Institute of Information Technology,
University of Dhaka

Software Project Lab-2 (SE-505)

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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 , 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.

List of Stakeholders

Stakeholders refers to any person or group who will be affected by the system directly or indirectly. Stakeholders include end-users who interact with the system and everyone else in an organization that might be affected by its installation.

At inception, a list of people who will contribute input as requirements are elicited. The initial list will grow as stakeholders are contacted because every stakeholder will be asked: "Whom else do you think I should talk

to?”

To identify the stakeholders, we consulted with the “Sultan Tea Garden” owner and found some requirements. We identified the following stakeholders for our “Tea Garden Management System” project.

- Garden Owner
- Employees
- Workers
- Land Owners

Story Behind Tea Garden Management System

Though most of the tea gardens in Bangladesh are situated in Sylhet and Chittagong division, there are also tea gardens in northern districts of Bangladesh. Those gardens serve local demand. There are many small and large tea gardens in Thakurgaon district. Those tea gardens usually manage all kinds of their work manually. There is scope for automating the system using software. For this reason, as our SPL-2 project we have chosen ‘Sultan Tea Garden’ which is located in Thakurgaon.

“Sultan Tea Garden” is near the Bangladesh-India border which is almost 90 acres in area. The “Sultan tea garden” produces most of the total tea leaves demand for the industry . Approximately 100 laborers work in the Tea garden.

Most of the demand for leaves is met by the Tea garden. For the remaining demand of tea leaves, “Contract farmer supervisor” contracts with farmers who have proper lands for tea farming. If the land owners are convinced, they send their papers for verification. After contracting,”Contract farmer supervisor” will check their paper manually and if Landowners fulfills requirements ,”Contract farmer supervisor” will approve the loan. Then approved landowners will get the loan money.

Landowners will get loans which they will use for producing tea leaves . After 2 years, landowners will pluck tea leaves and send them to the inventory. "Contract farmer supervisor" will confirm about the reception. 10% Price of the received leaves will be deducted from the loan amount and rest will be sent to the landowner. Loans will be categorized in 2 types according to their loan completion . They are : completed and uncompleted. Completed loans can apply for loan again and uncompleted loans will follow the previous proceeding.

Under the HR management,attendance of employees and workers will be kept.Employees and workers will give attendance and the HR manager will keep track of them. Employees will apply for vacation and the HR manager can approve or disapprove vacation applications.

On the basis of their attendance status, they will get their salary under Payroll management. A payroll manager will manage the system. Workers will get their wages on a weekly basis and employees will get their salary on a monthly basis. There will be a system generated payslip. Workers will not get payslip. Employees will get a bonus twice a year on the occasion of Eid. The bonus amount will be the same as their salary. The salary will be paid via mobile banking.

Inventory management is a systematic approach to sourcing, storing ingoing and outgoing products—both raw materials (tea leaves) and goods. There is an inventory manager who manages this segment. Tea leaves are the main concern of our inventory. There will also be stored pesticide, fertilizer, accessories in inventory. Tea leaves which are produced in the tea garden will be stored in inventory. Amount of Incoming and outgoing tea leaves will be counted also. Monthly inventory reports will be generated on the basis of tea leaves information.

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 (Employee, Land owners,Workers) will create an account providing information such as contact number, name, NID number, address.
2. A predefined account will be given to the system admin.
3. Land owners will have an individual profile where there will be basic information about them. They can upload their required documents while applying for a loan. If the loan application is approved by 'Contract Farmer Supervisor' manually, there will be a "loan section"

where they can see all kinds of insights about their loan. Land owners will get their loan money via mobile banking.

4. Employees already have an account. Attendance will be given manually . In their profile, they can see their attendance status and salary status.
5. Workers will have an account where they will have their basic information and their attendance list.
6. Employees will get their salary monthly and workers will get their wages weekly. Employees and workers will get their salary by mobile banking.
7. There will be an inventory section where information about incoming and outgoing tea leaves will be stored. Information about pesticide,fertilizer and other accessories will also be stored. Inventory manager will make an inventory report after every month.
8. Payroll manager will send salary to Employee, wages to workers and Loan money to Landowners by mobile banking.
9. System Admin can add/remove Employee, Land owners, Contract farmer Supervisor, Workers from the system.

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:

1. Making the system secure.
2. Recording transaction history among Land owners, Employee, and Workers.
3. Recording history of inventory reports.
4. Database update.
5. User friendly
6. Interactive and attractive user interface.
7. A system generated payslip will be given to the Employee.

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:

1. Yearly reports will be generated for inventory.

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 garden has many aspects, such as account management, loan management system, Human Resources Management, Payroll management, Inventory management. To run all of these features properly, a tea garden management system is needed.

1.Account Management :

User Perspective:

Create account: A tea garden management system has different types of users. They are Employees, Land owners and Workers. For every user, they have to create an account. 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. ID number
5. Address
6. Password

In mobile numbers ,users will have to give a valid Bangladeshi Mobile Number. For NID, users will have to give a valid NID number. For password, there should be a requirement for a strong password which will have minimum 8 letters, a capital letter minimum, a small letter minimum, at least a number and a special character. System will verify the NID number with the Full name, ID number. If the information is correct, users will get an OTP in their mobile number and by inputting the OTP, they will create their account.

Login account: The user can log-in using mobile number and password.

Recovery Account: If the user forgets his password, it can be recovered by giving their information and a recovery OTP will be sent to their mobile number.

System Admin perspective: An account for the System Admin will be given by the Management with a predefined username and password.

Tea garden management has 4-types of managers. All managers are special types of employees. System Admin is the main admin of the software. He/she will assign managers.“Contract Farmer Supervisor(CFS)” is a manager who manages loan applications and software works associated with landowners. Inventory Manager will update all information about inventory and generate inventory reports.HR manager will keep attendance , approve leave applications. Whereas a Payroll manager will manage the payroll management, where he/she will give salary and wages to employees and workers respectively via mobile banking.

2.Loan Management:

Loan Application: Land owners will have an individual profile where there will be basic information about them. They can upload their required documents while applying for a loan. Required documents are:

1. Papers of land
2. NID copy
3. 2 copy passport size photo

Loan Profile: If the loan application is approved by 'Contract Farmer Supervisor' manually, there will be a "loan section" where they can see all kinds of insights(loan amount remaining,Loan amount paid, Loan expiry date) about their loan. Land owners will get their loan money via mobile banking. Loans will be categorized in 2 types according to their loan completion . They are : completed and uncompleted. Completed loans can apply for loan again and uncompleted loans will follow the previous proceeding.

Loan Repayment: Landowners will get loans which they will use for producing tea leaves . After 2 years, landowners will pluck tea leaves and send them to the inventory.

10% Price of the received leaves will be deducted from the loan amount and the rest will be sent to the landowner.

3.HR Management

Sultan Tea Garden has 2 types of human resources. They are:
1.Employee
2. Workers

Employee Management: Employees are those people who manage the workers directly or indirectly and are also associated with any work of the tea leaves production. Admins are also employees. Employees already have an account. Attendance will be given manually. In their profile, they can see their attendance status and salary status.

Worker Management: Workers are the people who work in fields. They do plantation, nurturing, plucking tea leaves etc. Workers will have an account where they will have their basic information and their attendance list.

Both of the human resources are managed under HR management. Their attendance and leave will be kept under HR management. Employee management,managing worker detail and vacation management will be done under HR management.

4.Payroll Management

Employees and workers will get their salary by mobile banking.

Employee Salary: Employees will get their salary monthly. Attendance will be counted manually and then updated in the software. On the basis of employees' attendance they will get their salary . Absence will also affect their salary. Certain days of absence will have no problem for employees, but more than that will affect their salary. If the absence is limited on certain days, attendance will be counted as ‘with pay’.

If the day of absence exceeds certain days, then it will be counted as ‘without pay’.There will be a system generated payslip. Employees will get a bonus twice a year on the occasion of Eid. The bonus amount will be the same as their salary.

Workers Wages: Workers will get their wages weekly. For workers, any days of absence will deduct money from their wages. There is no need to give a vacation application for workers.

5.Inventory Management

Inventory management is a systematic approach to sourcing, storing ingoing and outgoing products—both raw materials (tea leaves) and goods.

Leaf Management: Tea leaves are the main concern of our inventory. Tea leaves which are produced in the tea garden will be stored in inventory. Then tea leaves which will be sent to the factory will go from here. Amount of Incoming and outgoing tea leaves will be counted in kg. The Inventory Manager will work here.

Goods Management:

There will also be stored pesticide,fertilizer,accessories in inventory. The amount of those goods will be stored.

Report Generation: Monthly inventory reports will be generated. It will contain incoming and outgoing leaves information and goods information.

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, System Admin, Land owner, Worker,CFS,Inventory Manager,Payroll Manager,HR manager
Secondary Actor: SMS, Mobile Banking

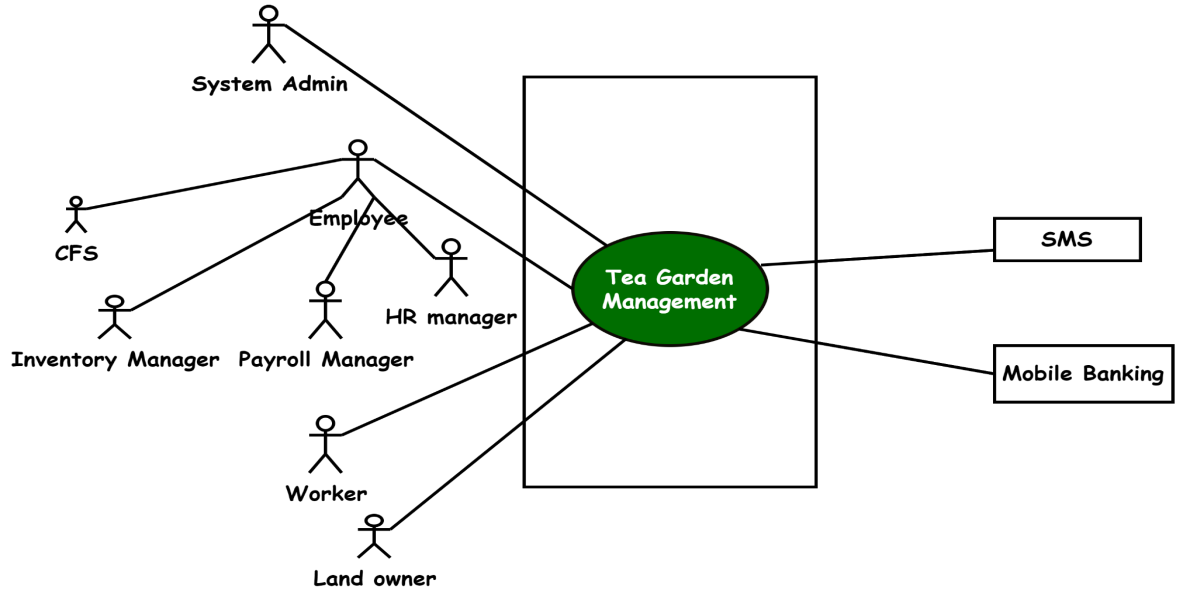


Figure:Use case Diagram of level 0

Level-1 :

Name: TGMS
Primary Actor: Employee,System Admin, Land owner, Worker,CFS,Inventory Manager,Payroll Manager,HR manager
Secondary Actor: SMS, Mobile Banking

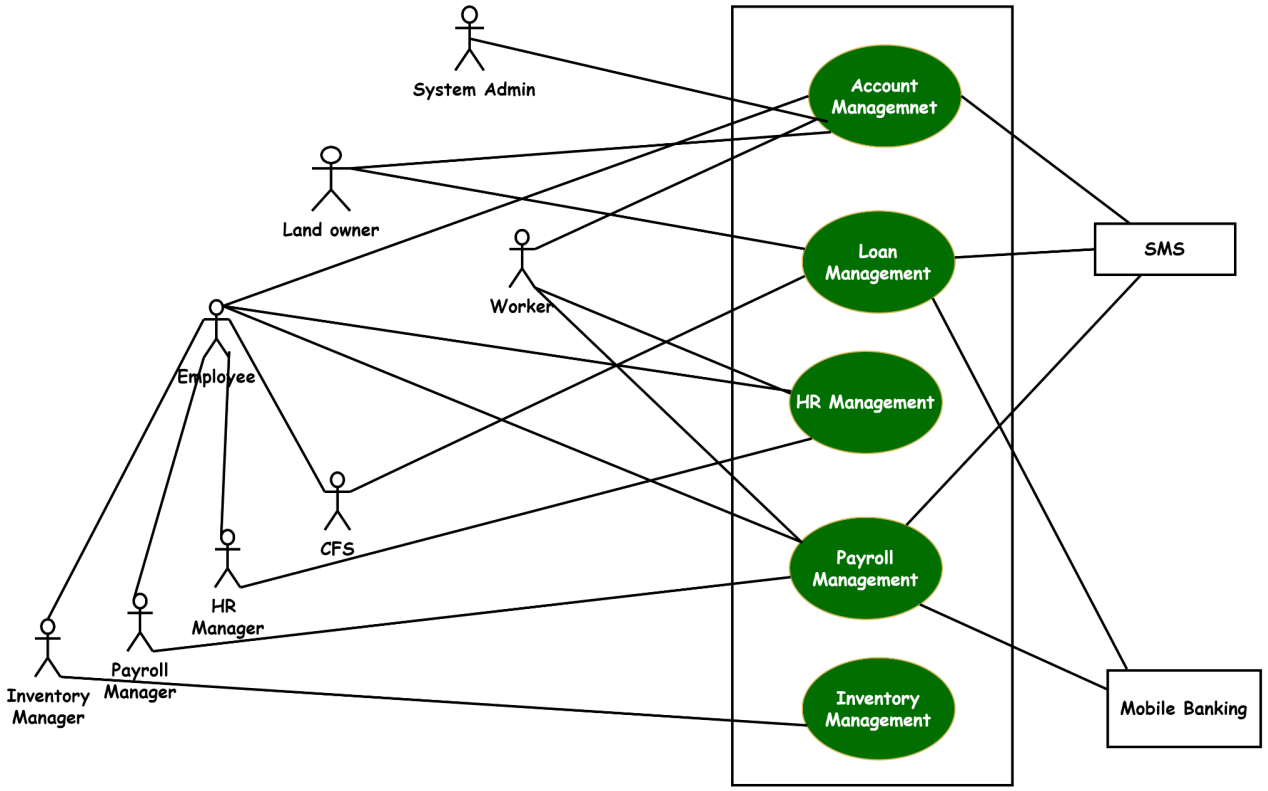


Figure:Use case Diagram of level 1

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 their documents. There will be 2 segments here. Loan profile and loan repayment.

3. HR Management: There are 2 types of Human resources- Employee and workers. Their profile information and attendance report will be managed under this segment.

4. Payroll Management: Employees and workers will get their salary by mobile banking. Employees will receive their salary monthly and workers will get their salary on a monthly basis. There will be a system generated payslip for those salaries and wages.

5. Inventory Management: There will be info about incoming and outgoing products(tea leaves, pesticides and other goods) and the admin will make reports about it monthly.

Level-1.1 :

Name: Account Management
Primary Actor: Employee, System Admin, Land owner, Worker
Secondary Actor: SMS

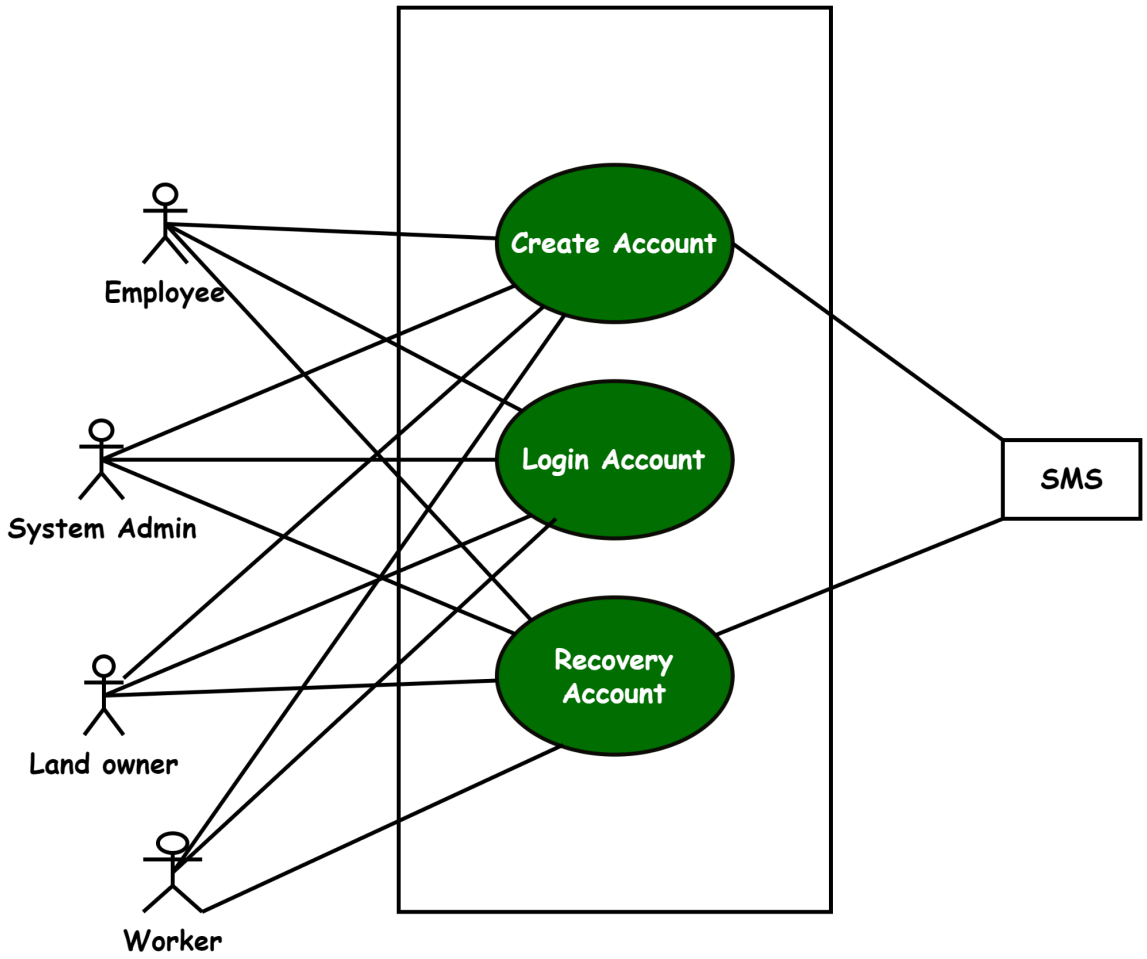


Figure:Use case Diagram of level 1.1

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. User will get a confirmation code to the provided mobile number if the information is corrected. By inputting this code, an account will be created.

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

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

Level-1.2 :

Name: Loan Management
Primary Actor: CFS, Land owner
Secondary Actor: SMS,Mobile Banking

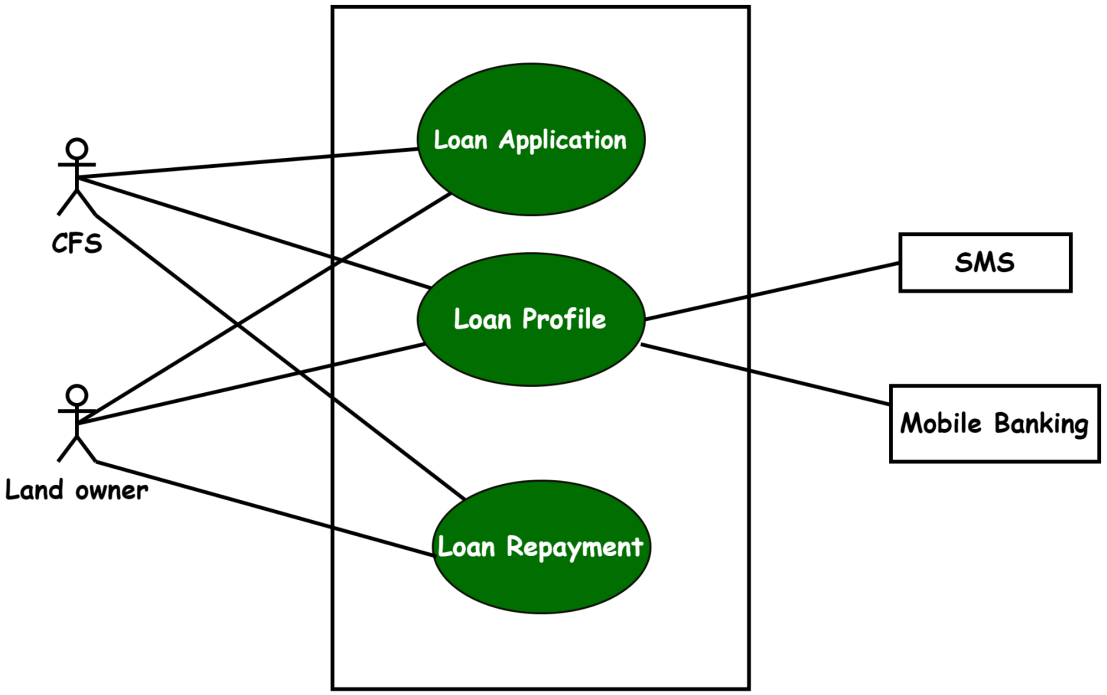


Figure:Use case Diagram of level 1.2

Description of use case diagram level-1.2:

Loan Application: Land owners can create their profile by providing their information(Full name, Mobile number, NID number, Address, Password). After creating an account they can apply for a loan. For applying, they have to provide - papers of land, 2 copies photo of NID, 2 copies passport size photo. After assessing the application, the contract farmer supervisor will confirm or suggest to the respective landowner.

Loan profile : Land owners have a profile. In this segment, there will be information about land owners. If the loan application is approved, there will be a "loan section" where they can see all kinds of insights(loan amount remaining,Loan amount paid, Loan expiry date) about their loan. Land owners will get their loan money via mobile banking. Loans will be

categorized in 2 types according to their loan completion . They are : completed and uncompleted.

Loan Repayment: After producing tea leaves, land owners will send it to inventory. 10% Price of the received leaves will be deducted from the loan amount and the rest will be sent to the landowner. Land owners will get confirmation sms for their repayment.

Level-1.3 :

Name: HR Management
Primary Actor: Employee, HR Manager, Worker

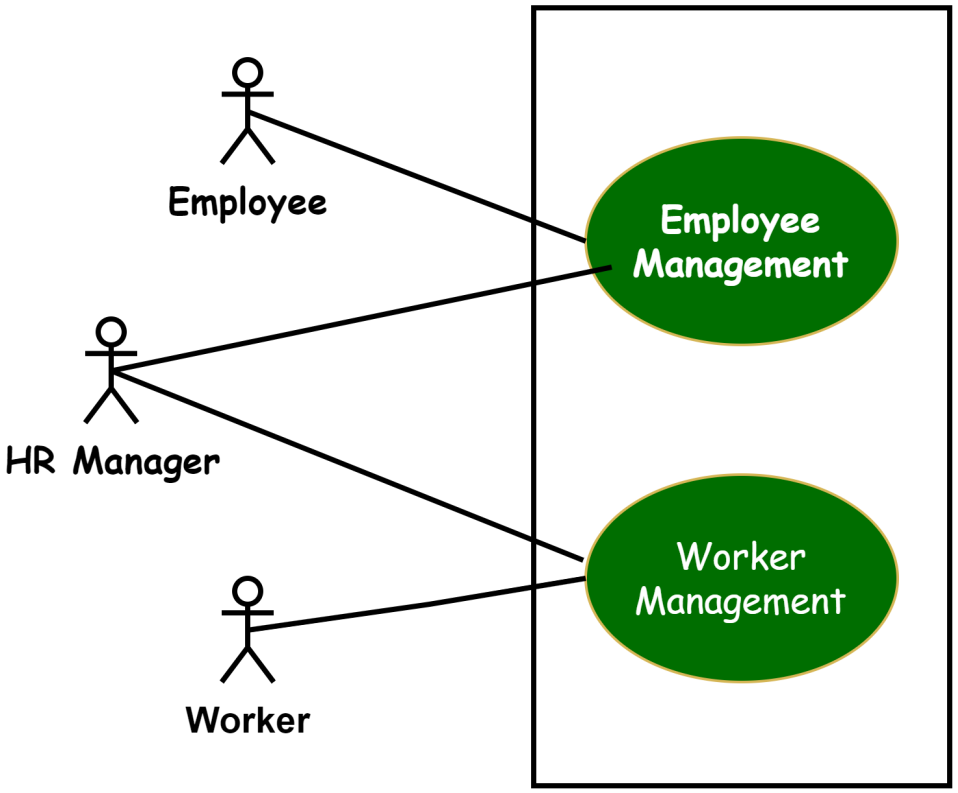


Figure:Use case Diagram of level 1.3

Description of use case diagram level-1.3:

There are 2 segments of HR management. They are Employee management and worker management.

Employee Management: All people associated with this tea garden will be managed under System Admin. With their basic information, there will be an attendance segment for each Employee and worker. Attendance will be taken manually and input the data to software.
Worker Management: Workers will have an account where they will have their basic information and their attendance list. They also can see their attendance. On a weekly basis their attendance will be computed.

Level-1.4:

Name: Payroll Management
Primary Actor: Employee, Payroll Manager, Worker
Secondary Actor: SMS, Mobile Banking

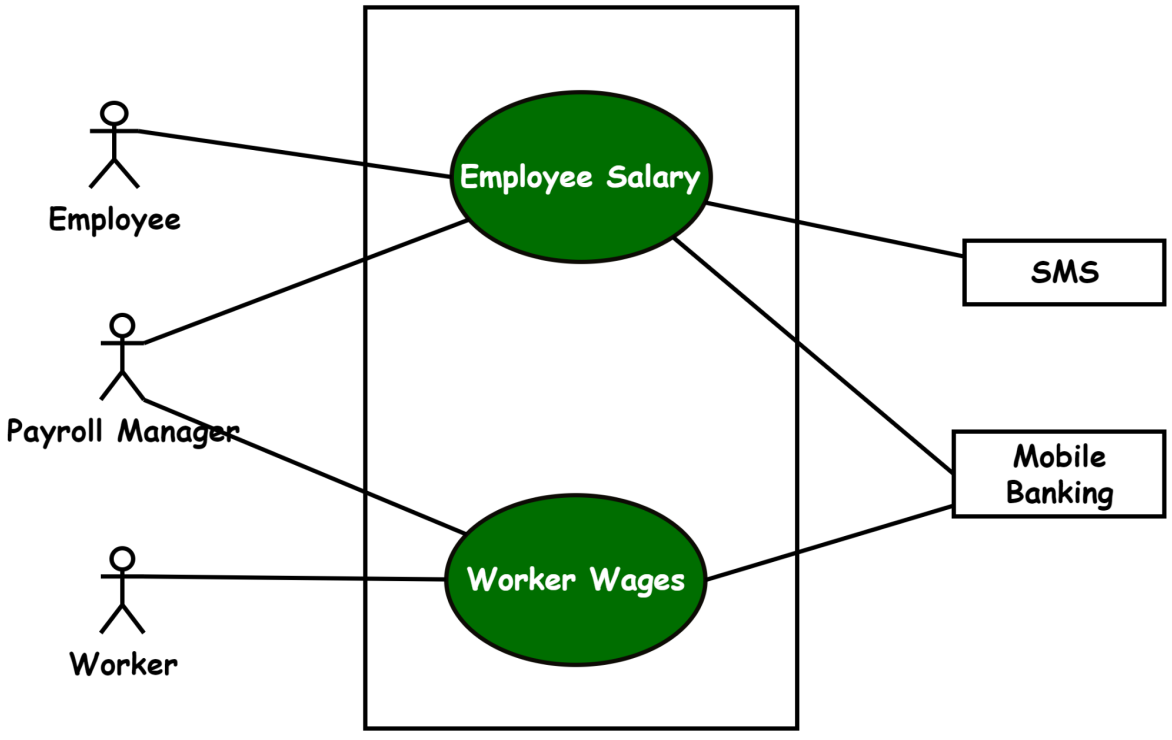


Figure:Use case Diagram of level 1.4

Description of use case diagram level-1.4:

Employee Salary: Employees will get their salary monthly. Attendance will be counted manually and then updated in the software. On the basis of employees' attendance they will get their salary . Absence will also affect their salary. Certain days of absence will have no problem for employees, but more than that will affect their salary. If the absence is limited on certain days, attendance will be counted as ‘with pay’.

If the day of absence exceeds certain days, then it will be counted as ‘without pay’.There will be a system generated payslip. Employees will get a bonus twice a year on the occasion of Eid. The bonus amount will be the same as their salary.

Workers Wages: Workers will get their wages weekly. For workers, any days of absence will deduct money from their wages. There is no need to give leave applications for workers.

Level-1.5:

Name: Inventory Management
Primary Actor: Inventory Manager

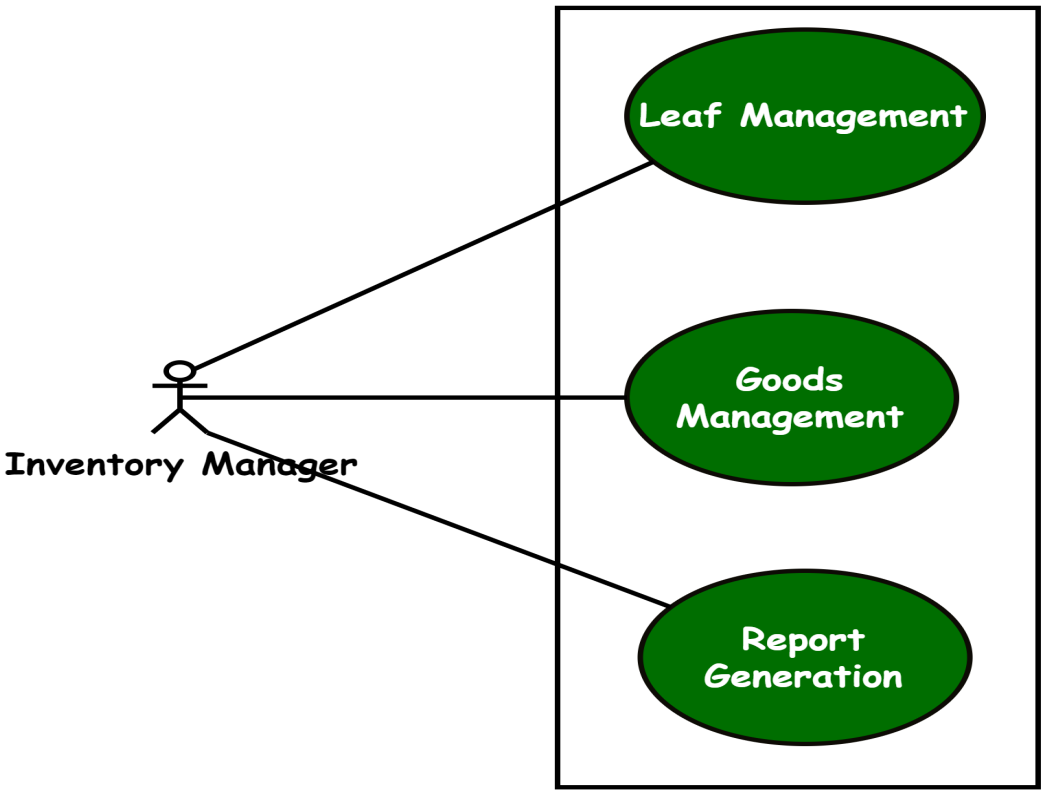


Figure:Use case Diagram of level 1.5

Description of use case diagram level-1.5:

Inventory management is a systematic approach to sourcing, storing ingoing and outgoing products—both raw materials (tea leaves) and goods.

Leaf Management: Tea leaves are the main concern of our inventory. Tea leaves which are produced in the tea garden will be stored in inventory. Then tea leaves which will be sent to the factory will go from here. Amount of Incoming and outgoing tea leaves will be counted in kg. Amount of Incoming and outgoing tea leaves will be counted in kg and updated in the system.

Goods Management: There will also be stored pesticide, fertilizer,accessories in inventory. The amount of those goods will be stored in the database.

Report Generation: Monthly inventory reports will be generated. It will contain incoming and outgoing leaves information and goods information.

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

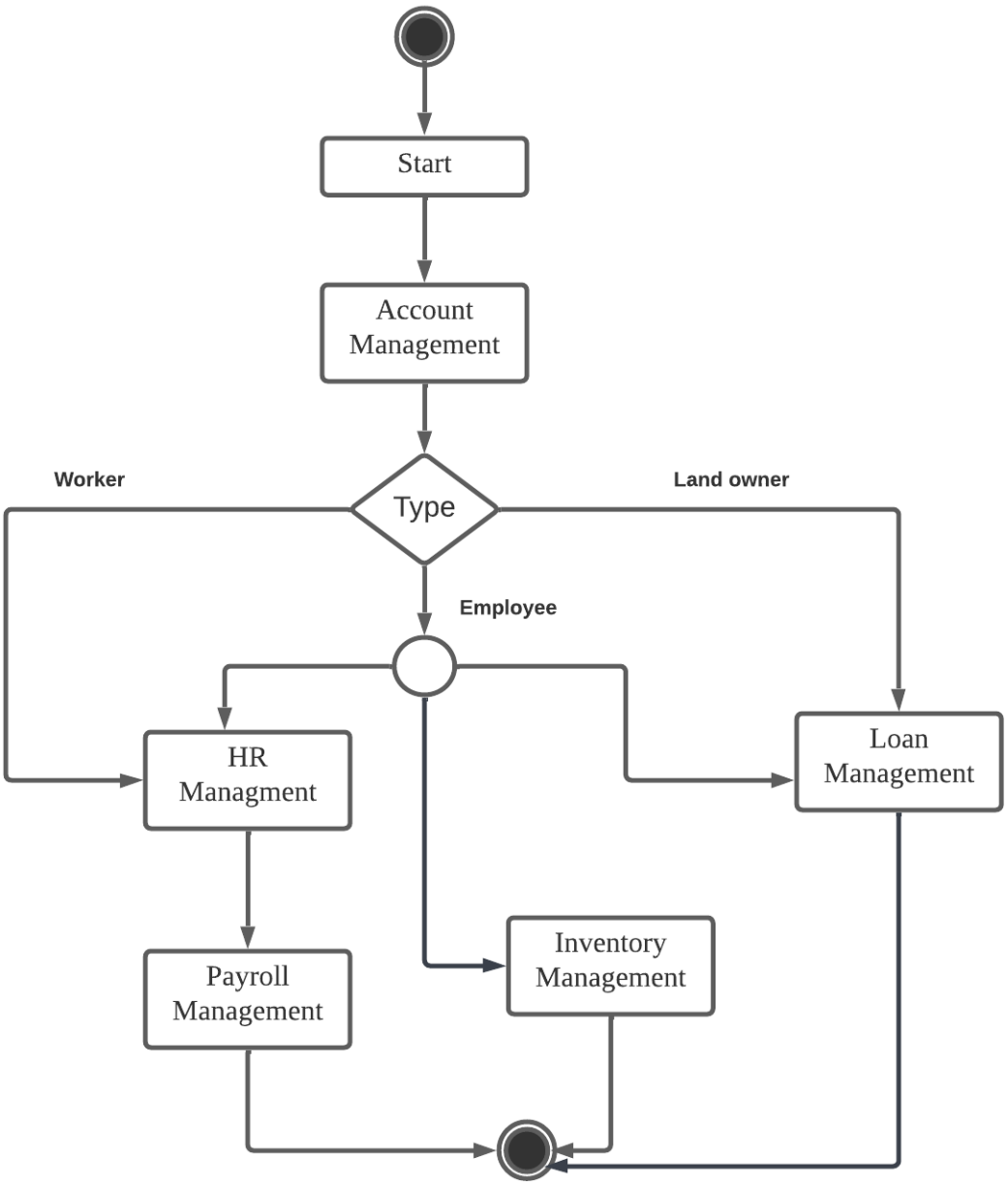


Figure:Activity Diagram of level 1

Level-1.1 :

Name: Account Management

Reference: Use case Diagram level-1.1

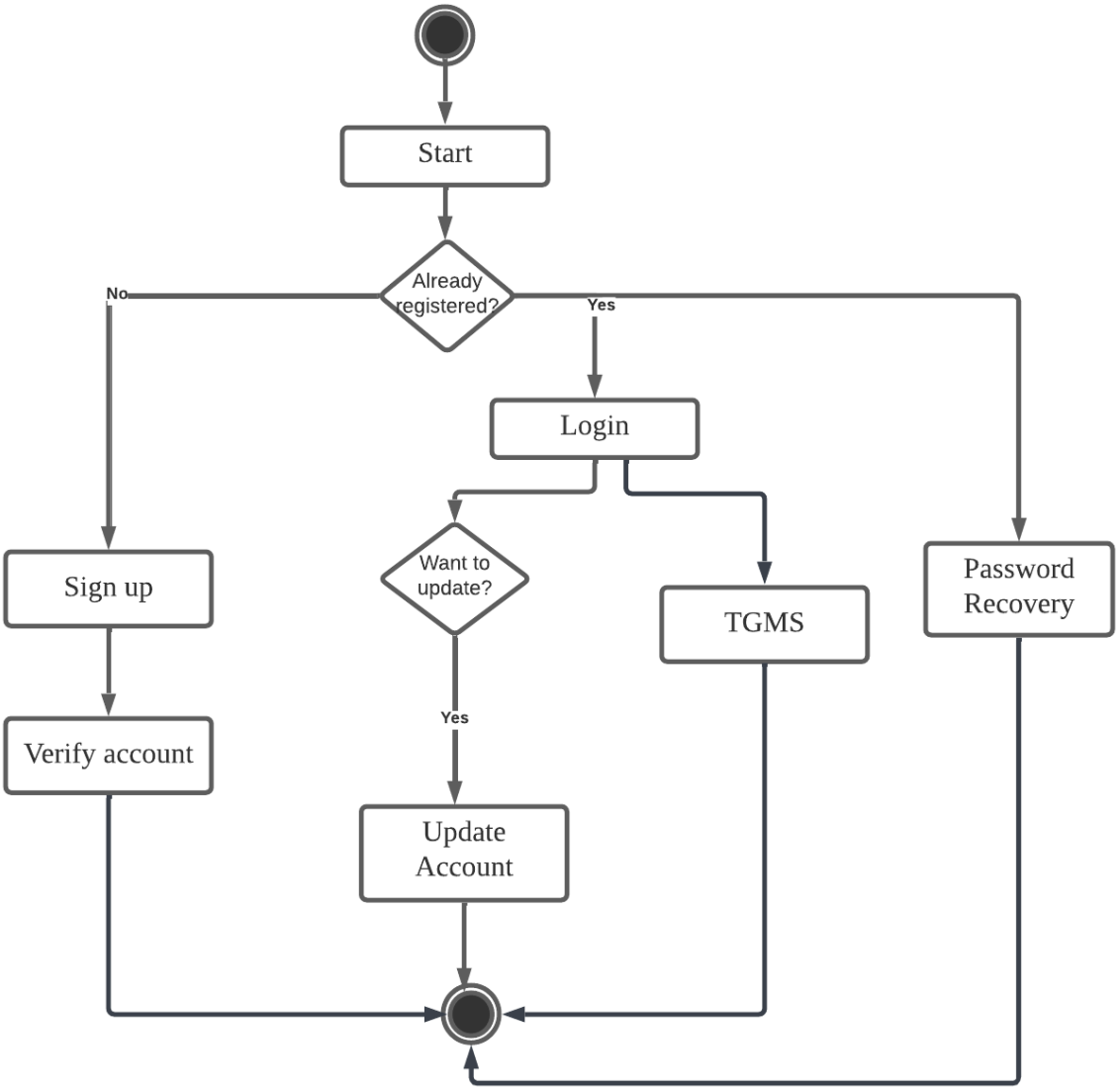


Figure:Activity Diagram of level 1.1

Level-1.2 :

Name: Loan Management

Reference: Use case Diagram level-1.2

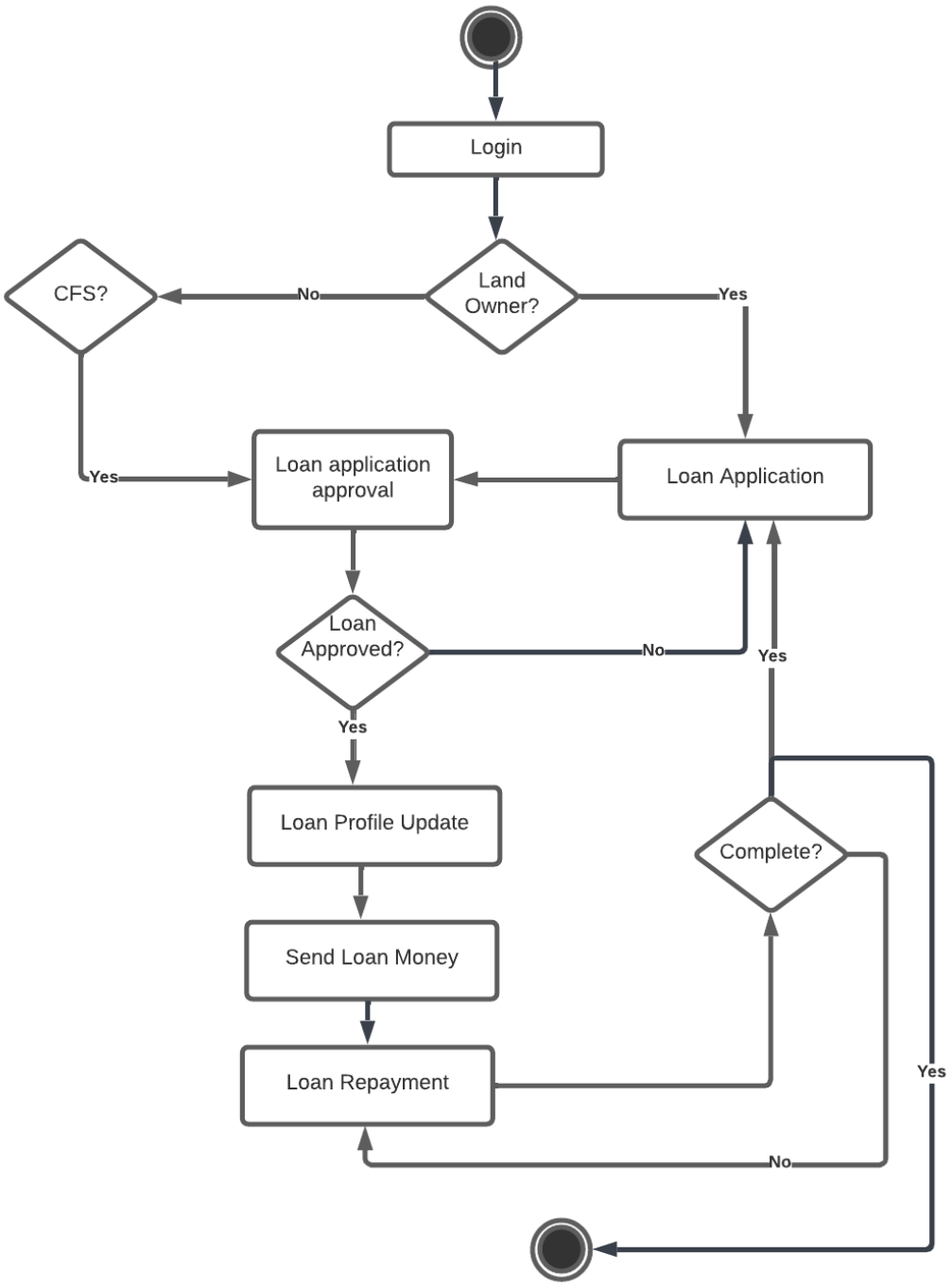


Figure:Activity Diagram of level 1.2

Level-1.3 :

Name: HR Management

Reference: Use case Diagram level-1.3

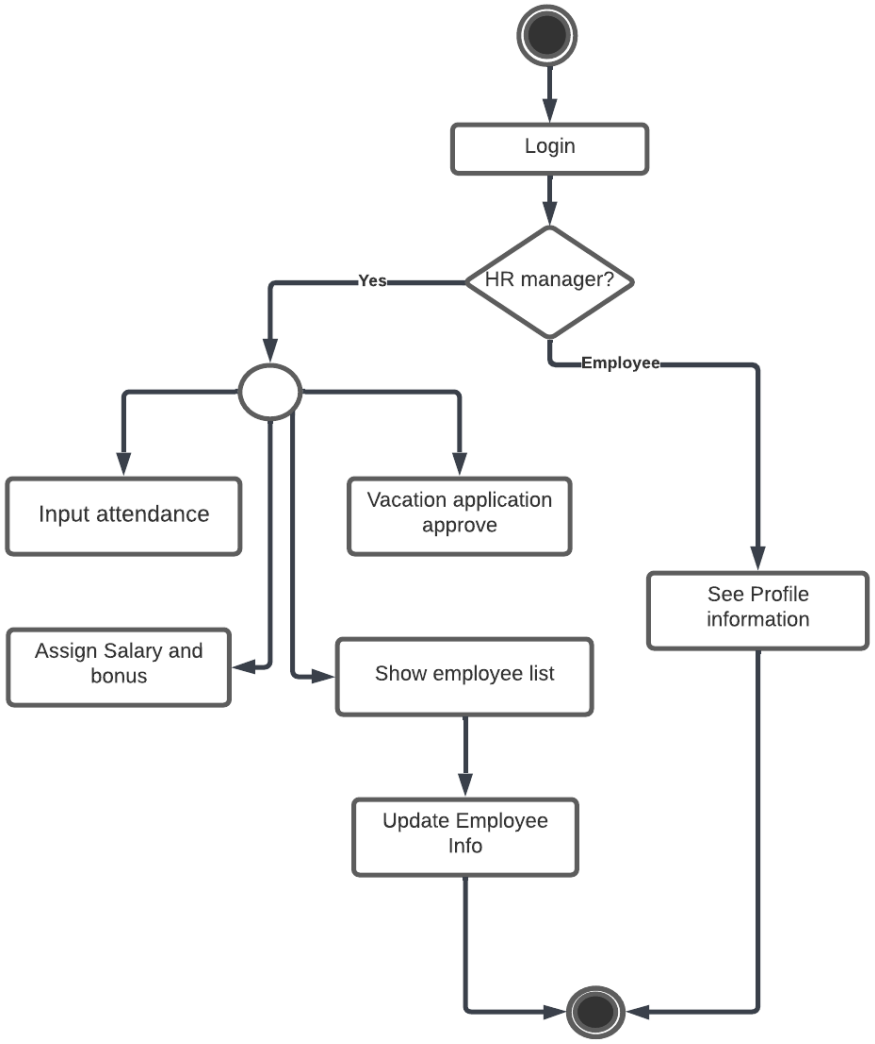


Figure:Activity Diagram of level 1.3

Level-1.4:

Name: Payroll Management

Reference: Use case Diagram level-1.4

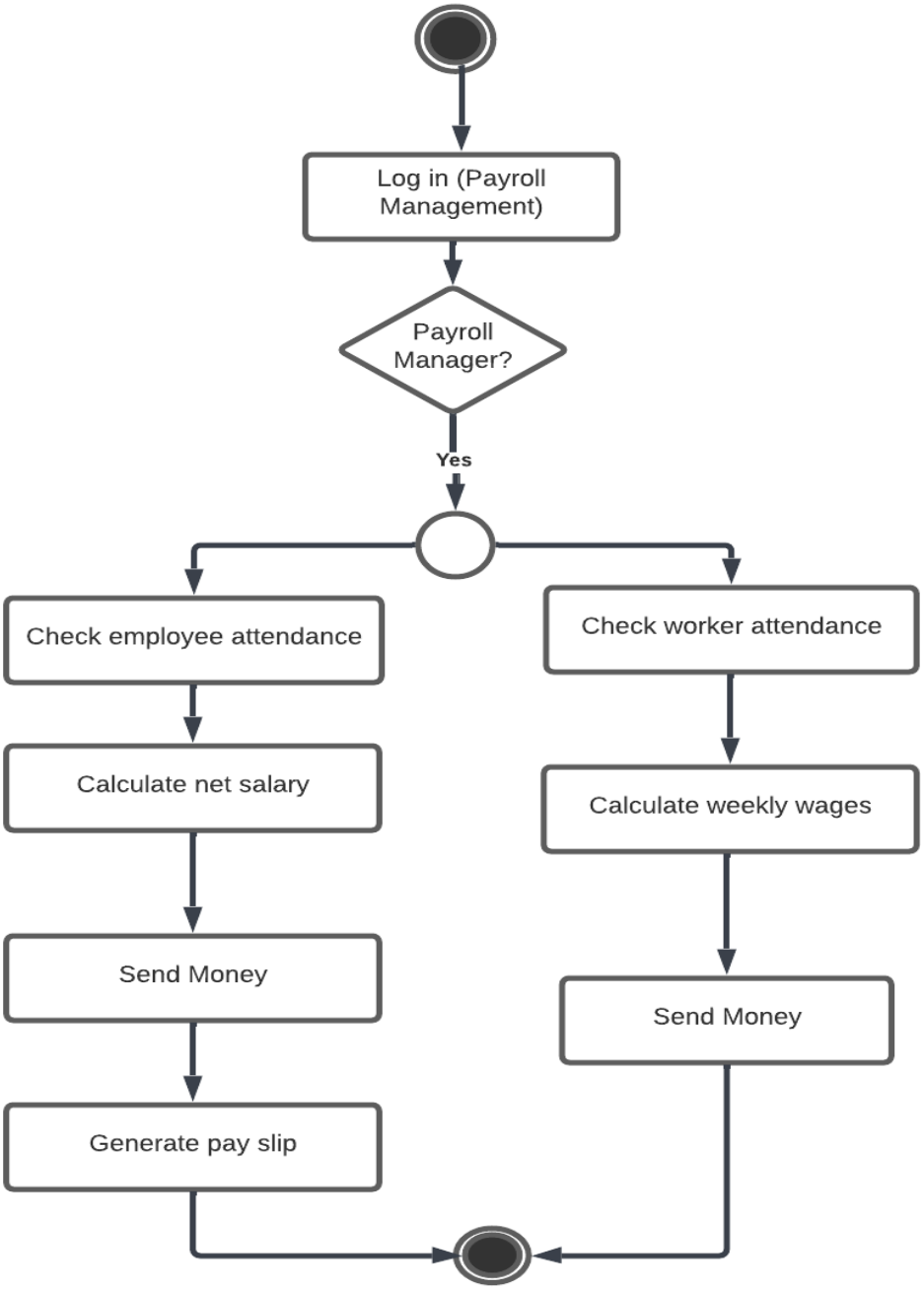


Figure:Activity Diagram of level 1.4

Level-1.5:

Name: Inventory Management

Reference: Use case Diagram level-1.5

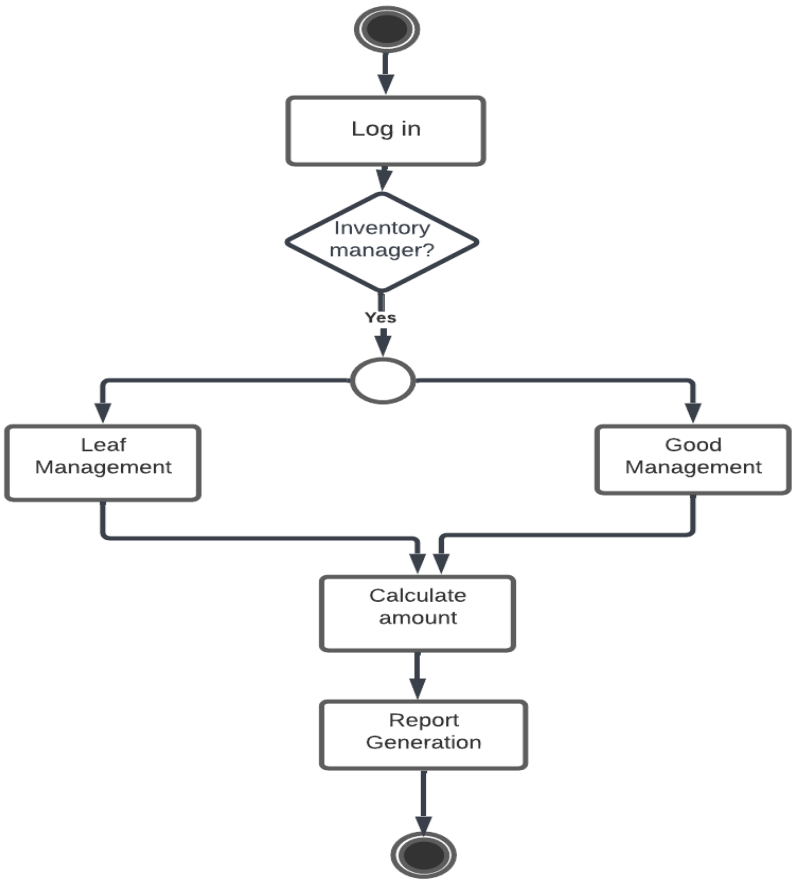


Figure:Activity Diagram of level 1.5

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.

SID (Swimlane ID): 1.1

Name : Account Management
Reference: Use case & Activity diagram level-1.1

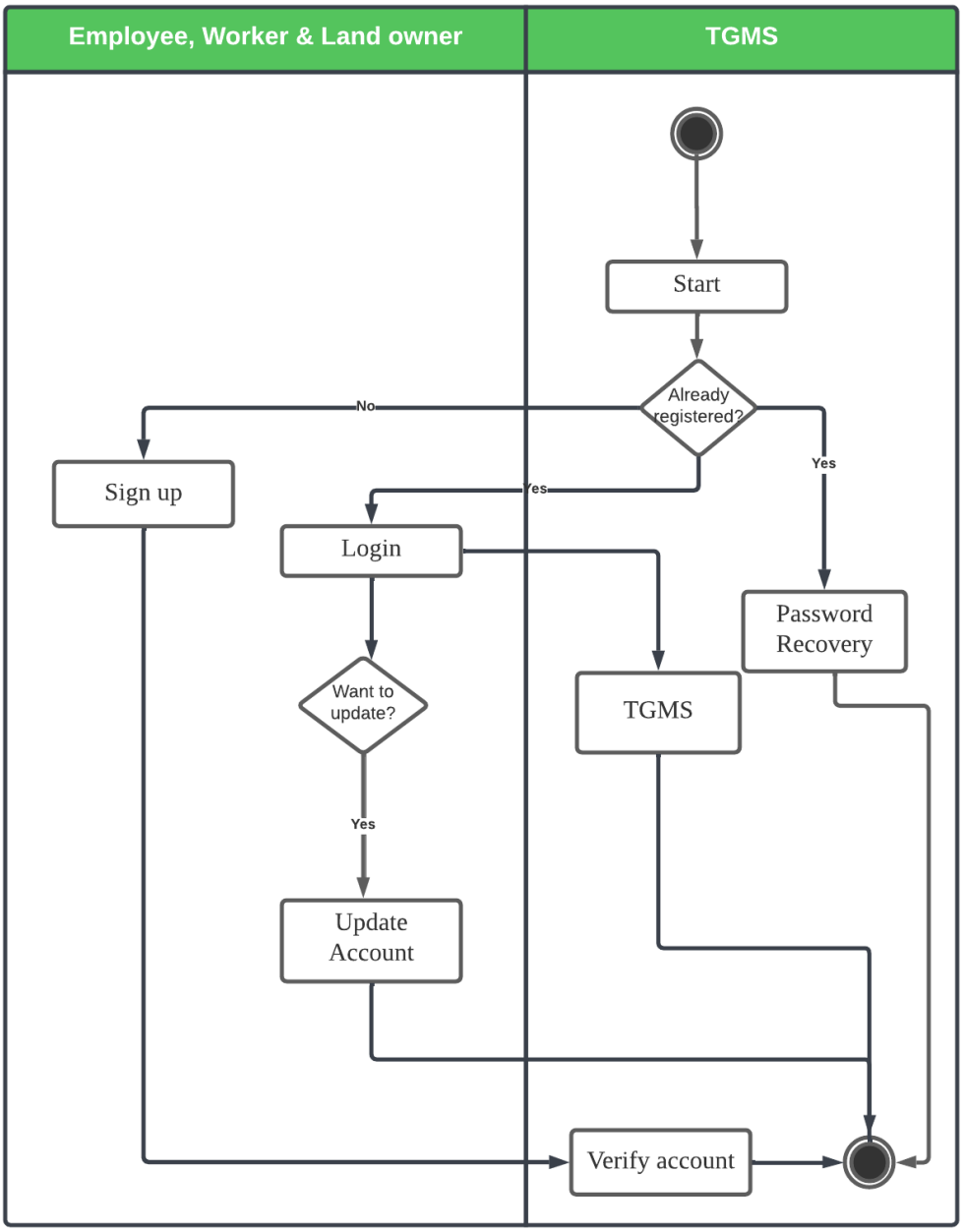


Figure:Swimlane Diagram of level 1.1

SID (Swimlane ID): 1.2

Name : Loan Management

Reference: Use case & Activity Diagram level-1.2

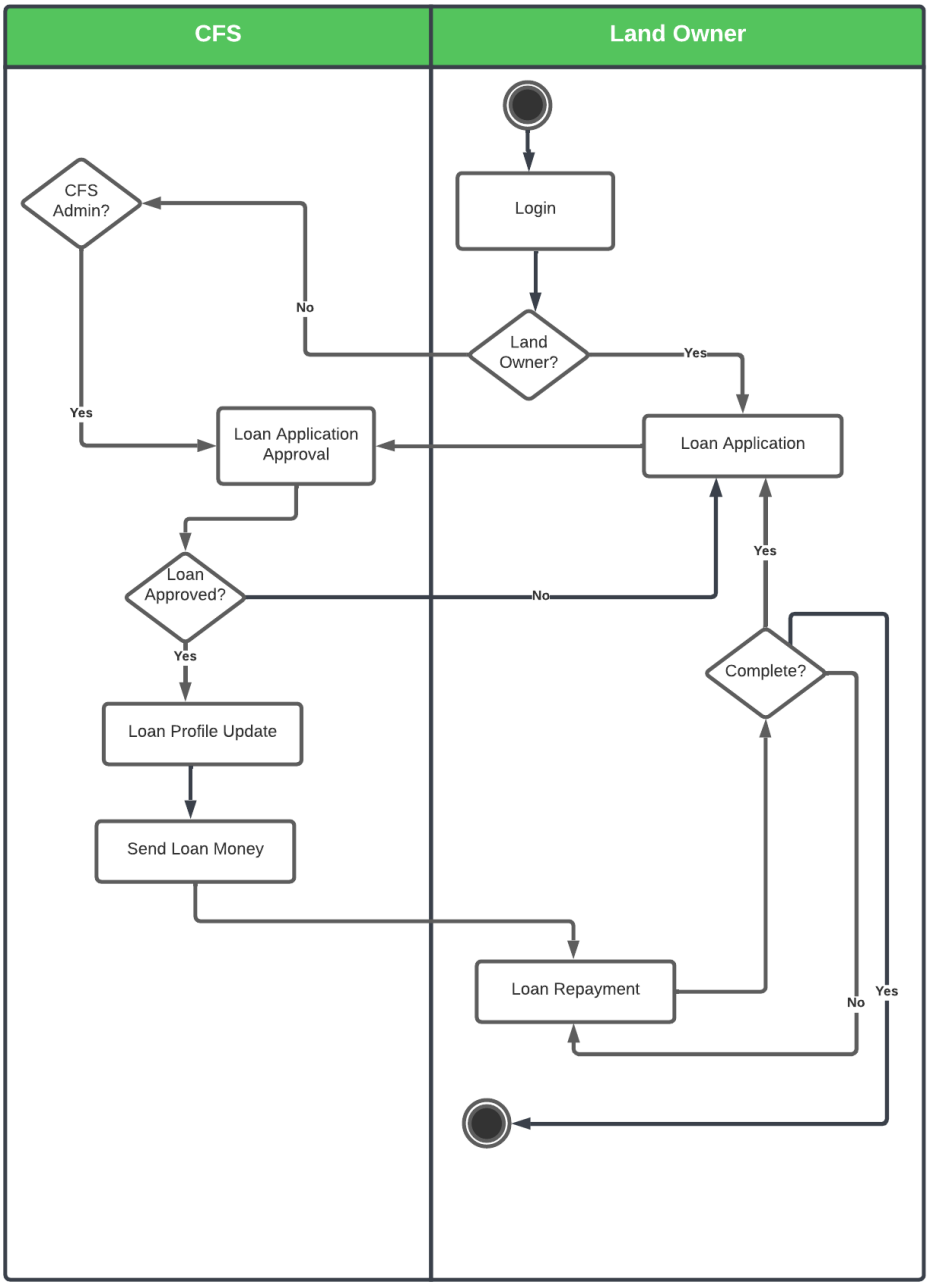


Figure:Swimlane Diagram of level 1.2

SID (Swimlane ID): 1.3

Name : HR Management
Reference: Use case & Activity diagram level-1.3

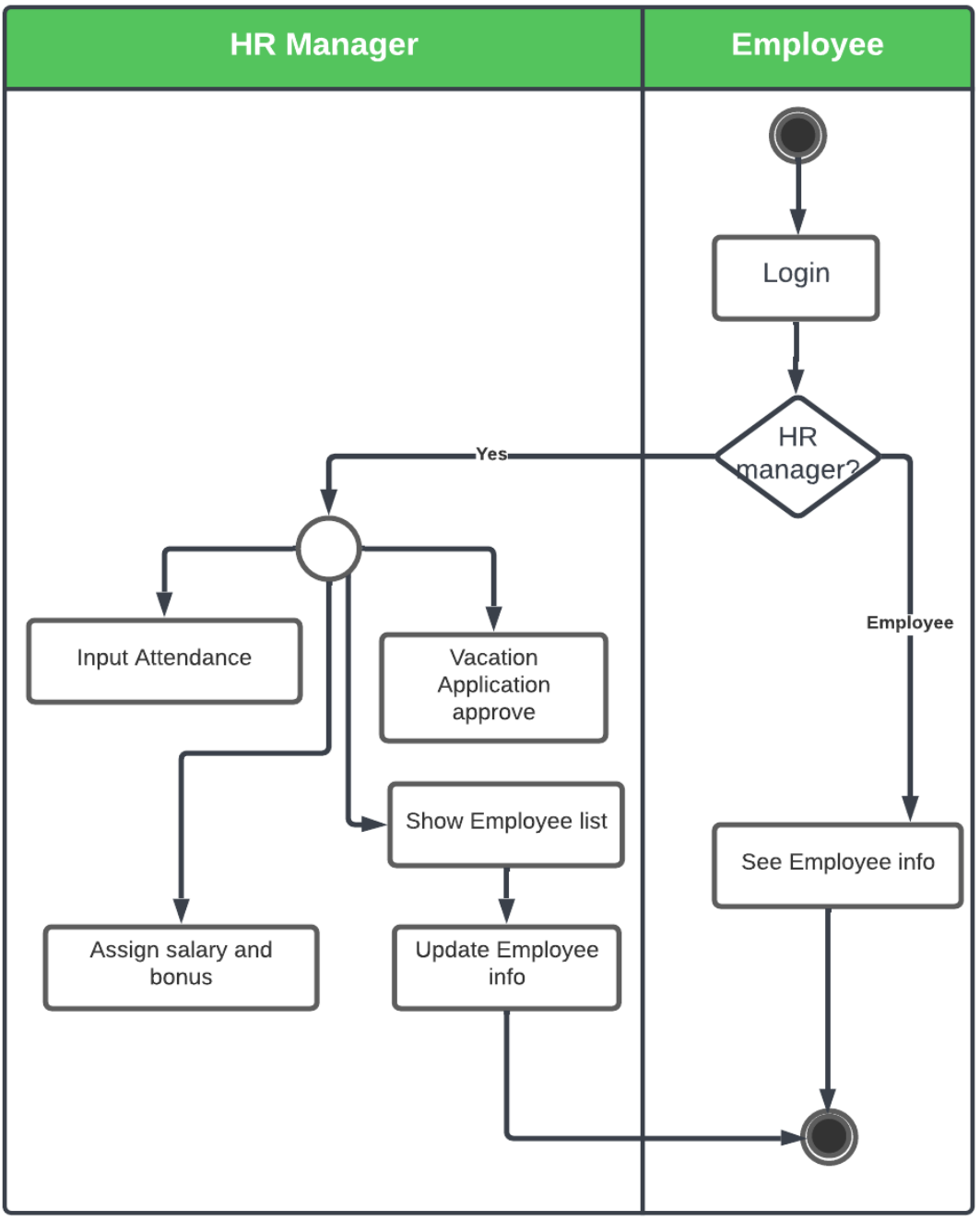


Figure:Swimlane Diagram of level 1.3

SID (Swimlane ID): 1.4

Name : Payroll Management
Reference: Use case & Activity diagram level-1.4

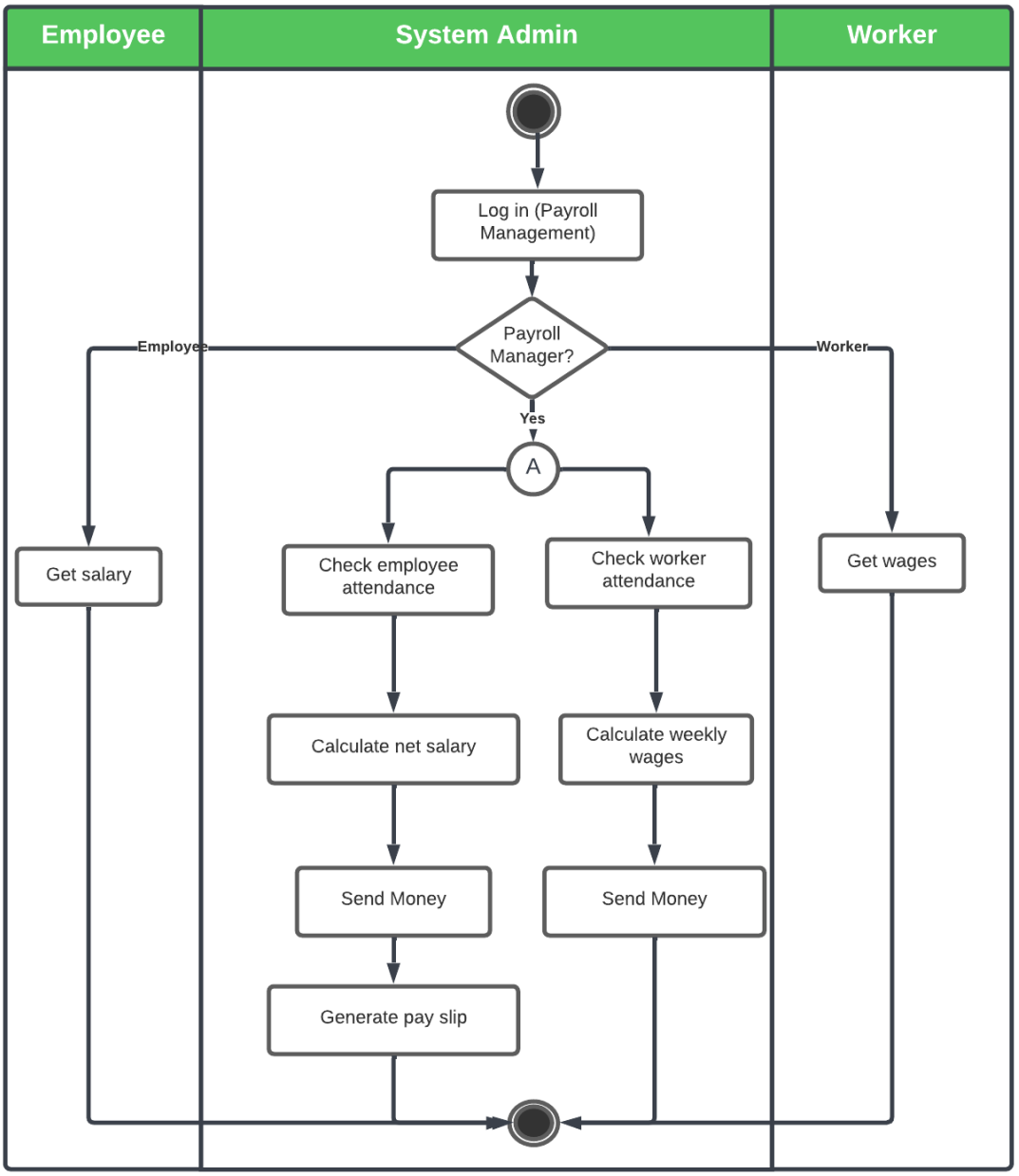


Figure:Swimlane Diagram of level 1.4

SID (Swimlane ID): 1.5

Name : Inventory Management
Reference: Use case & Activity diagram level-1.5

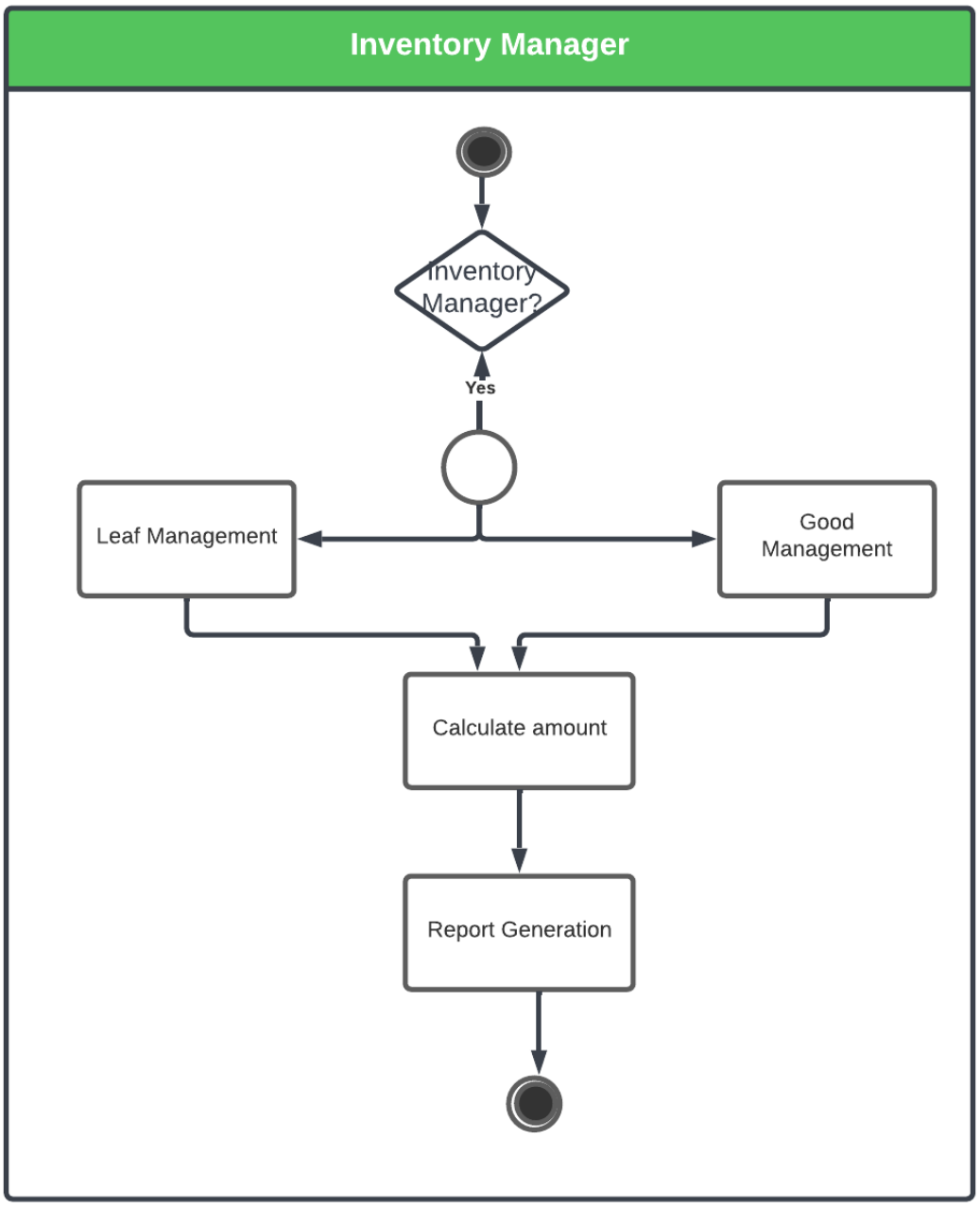


Figure:Swimlane Diagram of level 1.5

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
01	**Employee**	s	7,8,9,10,11,20,21,23,36,59
02	**Land owners**	s	78,8,9,10,11,13,36,41,42,43
03	**Workers**	s	79,8,9,10,11,20,21,24,

04	**Contract Farmer Supervisor**	s	7,8,9,10,11,13,20,21,23,36,59
05	**SMS**	s	70,71,73,77
06	TGMS	p	
07	Employee_ID	s	
08	Name	s	
09	Contact number	s	
10	NID number	s	
11	Address	s	
12	Account	p	
13	Loan Status	s	
14	Profile	p	
15	Verification	s	
16	Loan money	s	
17	Money	p	
18	**Mobile Banking**	s	16,23,24,59
19	Attendance	s	
20	Attendance Status	s	
21	Salary Status	s	
22	Attendance list	p	
23	Salary	s	
24	Wages	s	
25	Inventory	p	
26	Tea Leaves amount	s	

27	Pesticides amount	s	
28	Fertilizer amount	s	
29	Accessories amount	s	
30	Transaction history	p	
31	**Inventory Reports**	s	26,27,28,29,74
32	User Interface	p	
33	Payslip	s	
34	TGMS	p	
35	Log in	p	
36	Password	s	
37	Recovery Code	p	
38	**Loan**	s	41,42,43,45,46,72
39	**System Admin**	s	7,8,9,10,11,20,21,23,36
40	**Inventory Manager**	s	7,8,9,10,11,20,21,23,31,36
41	Documents	s	
42	Paper of land	s	
43	Photo	s	
44	Loan section	p	
45	Loan amount	s	
46	Loan expiry date	s	
47	Completed loan	p	
48	Incomplete loan	p	
49	Reception	p	
50	Production	p	

51	Field	p	
52	Plantation	p	
53	Nurturing	p	
54	Plucking	p	
55	Vacation	p	
56	Absence	p	
57	With pay	p	
58	Without pay	p	
59	Bonus	s	
60	Eid	p	
61	Raw Materials	p	
62	Goods	p	
63	factory	p	
64	Remaining Amount	p	
65	Monthly Inventory Reports	p	
66	Incoming leaves	p	
67	Outgoing leaves	p	
68	Transaction_id	s	
69	Production	p	
70	Salary SMS	s	
71	Wages SMS	s	
72	Loan_id	s	
73	SMS_ID	s	
74	Report_no	s	

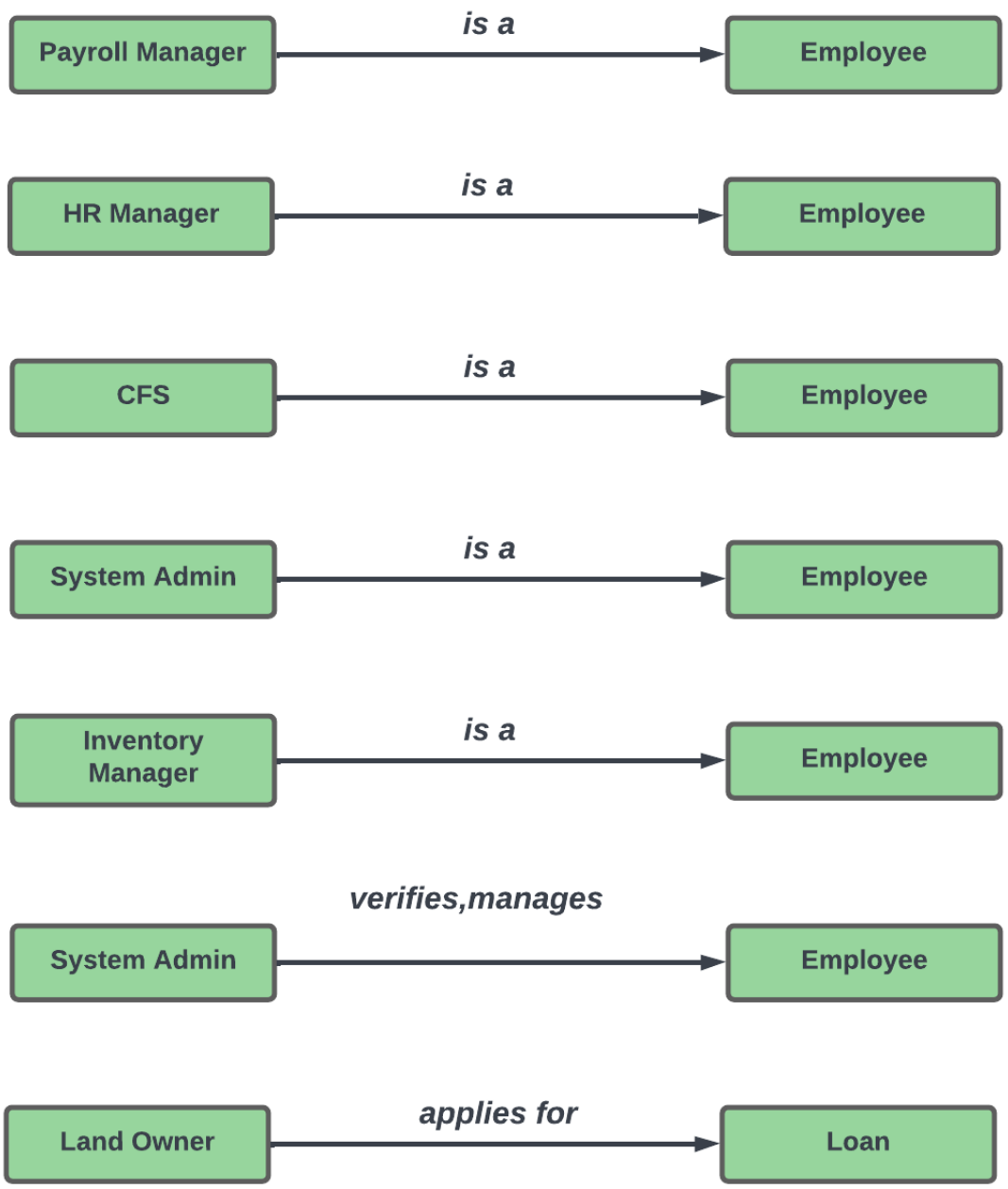
75	**HR Manager**	s	7,8,9,10,11,19,20,21,23,36,59
76	**Payroll Manager**	s	7,8,9,10,11,20,21,23,36,59
77	OTP	s	
78	Land_Owner_ID	s	
79	Worker_ID	s	

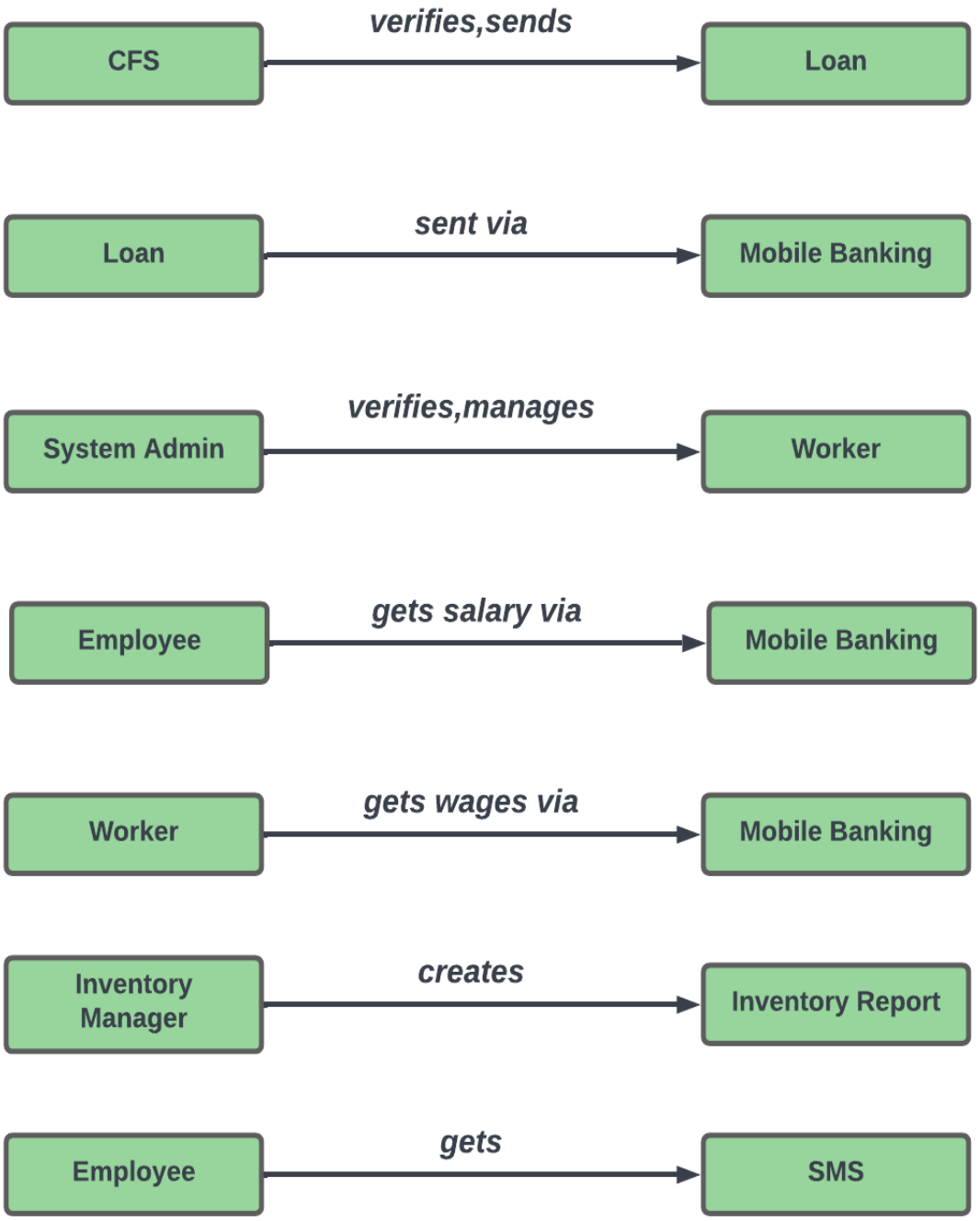
Final Data Object:

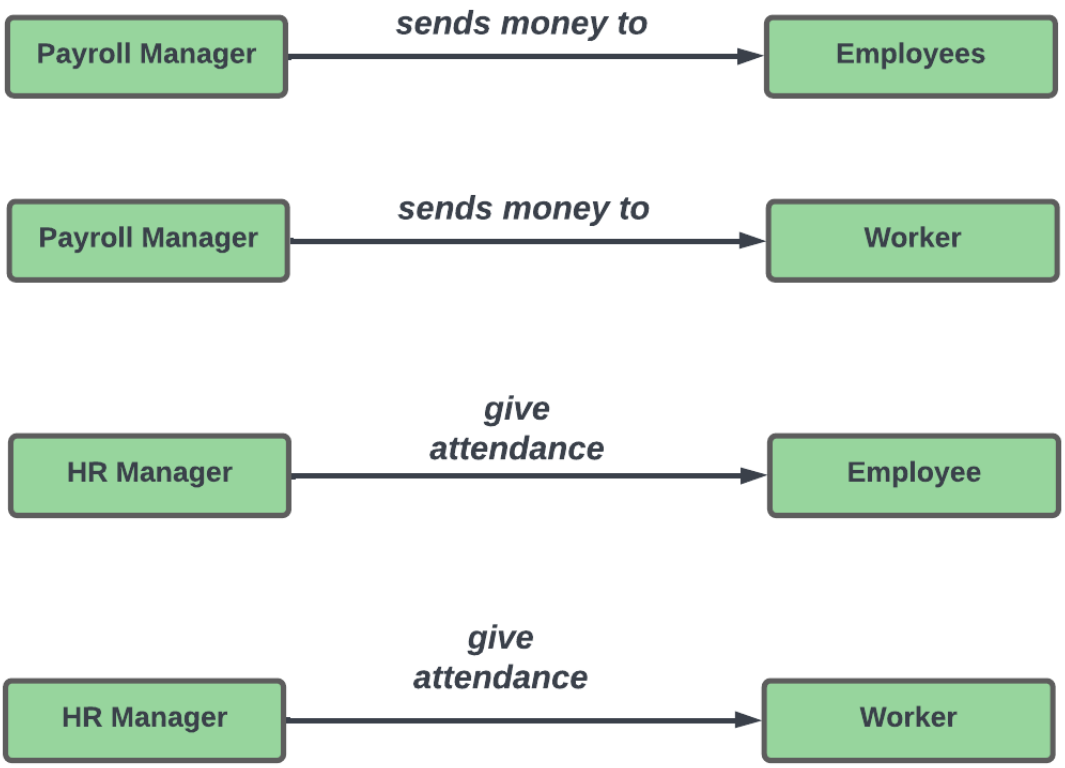
1. Employee
2. System Admin
3. HR Manager
4. Payroll Manager
5. Inventory Manager
6. Contract Farmer Supervisor
7. Land Owners
8. Workers
9. Loan
10. Mobile Banking
11. SMS
12. Inventory Report

Data Object Relationship:

Relationship between two Data objects:




CFS
verifies,sends
Loan
Loan
sent via
Mobile Banking
System Admin
verifies,manages
Worker
Employee
gets salary via
Mobile Banking
Worker
gets wages via
Mobile Banking
Inventory Manager
creates
Inventory Report
Employee
gets
SMS



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.

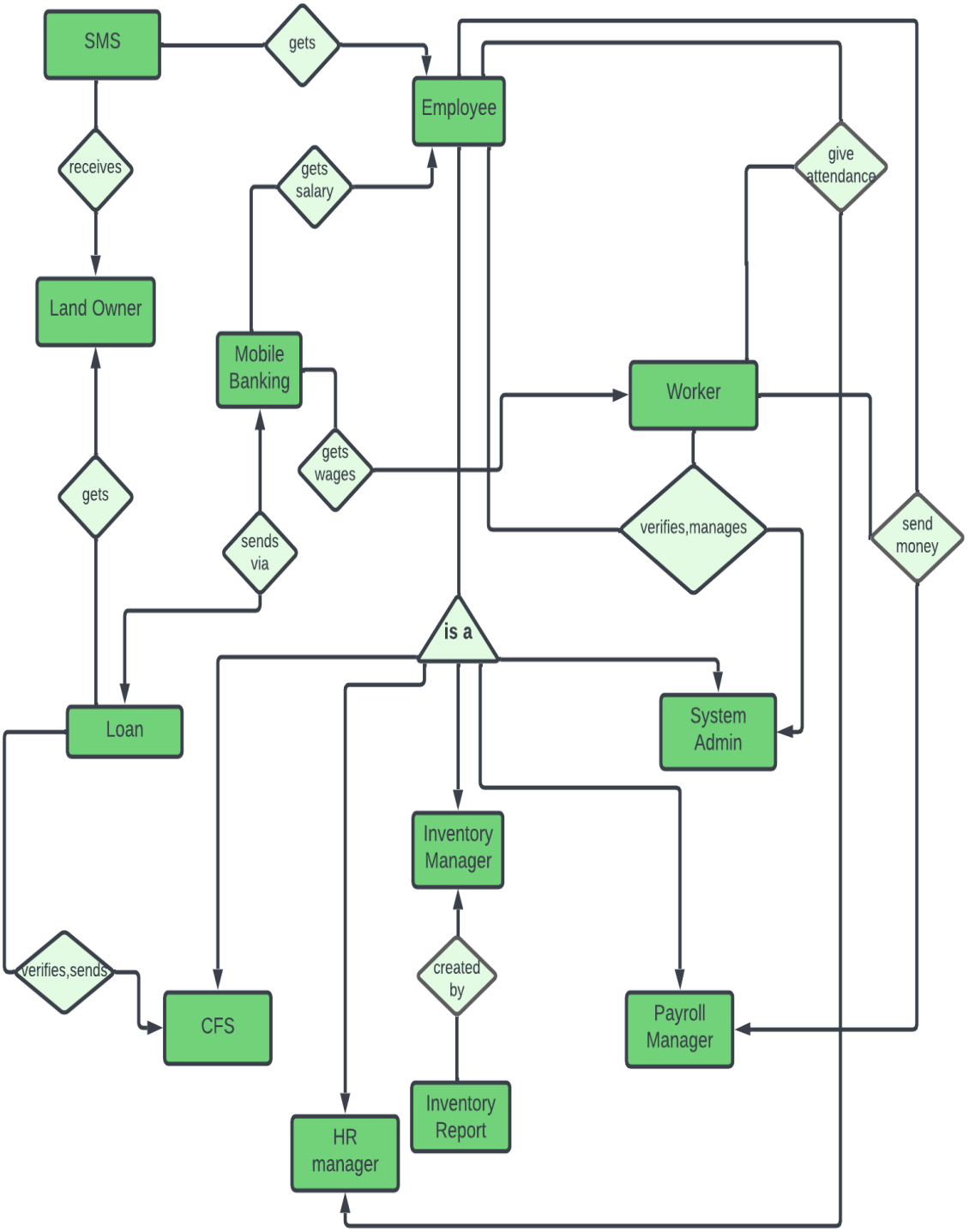


Figure:ER diagram

Schema Diagram:

Data objects	Attributes	Type	Size
Employee	-Full name	Varchar	40
	-Contact number	Varchar	40
	-NID number	Varchar	40
	-Password	Varchar	40
	-Address	Varchar	40
	-Attendance status	Varchar	40
	-Salary status	Varchar	40
	-Salary	Number	(10,2)
	-Bonus	Number	(10,2)
	- Employee_ID	Varchar	40
System Admin	-Full name	Varchar	40
	-Contact number	Varchar	40
	-NID number	Varchar	40
	-Password	Varchar	40
	-Address	Varchar	40
	-Attendance status	Varchar	40
	-Salary status	Varchar	40
	-Salary	Number	(10,2)
	-Bonus	Number	(10,2)
	- Employee_ID	Varchar	40
		Varchar	40

Land Owners	-Full name -Contact number -NID number -Password -Address -Loan status -Documents -Paper of land -Photo **-Land_Owner_ID**	Varchar Varchar Varchar Varchar Varchar Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40 40 40 40 40 40
Workers	-Full name -Contact number -NID number **-Worker_ID** -Address -Attendance status -Wages -Wages status -Employee_ID(fk)	Varchar Varchar Varchar Varchar Varchar Number Varchar Varchar Varchar	40 40 40 40 40 40 40 40 40
Contract Farmer Supervisor	-Full name -Contact number **- Employee_ID** -Address -Attendance status -Salary status	Varchar Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40 40

	-Salary -Bonus -Password	Number Number Varchar Varchar	(10,2) (10,2) 40 40
Inventory Manager	-Full name -Contact number **- Employee_ID** -Address -Salary -Bonus -Inventory report -Password	Varchar Varchar Varchar Varchar Number Number Varchar Varchar	40 40 40 40 (10,2) (10,2) 40 40
Loan	-Loan status -Documents -Paper of land -Loan amount -Loan expiry date -**Loan_ID** -Transaction_ID(fk) -Land_Owner_ID(fk)	Varchar Varchar Varchar Number Date&Time Varchar Varchar Varchar	40 40 40 (10,2) 40 40 40

Mobile Banking	-Loan money -Salary -Wages -Bonus **-Transaction_ID** -Loan_ID(fk) -Worker_ID(fk) -Employee_ID	Number Number Number Number Varchar Varchar Varchar Varchar	(10,2) (10,2) (10,2) (10,2) 40 40 40 40
SMS	-Salary SMS -Wages SMS -**SMS_ID** -OTP -Employee_ID(fk) -Land_Owner_ID(fk)	Varchar Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40 40
Inventory Report	**-Report_No** -Tea Leaves amount -Pesticides amount -Fertilizer amount -Accessories amount -Employee_ID(fk)	Varchar Varchar Varchar Varchar Varchar Varchar	40 40 40 40 40 40

HR Manager	-Full name -Contact number -NID number -Password -Address -Salary -Bonus **-Employee_ID**	Varchar Varchar Varchar Varchar Varchar Number Number Varchar	40 40 40 40 40 (10,2) (10,2) 40
Payroll Manager	-Full name -Contact number -NID number -Password -Address -Salary -Bonus **-Employee_ID**	Varchar Varchar Varchar Varchar Varchar Number Number Varchar	40 40 40 40 40 (10,2) (10,2) 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	Employee	38	Attendance list
2	Land owners	39	Salary
3	Workers	40	Wages
4	Contract Farmer Supervisor	41	Inventory
5	SMS	42	Tea Leaves amount
6	TGMS	43	Pesticides amount
7	Employee ID	44	Fertilizer amount
8	Name	45	Accessories amount

9	Contact number	46	Transaction history
10	NID number	47	Inventory Reports
11	Address	48	User Interface
12	Account	49	Payslip
13	Loan Status	50	TGMS
14	Profile	51	Log in
15	Verification	52	Password
16	Loan	53	Recovery Code
17	Money	54	Loan
18	Mobile Banking	55	System Admin
19	Attendance	56	Inventory Manager
20	Attendance Status	57	Documents
21	Salary Status	58	Paper of land
22	Photo	59	Vacation
23	Loan Section	60	Absence
24	Loan Amount	61	With pay
25	Loan expiry date	62	Without pay
26	Completed Loan	63	Bonus
27	Incomplete loan	64	Eid
28	Reception	65	Raw Materials
29	Production	66	Goods
30	Field	67	factory
31	Plantation	68	Remaining Amount
32	Nurturing	69	Monthly Inventory Reports
33	Plucking	70	Incoming leaves

34	Transaction_ID	71	Outgoing leaves
35	Attendance SMS	72	Loan_id
36	Salary SMS	73	SMS_ID
37	Wages SMS	74	Report_no
75	OTP	76	HR manager
77	Payroll Manager	78	Land_Owner_Id
79	Worker_id		

Verb listing:

No	Verb	No	Verb
1	create	15	provide
2	give	16	have
3	upload	17	apply
4	approve	18	see
5	get	19	send
6	add	20	remove
7	Make	21	record
8	update	22	can
9	view	23	recover
10	assign	24	manage
11	follow	25	use
12	produce	26	pluck

13	confirm	27	store
14	verify		

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
Land owners	4,5,7
Workers	4,5,7
Contract Farmer Supervisor	4,5,7
SMS	1
Transaction ID	2

Loan ID	2
SMS ID	2
Loan Status	3
Employee ID	2
Name	2
Contact number	2
NID number	2
Address	2
Verification	3
Loan money	2
Attendance	2
Salary	2
Wages	2
Inventory	6
Leaf amount	2,7
Inventory Reports	2,3,7
Payslip	2,7
Password	2
Documents	2,7
Paper of land	2
Photo	2
Loan Amount	2
Loan expiry date	2

Bonus	2
Mobile Banking	1
Loan	1,3
System Admin	4,5,7
Inventory Manager	4,5,7
Transaction	1,3
Profile	2
OTP	2
Land_Owner_ID	2
Worker_ID	2
HR Manager	4,5,7
Payroll Manager	4,5,7

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)
Land owners	1-6 (selected)
Workers	1-6 (selected)
Contract Farmer Supervisor	1-6 (selected)
Mobile Banking	2,3,6 (selected)
Loan	2,3,6 (selected)
System Admin	1-6 (selected)
Inventory Manager	1-6 (selected)
Transaction	2
SMS	2,5,6 (selected)
Inventory Reports	2
HR manager	1-6 (selected)
Payroll manager	1-6 (selected)

Attribute and Method Identification :

Class Name	Attribute	Method
Employee	-Full name	+create_account() +recover_password()

	-Contact number -NID number -Password -Address -Attendance status -Salary status -Salary -Bonus -Employee ID	+update_info() +login() +get_salary() +get_payslip() +get_OTP() +get_attendance() +see_profile() +get_salary_SMS()
Land owners	-Full name -Contact number -NID number -Password -Address -Loan status -Documents -Paper of land -Photo -Land owner ID	+create_account() +recover_password() +update_info() +login() +apply_loan() +get_loan() +see_profile() +repay_loan()
Workers	-Full name -Contact number -NID number -Worker ID -Address -Attendance status -Wages -Wages status	+create_account() +recover_password() +login() +get_wages() +get_attendance() +see_profile() +get_SMS()
Contract Farmer Supervisor	-Full name	+create_account() +recover_password()

	-Contact number - Employee ID -Address -Attendance status -Salary status -Salary -Bonus -Password	+update_info() +login() +update_landowner_info() +manage_landowner() +verify_loan_application() +approve_loan() +reset_loan()
System Admin	-Full name -Contact number -NID number -Password -Address -Attendance status -Salary status -Salary -Bonus - Employee ID	+create_account() +recover_password() +update_info() +login() +verify_account() +add_user() +update_user() +remove_user()
Inventory Manager	-Full name -Contact number - Employee ID -Address -Salary -Bonus -Inventory report -Password	+create_account() +recover_password() +update_info() +login() +make_report() +update_leaf_info() +update_goods_info() +calculate_leaf_info()
Mobile Banking	-Loan money -Salary -Wages	+send_salary() +send_wages() +send_loan_money() +notify_land_owner() +notify_Employee()

	-Bonus -Employee ID -Transaction ID	+notify_workers()
Loan	-Loan Status -Documents -Paper of land -Loan Amount -Loan expiry date -Loan ID	+apply_loan() +approve_loan() +send_loan() +update_loan_status() +repay_loan() +complete_loan()
SMS	-Salary SMS -Wages SMS -SMS ID -OTP	+send_OTP() +send_salary_notification() +send_wage_notification()
HR Manager	-Full name -Contact number -NID number -Password -Address -Salary -Bonus -Employee ID	+create_account() +recover_password() +update_info() +login() +input_attendance() +Vacation_application_approve() +show_employee_list()
Payroll Manager	-Full name -Contact number -NID number -Password -Address -Salary	+create_account() +recover_password() +update_info() +login() +set_salary() +set_wages() +set_bonus() +generate_payslip()

	-Bonus -Employee ID	

Analysis

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

CRC card

Class name	Responsibility	Collaborator
Employee	• Creating account • Recovering password • Updating profile • Login • Getting salary • Getting payslip • Getting OTP • Getting attendance • Getting salary SMS • View profile	Mobile Banking, System Admin,Payroll Manager, HR Manager, SMS
Land Owners	• Applying for loan • Getting approval • Getting loan money • Repaying loan • View Profile	Loan, SMS, CFS, Mobile Banking
Loan	• Applying loan • Approving loan • Sending loan • Updating loan status • Repaying loan • Completing loan	Land Owner, Mobile Banking, CFS
Workers	• Getting attendance • Getting wages • View profile • Getting wages SMS	Payroll Manager,HR Manager, Mobile Banking,SMS
Contract Farmer	• Updating landowner	Loan, Land Owners,

Supervisor	info • Managing landowner • Resetting loan • Approve loan	Mobile Banking
Mobile Banking	• Sending salary and wages • Sending loan money	Employee, Payroll Manager, Loan, SMS, Worker, CFS,Land Owners
System Admin	• Verifying account • Adding user • Updating user • Removing user	Employee, Worker, Land Owner, Mobile Banking
Inventory Manager	• Making report • Updating leaf info • Update goods info • Calculate leaf amount • Calculate goods amount	Employee
SMS	• Sending salary notification • Sending wage notification • Sending otp	Employee, Land Owner, Mobile Banking, Worker
HR Manager	• Inputting attendance • Approving Vacation application • Showing Employee list	Employee, Workers
Payroll Manager	• Setting salary • Setting wages • Generating payslip.	Employee, Worker, Mobile Banking

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 -Contact number -NID number -Password -Address -Attendance status -Salary status -Salary -Bonus -Employee ID	+create_account() +recover_password() +update_info() +login() +get_salary() +get_payslip() +get_OTP() +get_attendance() +see_profile() +get_salary_SMS()
Responsibility	Collaborator
• Creating account • Recovering password • Updating profile • Login • Getting salary • Getting payslip • Getting OTP • Getting attendance • Getting salary SMS	Mobile Banking, System Admin,Payroll Manager,HR Manager, SMS

• View profile	

Table:Class Card for Land Owner's Class

Land Owners	
Attribute	Method
-Full name -Contact number -NID number -Password -Address -Loan status -Documents -Paper of land -Photo -Land owner ID	+create_account() +recover_password() +update_info() +login() +apply_loan() +get_loan() +see_profile() +repay_loan()
Responsibility	Collaborator
• Applying for loan • Getting approval • Getting loan money • Repaying loan • View Profile	Loan, SMS, CFS, Mobile Banking

Table:Class Card for Workers Class

Workers	
Attribute	Method
-Full name -Contact number -NID number -Worker ID -Address -Attendance status -Wages -Wages status	+create_account() +recover_password() +login() +get_wages() +get_attendance() +see_profile() +get_SMS()
Responsibility	Collaborator
• Getting attendance • Getting wages • View profile • Getting wages SMS	Payroll Manager,HR Manager, Mobile Banking,SMS

Table:Class Card for Contract Farmer Supervisor Class

Contract Farmer Supervisor	
Attribute	Method
-Full name -Contact number - Employee ID -Address -Attendance status -Salary status -Salary -Bonus -Password	+create_account() +recover_password() +update_info() +login() +update_landowner_info() +manage_landowner() +verify_loan_application() +approve_loan() +reset_loan()
Responsibility	Collaborator
• Updating landowner info • Managing landowner • Resetting loan • Approve loan	Loan, Land Owners, Mobile Banking

Table:Class Card for System Admin Class

System Admin	
Attribute	Method
-Full name -Contact number -NID number -Password -Address	+create_account() +recover_password() +update_info() +login() +verify_account() +add_user() +update_user()

-Attendance status -Salary status -Salary -Bonus -Employee ID	+remove_user()
Responsibility	Collaborator
• Verifying account • Adding user • Updating user • Removing user	Employee, Worker, Land Owner, Mobile Banking

Table:Class Card for Inventory Manager Class

Inventory Manager	
Attribute	Method
-Full name -Contact number - Employee ID -Address -Salary -Bonus -Inventory report -Password	+create_account() +recover_password() +update_info() +login() +make_report() +update_leaf_info() +update_goods_info() +calculate_leaf_info()
Responsibility	Collaborator
• Making report • Updating leaf info • Update goods info • Calculate leaf amount • Calculate goods amount	Employee

Table:Class Card for Mobile Banking Class

Mobile Banking	
Attribute	Method
-Loan money -Salary -Wages -Bonus -Employee ID -Transaction ID	+send_salary() +send_wages() +send_loan_money() +notify_land_owner() +notify_Employee() +notify_workers()
Responsibility	Collaborator
• Sending salary and wages • Sending loan money	Employee, Payroll Manager, Loan, SMS, Worker, CFS,Land Owners

Table:Class Card for Loan Class

Loan	
Attribute	Method
-Loan Status -Documents -Paper of land -Loan Amount -Loan expiry date	+apply_loan() +approve_loan() +send_loan() +update_loan_status() +repay_loan() +complete_loan()

-Loan ID	
Responsibility	Collaborator
• Applying loan • Approving loan • Sending loan • Updating loan status • Repaying loan • Completing loan	Land Owner, Mobile Banking, CFS

Table:Class Card for SMS Class

SMS	
Attribute	Method
-Salary SMS -Wages SMS -SMS ID -OTP	+send_OTP() +send_salary_notification() +send_wage_notification()
Responsibility	Collaborator
• Sending salary notification • Sending wage notification • Sending otp	Employee, Land Owner, Mobile Banking, Worker

Table:Class Card for HR Manager Class

HR Manager	
Attribute	Method
-Full name -Contact number -NID number -Password -Address -Salary -Bonus -Employee ID	+create_account() +recover_password() +update_info() +login() +input_attendance() +Vacation_application_approve() +show_employee_list()
Responsibility	Collaborator
• Inputting attendance • Approving Vacation application • Showing Employee list	Employee, Workers

Table:Class Card for Payroll Manager Class

Payroll Manager	
Attribute	Method
-Full name -Contact number -NID number	+create_account() +recover_password() +update_info() +login()

-Password -Address -Salary -Bonus -Employee ID	+set_salary() +set_wages() +set_bonus() +generate_payslip()
Responsibility	Collaborator
• Setting salary • Setting wages • Generating payslip.	Employee, Worker, Mobile Banking

CRC Diagram

Diagram ID: 1

Name: Employee

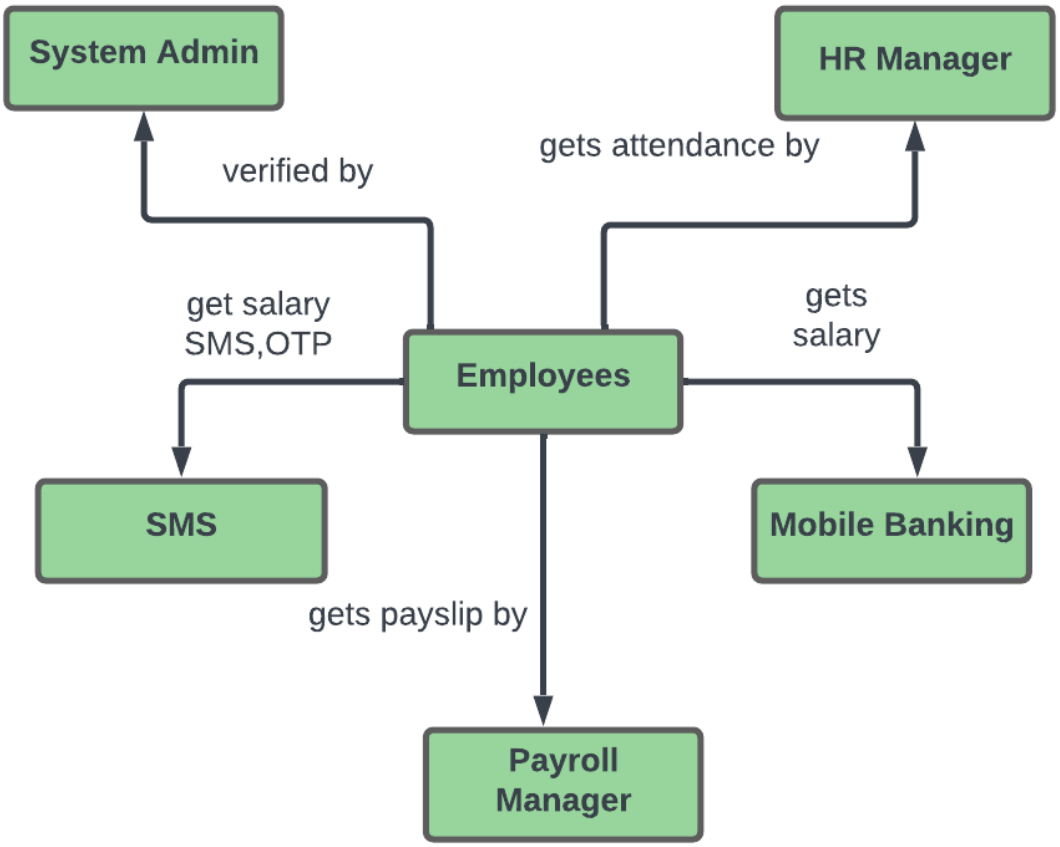


Diagram ID: 2

Name:Land Owners

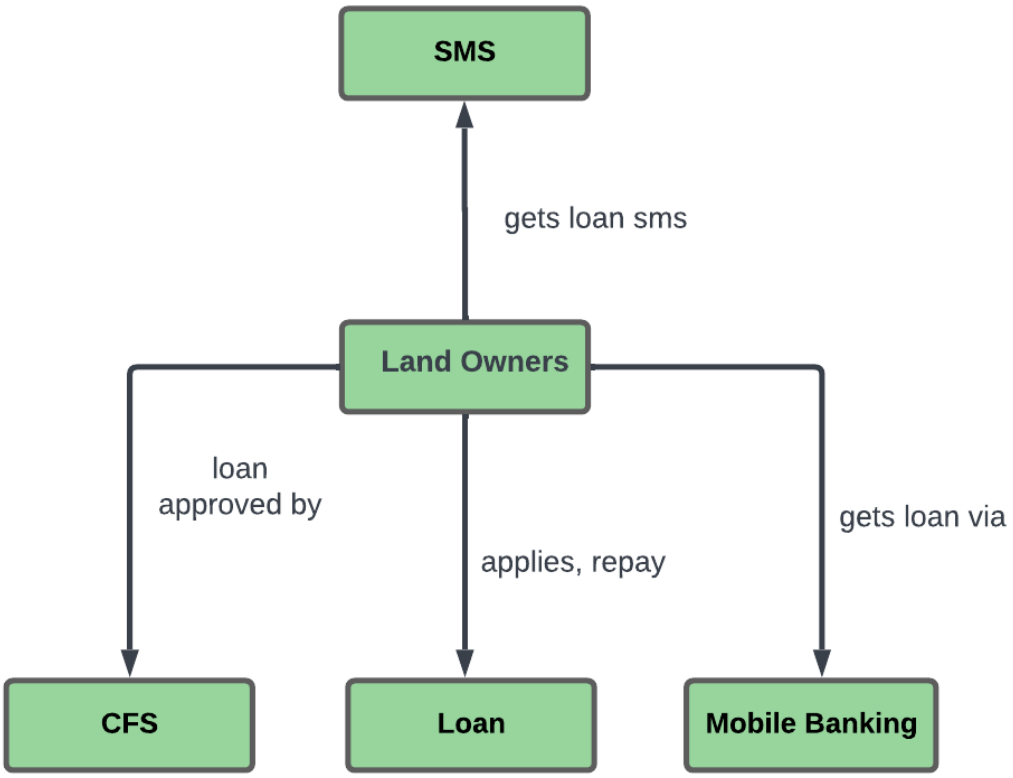


Diagram ID: 3

Name: Contract Farmer Supervisor

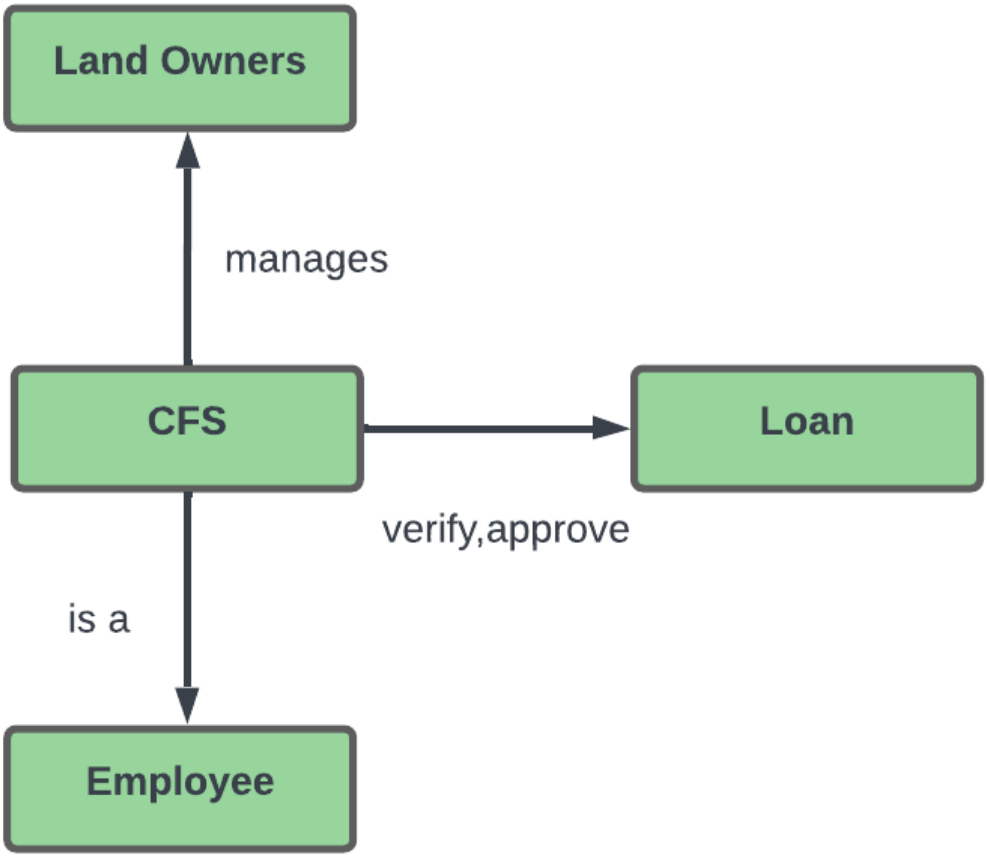


Diagram ID: 4

Name: System Admin

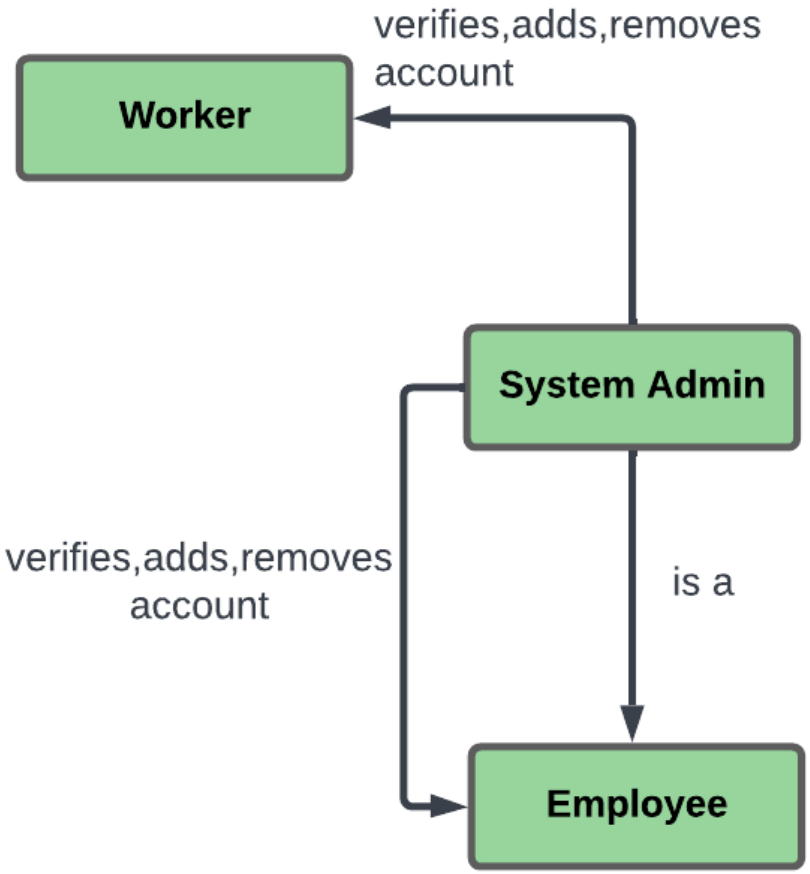


Diagram ID: 5

Name: Mobile Banking

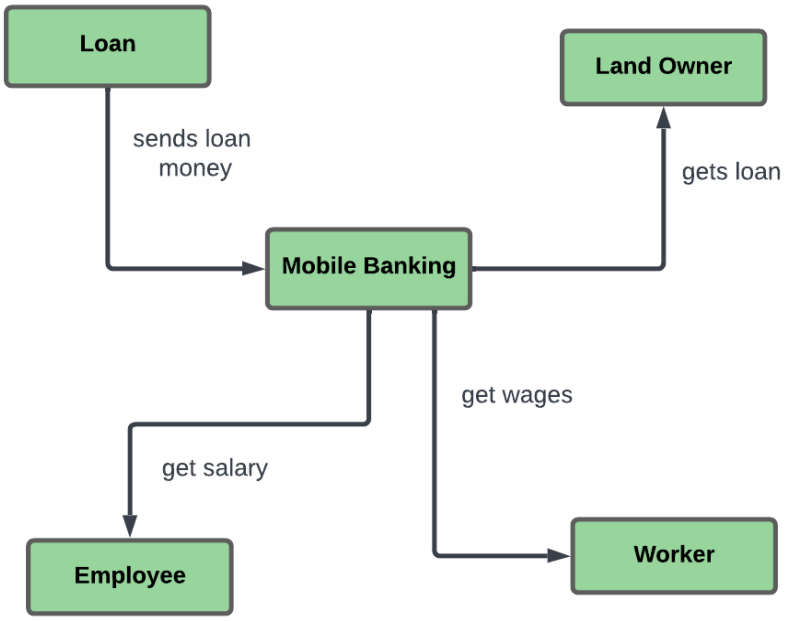


Diagram ID: 6

Name: Loan

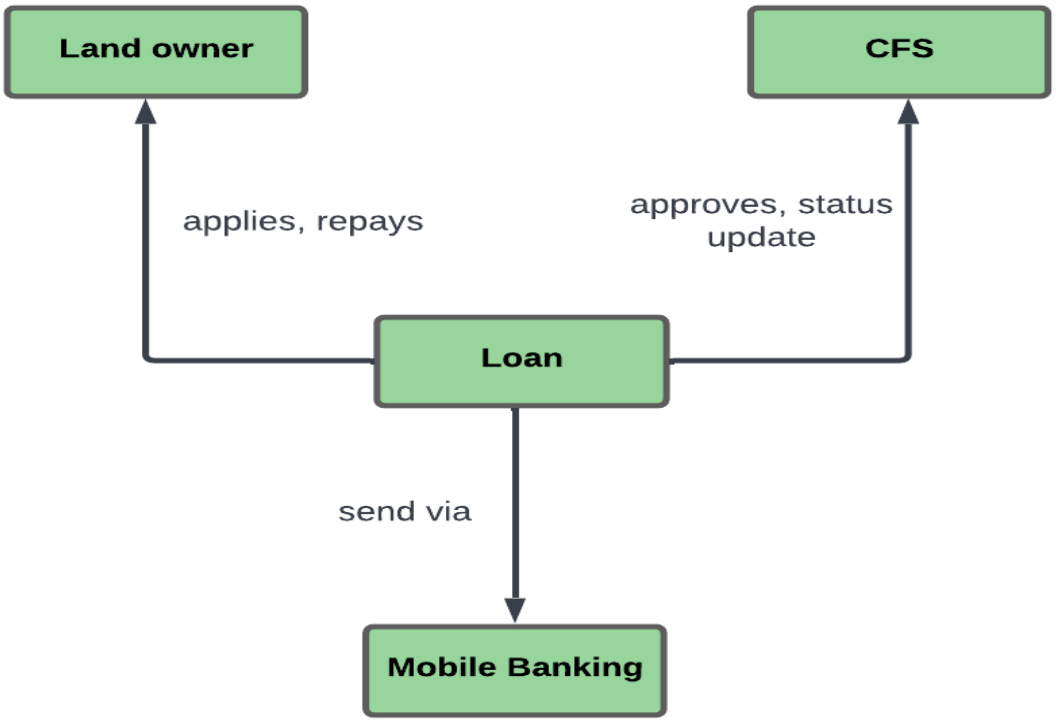


Diagram ID: 7

Name: SMS

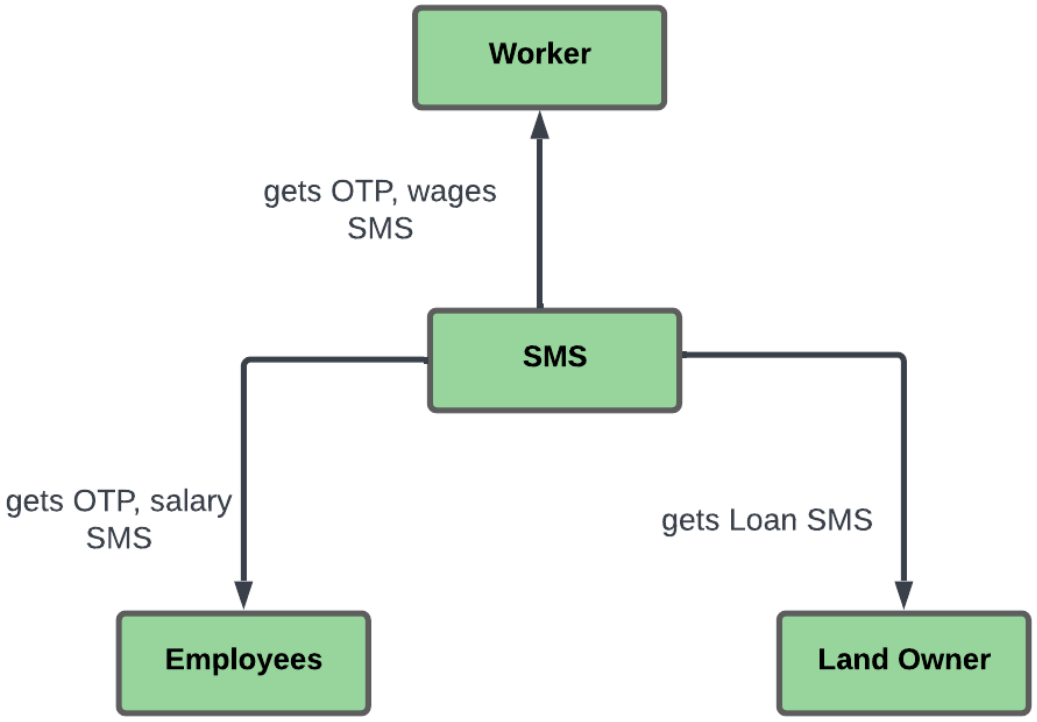


Diagram ID: 8

Name: Worker

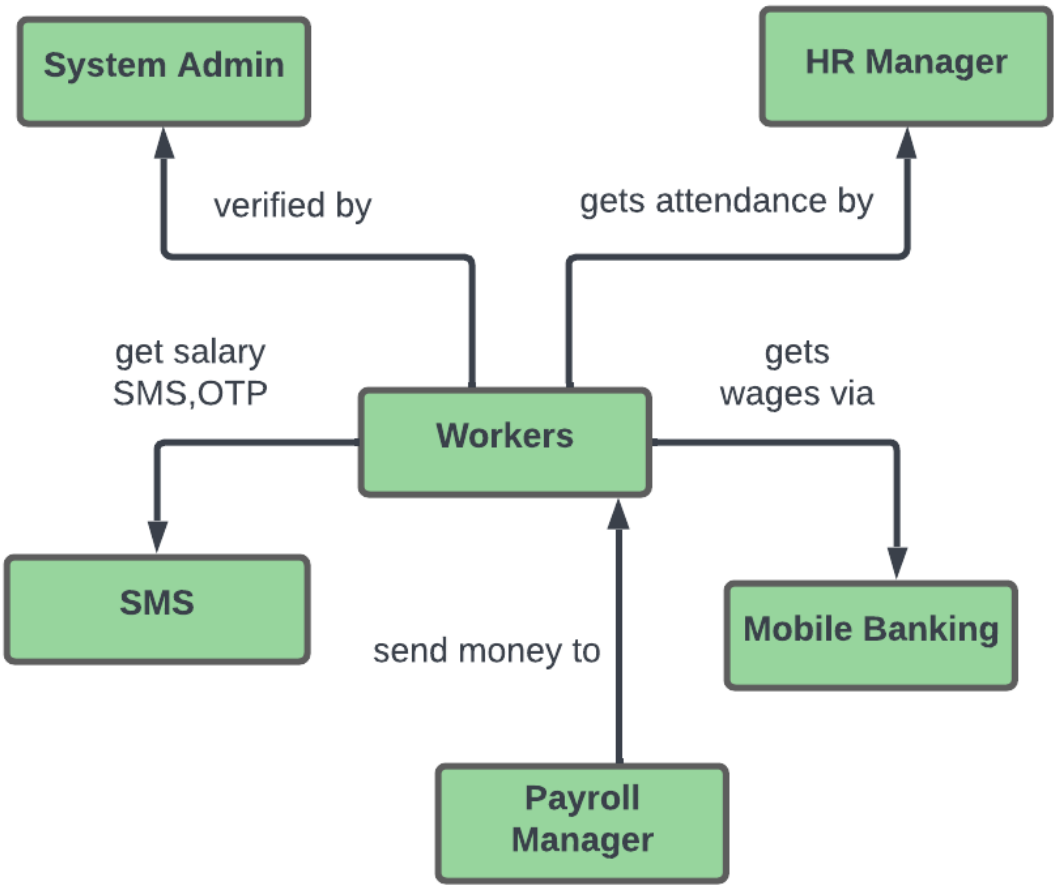
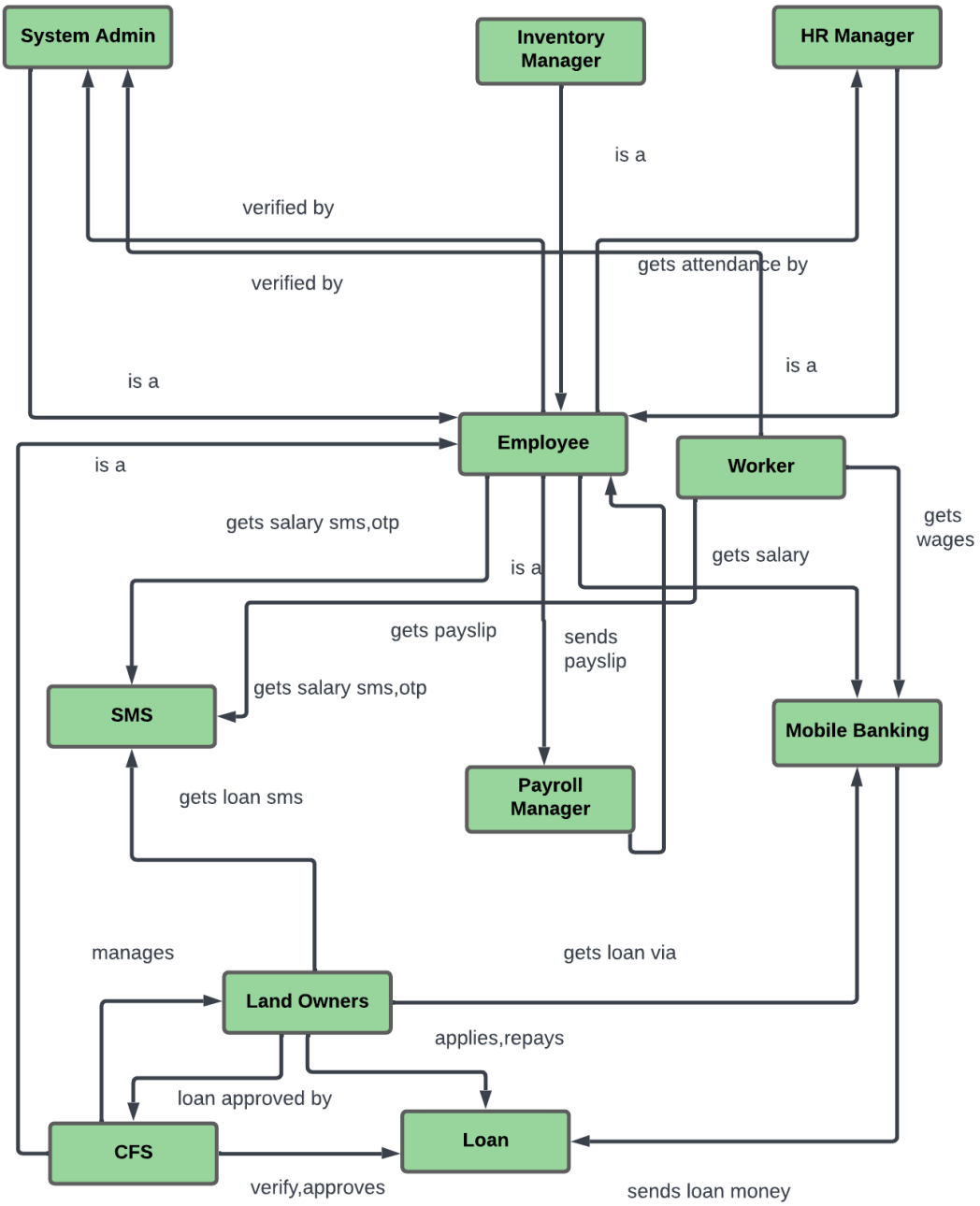


Diagram ID: 9



Behavioral Model of TGMS

State Transition Diagram

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

collaborators. In the State Transition Diagram the states are shown in boxed texts, and the transition is represented by arrows. It is also called State Chart or Graph. It is useful in identifying valid transitions.

SL no	**Event**	**State name**	**Initiator**	**Collaborator**
1.	Will Create an account	Create_Account	Employee, Workers, Land Owners	System Admin,SMS
2.	Will provide information	Provide_info	Employee, Workers, Land Owners	
3.	Will verify Information	Verify_info	System Admin	
4.	Will send otp	Send_otp	SMS	Employee, Workers, Land Owners
5.	Will be able to update user	Update_user	System Admin	Employee, Workers, Land Owners
6.	Will be able to update profile	Update_profile	Employee, Workers, Land Owners	System Admin
7.	Will be able to recover password	Recover_password	Employee, Workers, Land Owners	System Admin
8.	Will log into system	Login_system	Employee, Workers, Land Owners	
9	Will apply for loan	Loan_apply	Land Owners	Loan
10	Will approve loan application	Approve_loan	CFS	Loan

11	Will send Loan money	Send_loan	Mobile Banking, CFS	Loan,Land Owners
12	Will repay loan money	Repay_loan	Land Owners	Loan
13	Will send salary	Send_salary	Mobile Banking	Employee
14	Will send wages	Send_wages	Mobile Banking	Worker
15	Will get loan SMS	Get_loan_sms	Land Owners	SMS
16	Will get salary SMS	Get_salary_sms	Employee	SMS
17	Will get wage SMS	Get_wage_sms	Workers	SMS
18	Will generate Payslip	Generate_payslip	Payroll Manager	Employee
19	Will set salary	Set_salary	Payroll Manager	Employee
20	Will set wages	Set_wages	Payroll Manager	Worker
22	Will input attendance	Input_attendance	HR Manager	Employee, Worker
23	Will approve vacation application	Approve_vacation_application	HR Manager	Employee
24	Will calculate leaves amount	Calculate_leaves	Inventory Manager	
25	Will calculate goods amount	Calculate_goods	Inventory Manager	
26	Will generate report	Generate_report	Inventory Manager	
27	Will see employee list	See_employee_list	HR Manager	Employee, Worker, Land Owner
28	Will see profile	See_profile	Employee	

29	Will calculate salary	Calculate_salary	Payroll Manager	Employee
30	Will calculate wages	Calcualte_wages	Payroll Manager	Worker

State Transition:

ID: 1

Name: Employee
Employee:

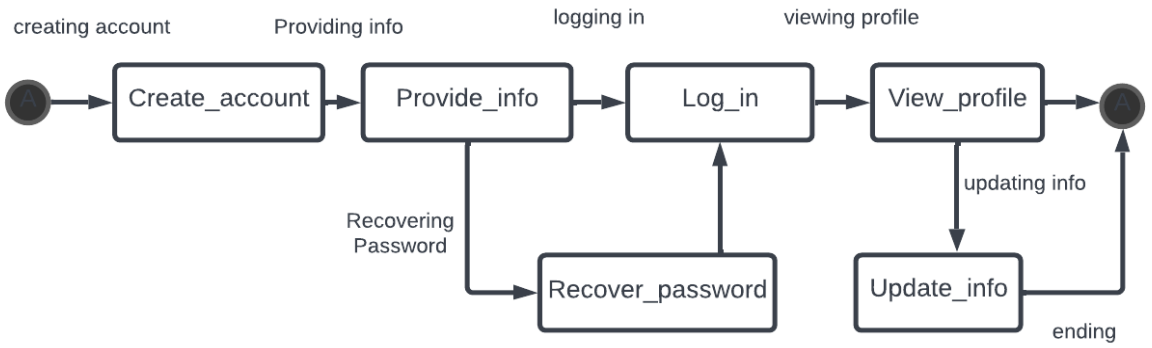


Figure: id 1

ID: 2

Name: System Admin
System Admin:

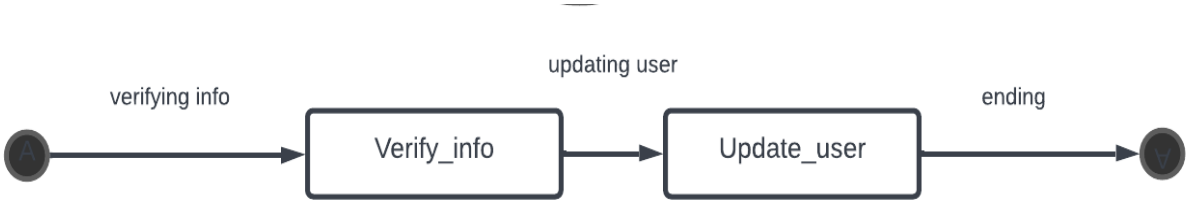


Figure: id 2

ID: 3

Name: Payroll Manager

Payroll Manager:

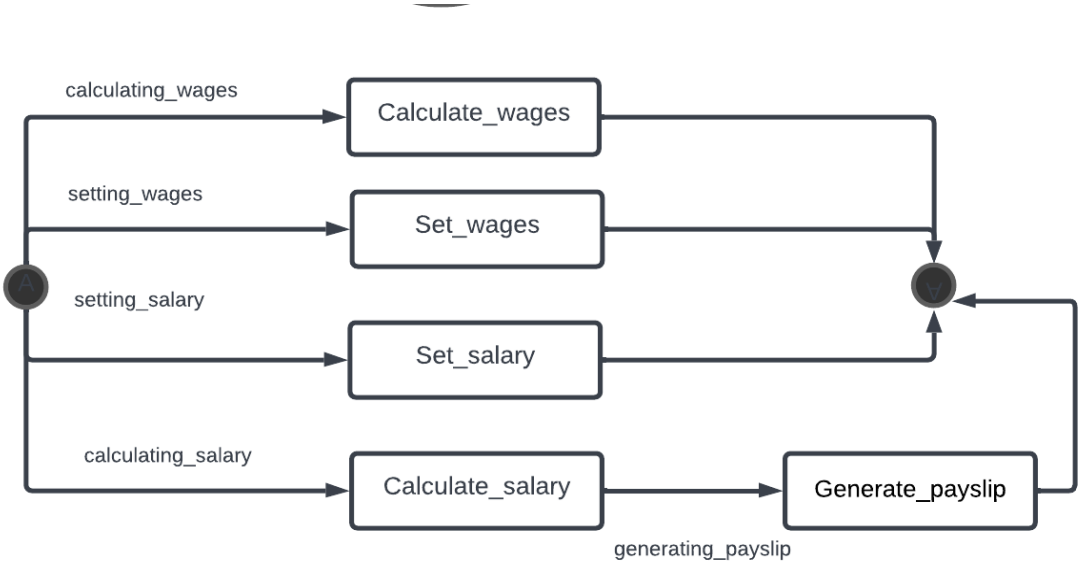


Figure: id 3

ID: 4

Name: CFS

CFS:

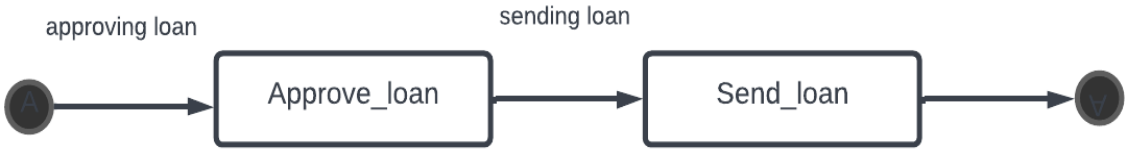


Figure: id 4

ID: 5

Name: Mobile Banking

Mobile Banking:

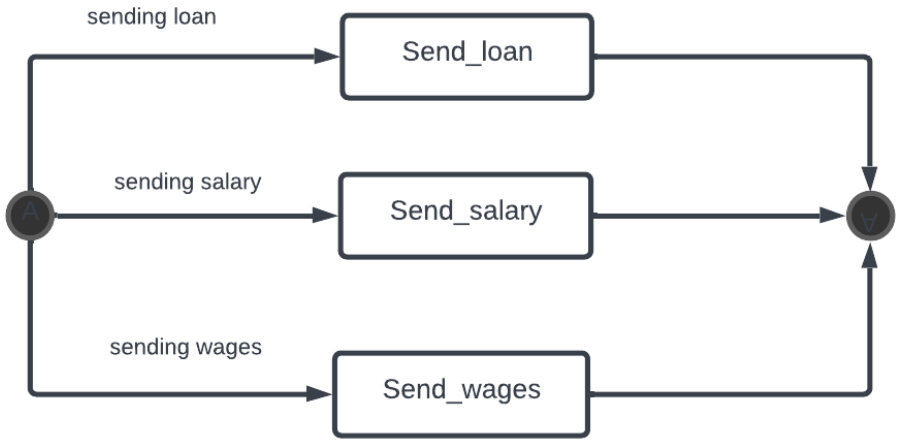


Figure: id 5

ID: 6

Name: HR Manager
HR Manager:

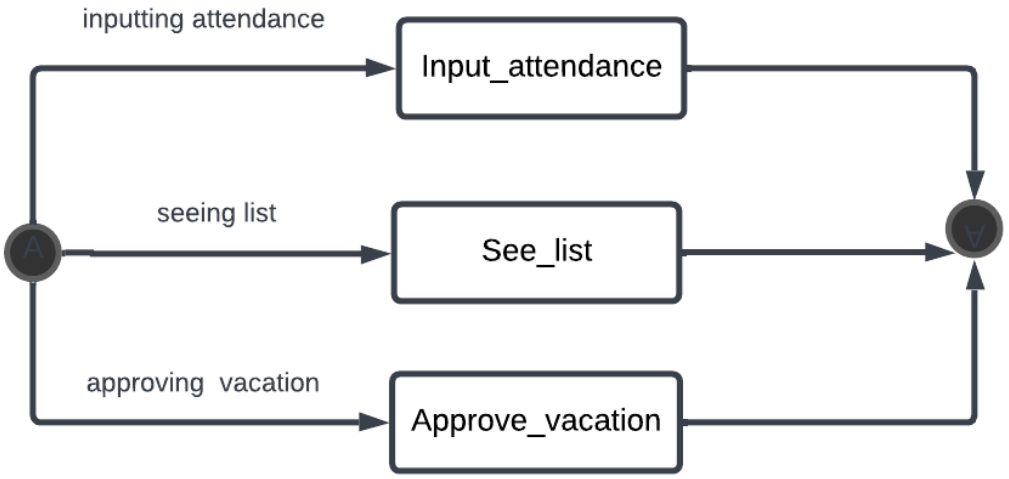


Figure: id 6

ID: 7

Name: Land Owner
Land Owner:

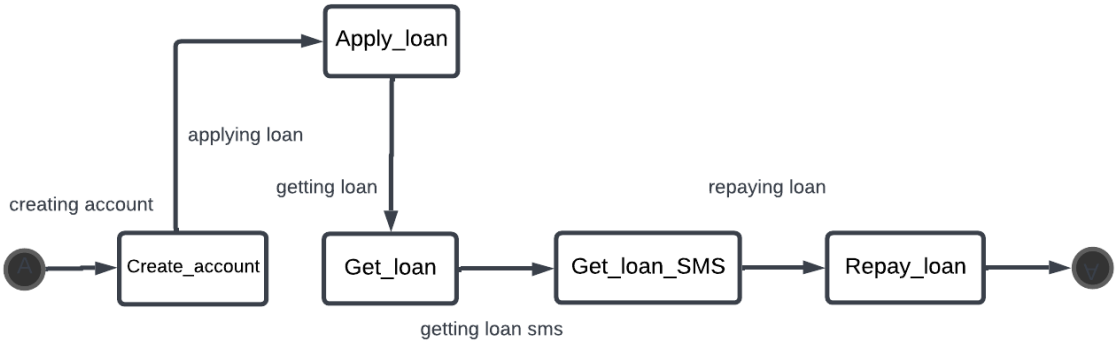


Figure: id 7

ID: 8

Name: Worker
Worker

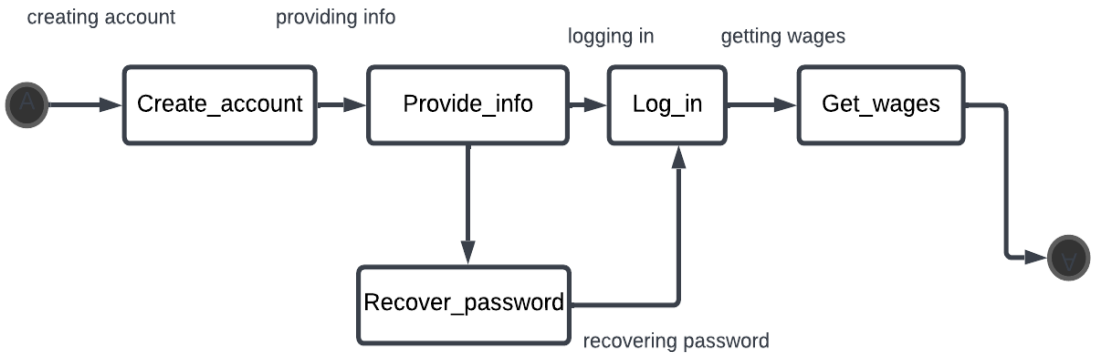
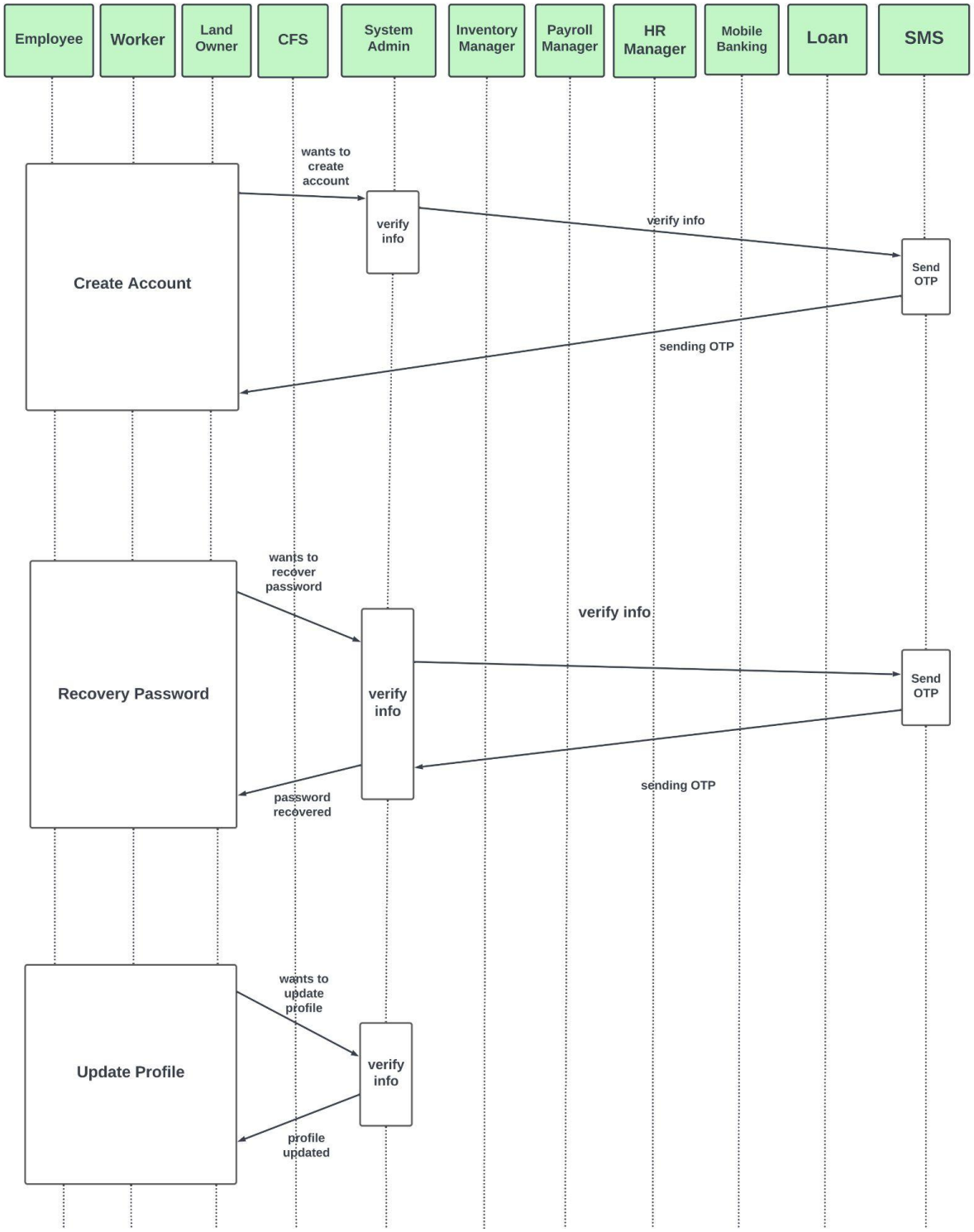
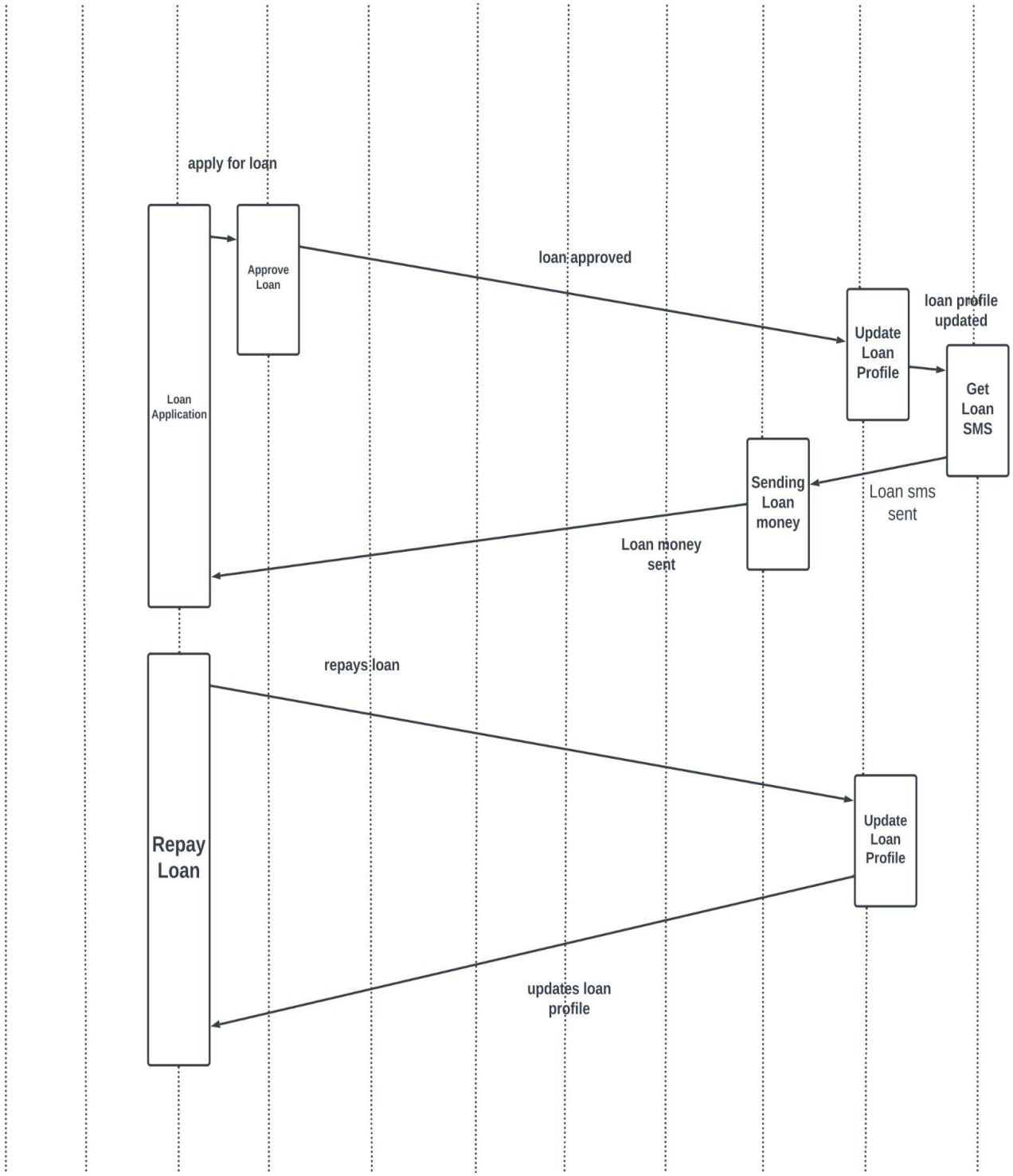


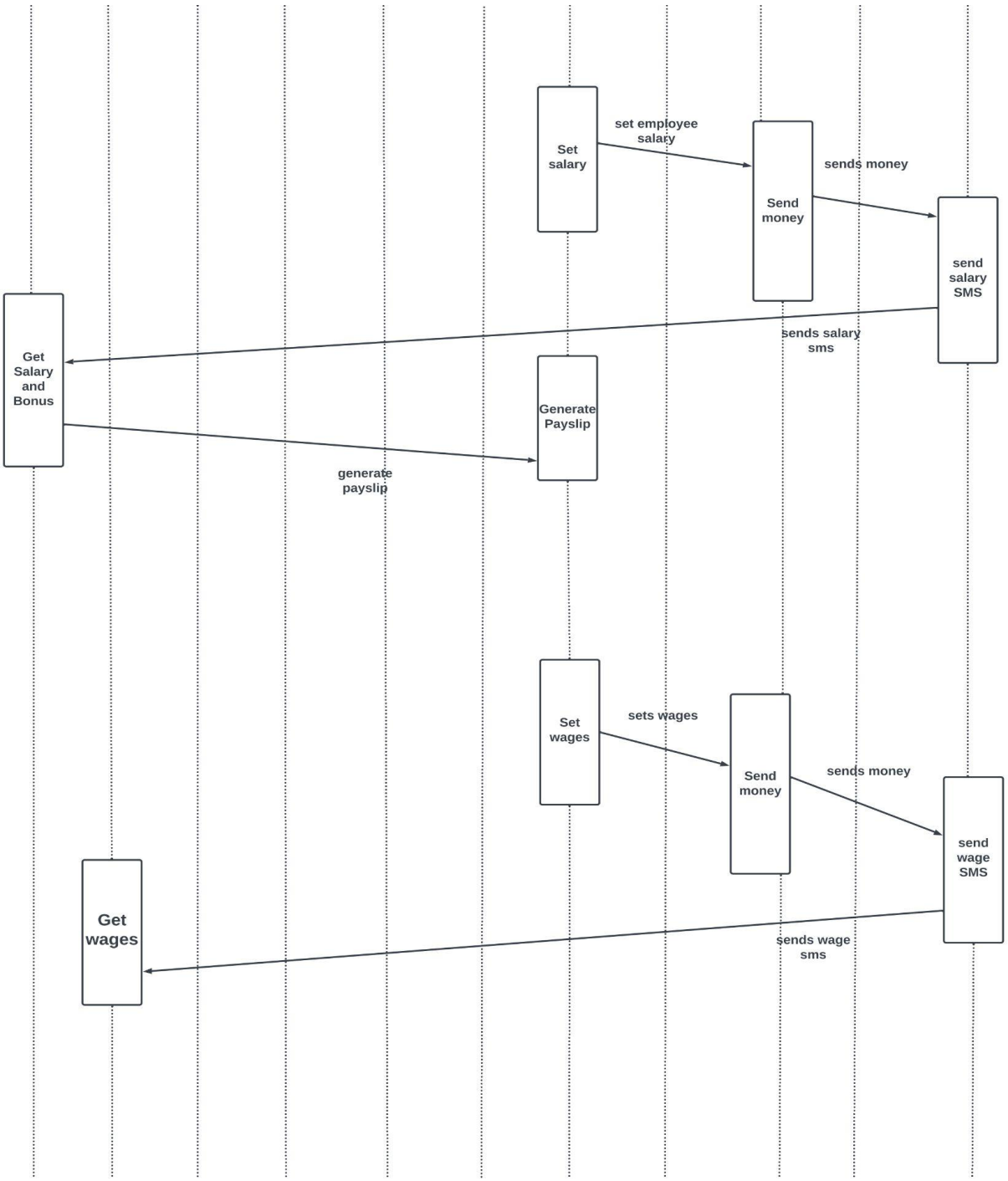
Figure: id 8

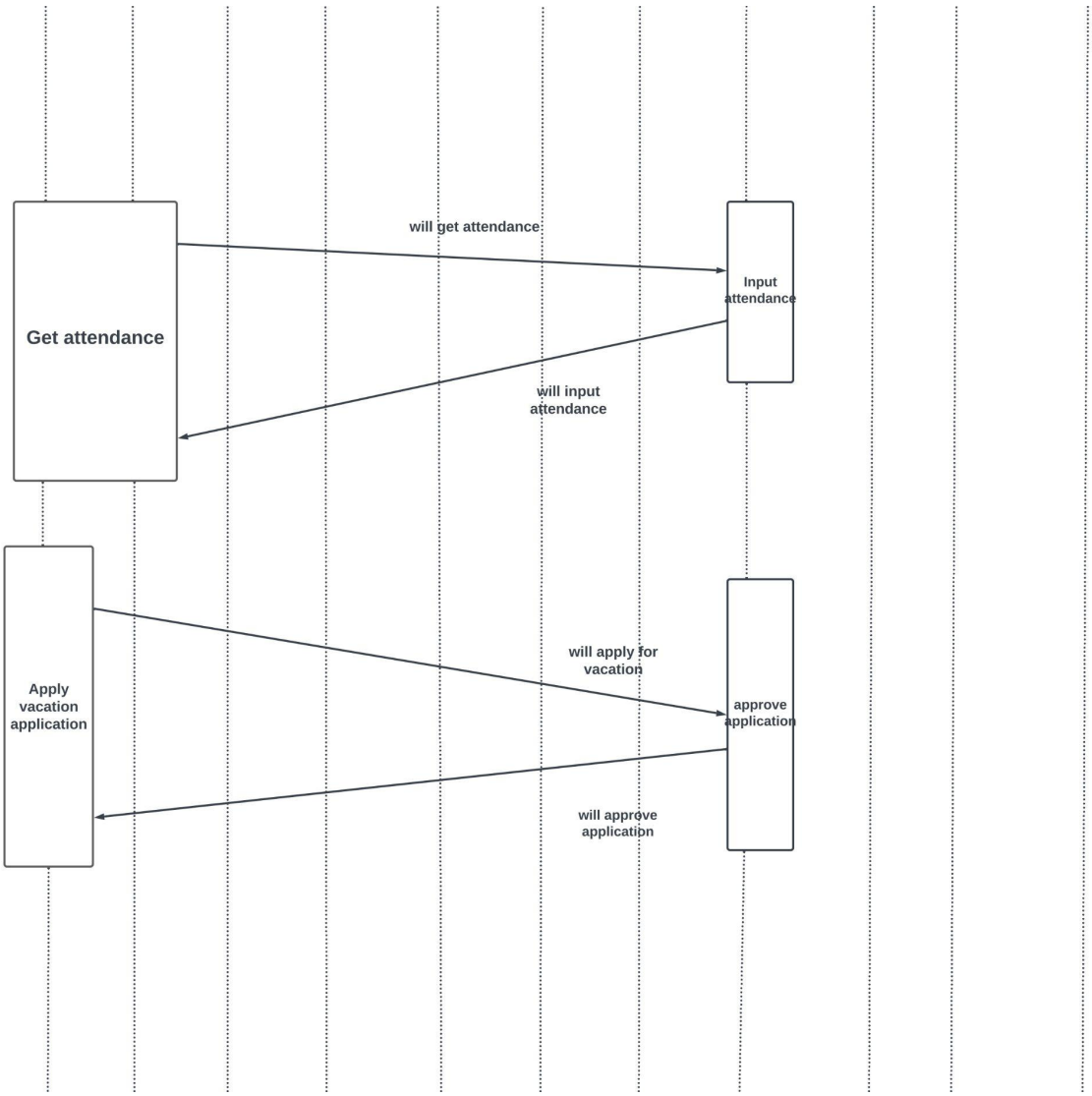
Sequence Diagram:

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.


Employee
Worker
Land Owner
CFS
System Admin
Inventory Manager
Payroll Manager
HR Manager
Mobile Banking
Loan
SMS
Create Account
wants to create account
verify info
verify info
Send OTP
sending OTP
Recovery Password
wants to recover password
verify info
verify info
Send OTP
sending OTP
password recovered
Update Profile
wants to update profile
verify info
profile updated


apply for loan
Approve Loan
loan approved
Update Loan Profile
loan profile updated
Get Loan SMS
Loan Application
Sending Loan money
Loan sms sent
Loan money sent
repays loan
Repay Loan
Update Loan Profile
updates loan profile


Set salary
set employee salary
Send money
sends money
send salary SMS
Get Salary and Bonus
sends salary sms
Generate Payslip
generate payslip
Set wages
sets wages
Send money
sends money
send wage SMS
Get wages
sends wage sms


Get attendance
will get attendance
Input attendance
will input attendance
Apply vacation application
will apply for vacation
approve application
will approve application