Activity 1

Dairy Farm Management System

ITP24_B4_06

Details of the Group Members: *(Provide the details of the group leader in the first row)*

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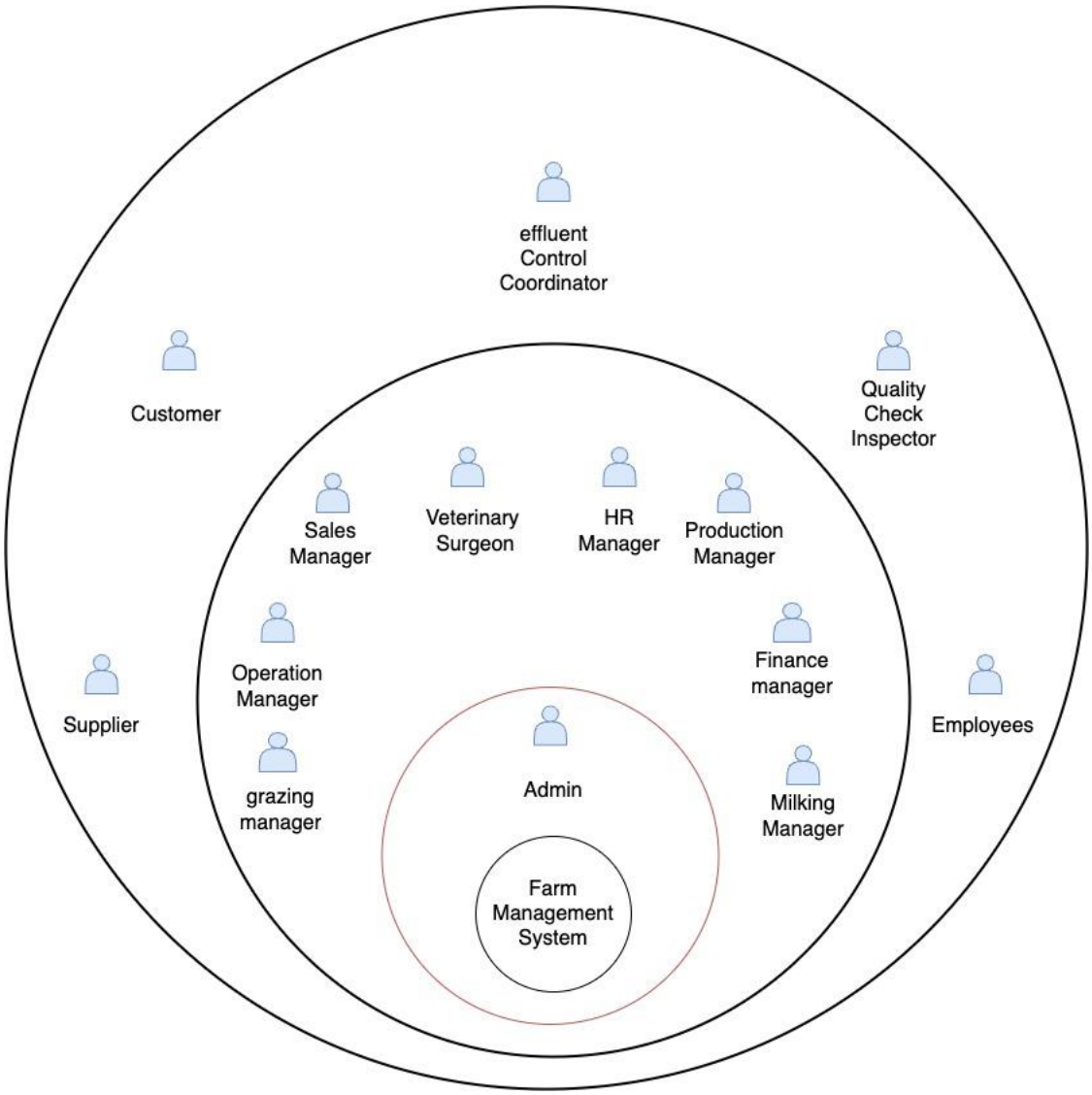
8.	DILSHAN J M H	IT22266828	0705559052	it22266828@my.sliit.lk

Stake Holders

- Admin
- Milking Manager
- Production Manager
- Finance Manager
- HR Manager
- Veterinary Surgeon
- Sales Manager
- Operation Manger
- Grazing Manger
- Customer
- Supplier
- Effluent Control Coordinator
- Quality Check Inspector
- Employees

Onion Diagram



A Finance Manager’s Story,

- As a Finance Manager,
  I want to be able to track financial transactions related to milk sales and purchases,
  So that I can maintain accurate records of revenue and expenses.

- As a Finance Manager,
  I want to generate financial reports summarizing milk sales and expenses,
  So that I can analyze profitability and make informed financial decisions.

- As a Finance Manager,
  I need to check that our financial records match up with what is in our inventory,
  So, I can be sure our accounts are correct and up to date.

- As a Finance Manager,
  I want to have access to budgeting and forecasting tools,
  So that I can plan for future expenses and revenue streams effectively.

A Grazing Manager's story,

- As a grazing manager,
  I want to be able to plan grazing sessions for livestock, So that I can effectively manage their movement across pastures.

- As a grazing manager,
  I want to be able to record grazing-related data during grazing sessions, So that I can track factors such as pasture utilization, forage consumption, and livestock health.

- As a grazing manager,
  I want to be able to record pasture conditions after grazing sessions, So I can assess pasture health and plan for recovery and re-grazing as needed.

- As a grazing manager,
  I want to be able to generate grazing reports through the system, So I can analyze grazing patterns, assess pasture productivity, and make informed decisions to optimize grazing management practices.

An Effluent control manager's story,

- As an effluent control manager,
  I want to be able to generate effluent control reports through the system,
  So that I can analyze effluent data, assess compliance with regulatory requirements, and implement strategies to minimize environmental impact.

- As an effluent control manager,
  I want to be able to assess manure stock levels in grazing areas,
  So that I can plan for proper manure management practices such as composting or spreading.

A Milking Manager's story,

- As a milking manager,
  I want to be able to schedule milking sessions,
  So, that I can organize every milking session according to the need.

- As a milking manager,
  I want to be able to record milking related data during milking sessions,
  So, that I can check the details like milk liters, irregularities before sending milk to the factory.

- As a milking manager,
  I want to be able to record storage details after storing milk in refrigerated tanks,
  So, I can clearly identify which milk batch is stored in which refrigerated tank.

- As a milking manager,
  I want to be able to generate milking reports through the system,
  So, I can analyze milking information and take necessary actions to improve efficiency.

A Quality Check Inspector's story,

- As a quality check inspector,
  I want to be able to log quality check details,
  So, I can ensure the quality of each milk batch after a milking session and before sending them to the factory.

An Operation Manager's Story,

- As an operations Manager,
  I want to have visibility into real-time inventory levels,
  so that I can make informed decisions about supplies.

- As an operations Manager,
  I want to be able to place orders for supplies efficiently,
  so that I can maintain optimal stock levels.

- As an operations Manager,
  I want to track supplier performance metrics,
  so that I can identify areas for improvement and optimize our supplier relationships.

- As an operations Manager,
  I want to be able to generate detailed reports about supplies,
  so that I can analyze inventory levels, track usage trends, and make informed decisions.

- As an operations Manager,
  I want to be able to automatically send invoices for supplies to the finance department,
  so that they can efficiently process payments.

A Supplier's Story,

- As a supplier,
  I want to receive notifications about orders placed,
  So that I can deliver the required supplies efficiently.

A HR Manager's Story,

- As a HR Manager
  I want to be able manage employee details by adding or deleting them from the system,
  So that I can maintain an up-to-date record of the current employees.

- As a HR Manager
  I want to be able to manage employee's task and add/delete them to/from the system,
  So that I can keep track of the task management.

- As a HR Manager,
  I want the ability to allocate work hours and make updates according to the schedule,
  So that I can closely monitor and record employee work hours for better time management.

A Veterinary Surgeon's Story,

- As a Veterinary Surgeon,
  I want to easily access and update breeding information for individual cows on the dairy farm website,
  so that I can efficiently manage the reproductive health of the herd.

- As a Veterinary Surgeon,
  I want a user-friendly interface on the dairy farm website that allows me to input and maintain detailed records for each cow,
  So that accurate and comprehensive animal registration can be ensured.

- As a Veterinary Surgeon,
  I want health record-keeping, guiding me through the process of entering detailed health information for each cow, including illnesses, treatments,
  so that to ensure comprehensive health records for each cow.

- As a Veterinary Surgeon,
  I want the website to support the recording of vaccinations and deworming activities,
  so that to contribute to a complete health history for each cow.

- As a Veterinary Surgeon,
  I want the dairy farm website to provide automated reminders and notifications for events like upcoming vaccinations or health check-ups,
  So that I can stay organized and proactive in managing the health of the herd.

A Sales Manager's story

- As a sales manager,
  I want to be able to approve and reject customer orders
  So, that I can ensure that only valid orders are processed.

- As a sales manager,
  I want to access real-time sales data and analytics dashboard so that I can make informed decisions and adjustments to sales strategies.

- As a sales manager,
  I want to generate comprehensive monthly sales reports with breakdowns by product category and sales channel, so that I can analyze sales performance and make data-driven decisions to optimize sales strategies.

- As a sales manager,
  I want to be able to view and update product inventory, track stock movements, and receive alerts for low inventory,
  So, that I can efficiently manage and optimized product availability to meet customer demand.

A Production Manager's story

- As a production manager,
  I want to access a real-time dashboard displaying available resources,
  so that I can efficiently plan and allocate resources for production tasks.

- As a production manager,
  I want to create and manage schedules for the production line of dairy-based products,
  so that I can ensure smooth and organized workflow management.

- As a production manager,
  I want to view the current stage of production for a specific product in real-time, along with estimated completion times,
  so that I can monitor progress effectively and make decisions.

- As a production manager,
  I want to monitor and control the temperature of the storeroom using IoT sensors,
  so that ensure it stays within defined limits to maintain product quality and safety.

- As a production manager,
  I want to conduct a 3-phase quality check through the system, store quality control reports, and analyze them,
  so that I can ensure product consistency and compliance with standards.

- As a production manager,
  I want to receive automatic notifications in case of quality control failures,
  so that allows timely intervention and corrective actions to be taken.

- As a production manager,
  I want to maintain an inventory of milk status and final products, with automated re-order requests triggered when stock levels reach predefined thresholds,
  so that I can ensure continuous production without stockouts.

- As a production manager,
  I want to create and manage recipes for dairy-based products within the system, specifying ingredients, quantities, and production steps,
  so that I can ensure consistent product quality and reproducibility.

- As a production manager,
  I want to analyze quality parameters, nutritional content, and other relevant factors through the system,
  so that I can ensure product quality meets regulatory standards and consumer expectations.

- As a production manager,
  I want to be able to release product batches and schedule the releasing of products based on factors such as demand forecasts, production capacity, and inventory levels,
  so that I can optimize production efficiency and meet market demands.

01. Functional Requirements

Financial Management:

- Track all financial transactions related to all the incomes/outcomes of the dairy farm.
- Automatically record incoming payments from milk sales and outgoing payments to suppliers for purchases.
- Record any additional expenses incurred, such as transportation or storage costs associated with milk production.
- Generate financial reports summarizing income, expenses, and overall profitability.
- Provide insights into revenue trends, cost breakdowns, and profit margins over specific time periods.
- Set financial targets and allocate funds for various expenses, including inventory, employee salaries, and operational costs.
- Provide forecasting tools to predict future financial performance based on historical data, market trends, and anticipated changes in demand or supply.
- Maintain compliance with regulatory requirements by documenting all financial transactions and approvals within the system.

Inventory Management:

- Provide real-time tracking of inventory levels for all items in stock.
- Track all movements of inventory items.
- Allow users to manually adjust inventory levels to account for discrepancies, losses, or damages.
- Generate detailed reports on various aspects of inventory management, such as current stock levels, usage trends, and stock movements.
- Notify users when inventory levels fall below predefined thresholds, triggering automatic replenishment processes or alerts for manual intervention.

Supplier Relationship Management (SRM):

- Maintain a centralized database of supplier information, including contact details, performance metrics, and transaction history.

- Track supplier performance metrics such as delivery timeliness, product quality, and communication responsiveness.
- Allow users to create and manage purchase orders directly within the system, specifying details such as item, quantity, price, delivery date, and supplier information.
- Facilitate the processing of supplier invoices, allowing users to verify, approve, and process invoices for payment in a timely manner.

Auto Stock Ordering Management:

- System automatically detects when stock of an item falls below the predefined threshold level.
- Operations Manager receives a notification about the auto-ordering request.
- Operations Manager accesses the system to review details of the auto-ordering request, including item, current stock level, required quantity, and supplier information.
- Operations Manager evaluates the auto-ordering request and decides whether to approve or reject it.
- If approved, the Operations Manager confirms the order within the system, authorizing the purchase from the designated supplier.
- If rejected, Operations Manager provides a reason for rejection and cancels the auto-ordering request.
- Upon approval, the system generates a purchase order and sends it to the designated supplier for fulfillment.
- System updates the status of the auto-ordering request to "Approved" and records the approval decision.
- Confirmation notification is sent to relevant stakeholders.

Milking Management:

- Allow the milking manager to schedule milking sessions, edit sessions, and cancel sessions.
- Allow the milking manager to record details regarding milking sessions such as milking duration, amount of milk, any irregularities, etc.
- Display milking session schedules and recorded data during sessions to the users.
- Allow quality check inspectors to log quality check status along with the relevant milk batch and the milking session ID.
- Allow the milking manager to record the details about the refrigerated tanks in which milk batches are stored.
- Allow the milking manager to generate comprehensive reports summarizing milking session data.

Employee Management:

- Allow the HR manager to input and store employee information, including names, addresses, contact information, job titles, salary, and employment status.
- Allow the HR manager to update/delete employee information when needed.
- Allow the HR Manager to add new tasks to the system, including details such as task name, description, and assigned employee.
- Allow the HR manager to add employee salaries, adding necessary bonuses and OT payments.
- Allow the HR Manager to allocate specific work hours to employees based on their schedules.
- The system should allow the HR Manager to add new tasks to the system, specifying details such as task name, description, and the employee assigned to the task.
- Display all employee information, work hours, tasks and tracking of the workforce's performance and contributions.
- Allow the HR manager to approve/reject leaves.
- Provide functionality to delete employee information from the system when an employee leaves the organization or for other relevant reasons.
- Allow the HR Manager to generate customizable reports for specific time periods or criteria, aiding in performance assessments and strategic decision-making.

Veterinary Management:

- The system should allow veterinarians to easily identify, and filter female cows based on relevant criteria for breeding.
- Veterinarians must be able to input and track the estruses cycle of female cows to optimize the timing of artificial inseminations.
- The system should track and record artificial inseminations of heifers, providing a comprehensive history for each cow.
- Veterinary surgeons should have the ability to create, edit, delete, and update breeding plans to manage the reproductive outcomes of the herd.
- The system must enable recording and updating of cow details throughout their lifespan, including ID, name, age, gender, status, and breed.
- A user-friendly search and filter function using names or IDs should be available for quick access to specific cow information.
- Veterinarians should be able to create, edit, and delete health records for each cow, including details of illnesses and treatments.
- The system should allow veterinarians to categorize sick cows, facilitating efficient health management.
- The system should automate reminders for timely vaccinations and deworming treatments, promoting preventive healthcare.
- Veterinarians should be able to download PDF reports containing comprehensive health and vaccination records for effective herd management.
- Veterinarians should be able to create reminders for upcoming vaccinations and deworming treatments.

Sales Data Analysis:

- Allow sales manager to generate various types of sales reports, including sales performance by product, region, time, and sales channel.
- Allow sales manager to analyze sales data using techniques such as charts, graphs, and dashboards to present sales analytics in an understandable format.
- Allow sales manager to generate reports from analyzed data and download them as PDF.

Order management:

- Allow sales manager to create, view, approve, and cancel customer orders.
- Allow sales manager to track order status and history, including order date, customer information, and order item.
- Allow sales manager to generate monthly sales reports and download them as PDF.
- Allow customers to browse and search the product catalog to view available products.
- The system should display product details, including name, description, price and image.
- Allow customers to add products to their shopping cart for future purchases.
- Allow customers to view and modify the content of their shopping cart before proceeding to the checkout.
- The system should track the status of each order and provide updates to the customers.
- Allow customers to access their order history to view details of past purchases.
- Allow customers to manage orders that are in the processing state, such as canceling or modifying orders before they are shipped.

User account management

- Allow users to register and log in to the system securely.
- The system should authenticate user's credentials and enforce access controls based on user roles.
- Allow customers to manage their profile, including updating personal information and changing password.

Grazing management

- Allow the grazing manager to schedule grazing sessions, edit session details, and cancel sessions as needed.
- Enable the grazing manager to record details about grazing sessions, including duration, livestock involved, pasture utilized, and any observed irregularities or incidents.

- Provide a user interface to display scheduled grazing session details, ongoing grazing activities, and recorded data during grazing sessions for real-time monitoring.
- Allow quality check inspectors to log the results of pasture quality inspections, including observations, measurements, and any issues detected, associated with specific grazing sessions.
- Enable the grazing manager to record and monitor pasture conditions after grazing sessions, including grass height, forage availability, soil erosion, and any signs of overgrazing or degradation.
- Provide functionality for the grazing manager to plan and manage pasture rotations, considering factors such as livestock preferences, pasture growth rates, and conservation objectives.
- Allow the grazing manager to generate comprehensive reports summarizing grazing session data, including livestock utilization rates, pasture productivity, environmental impact assessments, and compliance with grazing management plans.

Effluent control management

- Provide functionality for generating compliance reports related to effluent management activities, including regulatory compliance status, monitoring results, corrective actions taken, and future mitigation plans.
- Enable the effluent manager to assess the stock levels of manure in grazing areas, including tracking the accumulation rates, nutrient content, and potential environmental risks associated with manure buildup.

Production Management

- A real time dashboard that user can see the available resources and lets you plan and allocate required resources.
- Create and manage schedules of the production line of dairy based products.
- View in real-time the current stage of production process of a specific product with the estimated times to complete.

- Monitor and control the temperature of the storeroom with the integration of IoT sensors to keep it within the defined limits.
- Conduct a 3-phase quality check through the system and store, view and analyze Quality Control reports.
- Automatically notifies the veterinary surgeon and milking manager in case of quality control failure.
- Maintain an inventory of Milk status and final products with automated re-order requests.
- Create and manage recipes for dairy-based products including ingredients, quantities and production steps.
- Analyze quality parameters, nutritional content, and other relevant factors through the system to ensure the product quality.
- Release product batches and schedule the releasing of products.

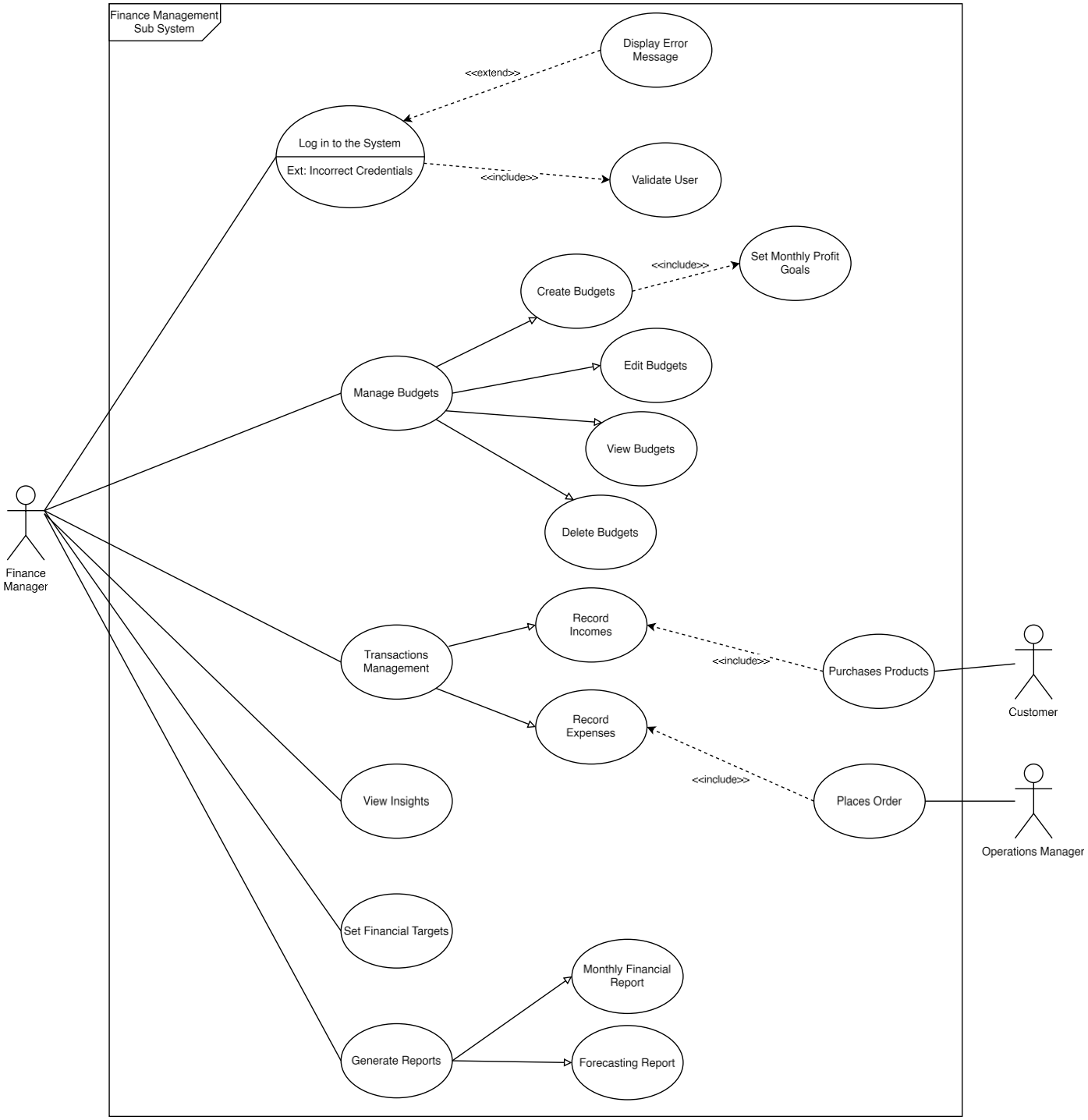
02. Non-Functional Requirements

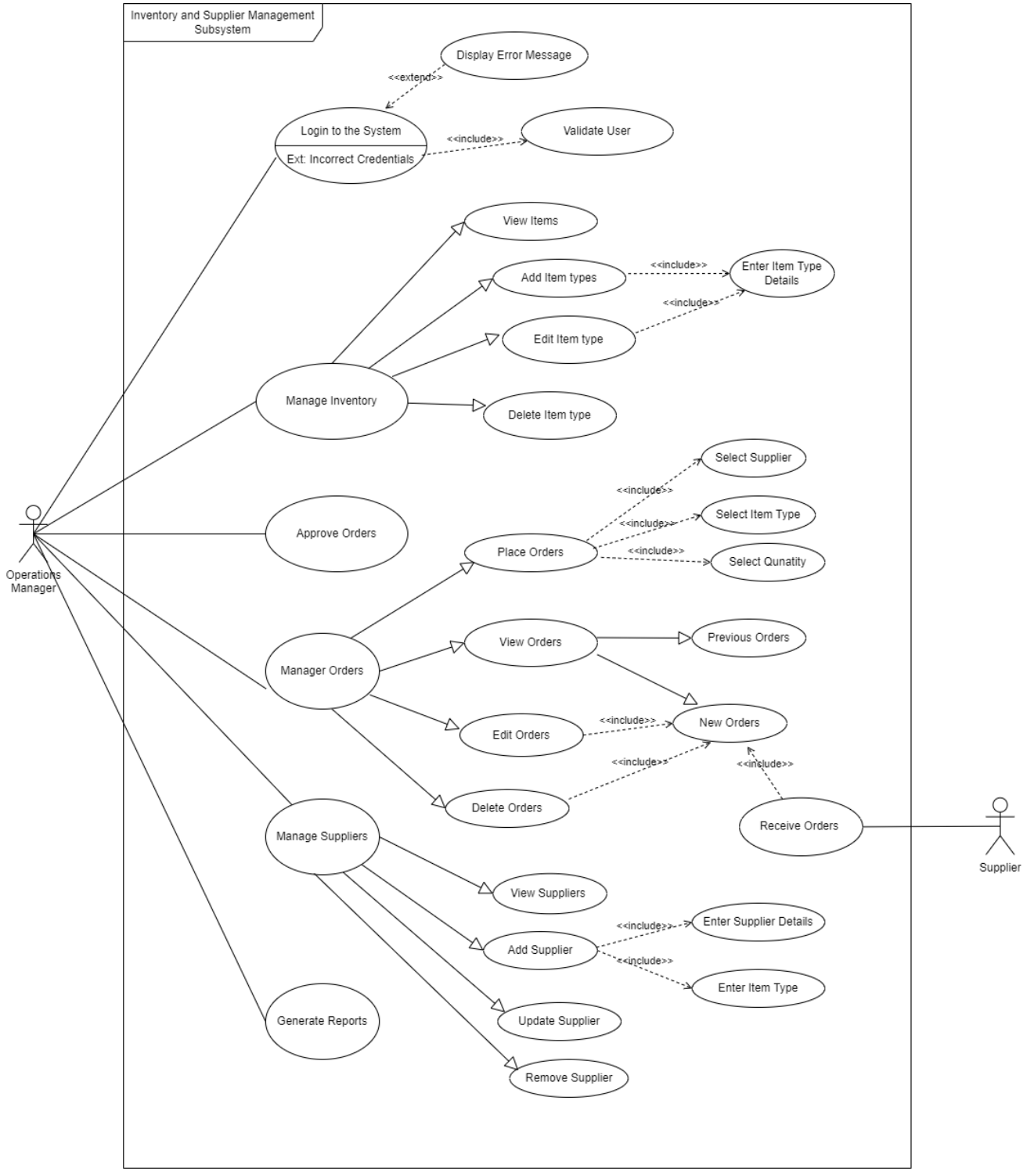
- Security
- Performance
- Usability
- Reliability
- Scalability
- Compatibility
- Accessibility
- Data backup and recovery
- Compliance
- Support and maintenance

03. Technical Requirements

- The system should be built using a client-server architecture.
- The system should be compatible with different web browsers and devices.
- The system should be hosted on a secure and reliable web server.
- The system should be integrated with IoT sensors.
- Front-end development – ReactJS library
- Back-end Development – Node.js, Express.js
- Database – MongoDB
- APIs
- Authentication and Authorization – JWT (JSON Web Tokens)
- Front-end hosting – Netlify
- Back-end hosting – Heroku

04. Use Case Diagrams




Inventory and Supplier Management Subsystem
Display Error Message
<<extend>>
Login to the System
Ext: Incorrect Credentials
<<include>>
Validate User
View Items
Add Item types
<<include>>
Enter Item Type Details
<<include>>
Edit Item type
Manage Inventory
Delete Item type
Select Supplier
<<include>>
Select Item Type
<<include>>
Select Qunatity
<<include>>
Approve Orders
Place Orders
Operations Manager
Manager Orders
View Orders
Previous Orders
New Orders
<<include>>
Edit Orders
<<include>>
<<include>>
Delete Orders
Receive Orders
Supplier
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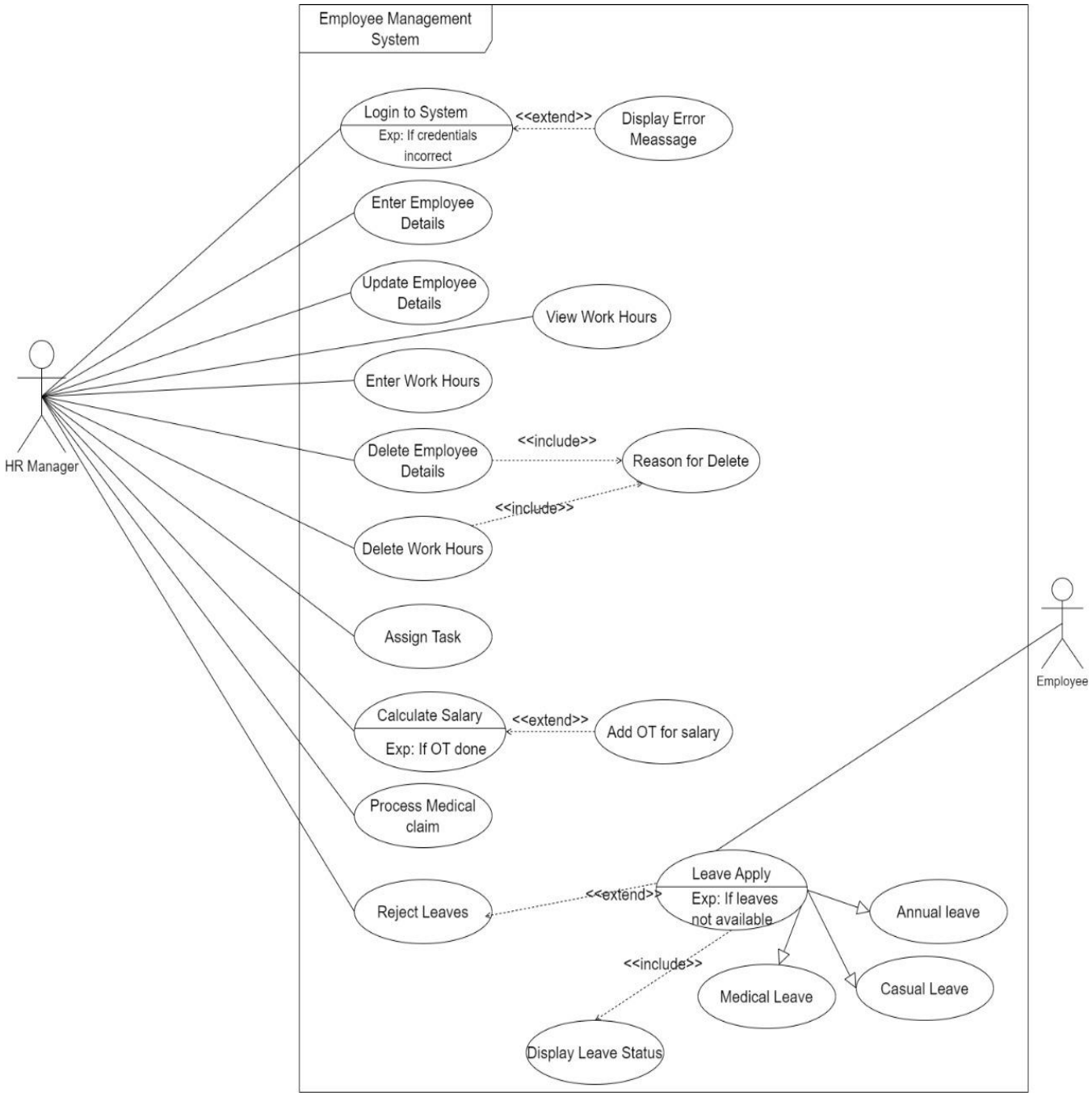
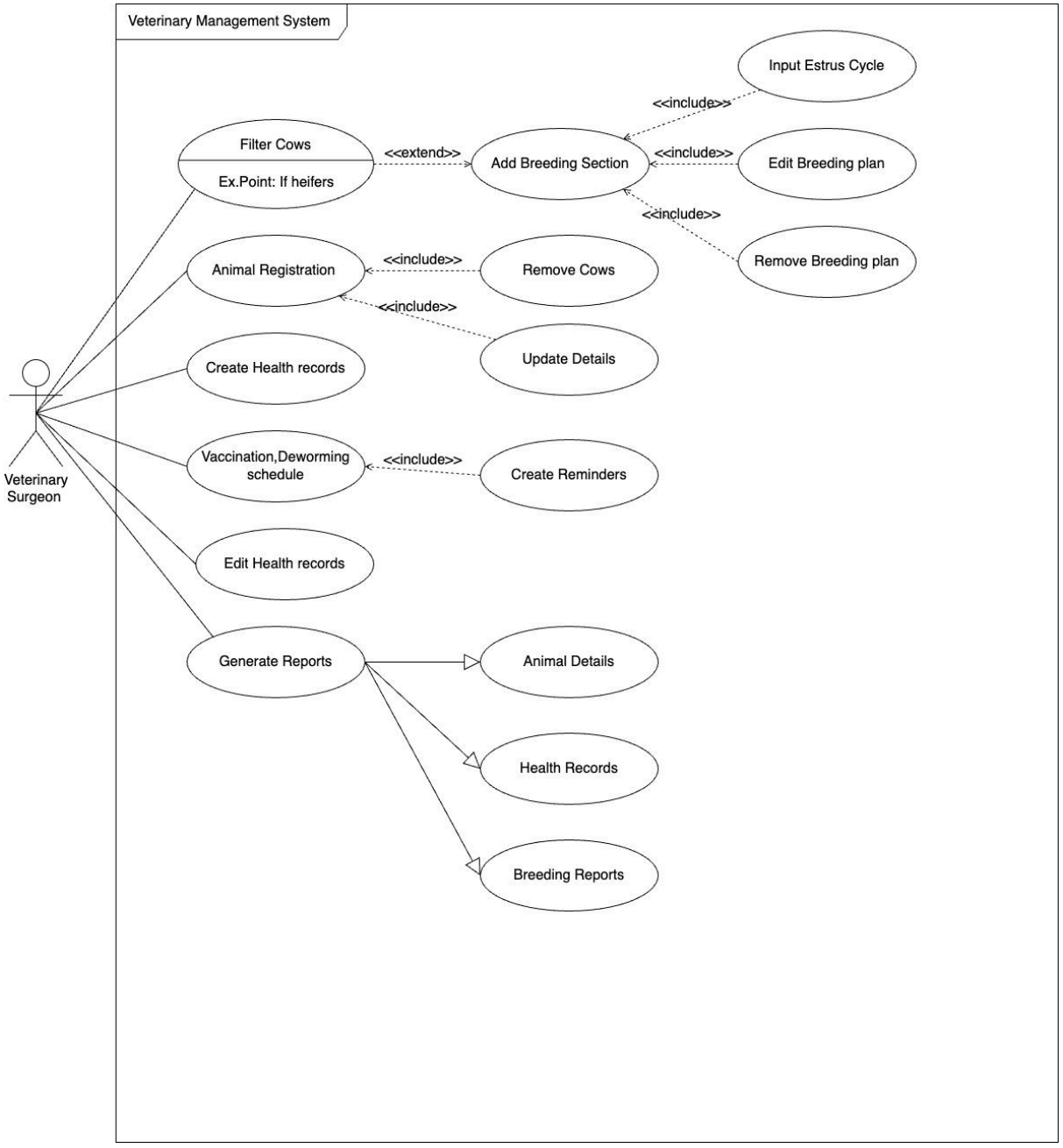
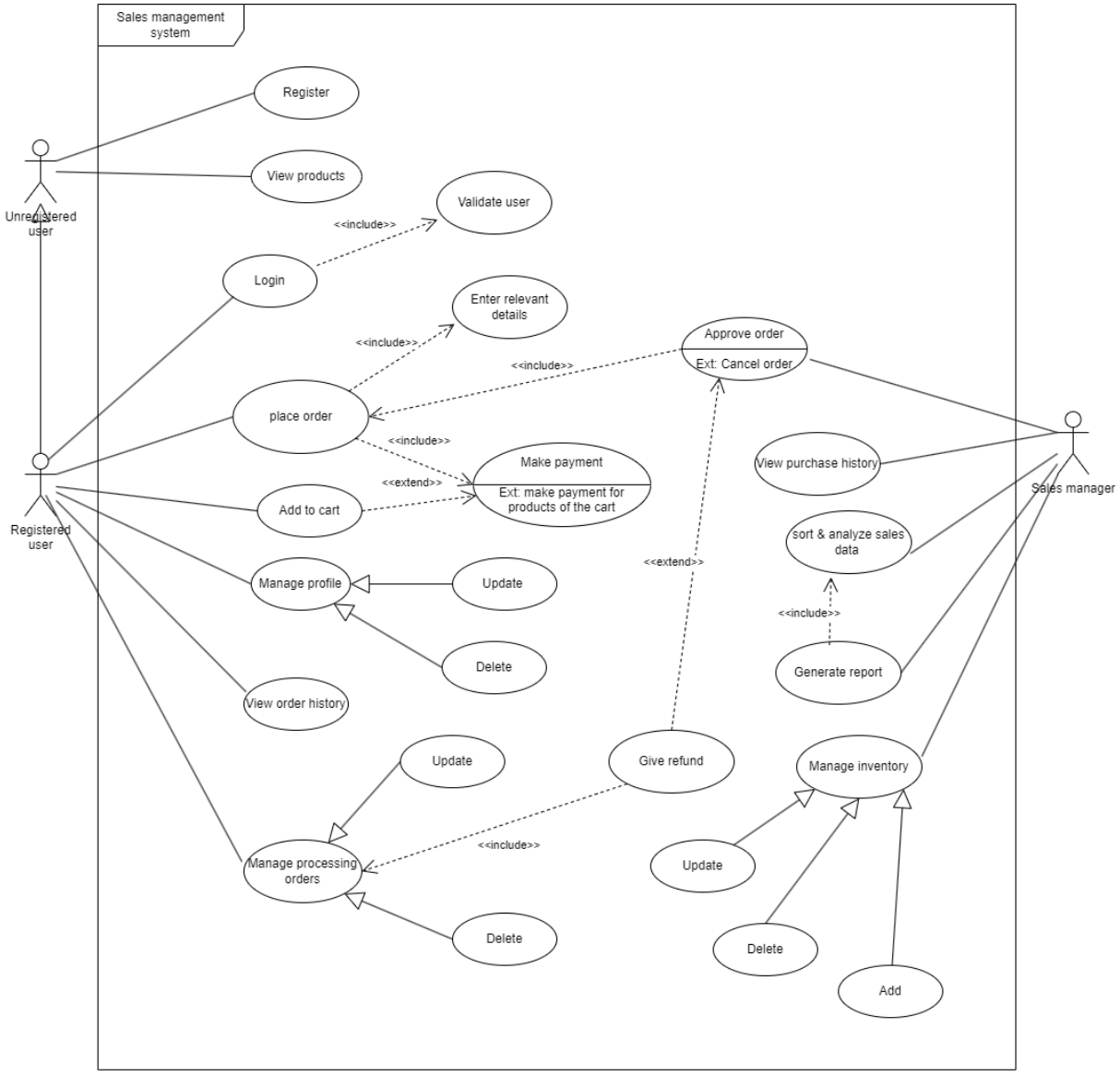
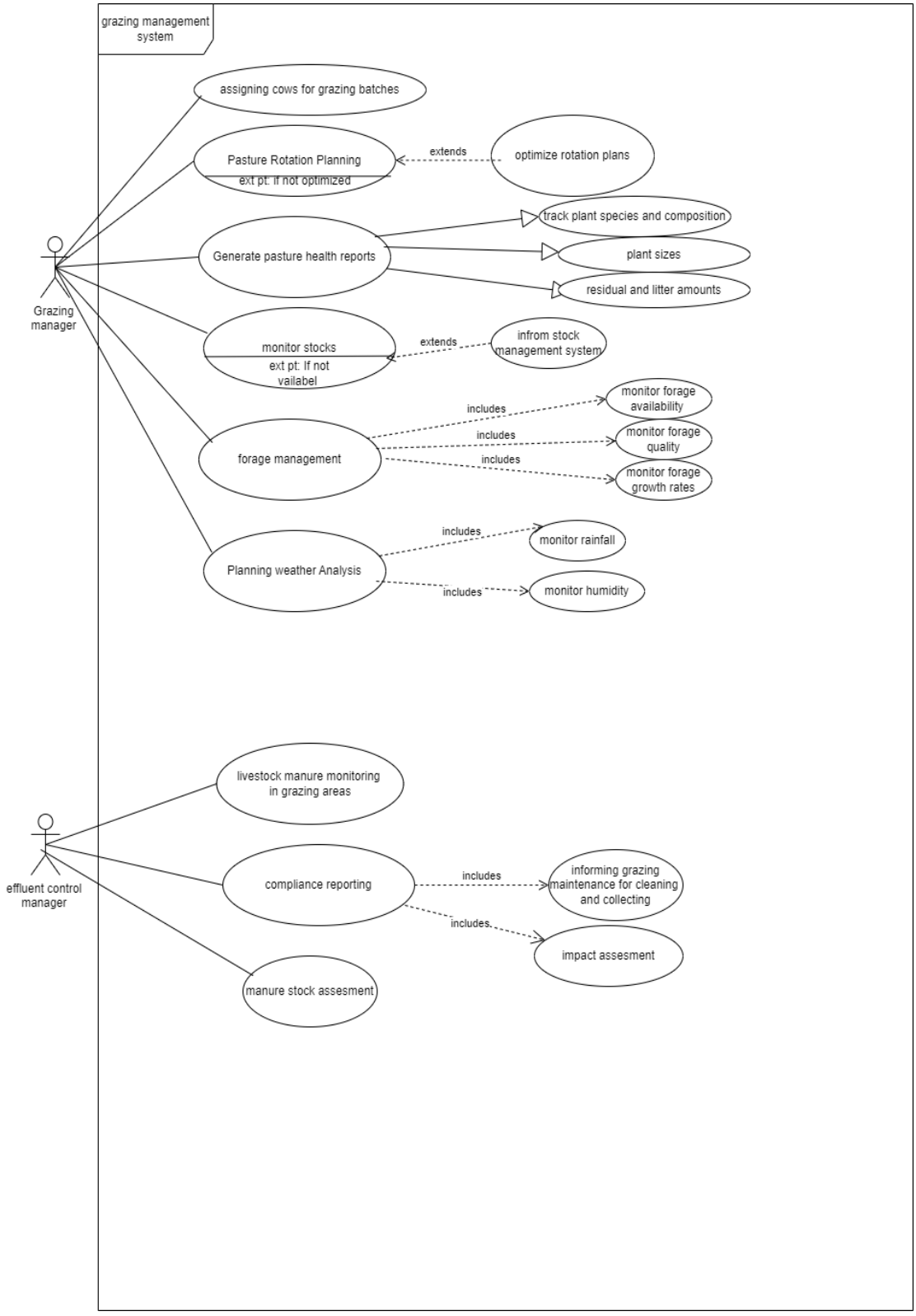
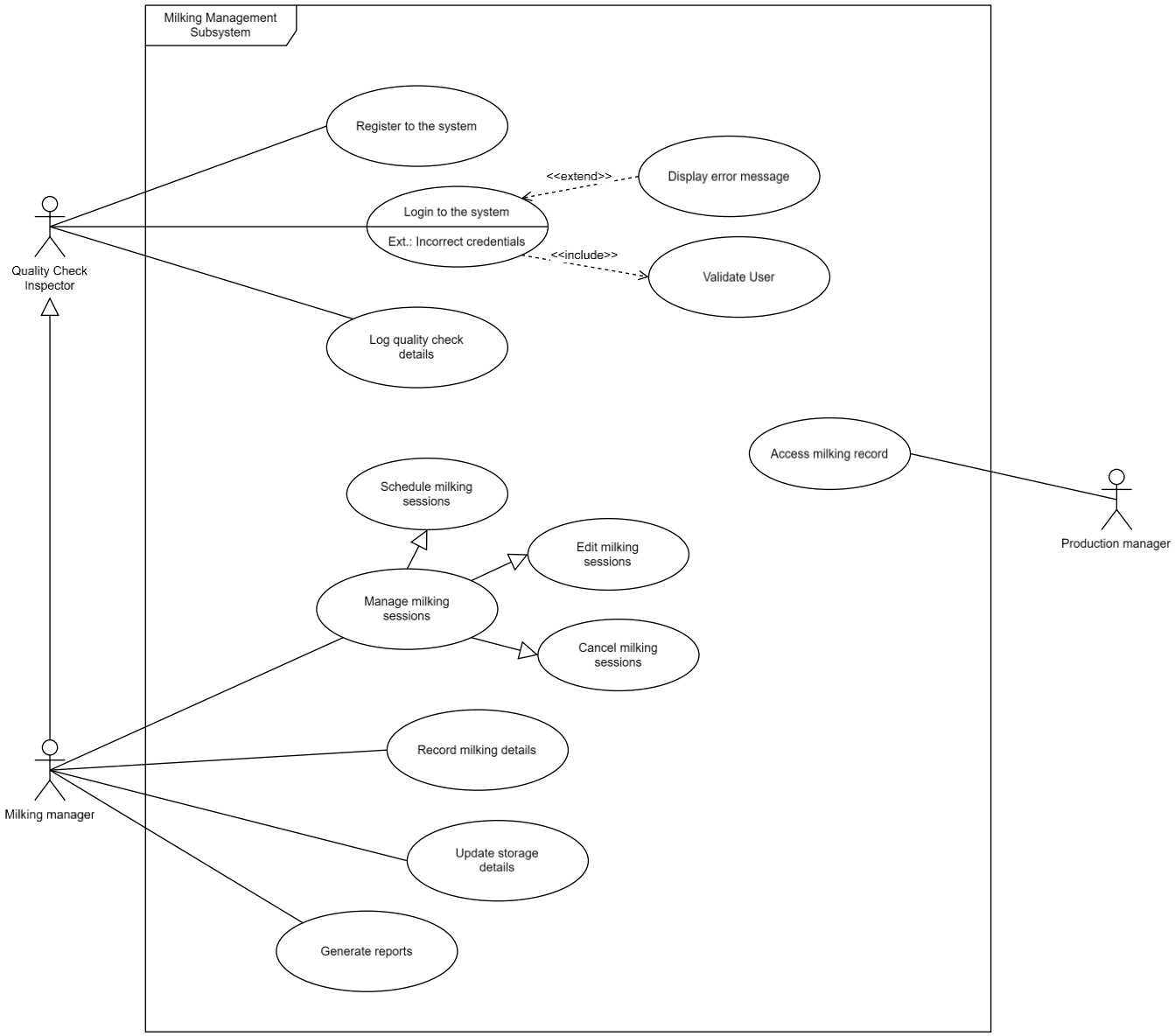
View Suppliers
<<include>>
Enter Supplier Details
Add Supplier
<<include>>
Enter Item Type
Generate Reports
Update Supplier
Remove Supplier


Employee Management System
Login to System
Exp: If credentials incorrect
<<extend>>
Display Error Meassage
Enter Employee Details
Update Employee Details
View Work Hours
Enter Work Hours
Delete Employee Details
<<include>>
Reason for Delete
<<include>>
Delete Work Hours
Assign Task
Calculate Salary
Exp: If OT done
<<extend>>
Add OT for salary
Process Medical claim
Reject Leaves
Leave Apply
Exp: If leaves not available
<<extend>>
Annual leave
Medical Leave
Casual Leave
<<include>>
Display Leave Status
HR Manager
Employee


Veterinary Management System
Input Estrus Cycle
<<include>>
Filter Cows
Ex.Point: If heifers
<<extend>>
Add Breeding Section
<<include>>
Edit Breeding plan
<<include>>
Remove Breeding plan
Animal Registration
<<include>>
Remove Cows
<<include>>
Update Details
Create Health records
Vaccination,Deworming schedule
<<include>>
Create Reminders
Edit Health records
Generate Reports
Animal Details
Health Records
Breeding Reports
Veterinary Surgeon


Sales management system
Register
View products
Validate user
<<include>>
Unregistered user
Login
Enter relevant details
<<include>>
Approve order
Ext: Cancel order
<<include>>
place order
<<include>>
Make payment
Ext: make payment for products of the cart
<<extend>>
Add to cart
Registered user
Manage profile
Update
Delete
View order history
<<extend>>
Update
Give refund
Manage processing orders
<<include>>
Delete
View purchase history
Sales manager
sort & analyze sales data
<<include>>
Generate report
Manage inventory
Update
Delete
Add


grazing management system
assigning cows for grazing batches
Pasture Rotation Planning
ext pt: if not optimized
extends
optimize rotation plans
Generate pasture health reports
track plant species and composition
plant sizes
residual and litter amounts
Grazing manager
monitor stocks
ext pt: If not vailabel
extends
infrom stock management system
forage management
includes
monitor forage availability
includes
monitor forage quality
includes
monitor forage growth rates
Planning weather Analysis
includes
monitor rainfall
includes
monitor humidity
livestock manure monitoring in grazing areas
effluent control manager
compliance reporting
includes
informing grazing maintenance for cleaning and collecting
includes.
impact assesment
manure stock assesment


Milking Management Subsystem
Register to the system
Display error message
<<extend>>
Login to the system
Ext.: Incorrect credentials
<<include>>
Validate User
Quality Check Inspector
Log quality check details
Access milking record
Production manager
Schedule milking sessions
Edit milking sessions
Manage milking sessions
Cancel milking sessions
Record milking details
Milking manager
Update storage details
Generate reports


Production Management Sybsystem
Conduct QC test
If QC test failed
<<Extends>>
Inform Production Manager
QC Inspector
Submit QC Report
<<Include>>
Handle QC failure
Monitor and control Temperature
Plan new products
View QC Report
Product planning
Analyse current products
Production Manager
Production Planing and Scheduling
Monitor Resource Allocation
Control storage temperature
Manage Product Storage
Handle expired products
Schedule and release Products
Genarate Production Reports
Track Ongoing Production

05. Use Case Descriptions

Use Case Name:	**Managing Budget**
Actor:	Finance Manager
Goal:	To create and manage budgets for specific time periods, such as monthly or yearly, to guide financial planning and expenditure control.
Overview:	The Finance Manager needs to set limits on spending for different categories like salaries, utilities, and supplies, ensuring the organization stays within financial bounds.
Pre-Conditions:	The Finance Manager is logged into the system.
Post-Conditions:	Budgets are successfully created and stored in the system.
Basic paths/alternative paths:	The Finance Manager goes to the "Manage Budgets" section. They choose the time period (e.g., month, quarter) for the budget. They decide how much money to allocate for different expenses like salaries, supplies, etc. The system checks if the total budget fits within available funds. The Finance Manager reviews and adjusts the budget if needed. Once done, the system saves the budget for future reference. Alternative Path: If there are changes in financial plans, the Finance Manager can update the budget at any time.
NFRs and TRs:	**NFR**:The system should be user-friendly for easy budget creation and tracking. It should provide alerts if spending approaches or exceeds set limits. **TR**:The system checks if the total budget fits within available funds

Use Case Name:	**Record Income and Expenses**
Actor:	Finance Manager
Goal:	To accurately record all financial transactions, including income and expenses, within the system.
Overview:	The Finance Manager needs to log all incoming revenue from milk sales, as well as outgoing expenses such as supplier payments and operational costs.
Pre-Conditions:	The Finance Manager is logged into the system and has access to the transaction recording functionality.
Post-Conditions:	The financial transactions are successfully recorded in the system.
Basic paths/alternative paths:	The Finance Manager selects the option to record income and expenses. The Finance Manager enters the details of the transaction, including the amount, date, category (income or expense), and description. The system validates the entered information and updates the financial records accordingly. The Finance Manager reviews the updated transaction log to ensure accuracy. Alternative Path: If there are any errors in the transaction details, the system provides prompts for correction before finalizing the record.
NFRs and TRs:	**NFR:**The system should ensure data integrity and accuracy in recording financial transactions. **TR**:Implement database management techniques to ensure data integrity and reliability

Use Case Name:	**Breeding Management**
Actor:	Veterinary Surgeon
Goal:	Efficiently manage the breeding process for cows, including identification of heifers and meticulous monitoring of estruses cycles.
Overview:	The veterinary surgeon utilizes the platform to filter and identify heifers, seamlessly adding them to the breeding section. The system facilitates the creation, editing, and deletion of breeding plans based on the monitored estrus cycles.
Pre-Conditions:	The veterinary surgeon has access to the platform and relevant permissions. Cows are appropriately registered in the system.
Post-Conditions:	Breeding plans are updated based on the identified heifers and estruses cycles.
Basic paths/alternative paths:	Veterinary surgeon logs into the platform. Selects the breeding management section. Filters and identifies heifers. Creates, edits, or deletes breeding plans as needed. *Alternative Path:* If estruses cycles are not accurately monitored, the veterinary surgeon may need to reassess and adjust breeding plans accordingly.
NFRs and TRs:	**Non-Functional Requirements (NFRs):** The platform should ensure real-time data updates for accurate breeding management. **Technical Requirements (TRs):** Integration with estruses monitoring devices to provide accurate data.

Use Case Name:	**Animal Registration**
Actor:	Veterinary Surgeon
Goal:	Register new cows, update information, and manage records for the herd.
Overview:	Veterinary surgeons effortlessly register new cows and maintain accurate records. They can edit and update early information for each animal and, when necessary, remove records for cows that have been sold or have passed away.
Pre-Conditions:	The veterinary surgeon has access to the platform and relevant permissions. The herd's existing records are up to date.
Post-Conditions:	New cows are successfully registered, and herd records are updated.
Basic paths/alternative paths:	Veterinary surgeon logs into the platform. Navigates to the animal registration section. Registers new cows, updates information, or removes records as necessary. *Alternative Path:* If there are technical issues, the veterinary surgeon may need to report and resolve them through the platform's support system.
NFRs and TRs:	**NFRs:** User-friendly interface for seamless registration and record management. **TRs:** Regular backups and data integrity checks to prevent loss of information.

Use Case Name:	**Healthcare Management**
Actor:	Veterinary Surgeon
Goal:	Maintain detailed medical histories, schedule vaccinations, and streamline healthcare management for the entire herd.
Overview:	Veterinary surgeons use the platform to keep comprehensive medical histories, schedule vaccinations, and provide timely treatment. The system generates reminders for vaccinations and allows for the separate monitoring of sick cows.
Pre-Conditions:	Cows are registered in the system with accurate health information.
Post-Conditions:	Healthcare records are updated, vaccinations are scheduled, and sick cows are appropriately monitored and treated.
Basic paths/alternative paths:	Veterinary surgeon logs into the platform. Navigates to the healthcare management section. Updates medical histories, schedules vaccinations, and monitors sick cows. *Alternative Path:* In case of a disease outbreak, the veterinary surgeon may need to follow an emergency healthcare protocol provided by the platform.
NFRs and TRs:	**NFRs:** Secure storage of healthcare data and timely reminders for vaccinations. **TRs:** Integration with disease databases for prompt updates on potential health threats.

Use Case Name:	**Employee Registration**
Actor:	HR Manager
Goal:	Employee information accurately and efficiently within the employee management system.
Overview:	The HR Manager needs to modify employee records to ensure that the information stored in the employee management system is current and reflects any changes in employment status or personal details.
Pre-Conditions:	The HR Manager must be authenticated and authorized to access and update employee records.
Post-Conditions:	The employee information in the system is updated with the changes made by the HR Manager.
Basic paths/alternative paths:	The HR Manager accesses the employee management system by providing valid credentials. Once logged in, the HR Manager navigates to the section of the system that allows them to view and edit employee information. *Alternative path:* If the HR Manager enters incorrect login credentials, the system prompts for re-entry or may lock the account after multiple failed attempts.
NFRs and TRs:	NFRs:The system should ensure security, reliability, scalability, and compliance with data protection regulations, providing a user-friendly interface with prompt response times and effective error handling. TRs: The system should ensure security, reliability, scalability, and compliance with data protection regulations, providing a user-friendly interface with prompt response times and effective error handling.

Use Case Name:	**Track Work Hours for Employees**
Actor:	HR Manager
Goal:	Accurately record and track the work hours of employees within the employee management system.
Overview:	Monitor and manage time-related information.
Pre-Conditions:	• Employees must be authenticated and authorized to log work hours. • Work hour tracking functionality must be accessible and operational within the employee management system.
Post-Conditions:	The system updates the employee's work hour record with the logged hours.
Basic paths/alternative paths:	• Employees log in and access the work hour tracking section. • They enter the start and end times of their work shift. • The system calculates the total work hours and updates the employee's record *Alternative path:* The work hour tracking system handles incomplete entries by prompting for missing details, notifies HR Managers of overlapping hours, facilitates manager verification, and informs users during system unavailability to log hours later, ensuring accuracy and transparency.
NFRs and TRs:	NFRs: Ensure secure authentication, low-latency performance, high reliability, scalability, compliance with data protection regulations, a user-friendly interface, and comprehensive audit logging. TRs: Test secure authentication, performance under various scenarios, reliability during standard business hours, scalability, compliance with data protection regulations, usability, and accurate audit log maintenance.

Use Case Name:	**Task Assignment and Completion**
Actor:	HR Manager
Goal:	Assign tasks to employees within the employee management system and track their completion.
Overview:	Receive task assignments, view task details, and mark tasks as completed, while managers use it to assign tasks, monitor progress, and track completion status.
Pre-Conditions:	Employees must be authenticated and authorized to access the task management functionality.
Post-Conditions:	• The system updates task completion status for each employee based on their actions. • Managers can view real-time progress and completion status of assigned tasks. • A task history log is updated, recording task assignments, modifications, and completion timestamps.
Basic paths/alternative paths:	• Employees log in, view assigned tasks, mark completion, and update task status; managers monitor progress. *Alternative path:* Managers reassign tasks, updating assignees. • System handles incomplete task information. • Managers modify tasks, system confirms changes, notifying employees. • Managers cancel tasks, confirming with appropriate notifications.
NFRs and TRs:	NFRs: The task management system must prioritize secure and user-friendly interfaces, high performance, reliability during business hours, scalability, compliance with data protection regulations, and effective error handling. TRs: Testing should validate authentication, performance under varied loads, system reliability, scalability, compliance with

	data protection, and thorough error-handling scenarios, including incomplete information or modifications.

Use Case Name:	**Inventory Management**
Actor:	Operations Managers
Goal:	To effectively manage and optimize relationships with suppliers to ensure smooth processes and supplier performance.
Overview:	The Supplier Relationship Management module provides Operations Managers with tools to manage supplier-related tasks and transactions efficiently. This includes maintaining supplier information, tracking supplier performance metrics, and managing purchase orders and invoices.
Pre-Conditions:	• The Operations Manager has access to the Supplier Relationship Management module. • Supplier information and transactional data are available in the system.
Post-Conditions:	• Supplier information is accurately maintained and up-to-date. • Supplier performance is monitored and evaluated based on predefined metrics. • Purchase orders and invoices are managed effectively, facilitating seamless procurement processes.
Basic paths/alternative paths:	The Operations Manager accesses the Supplier Relationship Management module. The Operations Manager maintains supplier information, including contact details, performance metrics, and transaction history. The Operations Manager tracks supplier performance metrics such as delivery timeliness, product quality, and communication responsiveness. The Operations Manager creates and manages purchase orders directly within the system, specifying details such as item, quantity, price, delivery date, and supplier information. The Operations Manager facilitates the processing of supplier invoices, verifying, approving, and processing invoices for payment in a timely manner. *Alternative path:*

	If the Operations Manager encounters any issues with supplier information or transactions, they may need to escalate the matter to higher management or engage with the supplier directly to resolve the issue.
NFRs and TRs:	**NFRs:** Timely notification delivery for effective supplier communication and decision-making. **TRs:** ensure prompt delivery of alerts and updates to relevant stakeholders, facilitating timely communication and decision-making processes.

Use Case Name:	**Supplier Relation Management**
Actor:	Operations Managers
Goal:	To effectively manage and optimize relationships with suppliers to ensure smooth processes and supplier performance.
Overview:	The Supplier Relationship Management module provides Operations Managers with tools to manage supplier-related tasks and transactions efficiently. This includes maintaining supplier information, tracking supplier performance metrics, and managing purchase orders and invoices.
Pre-Conditions:	• The Operations Manager has access to the Supplier Relationship Management module. • Supplier information and transactional data are available in the system.
Post-Conditions:	• Supplier information is accurately maintained and up-to-date. • Supplier performance is monitored and evaluated based on predefined metrics. • Purchase orders and invoices are managed effectively, facilitating seamless procurement processes.
Basic paths/alternative paths:	The Operations Manager accesses the Supplier Relationship Management module. The Operations Manager maintains supplier information, including contact details, performance metrics, and transaction history. The Operations Manager tracks supplier performance metrics such as delivery timeliness, product quality, and communication responsiveness. The Operations Manager creates and manages purchase orders directly within the system, specifying details such as item, quantity, price, delivery date, and supplier information. The Operations Manager facilitates the processing of supplier invoices, verifying, approving, and processing invoices for payment in a timely manner. *Alternative path:*

	If the Operations Manager encounters any issues with supplier information or transactions, they may need to escalate the matter to higher management or engage with the supplier directly to resolve the issue.
NFRs and TRs:	**NFRs:** Real-time inventory tracking for accurate stock management and decision-making. **TRs:** ensure that inventory data is updated in real-time across all relevant systems and interfaces

Use Case Name:	**Material Order Management**
Actor:	Operations Managers
Goal:	To efficiently manage material orders for the dairy farm.
Overview:	The Material Order Management module enables Operations Managers to create, track, and manage orders for materials required for dairy farm operations.
Pre-Conditions:	• The Operations Manager has access to the Material Order Management module. • Material catalogue and supplier information are available in the system.
Post-Conditions:	• Material orders are successfully created, tracked, and managed within the system. • Operations Manager has visibility into the status and history of material orders.

Basic paths/alternative paths:	The Operations Manager accesses the Material Order Management module. The Operations Manager creates a new material order by selecting required materials from the catalog, specifying quantities, and choosing suppliers. The system generates an order form with the selected materials and sends it to the designated suppliers. Operations Manager tracks the status of the material order within the system, receiving updates on order confirmation, shipment, and delivery. Upon receiving materials, Operations Manager verifies the delivery and updates the order status accordingly. The Operations Manager can modify or cancel the material order before delivery. *Alternative path:* If a supplier fails to fulfill the order or delays delivery, the Operations Manager may need to contact alternative suppliers or adjust the order accordingly.
NFRs and TRs:	**NFRs:** Real-time order tracking for timely material procurement and inventory management. **TRs:** Implement system alerts to notify Operations Manager of any delays or issues with material orders.

Use Case Name:	**Auto Stock Ordering Management**
Actor:	Operations Managers
Goal:	To efficiently manage auto-ordering requests for items falling below stock threshold levels.
Overview:	The system automates the process of detecting low stock levels for items and generating auto-ordering requests. Operations Managers receive notifications about these auto-ordering requests and can review, approve, or reject them as necessary.
Pre-Conditions:	• The system is configured to monitor stock levels and generate auto-ordering requests when items fall below predefined thresholds. • The Operations Manager has access to the system and receives notifications about auto-ordering requests.
Post-Conditions:	• Auto-ordering requests are effectively managed, either approved for purchase or rejected based on the Operations Manager's decision.
Basic paths/alternative paths:	The system automatically detects when the stock of an item falls below the predefined threshold level. Operations Manager receives a notification about the auto-ordering request. Operations Manager accesses the system to review details of the auto-ordering request, including item, current stock level, required quantity, and supplier information. Operations Manager evaluates the auto-ordering request and decides whether to approve or reject it. If approved, the Operations Manager confirms the order within the system, authorizing the purchase from the designated supplier. If rejected, Operations Manager provides a reason for rejection and cancels the auto-ordering request. Upon approval, the system generates a purchase order and sends it to the designated supplier for fulfilment. System updates the status of the auto-ordering request to "Approved" and records the approval decision. Confirmation notification is sent to relevant stakeholders,

NFRs and TRs:	**NFRs:** Timely notification delivery for efficient decision-making on auto-order requests. **TRs:** Implement system alerts to notify Operations Manager promptly when auto-ordering requests require attention.

Use Case Name:	**Grazing management**
Actor:	Grazing manager
Goal:	Efficiently manage grazing activities, monitor pasture health, and optimize forage management.
Overview:	Grazing managers utilize the platform to plan pasture rotations, generate pasture health reports, manage forage resources, and analyze weather conditions to optimize grazing management practices.
Pre-Conditions:	Pastures are registered in the system with accurate information on forage types, livestock preferences, and environmental conditions.
Post-Conditions:	Grazing plans are optimized, pasture health is monitored, forage resources are managed effectively, and weather conditions are considered in grazing management decisions.
Basic paths/alternative paths:	1.Grazing manager logs into the platform. 2.Navigates to the grazing management section. 3.Plans pasture rotations, considering livestock needs and pasture health. 4.Generates pasture health reports to assess pasture conditions, identify areas for improvement, and track changes over time. 5.Manages forage resources by monitoring availability, assessing growth rates, and planning for sustainable utilization. 6.Analyzes weather conditions to anticipate and mitigate potential impacts on grazing activities, such as drought or heavy rainfall. Alternative Path: •In case of extreme weather events or other emergencies, the grazing manager may need to follow emergency grazing protocols provided by the platform.
NFRs and TRs:	NFRs: Secure storage of grazing data to ensure confidentiality and integrity. Timely notifications and reminders for grazing activities and weather-related alerts. TRs:

	Integration with weather forecasting services for real-time weather updates and analysis. Compatibility with geographic information systems (GIS) for accurate mapping and monitoring of pasture conditions.

Use Case Name:	**Effluent Management**
Actor:	Effluent Control Manager
Goal:	Monitor and manage effluent discharges, ensure compliance with environmental regulations, and assess the impact of livestock manure on grazing areas.
Overview:	Effluent control managers utilize the platform to monitor livestock manure in grazing areas, generate compliance reports, assess manure stock levels, and implement measures to mitigate environmental impact.
Pre-Conditions:	Grazing areas and effluent discharge points are registered in the system with accurate information on manure management practices and environmental regulations.
Post-Conditions:	Effluent discharges are monitored and managed effectively, compliance with environmental regulations is demonstrated, manure stock levels are assessed, and mitigation measures are implemented as needed.
Basic paths/alternative paths:	1.Effluent control manager logs into the platform. 2. Navigates to the effluent management section. 3. Monitors livestock manure in grazing areas, assessing distribution, accumulation rates, and potential environmental risks. 4. Generates compliance reports to demonstrate adherence to environmental regulations, including monitoring results, regulatory requirements, and corrective actions taken. 5. Assesses manure stock levels to plan for proper management practices such as composting or spreading, considering nutrient content and environmental impacts. 6. Implements mitigation measures to minimize the environmental impact of livestock manure, such as erosion control, soil conservation, or habitat restoration. Alternative Path:

	•In case of environmental incidents or regulatory violations, the effluent control manager may need to follow emergency response protocols provided by the platform
NFRs and TRs:	**NFRs**: Secure storage of effluent data to ensure confidentiality and integrity. Timely notifications and alerts for environmental incidents or regulatory violations. **TRs:** Integration with environmental monitoring systems for real-time data collection and analysis. Compatibility with regulatory databases for tracking compliance requirements and reporting obligations.

Use Case Name:	**Place Order**
Actor:	Customer
Goal:	To enable customers to place orders for products they wish to purchase through the online platform, ensuring a seamless and convenient shopping experience.
Overview:	The Customer Place Order feature allows registered users to select products from the catalos, add them to their shopping cart, specify shipping and payment details, and complete the checkout process to finalize their orders.
Pre-Conditions:	• The customer must be logged in to their account. • The customer must have selected products to purchase and added them to the shopping cart.
Post-Conditions:	• The order is successfully placed and processed. • The customer receives an order confirmation email or notification. • The purchased items are removed from the inventory. • The customer's order history is updated with the new order details.
Basic paths/alternative paths:	1. The customer logs in to their account on the online platform. 2. The customer browses the product catalos and adds desired items to the shopping cart. 3. The customer navigates to the shopping cart to review the selected items and quantities. 4. The customer proceeds to checkout and enters shipping and payment information. 5. The customer confirms the order and completes the checkout process. 6. The system processes the order, deducts the purchased items from the inventory, and sends an order confirmation to the customer.
NFRs and TRs:	**NFRs:** The system should ensure the accuracy and consistency of order information, preventing duplicate or erroneous orders. **TRs:** The system should update the inventory in real-time to reflect the purchase of items and prevent overselling.

Use Case Name:	**Schedule Milking Sessions**
Actor:	Milking Manager
Goal:	To organize milking sessions according to the farm's needs.
Overview:	The Milking Manager uses the web application to schedule milking sessions for the dairy cows. They input the desired timing and frequency of milking sessions, ensuring efficient resource allocation and cow management.
Pre-Conditions:	• The Milking Manager must be logged into the web application. • The Milking Manager has access to the cattle details from the veterinary management subsystem.
Post-Conditions:	• Milking sessions are successfully scheduled in the system.
Basic paths/ Alternative paths:	The Milking Manager accesses the Milking Management module. Then navigates to the milking session scheduling section. The Milking Manager selects the desired cow group, date and time for the milking session and inputs any specific requirements or notes. *Alternative path:* If conflicts arise with existing scheduling, the system prompts the Milking Manager to adjust the timing or resolve conflicts accordingly.
NFRs and TRs:	**NFRs:** System reliability to ensure accurate scheduling, user-friendly interface for ease of use, and scalability to accommodate varying farm sizes. **TRs:** Data security measures to protect scheduling information and system responsiveness for real-time scheduling updates.

Use Case Name:	**User Profile Management**
Actor:	Customer
Goal:	To provide customers with the ability to manage their profile information, including personal details and communication preferences, to ensure accuracy and relevance.
Overview:	The Manage Profile feature allows registered users to access and update their profile information, such as name, contact details, address, and communication preferences, providing them with control over their account settings and ensuring the information remains up to date.
Pre-Conditions:	• The customer must be logged in to their account on the online platform. • The customer's profile page must be accessible and editable. • The customer must have the necessary permissions to modify their profile information.
Post-Conditions:	• The customer's profile information is successfully updated and saved. • Any changes made to the profile details are reflected accurately in the system. • The customer receives a confirmation message or notification indicating the successful update of their profile.
Basic paths/alternative paths:	1. The customer logs in to their account on the online platform. 2. The customer navigates to the profile or account settings section. 3. The customer views their current profile information, including name, contact details, and address. 4. The customer selects the option to edit their profile. 5. The customer makes changes to the desired fields, such as updating their name, email address, or phone number. 6. The customer saves the changes, triggering the system to update and store the modified profile information. **7.** The system confirms the successful update of the customer's profile and provides a confirmation message or notification.
NFRs and TRs:	**NFRs:** The system should respond promptly to user interactions and update profile information in real-time, ensuring a seamless and responsive user experience. **TRs:** The system should authenticate users securely before allowing them to access and modify their profile details.

Use Case Name:	**Processing Order Management**
Actor:	Customer
Goal:	Allow customers to manage orders that are currently in the processing stage, enabling them to make modifications or cancellations as necessary before the orders are shipped.
Overview:	The Manage Processing Order feature empowers customers to view and take action on orders that are currently being processed by the system. Customers can review the details of their processing orders, make changes to order items, update shipping information, or cancel orders if needed.
Pre-Conditions:	• The customer must be logged in to their account on the online platform. • The order must be in the processing stage, indicating that it has not yet been shipped.
Post-Conditions:	• Any modifications or cancellations made to the processing order are successfully applied. • The customer receives a confirmation message or notification indicating the outcome of their action
Basic paths/alternative paths:	1. The customer logs in to their account on the online platform. 2. The customer navigates to the order history section or the processing orders page. 3. The customer identifies the processing order they wish to manage and selects the option to view order details. 4. The customer reviews the order details, including items, quantities, and shipping information. 5. If modifications are needed, the customer selects the option to edit the order. 6. The customer makes changes to the order items, updates shipping information, or selects the option to cancel the order. 7. The customer confirms the changes and submits the updated order. 8. The system processes the customer's request, applying the modifications or cancelling the order accordingly. 9. The system sends a confirmation message or notification to the customer, informing them of the outcome of their action.
NFRs and TRs:	**NFRs:** The system should respond promptly to user interactions and process order modifications or cancellations in real-time.

	TRs: The system should update the order status in real-time after modifications or cancellations are applied, reflecting the current state of the order.

Use Case Name:	**Approve order**
Actor:	Sales manager
Goal:	Enable sales managers to review and approve customer orders to ensure accuracy and completeness before processing and fulfilment.
Overview:	The Approve Order feature provides sales managers with the ability to review pending customer orders, verify order details, and approve orders for further processing.
Pre-Conditions:	• The sales manager must be logged in to their account on the online platform. • There must be pending orders awaiting approval in the system.
Post-Conditions:	• Approved orders are marked as processed and ready for fulfilment. • Customers receive confirmation notifications indicating that their orders have been approved.
Basic paths/alternative paths:	1. The sales manager logs in to their account on the online platform. 2. The sales manager navigates to the pending orders section or order management dashboard. 3. The sales manager reviews the details of each pending order, including items, quantities, and customer information. 4. If the order meets company standards and customer requirements, the sales manager selects the option to approve the order. 5. The sales manager confirms the approval, triggering the system to mark the order as processed. 6. The system updates the order status and sends a confirmation notification to the customer indicating that their order has been approved.
NFRs and TRs:	**NFRs:** Access to order approval functionality should be restricted to authorized sales managers to prevent unauthorized modifications or approvals. **TRs:** The system should integrate seamlessly with the order management system to retrieve and update order details during the approval process.

Use Case Name:	**Sort and analyze sales data**
Actor:	Sales manager
Goal:	Enable sales managers to efficiently sort and analyse sales data to gain insights into sales performance and make informed business decisions.
Overview:	The Sort and Analyse Sales Data feature provides sales managers with tools to organize, filter, and analyse sales data based on various criteria such as product category, time period, region, and sales channel. This functionality allows sales managers to identify trends, patterns, and opportunities for improvement in sales strategies.
Pre-Conditions:	• The sales manager must be logged in to their account on the online platform. • Sales data must be available in the system, including information on products sold, sales volumes, revenue, and customer demographics.
Post-Conditions:	• Sales data is sorted and analysed based on specified criteria, providing insights into sales performance. • Sales managers can generate reports, charts, or graphs to visualize sales trends and patterns.
Basic paths/alternative paths:	1.The sales manager logs in to their account on the online platform. 2.The sales manager navigates to the Sort and Analyse Sales Data section or dashboard. 3.The sales manager selects the criteria for sorting and analysing sales data, such as product category, time period, region, or sales channel. 4.The system retrieves and organizes sales data based on the specified criteria. 5.The sales manager reviews the sorted sales data, identifying trends, patterns, and outliers. 6.The sales manager generates reports, charts, or graphs to visualize the sales data and gain insights into sales performance. 7.The sales manager analyses the sales data to identify opportunities for improvement in sales strategies and tactics.

NFRs and TRs:	**NFRs:** The system should be able to process and analyse large volumes of sales data efficiently, providing quick responses to user queries. **TRs:** The system should provide options for sorting and filtering sales data based on various criteria, allowing sales managers to narrow down the analysis.

Use Case Name:	**Inventory management (sales)**
Actor:	The sales manager
Goal:	Enable sales managers to efficiently manage inventory of products, ensuring adequate stock levels, accurate tracking, and timely replenishment to meet customer demand.
Overview:	The Manage Inventory feature provides sales managers with tools to oversee and control the inventory of products available for sale.
Pre-Conditions:	The sales manager must be logged in to their account on the online platform. Product inventory data must be available in the system, including information on product quantities, SKUs, descriptions, and suppliers.
Post-Conditions:	Inventory data is updated and synchronized across the system, reflecting changes made by the sales manager.
Basic paths/alternative paths:	1.The sales manager logs in to their account on the online platform. 2.The sales manager navigates to the Manage Inventory section or inventory management dashboard. 3.The sales manager views the current inventory status, including product quantities, SKUs, and descriptions. 4.If necessary, the sales manager updates product information such as prices, descriptions, or supplier details. 5.If stock levels are low or out-of-stock, automatically send the notification to production. 6. The sales manager verifies that inventory data is accurate and reflects the latest changes.

NFRs and TRs:	**NFRs:** The system should ensure the accuracy and integrity of inventory data, preventing discrepancies or errors in stock levels and product information. **TRs:** The system should track inventory movements and transactions in real-time, providing visibility into stock levels and changes.

Use Case Name:	**Record Milking Details**
Actor:	Milking Manager
Goal:	To maintain accurate information about completed milking sessions for quality control and monitoring purposes.
Overview:	The Milking Manager utilizes the web application to record details from each milking session, including milk litres, milking duration, and any observed irregularities, etc. This information can be accessed by authorized users, such as the Production Manager, for monitoring and analysis.
Pre-Conditions:	• The Milking Manager must be logged into the web application.
Post-Conditions:	• Milking details for the session are successfully recorded in the system.
Basic paths/ **Alternative paths:**	The Milking Manager accesses the Milking Management module. Then navigates to the milking sessions section. The Milking Manager selects the relevant milking session and inputs details such as the milk yield, milking duration, and any irregularities observed during the session. *Alternative path:* If any errors or discrepancies are identified, the system prompts the Milking Manager to correct the information before proceeding.
NFRs and TRs:	**NFRs:** System reliability to ensure accurate recording of milking details, data integrity to prevent loss or corruption of recorded information, and user access controls to restrict access. **TRs:** Data security to protect sensitive milking data and system performance to ensure timely recording of information.

Use Case Name:	**Monitor and control temperature**
Actor:	Production Manager
Goal:	Ensure the temperature is within the pre-defined limits to protect the products
Overview:	The system utilizes integrated IoT temperature sensors to continuously monitor real-time temperature readings within storage rooms. Production managers can access temperature data, receive alerts for out-of-range readings, and remotely adjust thermostat settings to maintain predefined temperature thresholds.
Pre-Conditions:	IoT temperature sensors are properly installed and operational within storerooms, predefined temperature ranges should be assigned for the storerooms.
Post-Conditions:	Real-time temperature data is displayed, User will receive notification alerts when temperature readings deviate from acceptable ranges and Users can adjust thermostat settings remotely.
Basic paths/alternative paths:	System monitors real-time temperature data. If temperature readings remain within predefined thresholds, no action is required. If temperature readings exceed or fall below thresholds, the system triggers an alert notification for designated users. Users can access the system to view real-time data and acknowledge alerts. To rectify out-of-range temperatures, users can remotely adjust thermostat settings within the system. *Alternative Path:* System malfunctions prevent real-time data retrieval or alert notifications. Users are unable to remotely adjust thermostat settings due to technical issues. Manual intervention is required to address equipment failures causing temperature fluctuations.
NFRs and TRs:	**Non-Functional Requirements (NFRs):** Response Time: Temperature data updates within 5 seconds Alert Notification Time: Immediate delivery of alerts upon threshold breaches Data Integrity: Accurate and reliable temperature data recording

	• **Technical Requirements (TRs):** Integration with compatible IoT temperature sensors. Automated alert notification system. Remote thermostat control functionality.

Use Case Name:	**Production Planning and Scheduling**
Actor:	Production Manager
Goal:	Optimize production efficiency by effectively planning and scheduling production runs for dairy products.
Overview:	The system assists production managers and planners in creating, visualizing, and managing production schedules. It considers various factors like resource availability, demand forecasts, recipe requirements, and lead times to generate optimized production plans.
Pre-Conditions:	System holds accurate data on available resources (machinery, personnel, materials). Master production schedule with desired product quantities and deadlines is established. Bill of materials (BOM) and recipe details are uploaded for each product.
Post-Conditions:	Detailed production schedules are generated, outlining tasks, resource assignments, and timelines. Real-time updates reflect changes in resources or scheduling requirements. Visualizations aid in understanding production flow and identifying potential bottlenecks. Reports provide insights into production efficiency and capacity utilization.
Basic paths/alternative paths:	Production planner inputs desired production quantities and deadlines for specific products. System accesses master production schedule and resource availability data. Based on BOMs and recipe requirements, system calculates resource needs for each production run. Using optimization algorithms, the system generates detailed production schedules, assigning tasks, allocating resources, and sequencing activities. Production manager reviews and approves schedules, making adjustments if necessary.

	Approved schedules are communicated to relevant personnel and integrated with other production systems (e.g., inventory management). The system tracks progress, monitors resource utilization, and provides real-time updates on schedule adherence. *Alternative Path:* Unexpected resource shortages require schedule adjustments or production rescheduling. Demand fluctuations necessitate changes to production quantities or deadlines. Equipment breakdowns or maintenance needs demand schedule modifications.
NFRs and TRs:	**Non-Functional Requirements (NFRs):** Ability to accommodate changes in production requirements, Capable of handling varying production volumes and complexities • **Technical Requirements (TRs):** Integration with resource management and inventory system. • Real-time data reporting and visualization capabilities