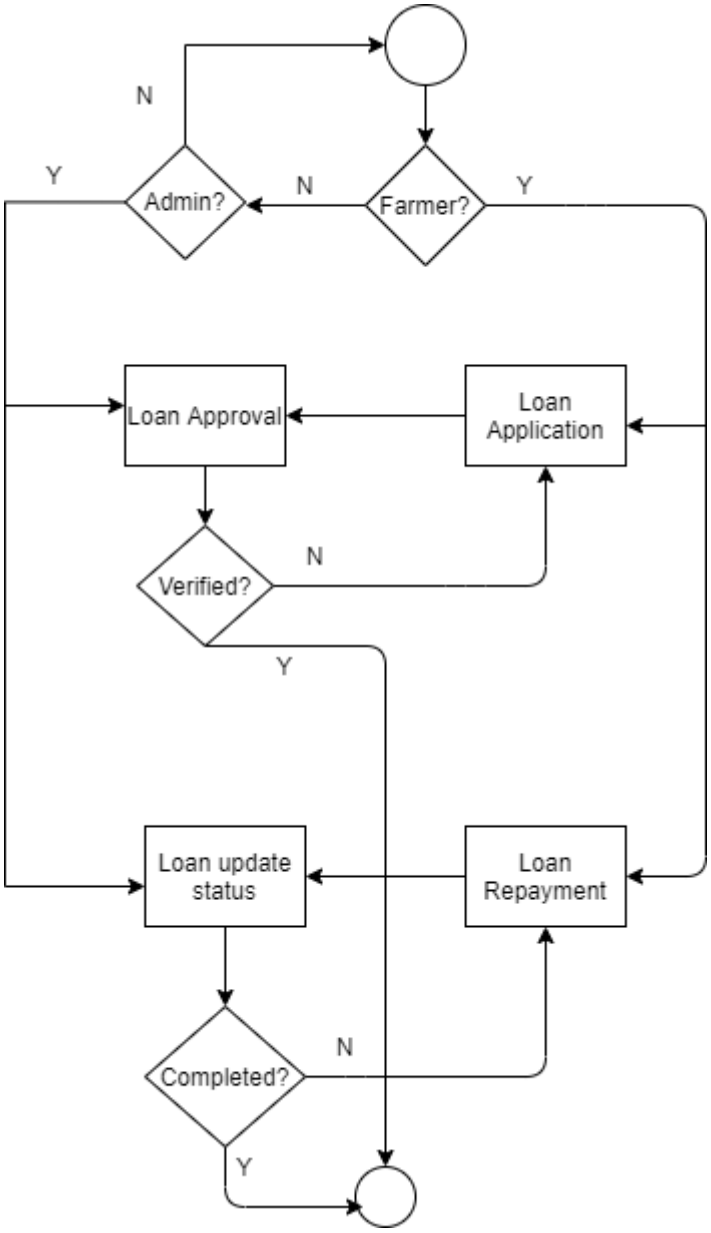


Figure : Loan Management

Payroll Management

Level 1.3:

Name: Payroll Management

Reference: Use case Diagram level-1.3

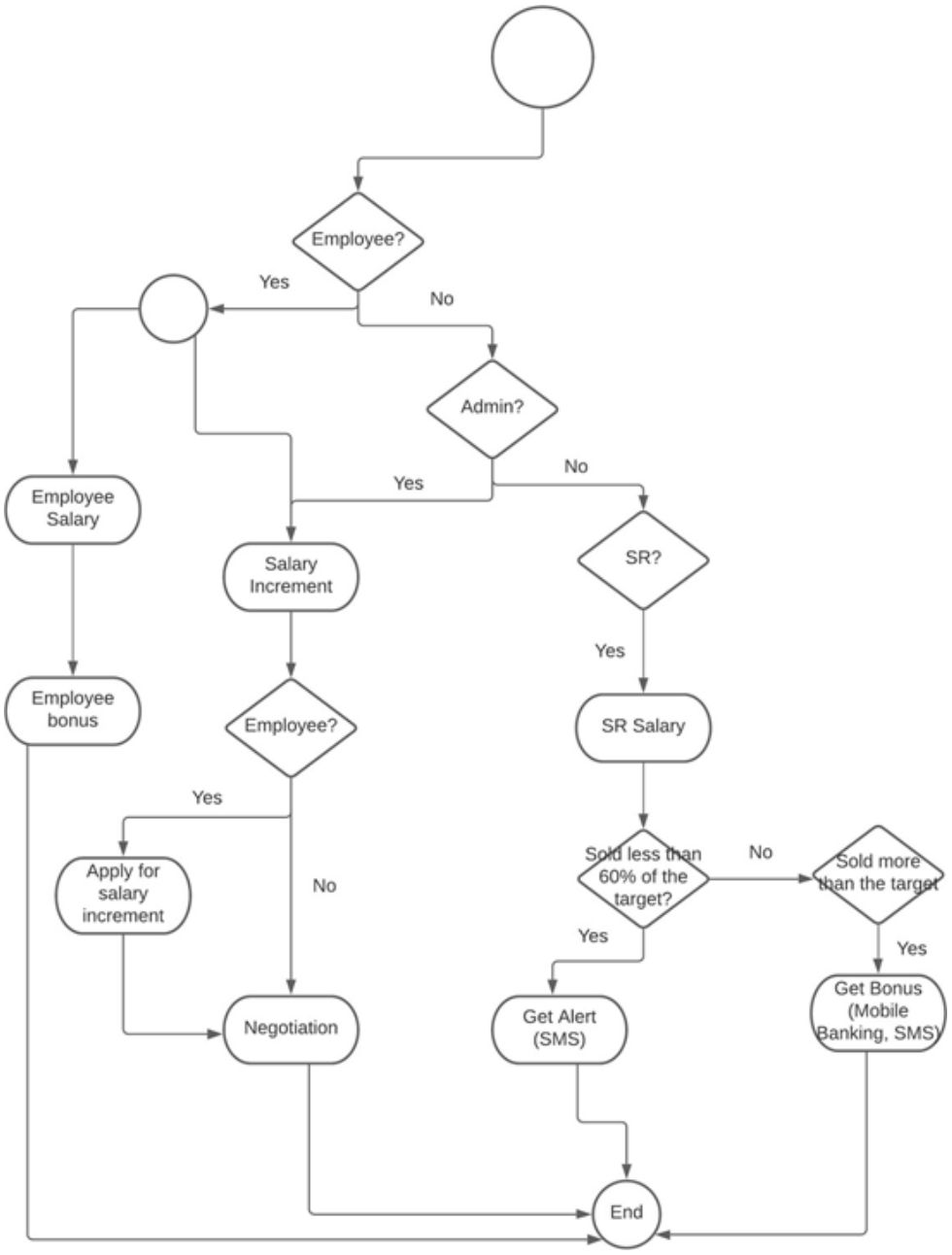


Figure : Payroll Management

Warehouse Management

Level 1.4:

Name: Warehouse Management

Reference: Use case Diagram level-1.4

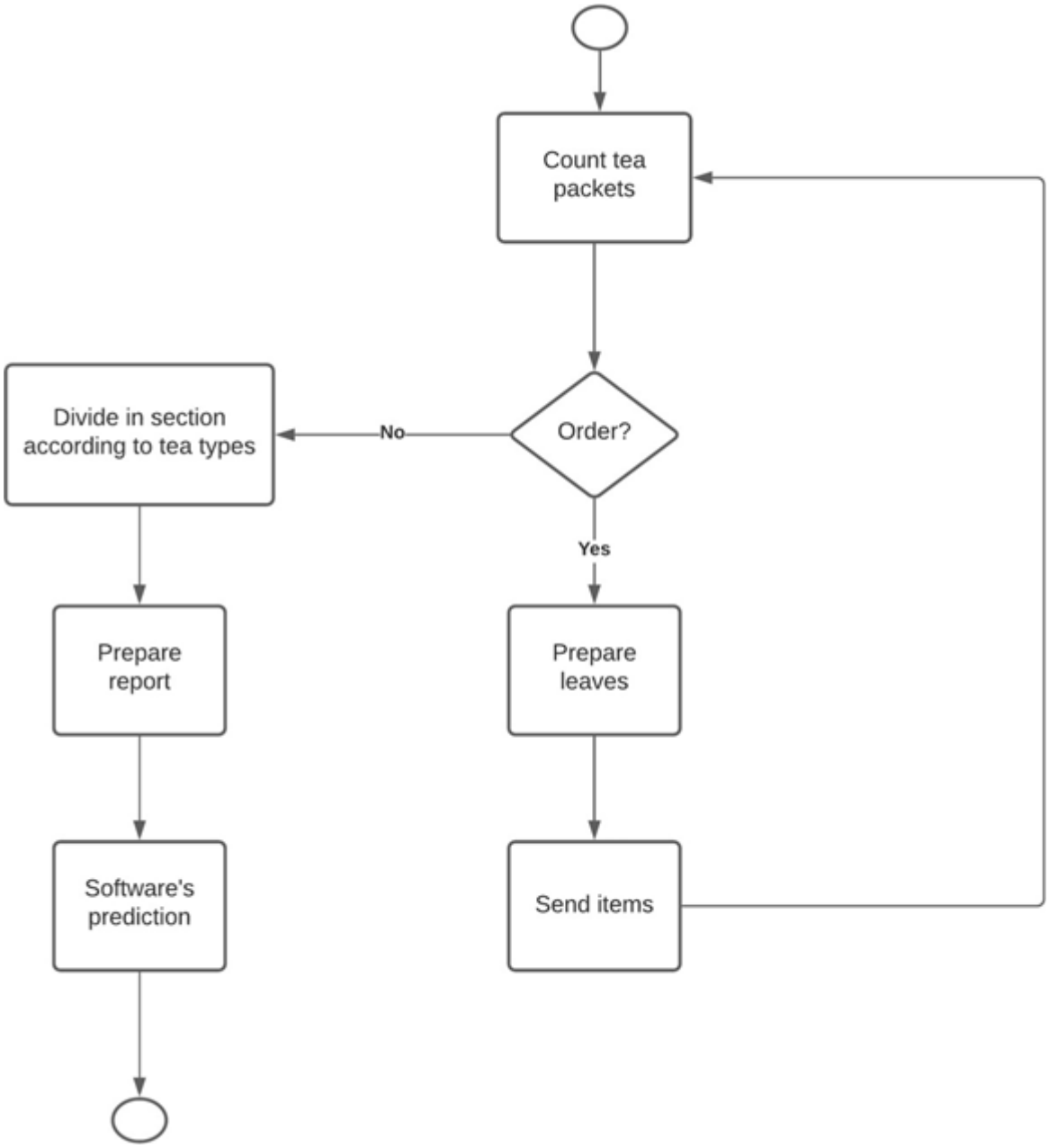


Figure :Warehouse Management

Transport Management

Level 1.5:

Name : Transport Management

Reference: Use case Diagram level-1.5

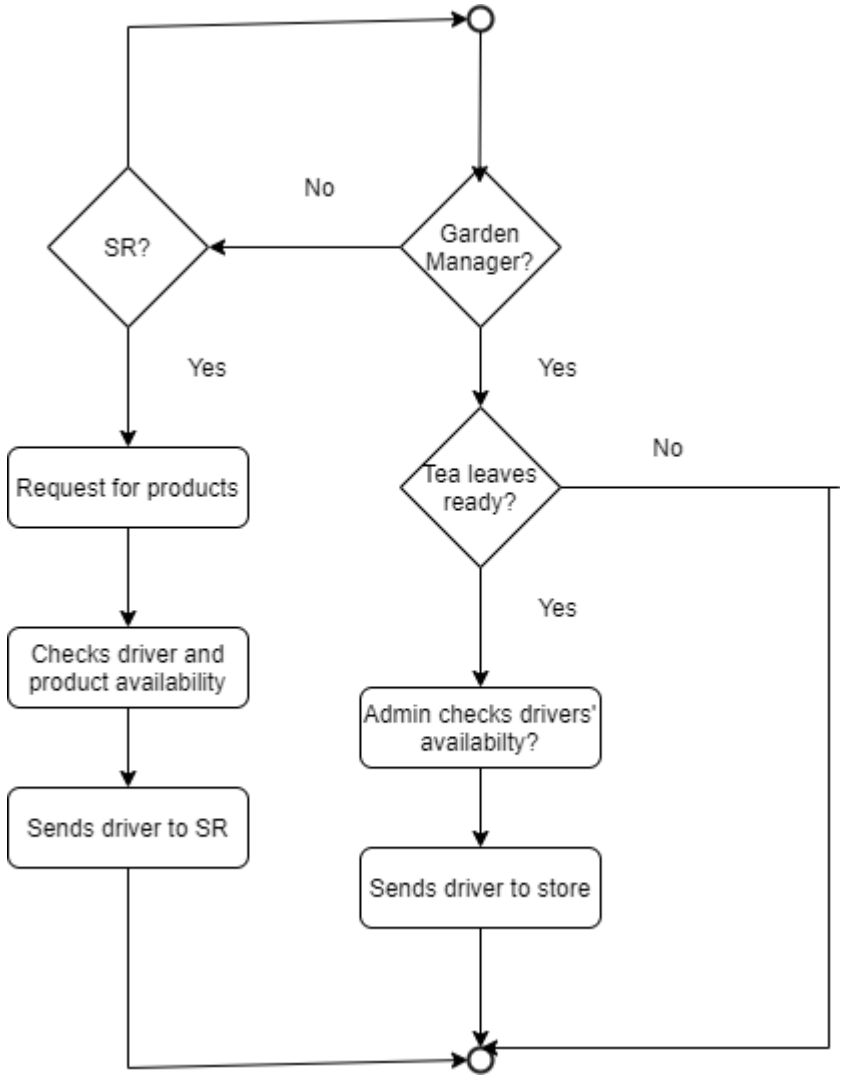


Figure : Transport Management

Database Management

Level 1.6:

Name: Database Management

Reference: Use case Diagram level-1.6

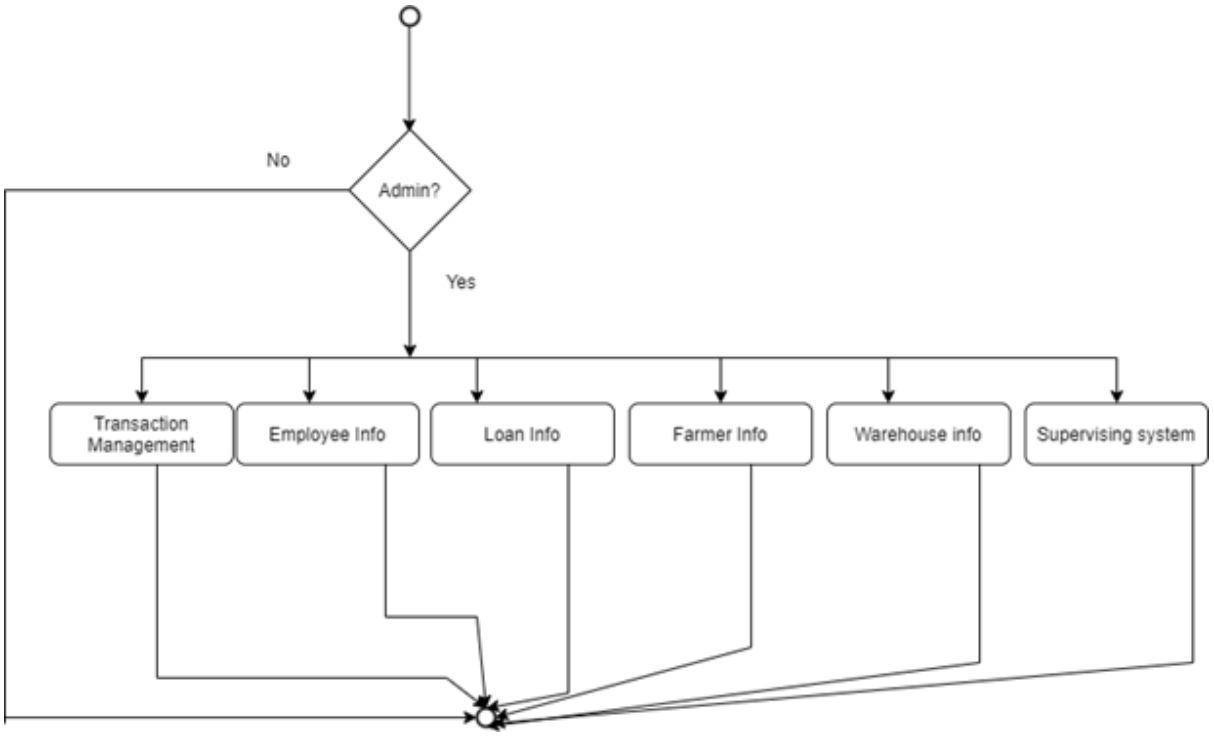


Figure : Database Management

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 : Account management
Reference: Use case & Activity diagram level-1.1

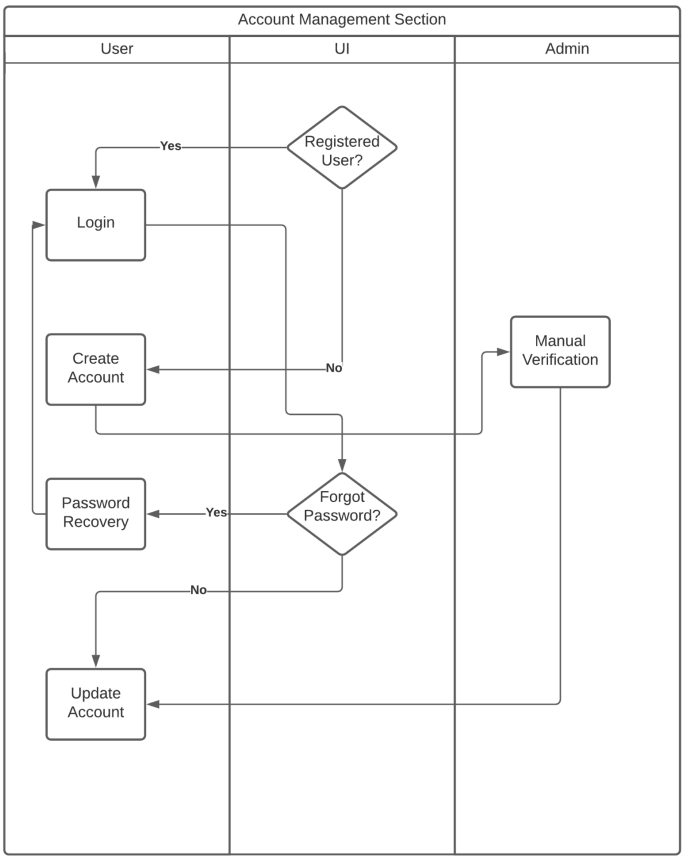


Figure:Swimlane Diagram of account management

SID(Swimlane ID): 1.2

Name : Loan management
Reference: Use case & Activity diagram level-1.2

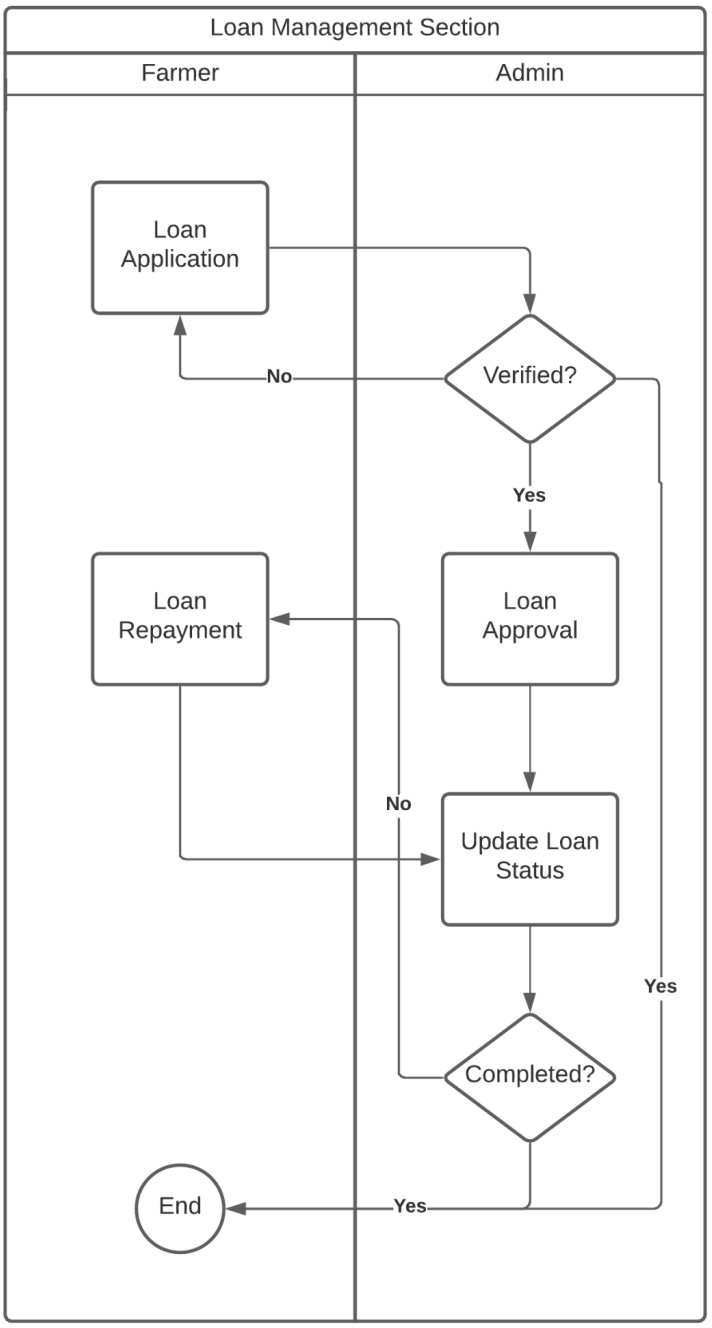


Figure:Swimlane Diagram of loan management

SID(Swimlane ID): 1.3

Name : Payroll management
Reference: Use case & Activity diagram level-1.3

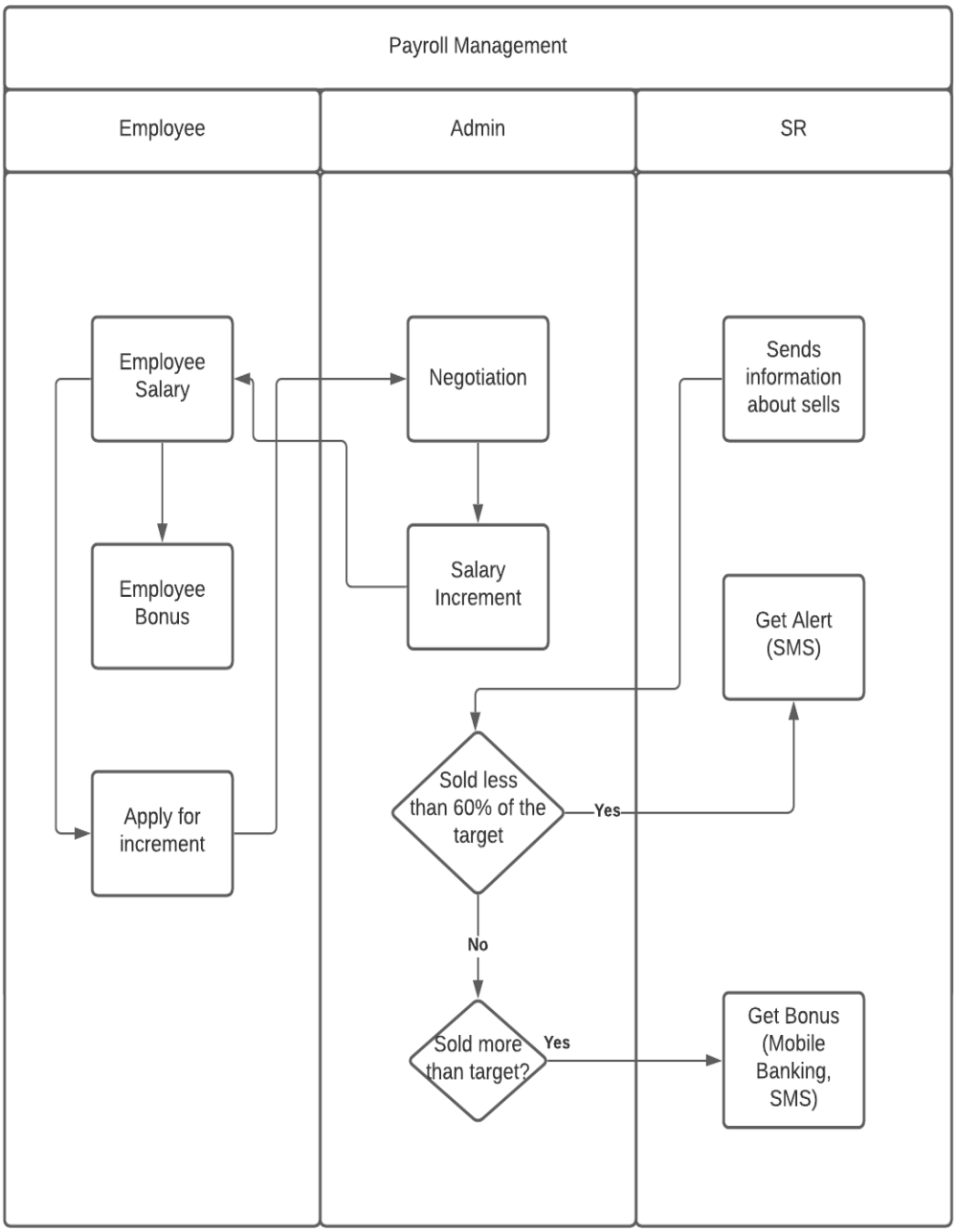


Figure:Swimlane Diagram of payroll management

SID(Swimlane ID): 1.4

Name: Warehouse management
Reference: Use case & Activity diagram level-1.4

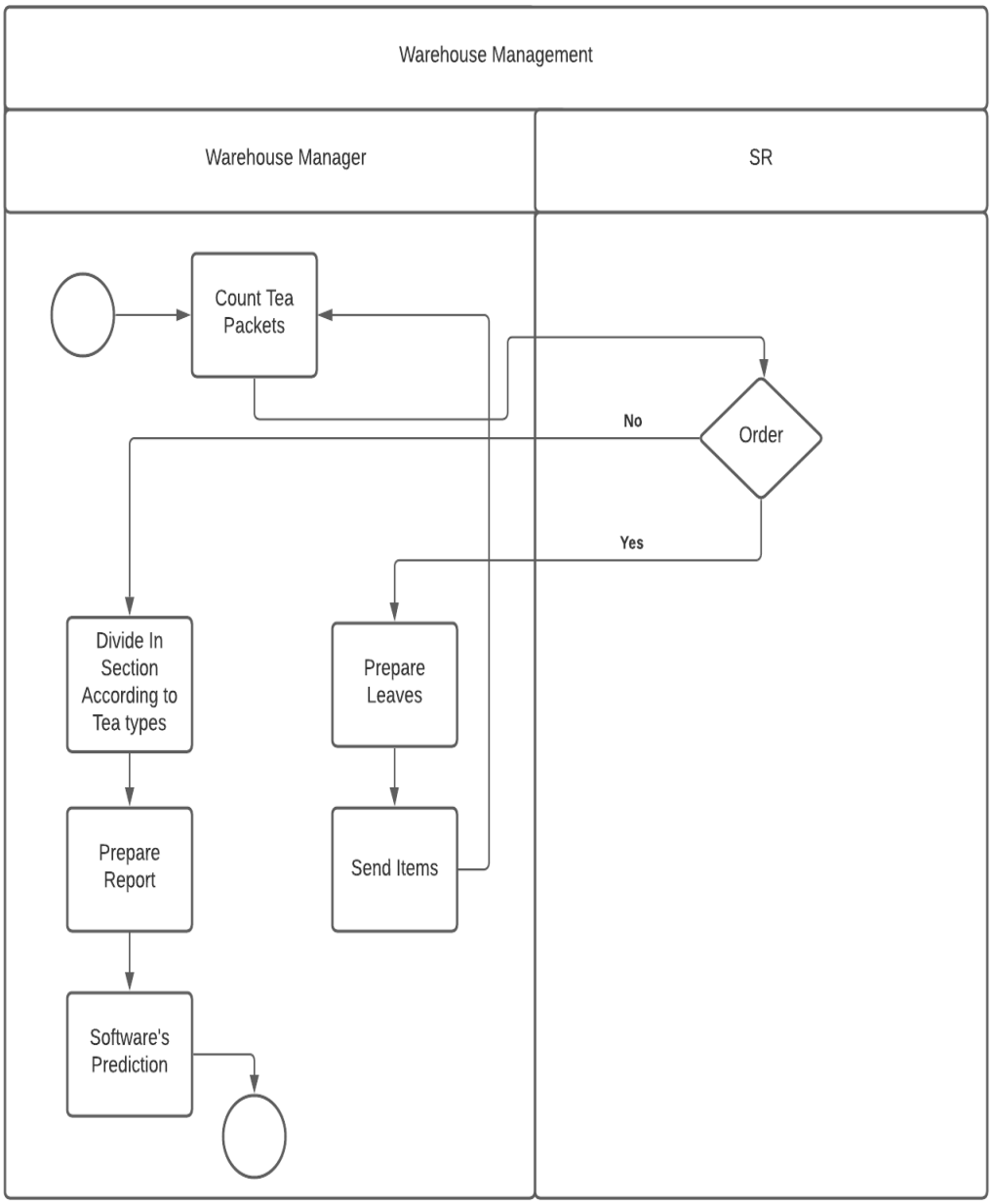


Figure:Swimlane Diagram of warehouse management

SID(Swimlane ID): 1.5

Name : Transport management
Reference: Use case & Activity diagram level-1.5

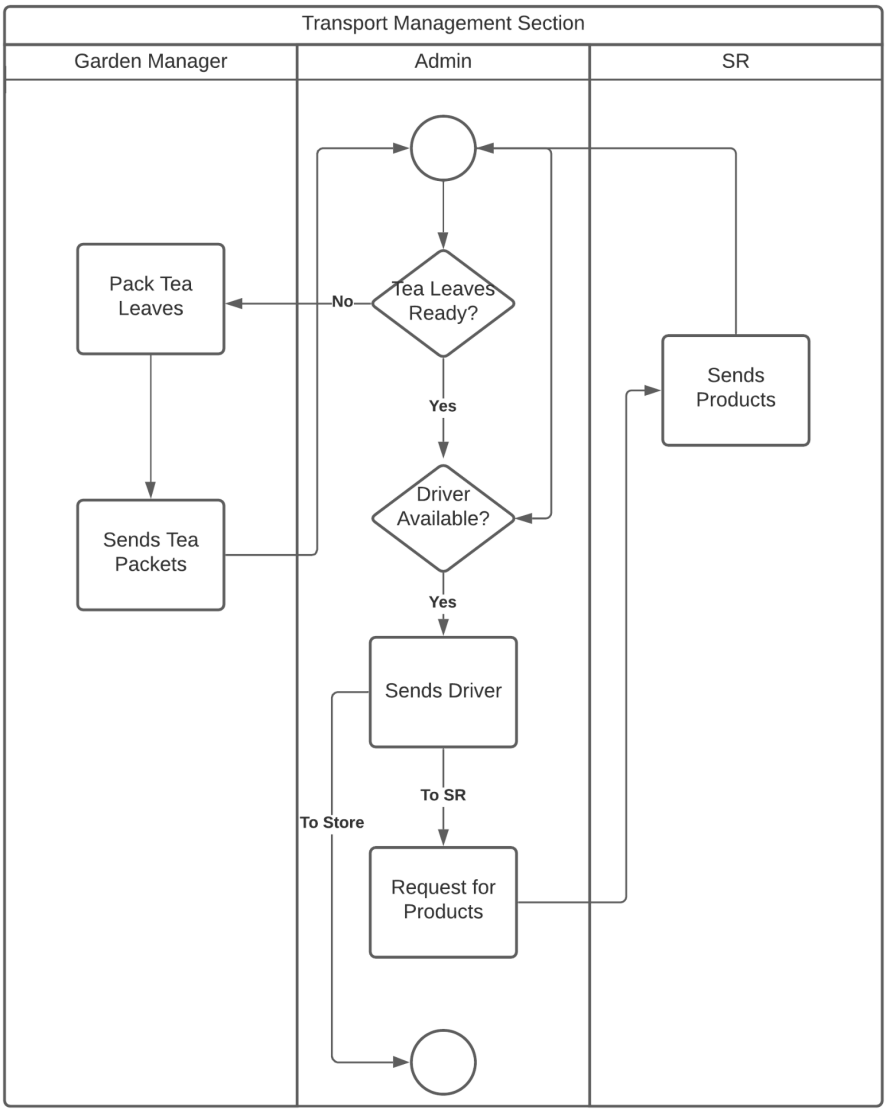


Figure:Swimlane Diagram of transport management

SID(Swimlane ID) : 1.6

Name : Database management
Reference: Use case & Activity diagram level-1.6

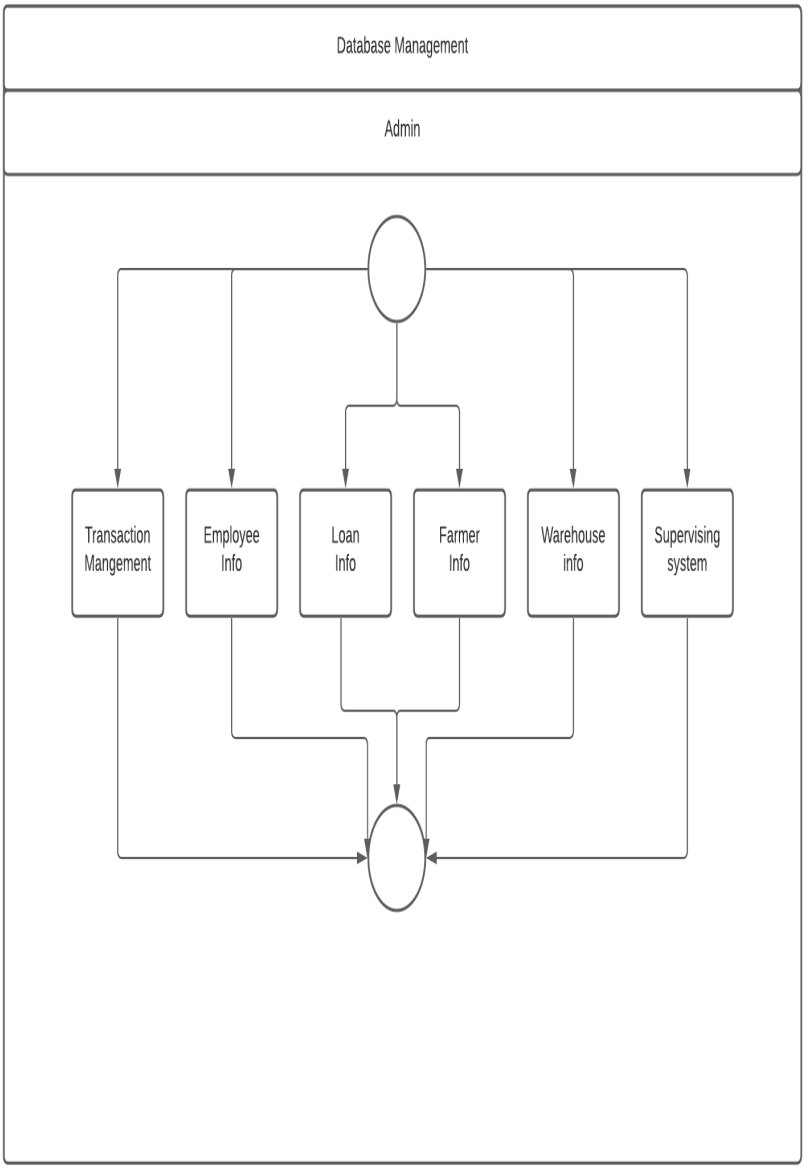


Figure:Swimlane Diagram of database management

Data Based Modeling

Data Modeling 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 modeling. 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:

Serial	Noun	Problem/solution space	Attribute
1	TGMS	p	
2	Tea Garden	p	
3	Employee	s	6,7,8,9,12,13,27,28
4	Farmer	s	6,7,8,12,13,48,53
5	Account	p	

6	Full Name	p	
7	Mobile Number	p	
8	NID Number	p	
9	Employee ID	p	
10	Admin	s	6,7,8,12,13
11	Confirmation Code	p	
12	Username	p	
13	Password	p	
14	Forget Password	p	
15	OTP	p	
16	Database	s	
17	Sales Representative	s	6,7,8,9,12,13,27,28
18	Driver	s	
19	GPS	p	
20	Bank Statement	p	
21	Garden Manager	s	6,7,8,9,12,13,27,28
22	Tea Packet	p	
23	Inventory	p	22,25,39,45
24	Order	s	40,41,60
25	Production	p	
26	Money	p	
27	Salary	p	
28	Bonus	p	
29	Mobile Banking	s	27,28,42,61

30	Sultan Tea	p	
31	Nagar Valley Tea	p	
32	Shahbag Sultan Tea	p	
33	Top Manager	p	
34	Department	p	
35	Alert	p	
36	Increment	p	
37	Negotiation	p	
38	Update	p	
39	Sell Quantity	p	
40	Order Date	p	
41	Order Quantity	p	
42	Transaction	s	
43	Cancellation	s	
44	Prediction	p	
45	Monthly Report	p	22,25,39,41,44
46	Non-registered User	p	6,7,8,9
47	Loan	s	
48	Bank Statement	p	
49	Product	p	
50	Purchase Cost	p	
51	Loan Approval	p	
52	Repayment	p	
53	Loan Status	p	
54	Loan SMS	p	53,55,59

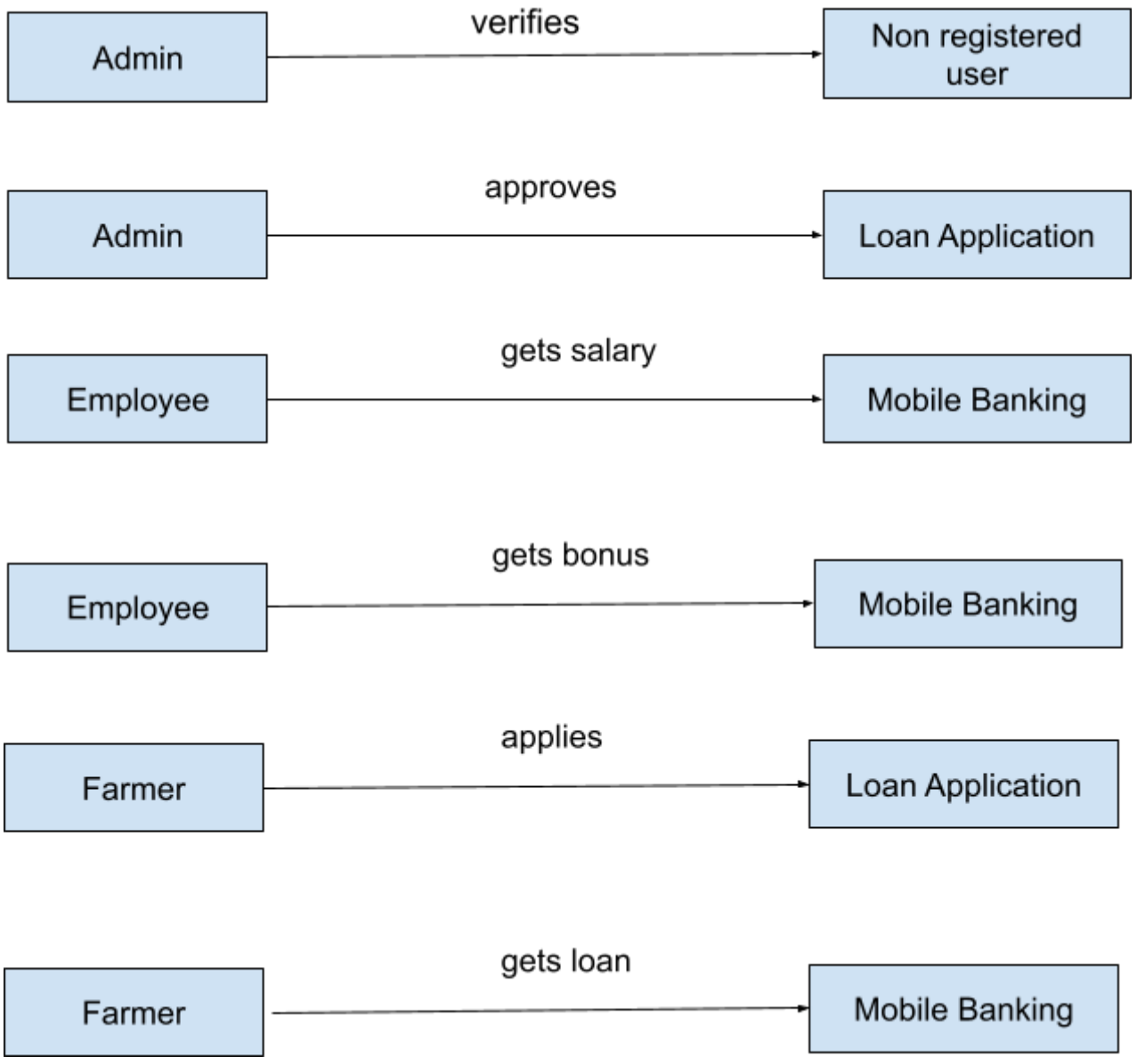
55	Date	p	
56	List	p	
57	Manufactured Product	p	
58	Loan Application	p	6,7,8,9,20
59	Loan Amount	p	
60	Order ID	p	
61	Transaction ID	p	

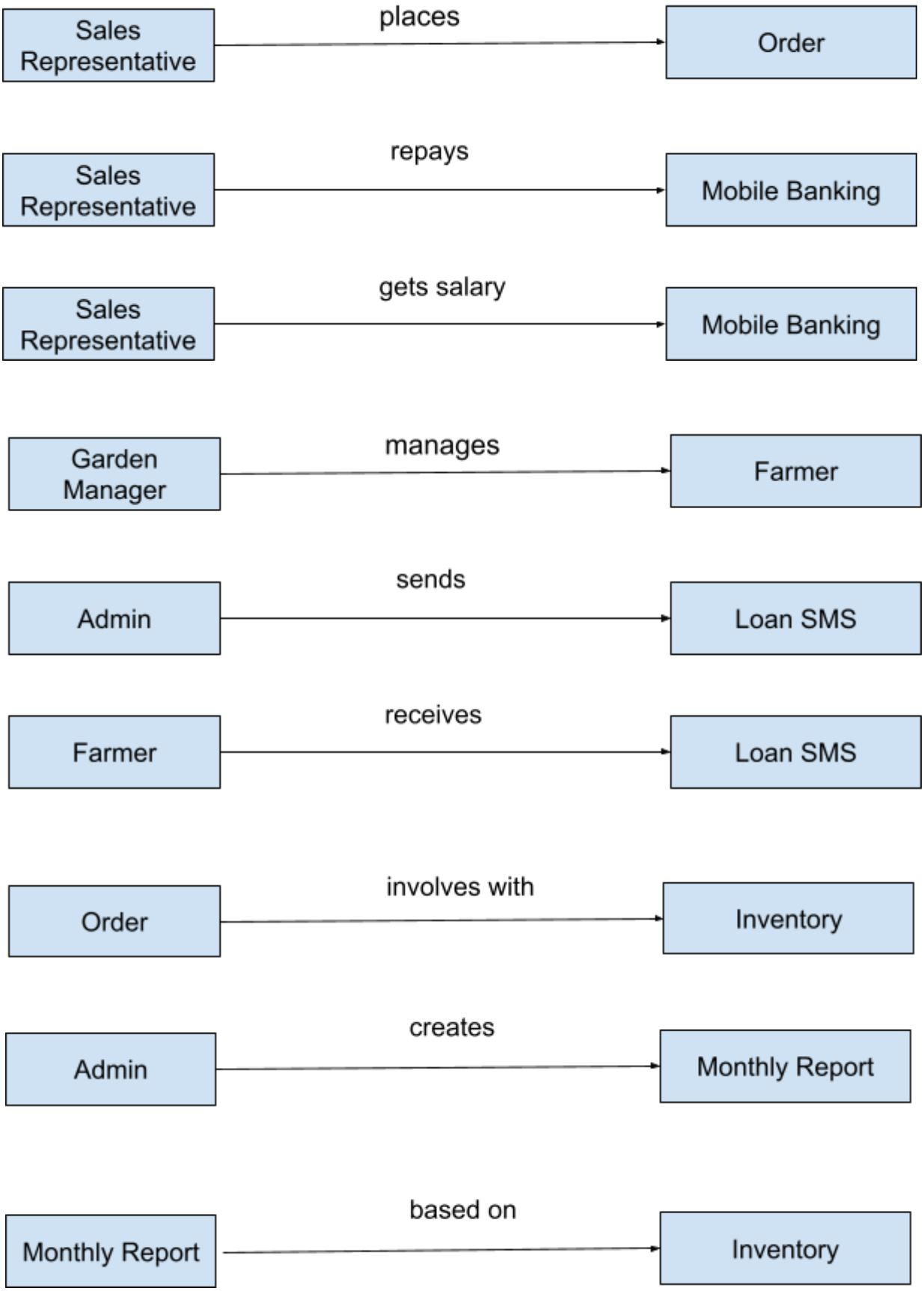
Final Data Object:

1. Employee
2. Farmer
3. Admin
4. Sales Representative
5. Garden Manager
6. Order
7. Mobile Banking
8. Monthly Report
9. Non-registered user
10. Loan SMS
11. Loan Application
12. Inventory

Data Object Relationship:

Relation between data objects




Sales Representative
places
Order
Sales Representative
repays
Mobile Banking
Sales Representative
gets salary
Mobile Banking
Garden Manager
manages
Farmer
Admin
sends
Loan SMS
Farmer
receives
Loan SMS
Order
involves with
Inventory
Admin
creates
Monthly Report
Monthly Report
based on
Inventory

ER Diagram:

Definition of ER Diagram An Entity Relationship (ER) Diagram is a type of flowchart that illustrates how “entities” such as people, objects or concepts relate to each other within a system.

ER Diagram

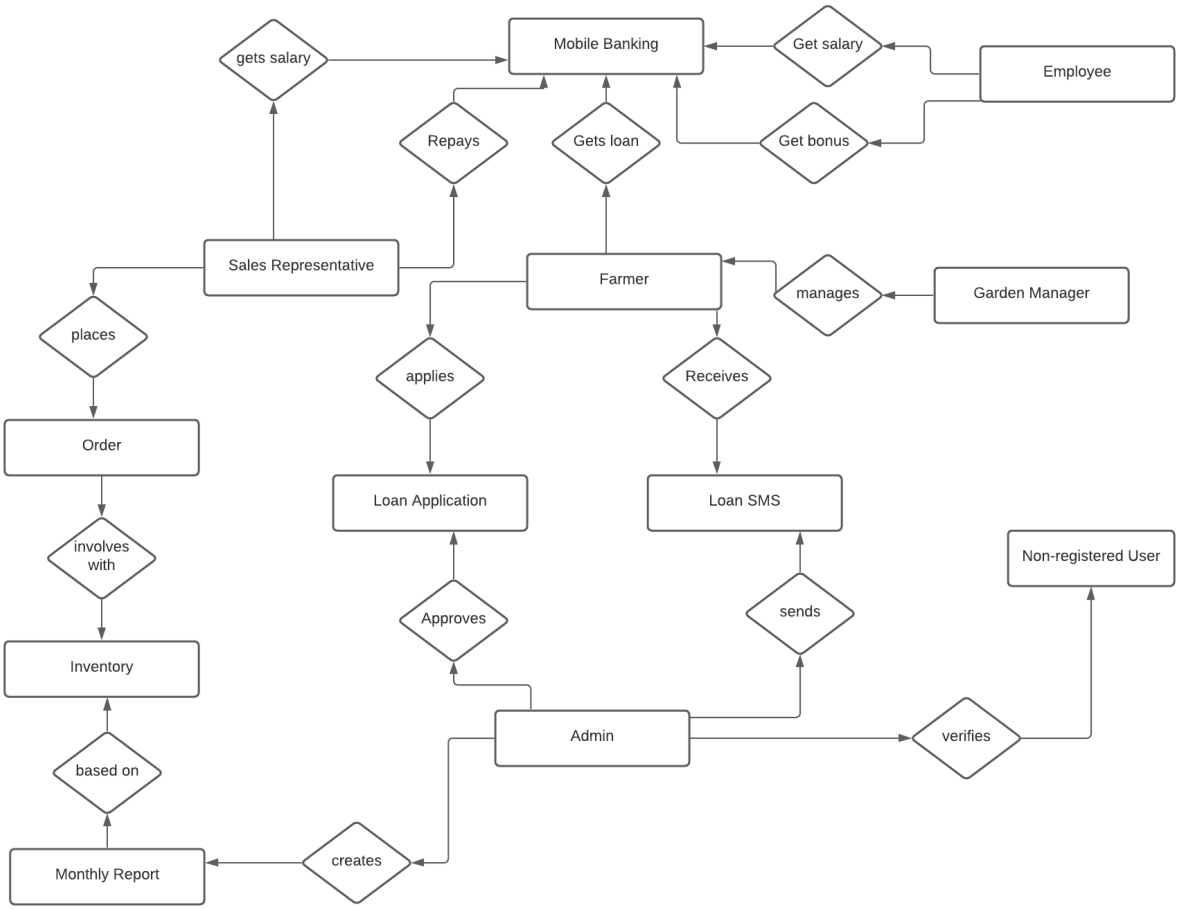


figure:ER diagram

Schema Diagram:

Data Object	Attributes	Type	Size
Admin	- full name - mobile number - nid number - Username - password	Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40
Employee	- full name - mobile number - Employee Id - nid number - password - Username - salary - bonus	Varchar Varchar Varchar Varchar Varchar Varchar Number Number	40 40 40 40 40 40 40 40
Farmer	- full name - mobile number - nid number - Username - password - bank statement - loan status	Varchar Varchar Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40 40 40
Sales Representative	- full name - mobile number - nid number - Username - Employee id - password - salary - bonus	Varchar Varchar Varchar Varchar Varchar Varchar Number Number	40 40 40 40 40 40 40 40
Garden Manager	- full name - mobile number - nid number - Username - Employee id - password - salary	Varchar Varchar Varchar Varchar Varchar Varchar Number	40 40 40 40 40 40 40

	- bonus	Number	40
Order	- Order Id - order date - order quantity	Varchar Date and Time Number	40 40 40
Mobile Banking	- salary - bonus - transaction - Transaction Id	Number Number Number Varchar	40 40 40 40
Monthly Report	- tea packet - production - sell quantity - order quantity - prediction	Varchar Varchar Number Number Varchar	40 40 40 40 40
Non-registered User	- full name - mobile number - nid number - Employee id	Varchar Varchar Varchar Varchar	40 40 40 40
Loan SMS	- loan sms - loan status - date - loan amount	Varchar Varchar Date and Time Number	40 40 40 40
Loan Application	- full name - mobile number - nid number - Employee id - bank statement	Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40
Inventory	- tea packet - production - sell quantity - monthly report	Varchar Varchar Number Varchar	40 40 40 40

Class-Based Modeling

CLASS BASED MODELING CONCEPT : Class-based modeling 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.

Noun list from Tea Garden Management System :

No	Noun	**No.**	Noun
1	TGMS	32	Shahbag Sultan Tea
2	Tea Garden	33	Top Manager
3	Employee	34	Department
4	Farmer	35	Alert
5	Account	36	Increment
6	Full Name	37	Negotiation
7	Mobile Number	38	Update
8	NID Number	39	Sell Quantity
9	Employee ID	40	Order Date
10	Admin	41	Order Quantity
11	Confirmation Code	42	Transaction
12	Username	43	Cancellation
13	Password	44	Prediction
14	Forget Password	45	Monthly Report
15	OTP	46	Non-registered User

16	Database	47	Loan
17	Sales Representative	48	Bank Statement
18	Driver	49	Product
19	GPS	50	Purchase Cost
20	Bank Statement	51	Loan Approval
21	Garden Manager	52	Repayment
22	Tea Packet	53	Loan Status
23	Inventory	54	Loan SMS
24	Order	55	Date
25	Production	56	List
26	Money	57	Manufactured Product
27	Salary	58	Loan Application
28	Bonus	59	Loan Amount
29	Mobile Banking	60	Order ID
30	Sultan Tea	61	Transaction ID
31	Nagar Valley Tea		

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

Potential nouns to become a class after general classification criteria :

Noun	**General class**
Employee	4,5,7
Farmer	4,5,7
GPS	1
Sales Representative	4,5,7
Driver	4,5,7
Garden Manager	4,5,7
Order	1,2,3
Mobile Banking	1,3
Loan	1,3
Transaction	1,3
Cancellation	1,3
Database	1,2,7
Non-registered employee	4,5,7

TGMS	4
Admin	4,5,7
Tea Garden	6
Warehouse	5,6
SMS	1,3
Account	2,7
Report	2
Inventory Management	3

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 :

Noun	Selection Criteria
Employee	1-6(selected)
Farmer	1-6(selected)
GPS	2
Loan	2,3,6 (selected)
Transaction	1,3
Cancellation	1,3
Admin	1-6(selected)
Order	2
Sales Representative	1-6(selected)
Non-registered employee	1-6(selected)
SMS	2,5,6 (selected)
Mobile Banking	2,6 (selected)
Driver	1-6 (selected)
Garden Manager	1-6 (selected)
Database	1-6 (selected)

Attribute and Method Identification :

Class Name	Attribute	Method
Employee	- full_name - mobile_number - employee_Id - nid_number - password - username - salary - bonus	+create_account() +recover_password() +update_info() +login() +get_salary() +get_bonus() +get_notification() +set_inventory_report() +report_issue()
Farmer	- full_name - mobile_number - nid_number - username - password - bank_statement - loan_status	+create_account() +recover_password() +update_info() +login() +get_notification() +apply_loan() +pay_loan() +send_production_info()
Loan	- loan_sms - loan_status - date - loan_amount - full_name - mobile_number - nid_number - employee_id - bank_statement	+apply_loan() +approve_loan() +send_loan() +update_loan_status() +repay_loan() +complete_loan()

Admin	- full_name - mobile_number - nid_number - username - password	+create_account() +recover_password() +update_info() +login() +make_report() +set_salary() +verify_users() +set_bonus() +approve_loan() +send_alert() +update_user() +delete_user() +managing_database() +update_inventory_info() +send_otp() +update_garden_info() +reset_loan() +make_prediction_report() +update_sell_info() +set_sales_target()
Sales Representative	- full_name - mobile_number - nid_number - username - employee_id - password - salary - bonus	+create_account() +recover_password() +update_info() +login() +get_notify() +get_salary() +get_bonus() +place_order() +sell_count()
Non-registered employee	- full_name - mobile_number - nid_number - employee_id	+create_account() +update_info() +login() +get_verified()

Mobile Banking	- salary - bonus - transaction - transaction_Id	+make_transaction() +notify_admin() +notify_sr() +notify_farmers() +notify_employees() +send_confirmation() +make_payment()
SMS		+send_confirmation() +send_alert() +send_otp() +send_loan_status()
Database	- employee_id - transaction_id	+transaction_history() +employee_Info() +update_employee() +calc_transaction() +inventory_status() +store_loan_info() +order_info()
Garden Manager	- full _name - mobile_number - nid_number - username - employee_id - password - salary - bonus	+create_account() +recover_password() +update_info() +login() +update_farmers_info() +manage_farmers() +verify_loan_application() +make_leaf_report() +send_garden_info()

Analysis

All classes included in the class based diagram are selected as classes for our system.

CRC card

Class name	Responsibility	Collaborator
Employee	• Setting inventory report • Reporting issue	Mobile Banking,Admin,SMS
Farmer	• Applying for loan • Paying loan • Sending production info	Loan,Mobile Banking,SMS,Garden Manager
Loan	• Approving loan • Sending loan • Updating loan status • Repaying loan • Completing loan	Admin,Mobile Banking,Farmer,SMS,Garden Manager
Admin	• Creating account • Recovering password • Updating info • Notifying user	Employee,Farmer,Loan, Sales Representative,Non-registered employee,Mobile Banking,SMS,Database,

	• Making report • Setting salary • Verifying users • Setting bonus • Approving loan • Sending alert • Updating user • Deleting user • Managing database • Updating • inventory info • Sending otp • Updating garden info • Resetting loan • Making prediction report • Updating sell info • Setting sales target	Garden Manager
Sales Representative	• Placing order • Sales count	Admin,Mobile,Banking, SMS
Non-registered employee	• Getting verified	Admin
Mobile Banking	• Making transaction • Notifying admin • Notifying Sales Representative • Notifying farmers • Notifying employees • Sending confirmation • Making payment	Admin,SMS
SMS	• Sending confirmation	Admin

	• Sending alert • Sending otp • Sending loan status	
Database	• Storing transaction history • Storing employee Info • Updating employee • Calculating transactions • Inventory status • Storing loan info • Ordering info	Admin
Garden Manager	• Updating farmers info • Managing farmers • Verifying loan application • Making leaf report • Sending garden info	Farmer,Admin,Loan, Mobile Banking,SMS

CLASS CARDS

After identifying our final classes we have generated the following class cards.

Table:Class Card for Employee Class

Employee	
Attribute	Method
- full_name - mobile_number - employee_Id - nid_number - password - username - salary - bonus	+create_account() +recover_password() +update_info() +login() +get_salary() +get_bonus() +get_notification() +set_inventory_report() +report_issue()
Responsibility	Collaborator
• Setting inventory report • Reporting issue	Mobile Banking,Admin,SMS

Table:Class Card for Farmer Class

Farmer	
Attribute	Method
- full_name - mobile_number - nid_number - username - password - bank_statement - loan_status	+create_account() +recover_password() +update_info() +login() +get_notification() +apply_loan() +pay_loan() +send_production_info()

Responsibility	Collaborator
• Applying for loan • Paying loan • Sending production info	Loan,Admin,Mobile Banking,SMS,Garden Manager

Table:Class Card for Loan Class

Loan	
Attribute	Method
- loan_sms - loan_status - date - loan_amount - full_name - mobile_number - nid_number - employee_id - bank_statement	+apply_loan() +approve_loan() +send_loan() +update_loan_status() +repay_loan() +complete_loan()
Responsibility	Collaborator
• Approving loan • Sending loan • Updating loan status • Repaying loan • Completing loan	Admin,Mobile Banking,Farmer,SMS,Garden Manager

Table:Class Card for Admin Class

Admin	
Attribute	Method
- full_name - mobile_number - nid_number - username - password	+create_account() +recover_password() +update_info() +login() +make_report() +set_salary() +verify_users() +set_bonus() +approve_loan() +send_alert() +update_user() +delete_user() +managing_database() +update_inventory_info() +send_otp() +update_garden_info() +reset_loan() +make_prediction_report() +update_sell_info() +set_sales_target()
Responsibility	Collaborator
• Creating account • Recovering password • Update info • Notifying user • Making report • Setting salary • Verifying users • Setting bonus	Employee,Farmer,Loan,Sales Representative,Non-registered employee,Mobile Banking,SMS,Database,Garden Manager

• Approving loan • Sending alert • Updating user • Deleting user • Managing database • Updating inventory info • Sending OTP • Updating garden info • Resetting loan • Making prediction report • Updating sales info • Setting sales target	

Table:Class Card for Sales Representative Class

Sales Representative	
Attribute	Method
- full_name - mobile_number - nid_number - username - employee_id - password - salary - bonus	+create_account() +recover_password() +update_info() +login() +get_notify() +get_salary() +get_bonus() +place_order() +sell_count()
Responsibility	Collaborator
• Placing order • Sales count	Admin,Mobile Banking,SMS

Table:Class Card for Non-registered employee Class

Non-registered employee	
Attribute	Method
- full_name - mobile_number - nid_number - employee_id	+create_account() +update_info() +login() +get_verified()
Responsibility	Collaborator
• Getting verified	Admin

Table:Class Card for Mobile Banking Class

Mobile Banking	
Attribute	Method
- salary - bonus - transaction - transaction_Id	+make_transaction() +notify_admin() +notify_sr() +notify_farmers() +notify_employees() +send_confirmation() +make_payment()
Responsibility	Collaborator
• Making transaction • Notifying admin • Notifying SR	Admin,SMS

• Notifying farmers • Notifying employees • Sending confirmation • Making payment	

Table:Class Card for SMS Class

SMS	
Attribute	Method
	+send_confirmation() +send_alert() +send_otp() +send_loan_status()
Responsibility	Collaborator
• Sending confirmation • Sending alert • Sending OTP • Sending loan status	Admin

Table:Class Card for Database Class

Database	
Attribute	Method
- employee_id - transaction_id	+transaction_history() +employee_Info() +update_employee() +calc_transaction() +inventory_status() +store_loan_info()

	+order_info()
Responsibility	Collaborator
• Storing transaction history • Storing employee Info • Updating employee • Calculating transactions • Inventory status • Storing loan info • Ordering info	Admin

Table:Class Card for Garden Manager Class

Garden Manager	
Attribute	Method
- full _name - mobile_number - nid_number - username - employee_id - password - salary - bonus	+create_account() +recover_password() +update_info() +login() +update_farmers_info() +manage_farmers() +verify_loan_application() +make_leaf_report() +send_garden_info()
Responsibility	Collaborator
• Updating farmers info • Managing farmers • Verifying loan application • Making leaf report • Sending garden info	Farmer,Admin,Loan,Mobile Banking,SMS

CRC Diagram

Diagram Id: 1

Name: Admin

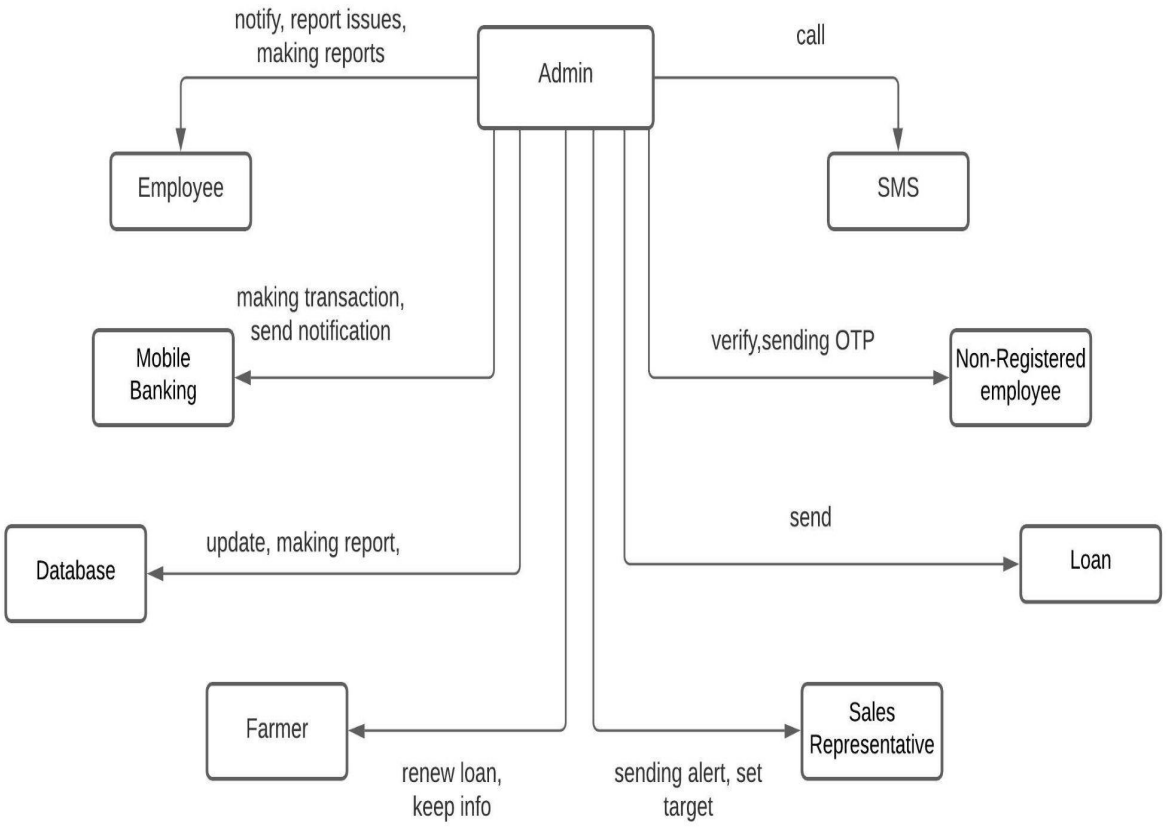


Diagram Id: 2

Name: Employee

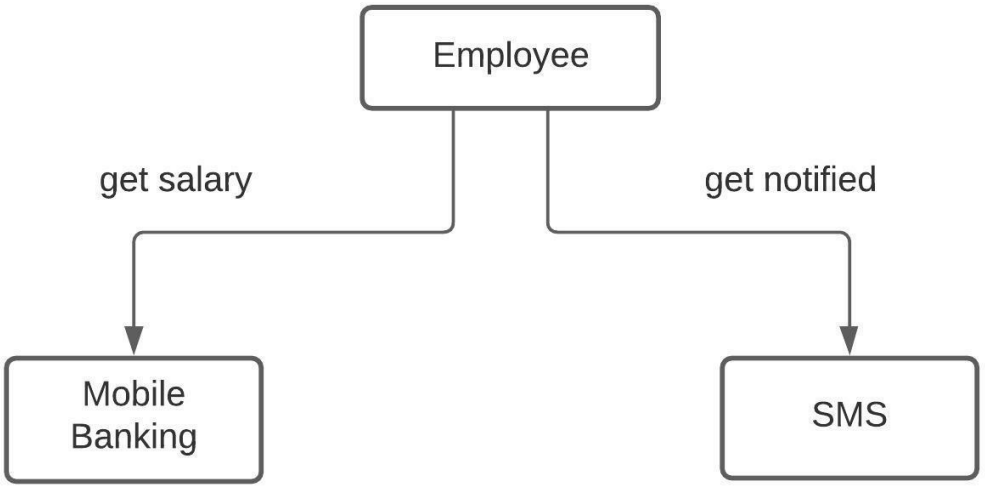


Diagram Id: 3

Name: Loan

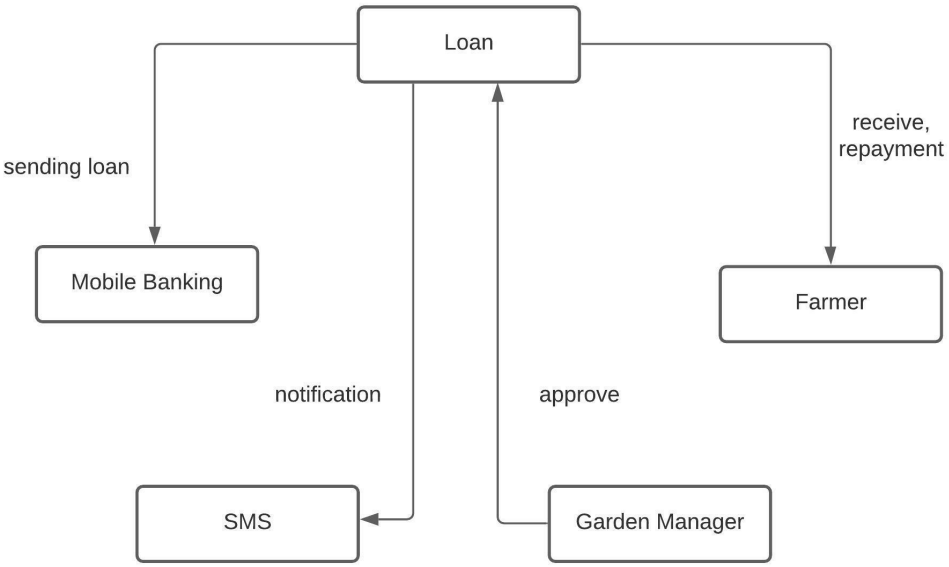

Loan
sending loan
receive,
repayment
Mobile Banking
Farmer
notification
approve
SMS
Garden Manager

Diagram Id: 4

Name: Garden Manager

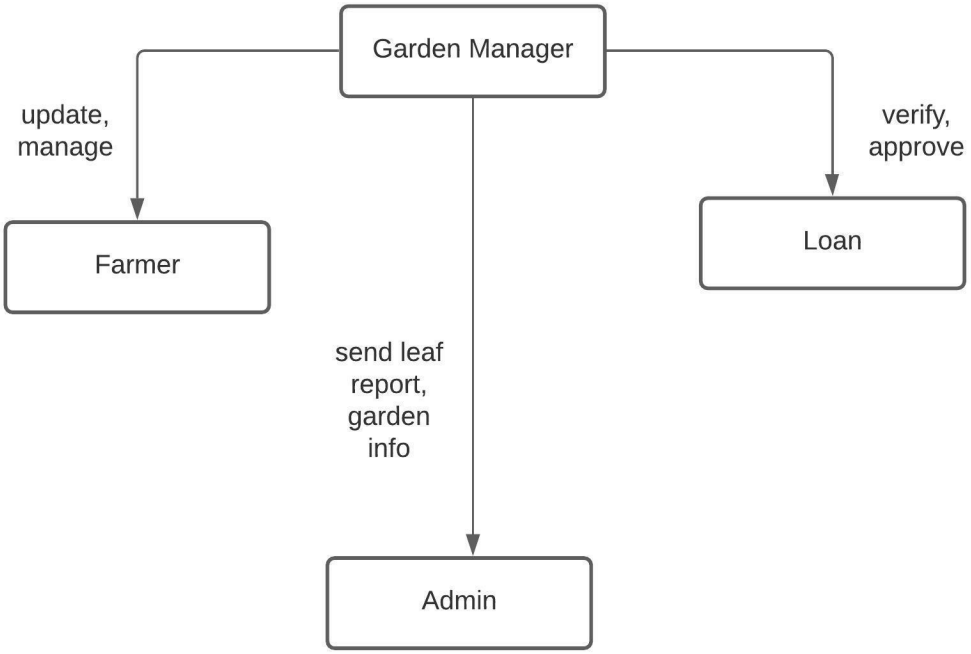


Diagram Id: 5

Name: Sales Representative

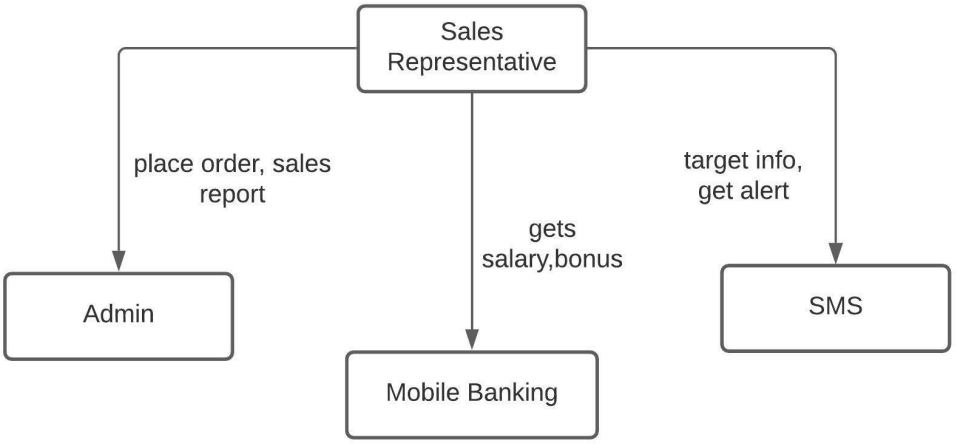


Diagram Id: 6

Name: Database

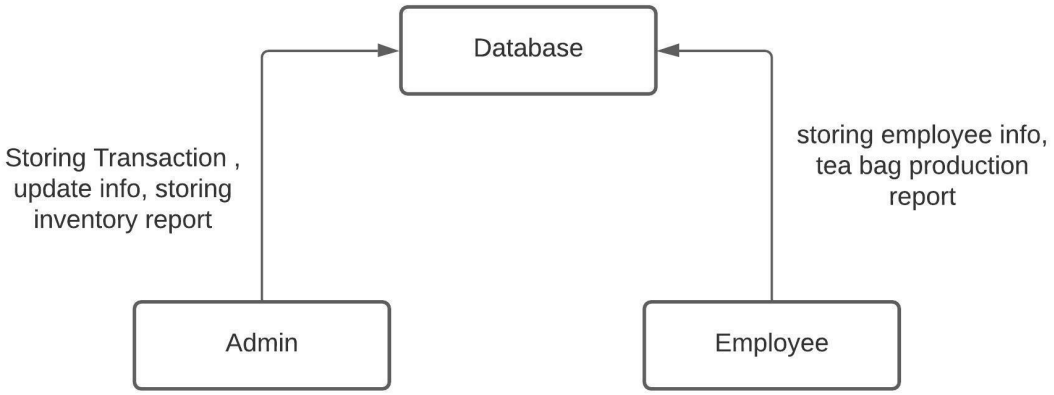
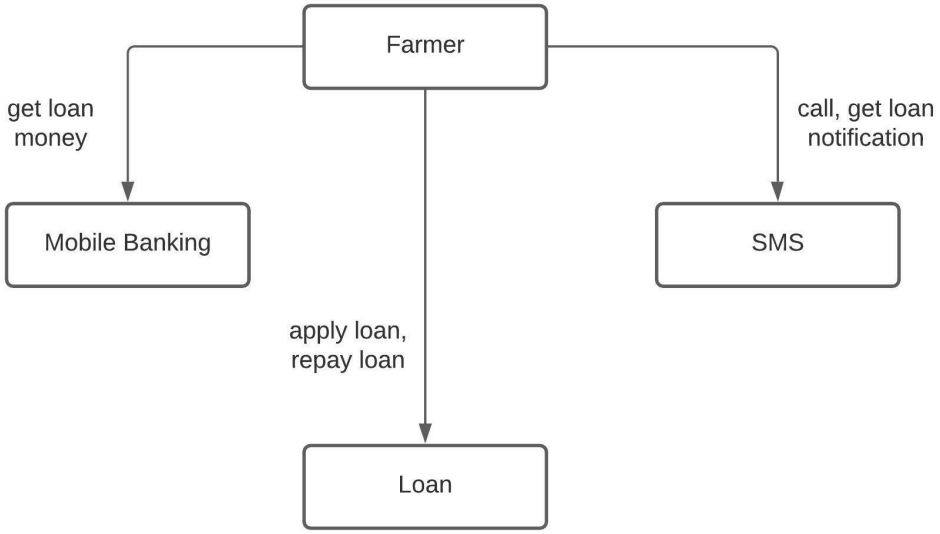


Diagram Id: 7

Name: Farmer



Behavioral Model of TGMS

State Transition Diagram

State diagram represents active states for each class of events (triggers). For this we identified all the events, their initiators and collaborators.

Event Table:

SL no	Event	State name	Initiator	Collaborator
1.	Will create an account	Create_account	Non-registered employee	Admin,SMS
2.	Will provide information	Provide_info	Non-registered employee	
3.	User's Information will be verified	Verify_info	Admin	
4.	Will be able to update information	Update_info	Employee,Sales Representative, Garden Manager	Admin
5.	Will send otp	Send_otp	Admin	SMS,Employee,Sales Representative, Garden Manager
6.	Will be able to recover password	Recover_password	Non-registered employee	Admin
7.	Will log into system	Login_system	Admin,Employee ,Sales Representative, Garden Manager	
8.	Will apply for loan	Loan_apply	Farmer	Admin,Garden Manager
9.	Will verify loan	Verify_loan	Garden	

	application		Manager	
10.	Will approve loan application	Approve_loan	Admin	
11.	Will send loan money	Send_loan	Mobile Banking	Farmer,Loan
12.	Will repay loan money	Repay_loan	Mobile Banking	Farmer,Loan
13.	Will send loan status	Loan_status	Admin	SMS,Loan
14.	Will get salary	Get_salary	Admin	SMS,Employee,Sales Representative, Garden Manager,Mobile Banking
15.	Will send loan sms	Loan_sms	SMS	Farmer
16.	Will get bonus	Get_bonus	Admin	SMS,Employee,Sales Representative, Mobile Banking
17	Will set sales target	Set_sales_ target	Admin	Sales Representative,SMS
18.	Will get alert SMS	Get_alert	Admin	SMS,Sales Representative
19.	Will place order	Place_order	Sales Representative	Admin
20.	Will be able to cancel order	Cancel_order	Sales Representative	Admin
21.	Will make leaf report	Make_leaf_ report	Garden Manager	Admin
22.	Will send garden info	Send_garden_ info	Garden Manager	Admin

23.	Will update inventory report	Update_inventory_report	Admin	
24.	Will make prediction report	Make_prediction_report	Admin	
25.	Store transaction history	Store_transaction_history	Admin	Database
26.	Store employee info	Store_employee_info	Admin	Database
27.	Will Calculate transaction	Calculate_transaction	Admin	Database
28.	Store tea packet production info	Store_production_info	Admin	Database
29.	Transporting tea leaf	Transport_tea_leaf	Employee	Garden manager, Admin
30.	Can count sold packet	Count_sold_packets	Sales Representative	Admin
31.	Will update sales report	Update_sales_report	Admin	Database,Sales Representative

State Transition:

ID: 1

Name: Admin
Admin:

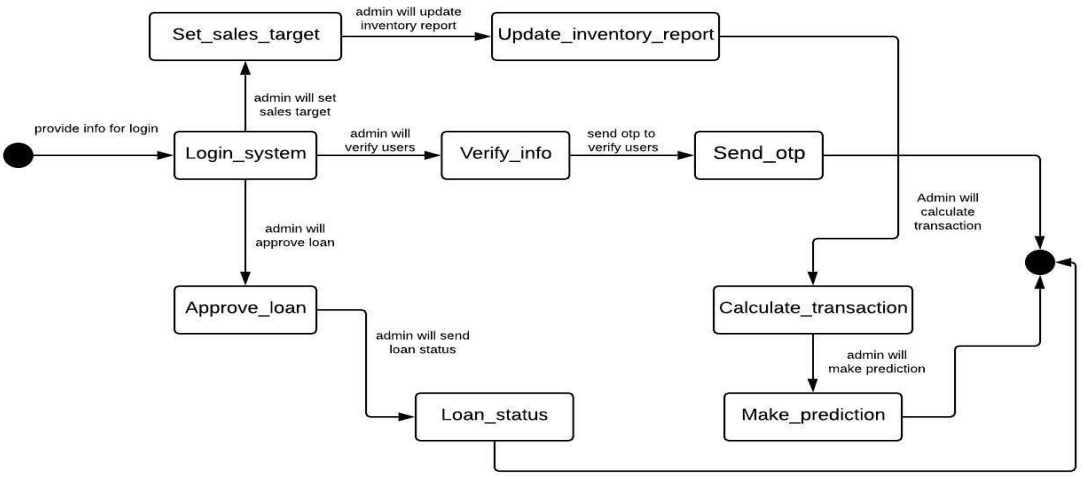


Figure: id 1

ID: 2

Name:Non-registered employee
Non-registered employee

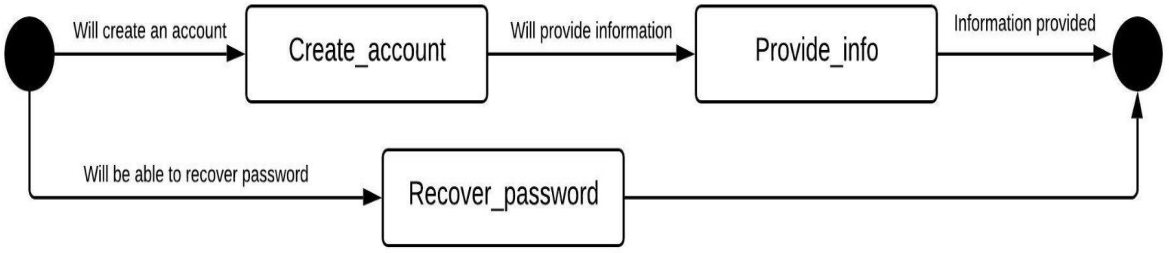


Figure: id 2

ID: 3

Name:Employee
Employee

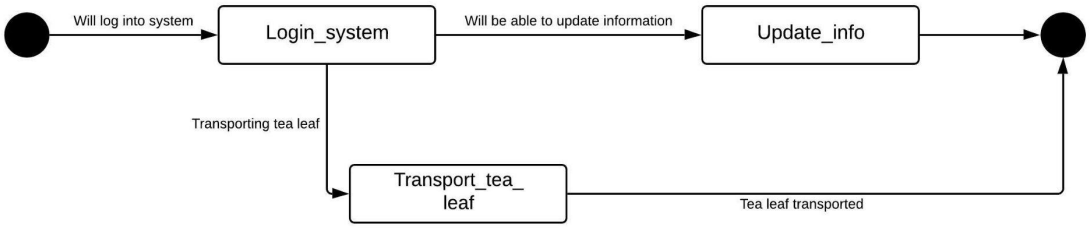


Figure: id 3

ID: 4

Name:Sales Representative
Sales Representative

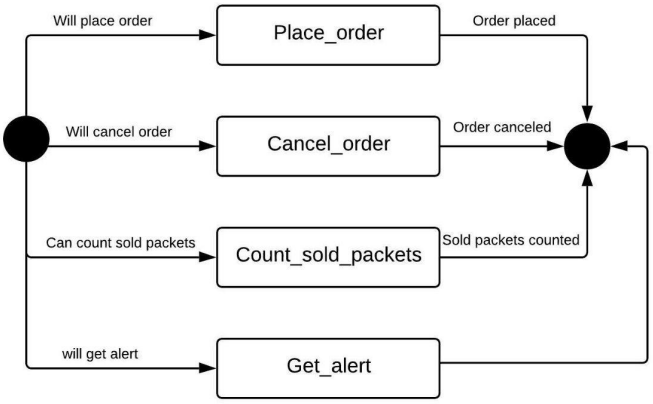


Figure: id 4

ID: 5

Name:Garden Manager
Garden Manager :

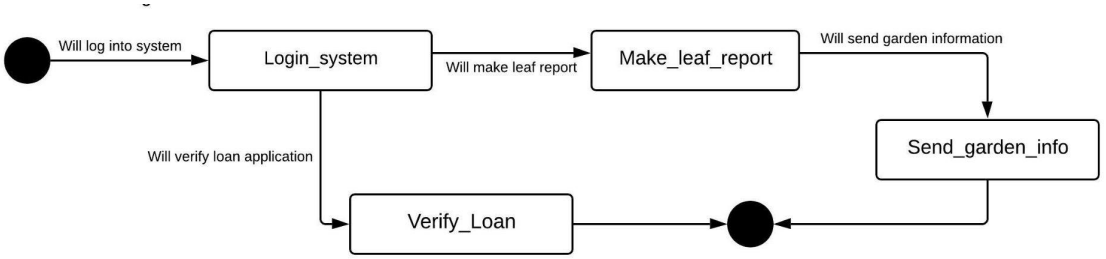


Figure: id 5

ID: 6

Name:Mobile Banking
Mobile Banking:

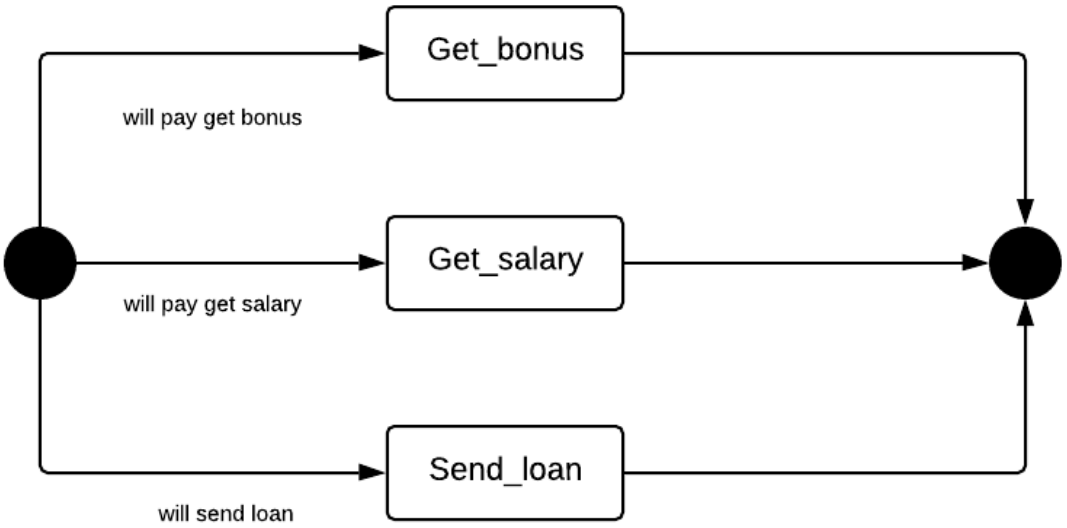


Figure: id 6

ID: 7

Name:Farmer
Farmer:

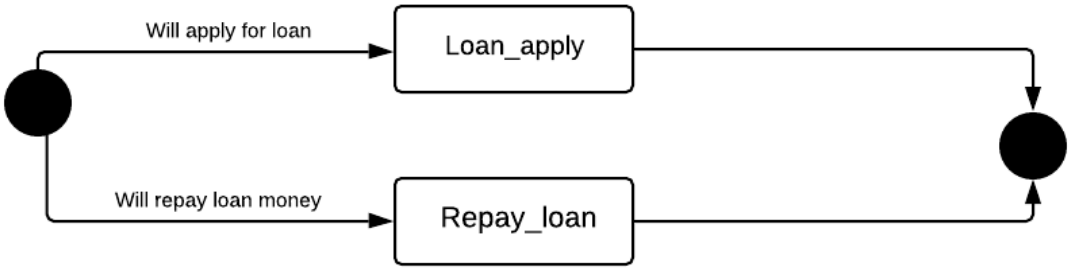


Figure: id 7

ID: 8

Name:Database
Database:

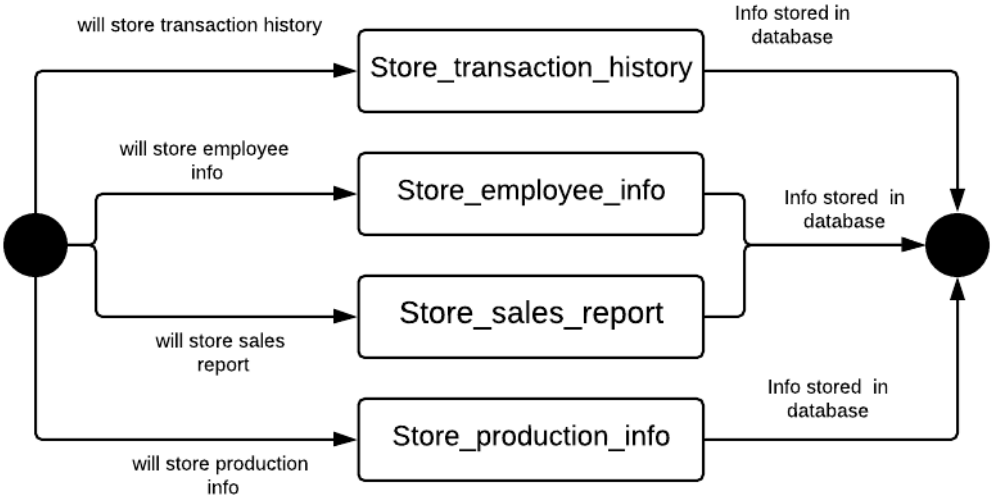


Figure: id 8

ID: 9

Name:SMS
SMS:

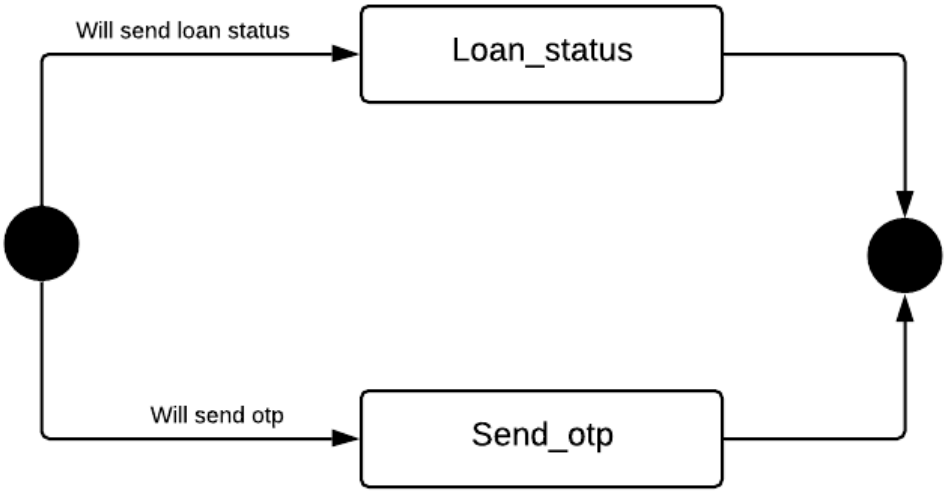


Figure: id 9

ID: 10

Name: Loan
Loan:

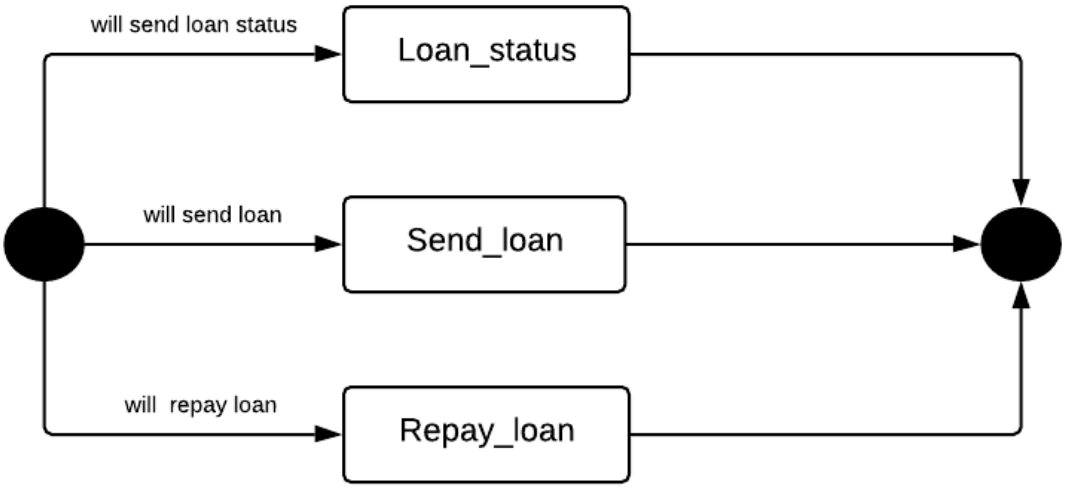
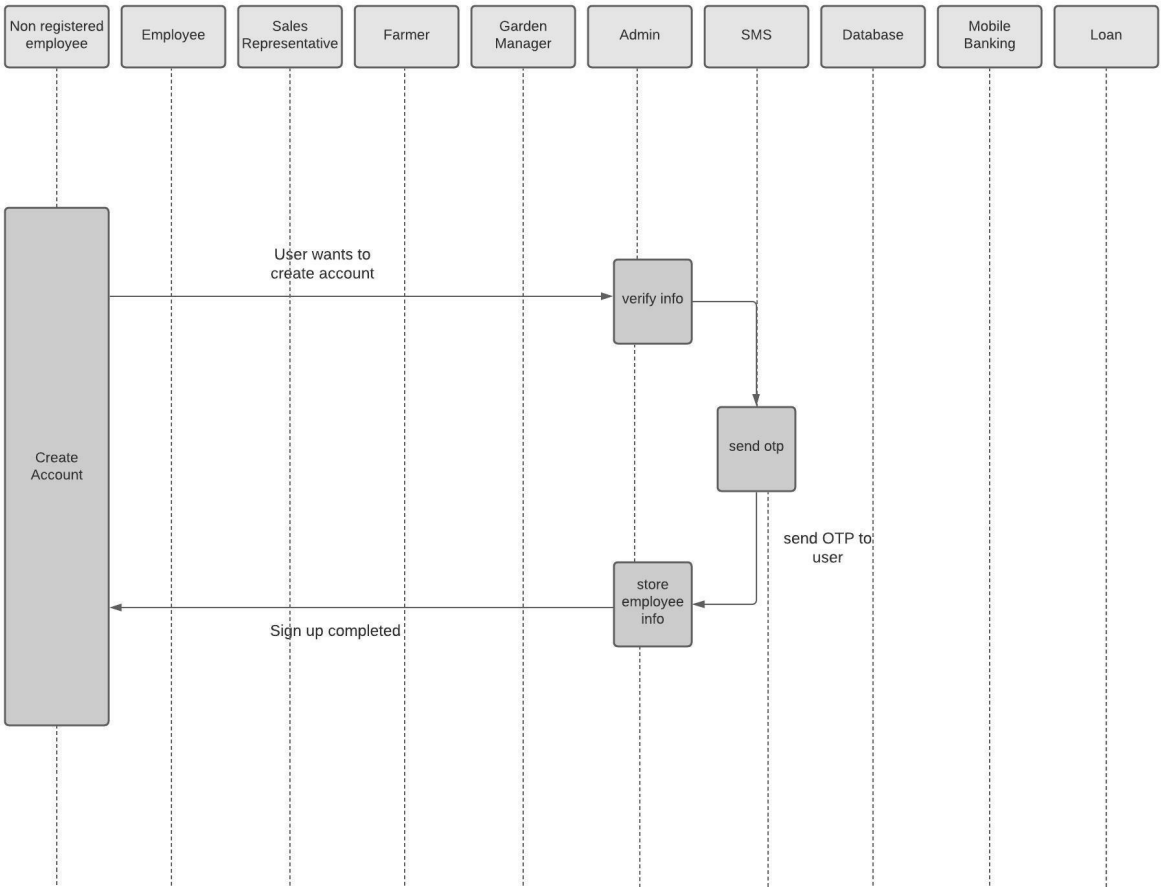
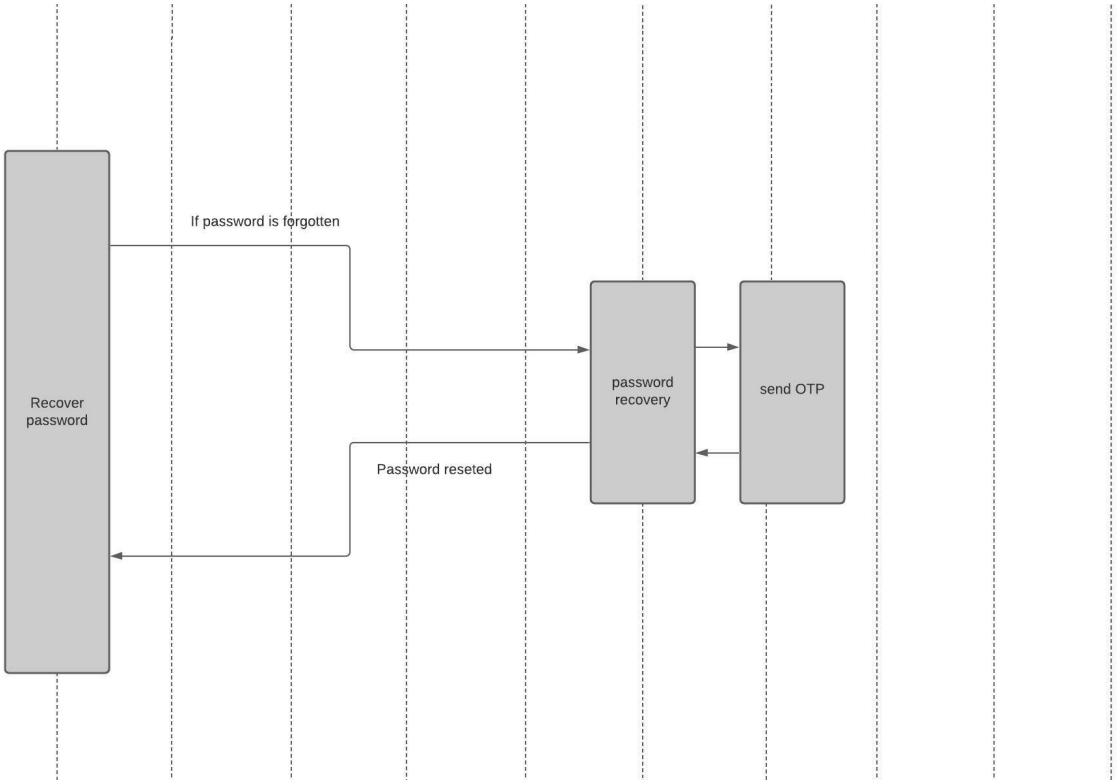


Figure: id 10

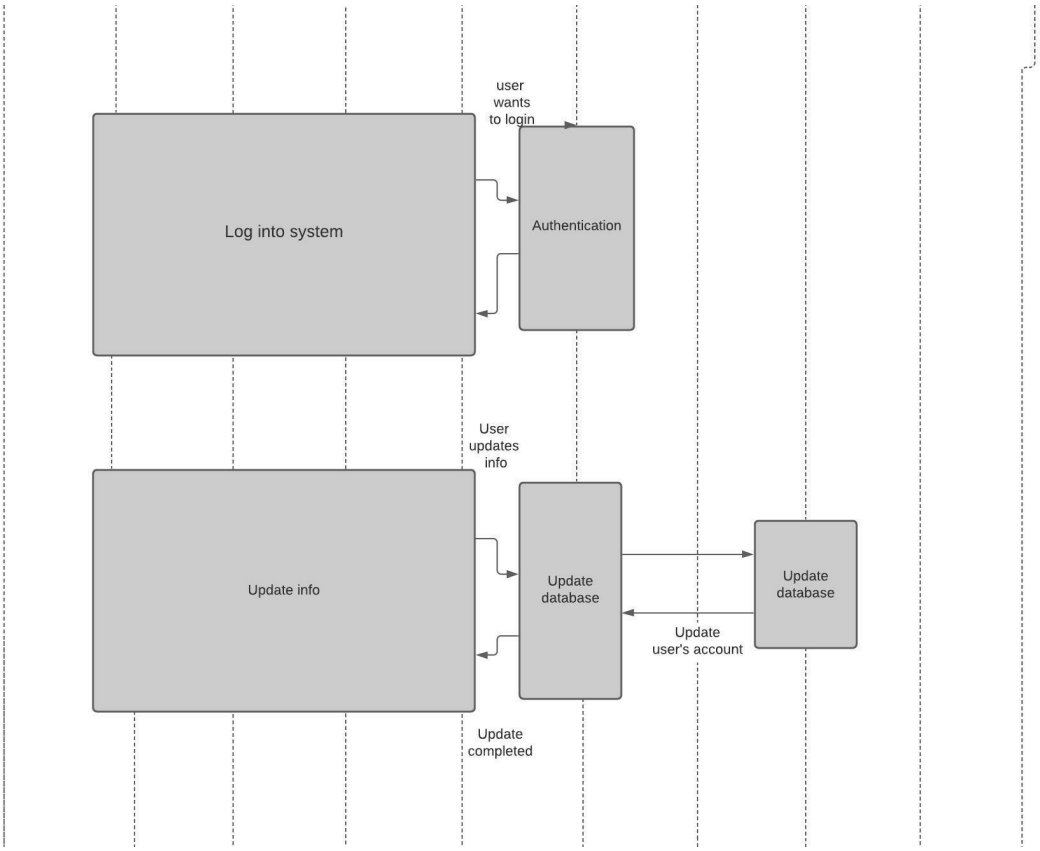
Sequence Diagram :

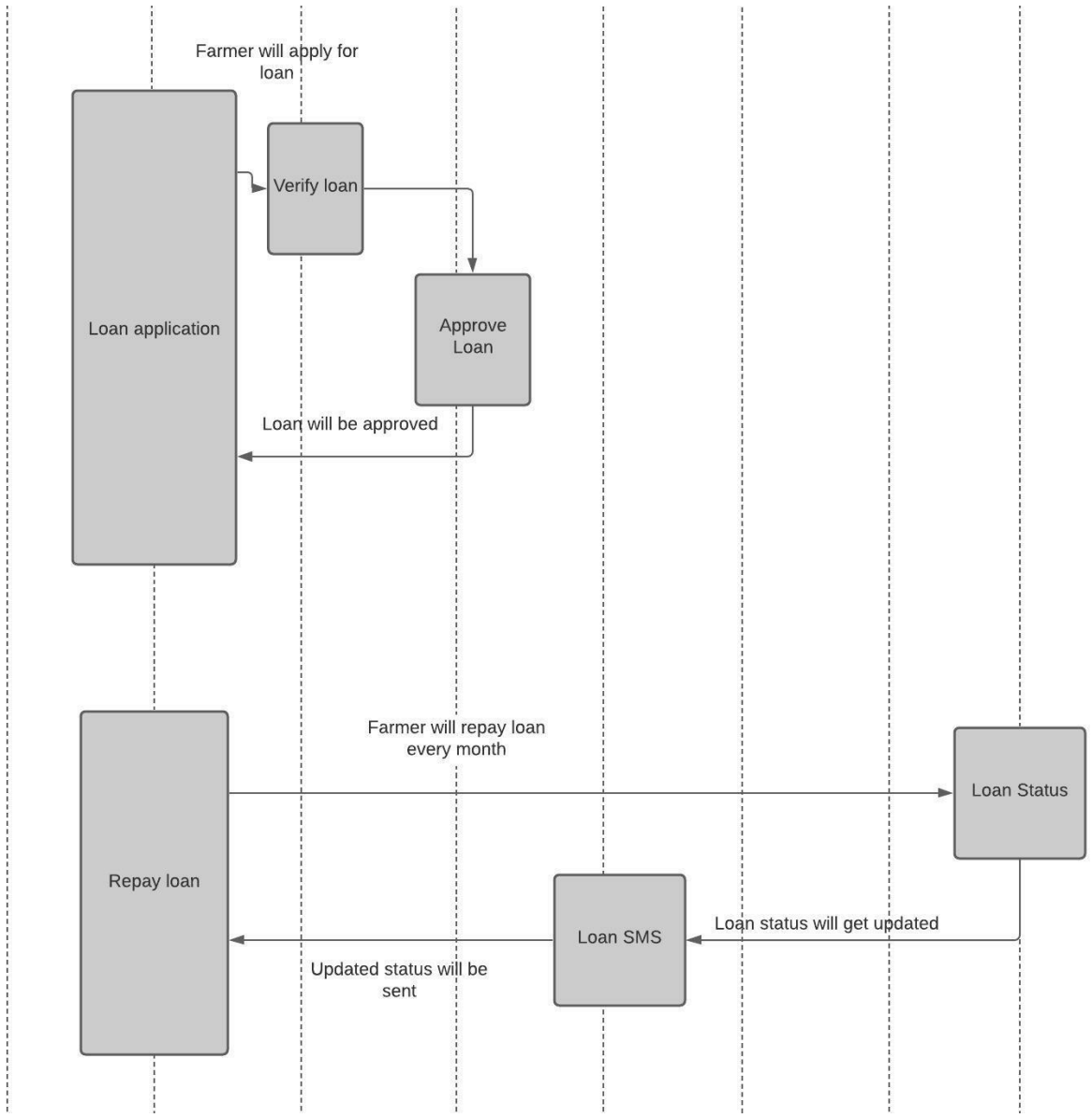
The second type of behavioral representation, called a sequence diagram in UML, is a representation of how events cause flow from one object to another as a function of time. In essence, the sequence diagram is a shorthand version of the use case. It represents key classes and the events that cause behavior to flow from class to class




Recover password
If password is forgotten
password recovery
send OTP
Password reseted

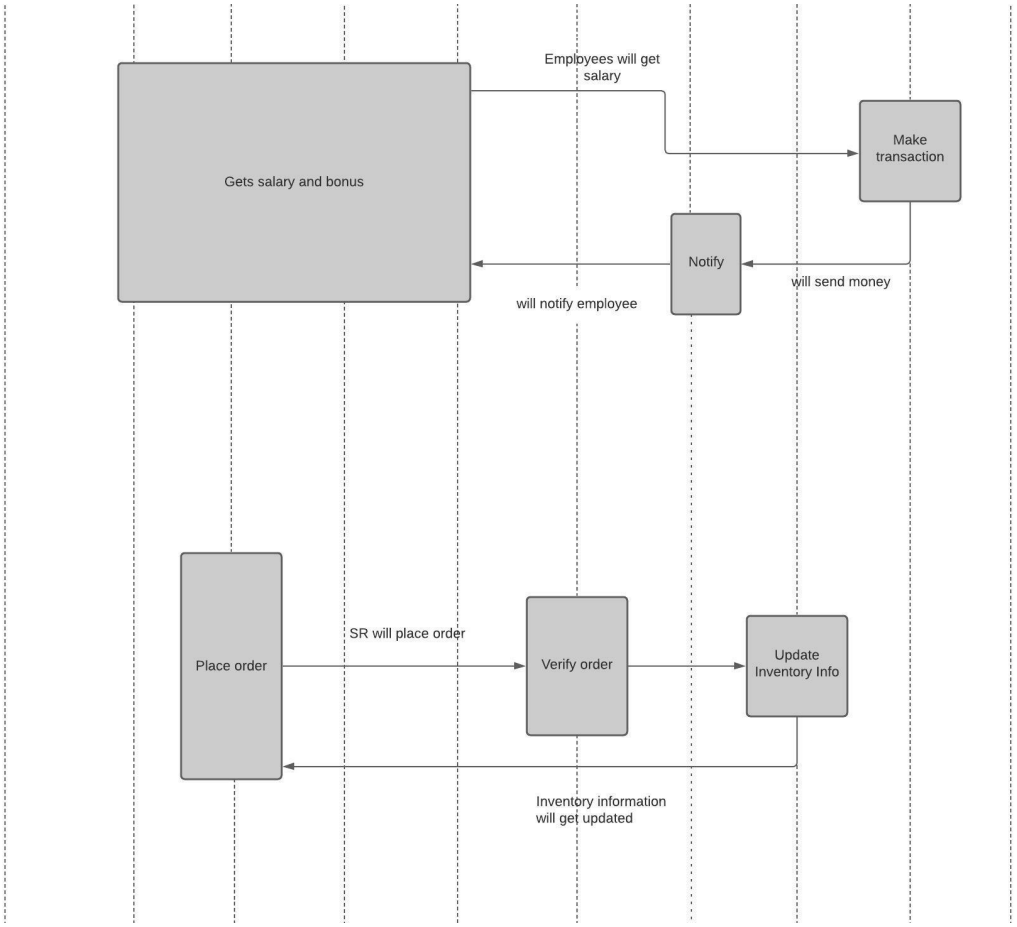
*


user
wants
to login
Log into system
Authentication
User
updates
info
Update info
Update
database
Update
database
Update
user's account
Update
completed

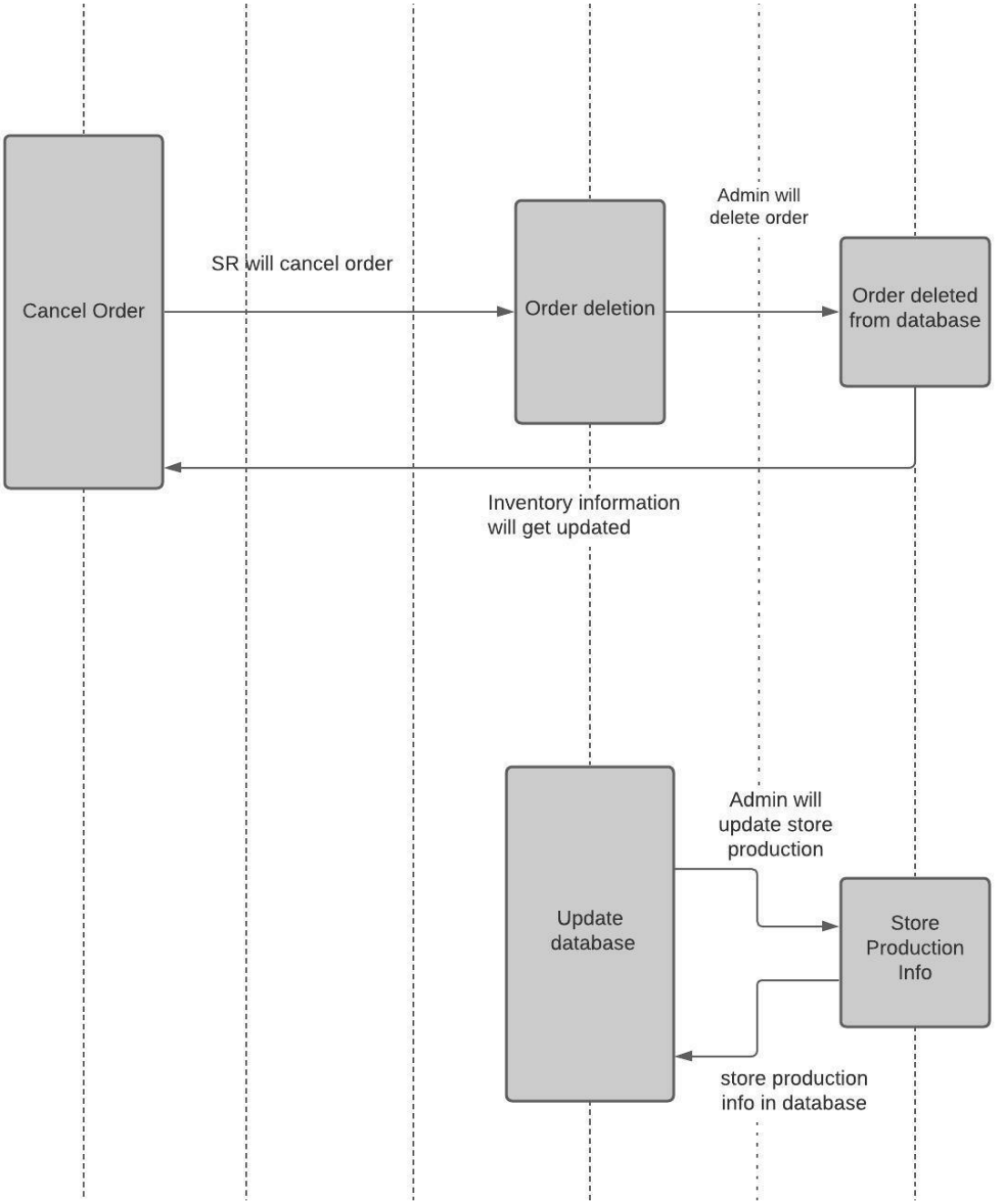

Farmer will apply for loan
Verify loan
Loan application
Approve Loan
Loan will be approved
Farmer will repay loan every month
Loan Status
Repay loan
Loan SMS
Loan status will get updated
Updated status will be sent

*

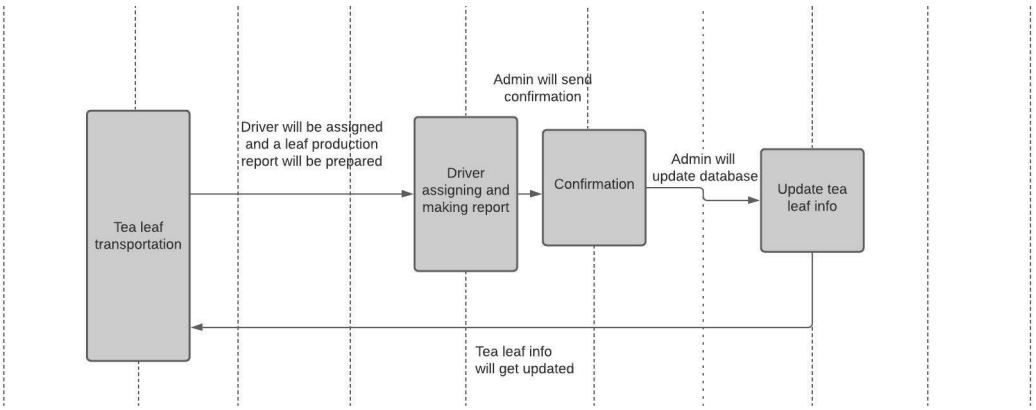
*


Employees will get salary
Gets salary and bonus
Make transaction
Notify
will send money
will notify employee
Place order
SR will place order
Verify order
Update Inventory Info
Inventory information will get updated

*


Cancel Order
SR will cancel order
Order deletion
Admin will
delete order
Order deleted
from database
Inventory information
will get updated
Update
database
Admin will
update store
production
Store
Production
Info
store production
info in database

*


Admin will send
confirmation
Driver will be assigned
and a leaf production
report will be prepared
Admin will
update database
Tea leaf
transportation
Driver
assigning and
making report
Confirmation
Update tea
leaf info
Tea leaf info
will get updated