

CNC-314 Database system

Group project



Dairy Management System

Requirements Document

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E-JUST LOGO



Dairy Management System

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Table of Contents

1. INTRODUCTION	5
1.1 Document Purpose	5
2. BUSINESSS REQUIRMENTS SPECIFICATION	5
2.1 Business Purpose	5
2.2 Business Scope	5
2.3 Business Overview	6
2.4 Goals and objective.....	6
2.5 SWOT Analysis	6
2.6 Cost-Benefit Analysis	7
3. STACKHOLDERS REQUIRMENTS SPECIFICATION	9
3.1 Purpose.....	9
3.2 Stackholder.....	9
3.3 Stakeholder Roles and Responsibilities	9
4. SYSTEM OPERATIONAL CONCEPT	11
4.1 Purpose.....	11
4.2 System Scope	11
4.3 Key Features	11
4.4 System Operations.....	13
4.5 System Goals and Objectives	13
4.6 Conclusion	13
4.7 Context Diagram	14
4.8 Data Flow Diagram	15

5.SYSTEM REQUIRMENTS SPECIFICATION	22
5.1 System purpose	22
5.2 System scope	22
5.3 System overview	24
5.3.1System context.....	24
5.3.2 system functions.....	24
5.3.3 user characteristics.....	26
5.4 System functional requirements	27
5.5 System non-functional requirements.....	29
6. Data Dictionary	31
7. Mapping	36
8. Schema	37

1. INTRODUCTION:

1.1 purpose:

The purpose of our Dairy Farm Management System is to ensure the holistic well-being of the herd while optimizing milk production and farm efficiency. This system serves as a digital hub for monitoring and managing individual cows' health records, reproductive cycles, and milk production data. By providing real-time insights into the health status of each cow, farmers can promptly identify and address potential issues. The Dairy Farm Management System plays a pivotal role in data-driven decision-making, supporting farmers in maximizing productivity, minimizing operational costs, and adhering to industry regulations. Ultimately, it contributes to the sustainable and ethical management of dairy farms, creating an environment where cows are healthy, content, and productive.

2. BUSINESSS REQUIRMENTS SPECIFICATION

2.1) Business purpose

The purpose of the Dairy Farm Management System is to streamline and enhance the operations of the dairy farm by leveraging technology. This system aims to improve efficiency, increase productivity, and provide valuable insights for better decision-making.

2.2) Business scope

The Dairy Farm Management System will cover all aspects of dairy farm operations, including but not limited to:

- 1. Manager:**
 - Data analytics for informed decision-making.
- 2. Dairy Farmers:**
 - Milk production tracking for optimization.
- 3. Veterinarians:**
 - Health monitoring
 - Diagnostic support for accurate treatment.
- 4. Salesman:**
 - Inventory management for optimal stock levels.
 - Sales analytics for performance tracking.

2.3) Business overview

The Dairy Farm Management System will be a comprehensive software solution designed to integrate seamlessly with existing farm processes. It will provide a centralized platform for data management, analysis, and reporting, ultimately leading to improved farm management.

2.4) Goals and Objectives

Goals

1. Increase overall farm productivity by 20% within the first year.
2. Enhance the traceability of milk production and distribution processes.
3. Improve animal health monitoring and reduce the incidence of diseases.

Objectives

1. Implement a user-friendly interface for easy adoption by farm personnel.
2. Integrate real-time data collection devices for accurate and timely information.
3. Establish a reliable reporting system for key performance indicators.

2.5) SWOT analysis

Strengths

1. **Established Reputation in the Dairy Industry**
 - Leverage the farm's positive reputation to attract customers and build brand loyalty.
 - Utilize customer testimonials and case studies to showcase the farm's success.
2. **Experienced and Skilled Farm Personnel**
 - Capitalize on the expertise of farm personnel to ensure the efficient implementation and use of the Dairy Farm Management System.
 - Provide ongoing training programs to keep the team updated on modern agricultural practices.
3. **Access to High-Quality Dairy Breeds**
 - Market the farm's commitment to quality by highlighting the superior breeds.
 - Explore opportunities for selective breeding programs to enhance herd characteristics.

Weaknesses

1. Reliance on Manual Record-Keeping

- Implement the Dairy Farm Management System to automate record-keeping and reduce the risk of errors.
- Conduct training sessions to facilitate a smooth transition from manual to automated processes.

2. Limited Use of Technology in Farm Operations

- Invest in modern agricultural technologies to improve overall farm efficiency.
- Encourage the adoption of technology among farm personnel through workshops and incentives.

3. Inconsistent Data Management Practices

- Establish standardized data management protocols to ensure consistency.
- Implement regular audits to identify and address any data management inconsistencies.

Opportunities

1. Adoption of Technology for Improved Farm Efficiency

- Embrace precision farming technologies for optimized resource utilization.
- Explore automation options to streamline routine tasks and enhance overall operational efficiency.

2. Expansion of Product Offerings Based on Market Trends

- Conduct market research to identify emerging trends and consumer preferences.
- Diversify product offerings to meet market demands, such as introducing organic or specialty dairy products.

3. Collaboration with Tech Providers for Innovative Solutions

- Form strategic partnerships with technology providers to access cutting-edge solutions.
- Explore collaborations that enhance data analytics capabilities for better decision-making.

2.6) Cost-benefit analysis

Costs

1) Initial Development and Implementation Costs

- **Description:** This includes expenses related to the development and deployment of the Dairy Farm Management System software.

- **Justification:** Investment in robust software development to ensure a comprehensive and effective solution.

2) Training Costs for Farm Personnel

- **Description:** Training programs for farm personnel to ensure smooth adoption of the new system.
- **Justification:** Well-trained personnel lead to efficient system utilization, reducing errors and improving overall productivity.

3) Maintenance and Support Costs

- **Description:** Ongoing costs for system maintenance, updates, and user support.
- **Justification:** Essential for ensuring the system remains current, secure, and provides uninterrupted service.

Benefits

1) Increased Productivity and Operational Efficiency

- **Description:** Streamlining farm processes will lead to a projected increase in overall productivity.
- **Justification:** Efficiency gains from automated processes and real-time data insights.

2) Reduction in Manual Errors and Data Inconsistencies

- **Description:** Minimizing errors in data entry and management.
- **Justification:** Reducing errors enhances accuracy in reporting and decision-making.

3) Improved Decision-Making Through Data-Driven Insights

- **Description:** Utilizing data analytics for informed decision-making.
- **Justification:** Strategic decisions based on accurate and timely data can positively impact profitability.

3. Stakeholder Requirements Specification (StRS) for Diary Management System

3.1) Purpose:

The purpose of the Stakeholder Requirements Process is to define the requirements for a system That express the intended interaction the services needed by users and other stakeholders in a defined environment. The Dairy Management System is designed to streamline and enhance the operations of a diary by incorporating various stakeholders' requirements.

All These stakeholders work together to ensure the health, productivity and welfare of the dairy as well as the production of high-quality milk . they contribute to the overall functioning ,development, and sustainability of the dairy management system for cows.

3.2) Stakeholders:

1. Manager
2. Dairy Farmers
3. Veterinarians
4. Clients
5. Sales man

3.3) Stakeholder Roles and Responsibilities

1) Manager :

- **Decision-Making:** The manager plays a crucial role in making strategic decisions for the dairy farm. This includes decisions related to resource allocation, herd management.
- **Financial Management:** Ensuring the overall economic sustainability of the dairy farm. The manager aims to maximize productivity while minimizing costs.

2) Dairy Farmers:

- **Milk Production:** The primary role of dairy farmers is to manage and optimize the production of milk.

3) Veterinarians:

- Professionals specialized in animal health who play a critical role in monitoring the health and well-being of dairy cows, providing medical care, and offering advice on disease prevention and Treatment
- Health and Welfare: Dairy farmers are responsible for the overall health and welfare of the cows .

4) Clients :

- Milk Procurement: Clients, such as dairy processing companies, rely on the dairy management system to ensure a steady and high-quality milk supply. They may have specific requirements regarding milk quality, and the system helps in meeting these standards
- Quality Assurance: Clients depend on the dairy management system to maintain and provide documentation on the quality and safety of the milk supplied.

5) Sales man:

- Orders Management: Salesmen may use the system to manage and track orders, ensuring timely delivery to clients. This involves coordination with the dairy farm and clients to meet demand

4. System Operational Concept Specification (OpsCon)

4.1) Purpose:

The Dairy Farm Management System is a integrated solution designed to optimize and simplify the management of diverse activities within a dairy farm. By consolidating breeding, cow management, employee information, expenditures, health records, income tracking, milk sales, and milk production, the system aims to enhance operational efficiency and facilitate data-driven decision-making.

4.2) Scope:

The system encompasses the entire spectrum of dairy farm operations, ensuring a comprehensive approach to managing resources, processes, and data. It caters to the specific needs of breeding, cow care, financial tracking, and milk production, fostering a holistic and streamlined management environment.

4.3) Key Features :

1) Breeding Module:

- Breeding Records: Capture and maintain comprehensive breeding records for each cow.

2) Cow Management:

- Comprehensive Cow Profiles: Maintain detailed records for each cow, including health history, vaccinations, and production metrics.

3) Employee Information:

- Staff Profiles: Maintain employee information, roles, and responsibilities.

4) Financial Tracking:

- Expenditure Monitoring: Track farm expenditures, including feed costs, veterinary expenses, and equipment maintenance.
- Income Tracking: Record and analyze income from milk sales and other revenue streams.

5) Health Records:

- Manage cow health to determine the disease and the deal with it with the specific treatment
- Medication Tracking: Manage medication process
- Add this medication process cost to the expenditure records

6) Milk Production :

- Production Tracking: track daily milk production per cow.

7) Milk Sales:

- Sales Management: Record and manage milk sales transactions.

4.4) System Operations:

- 1) Data Input:
 - User-friendly Interfaces: Provide intuitive interfaces for manual data input.
- 2) Data Processing:
 - Data Validation: Implement checks to ensure accuracy and completeness of entered data.
 - Real-time Analytics: Process data in real-time to generate actionable insights.
- 3) User Accessibility:
 - Role-based Access: Implement role-based access control to ensure data security and privacy.

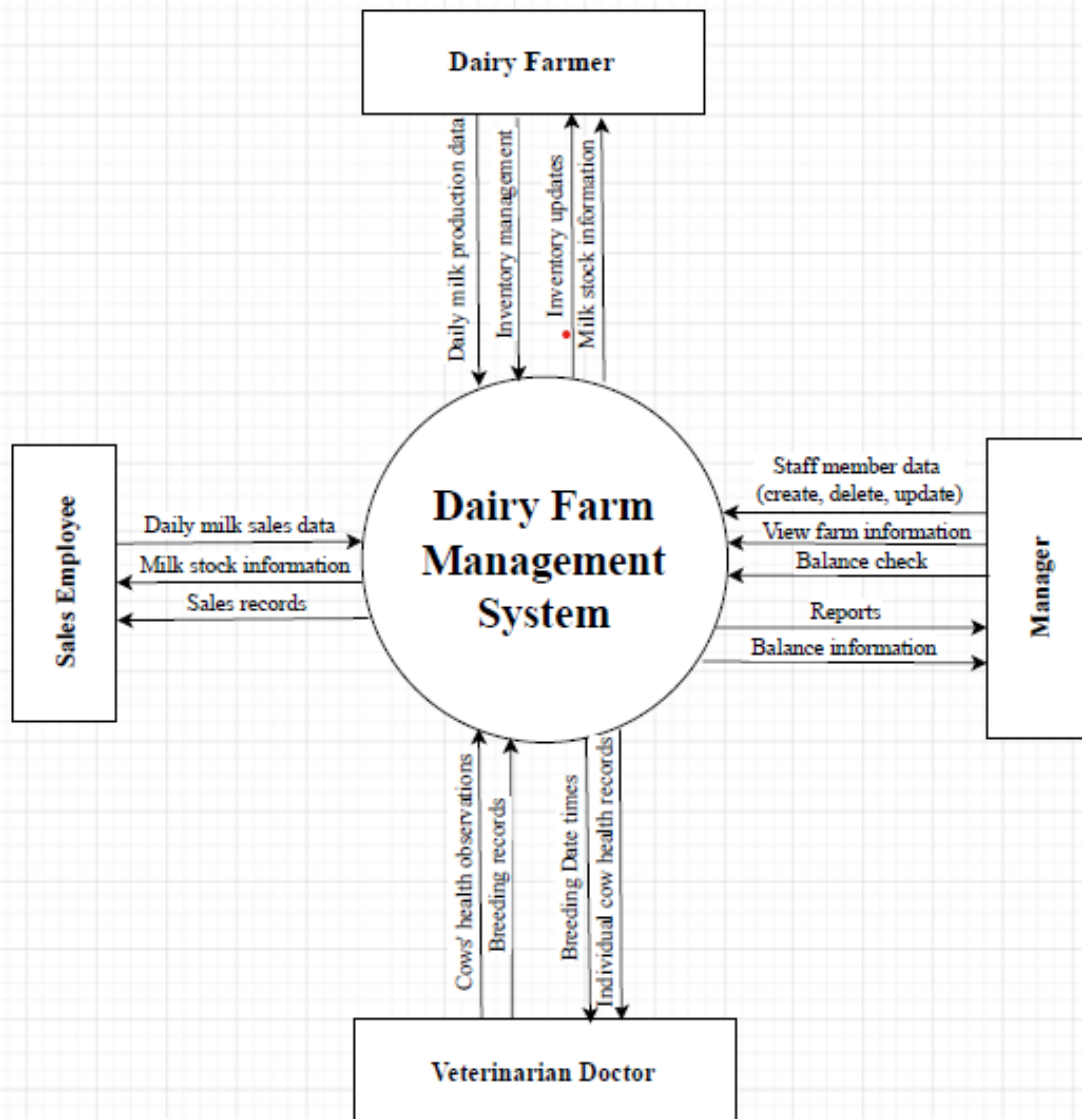
4.5) Goals and Objectives:

- 1) Operational Efficiency:
 - Enhance overall farm efficiency by automating routine tasks and optimizing resource allocation.
- 2) Informed Decision Making:
 - Empower farm managers and employees with timely and accurate information to make informed decisions

4.6) Conclusion:

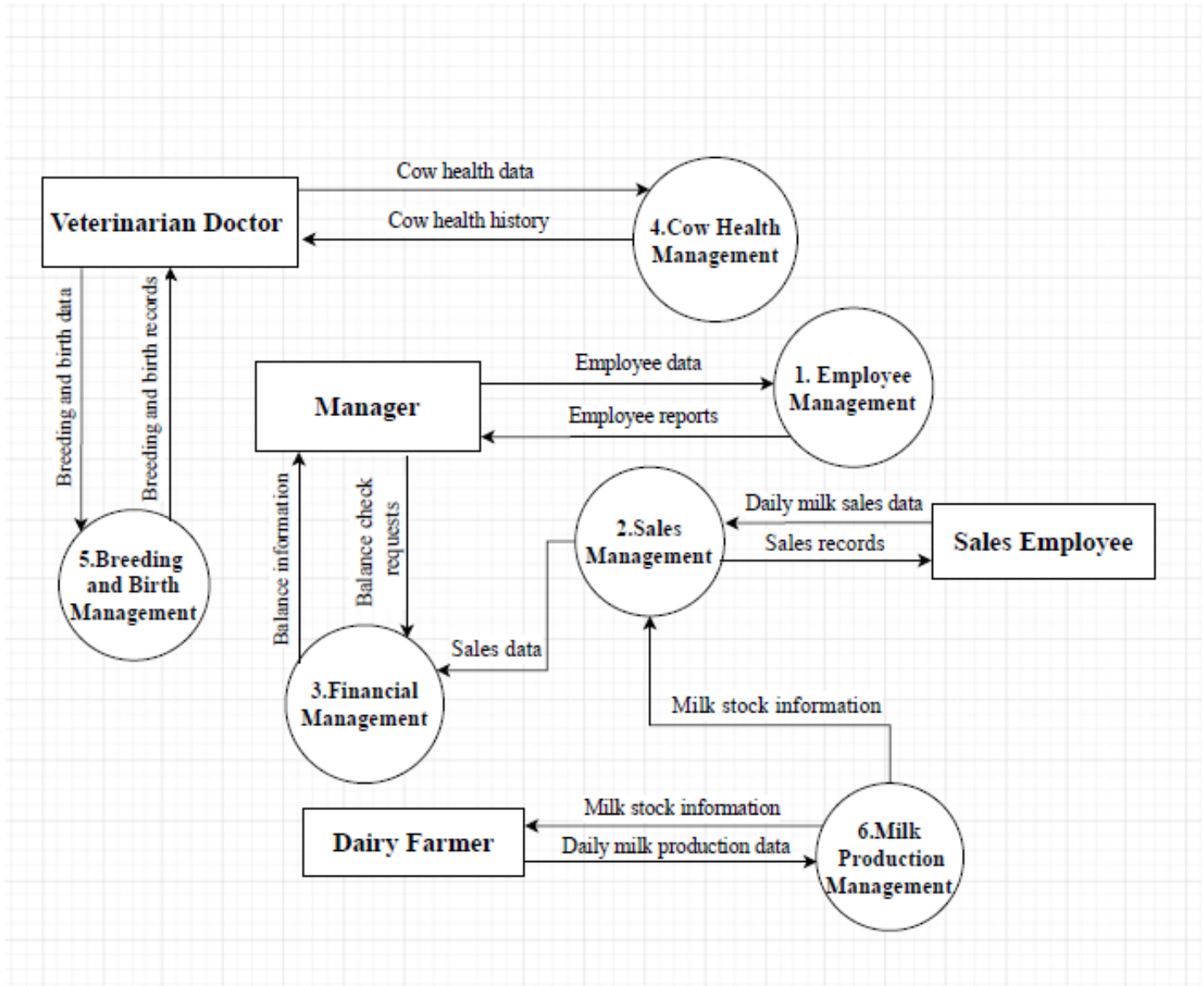
The Dairy Farm Management System aspires to revolutionize dairy farm operations by providing a comprehensive and user-friendly platform. By integrating key modules and functionalities, the system aims to contribute to the success, sustainability, and profitability of dairy farms, promoting a modern and efficient approach to farm management. This System Operational Concept serves as a guiding document for development, implementation, and continuous improvement of the Dairy Farm Management System.

4.7) Context diagram :

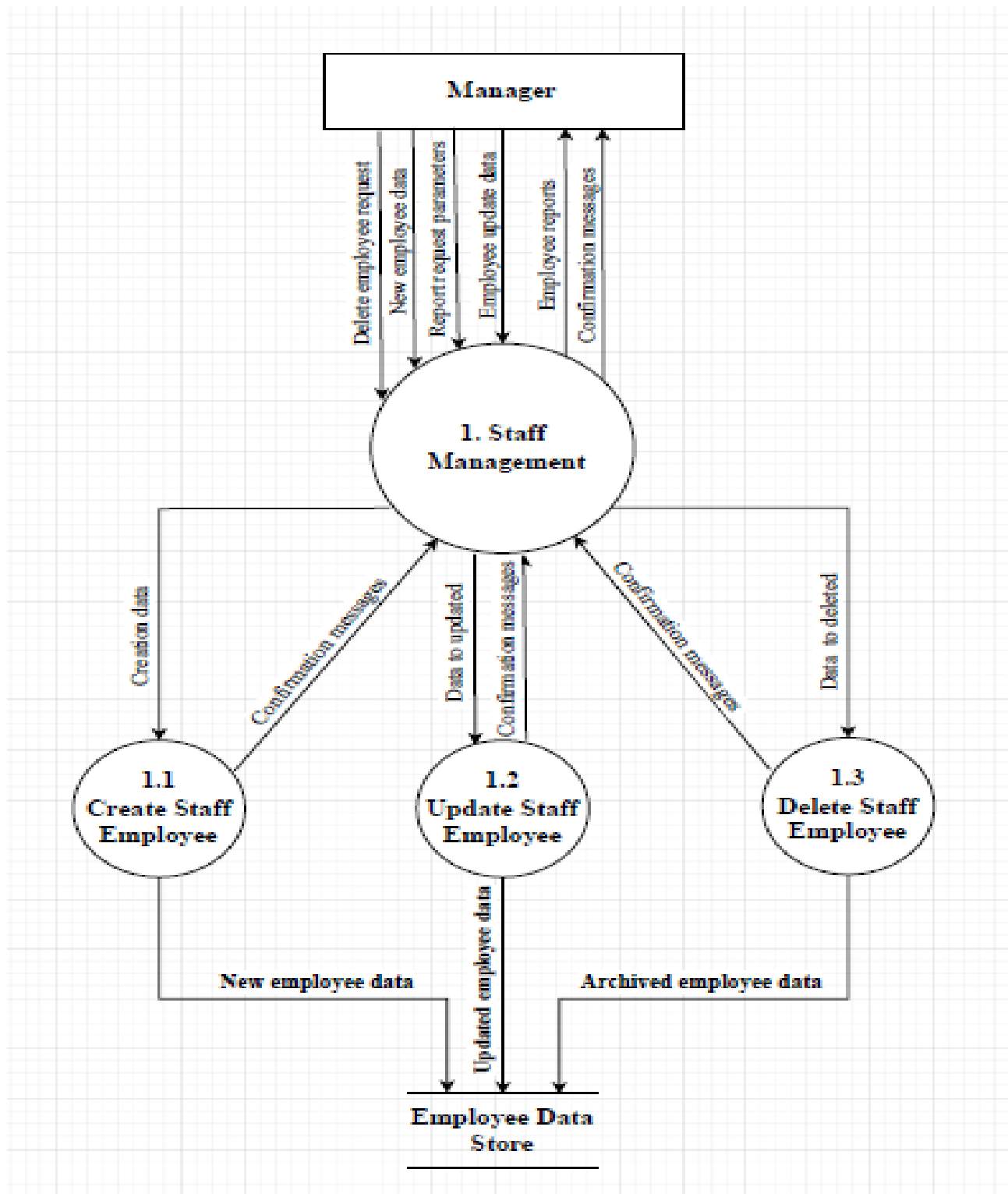


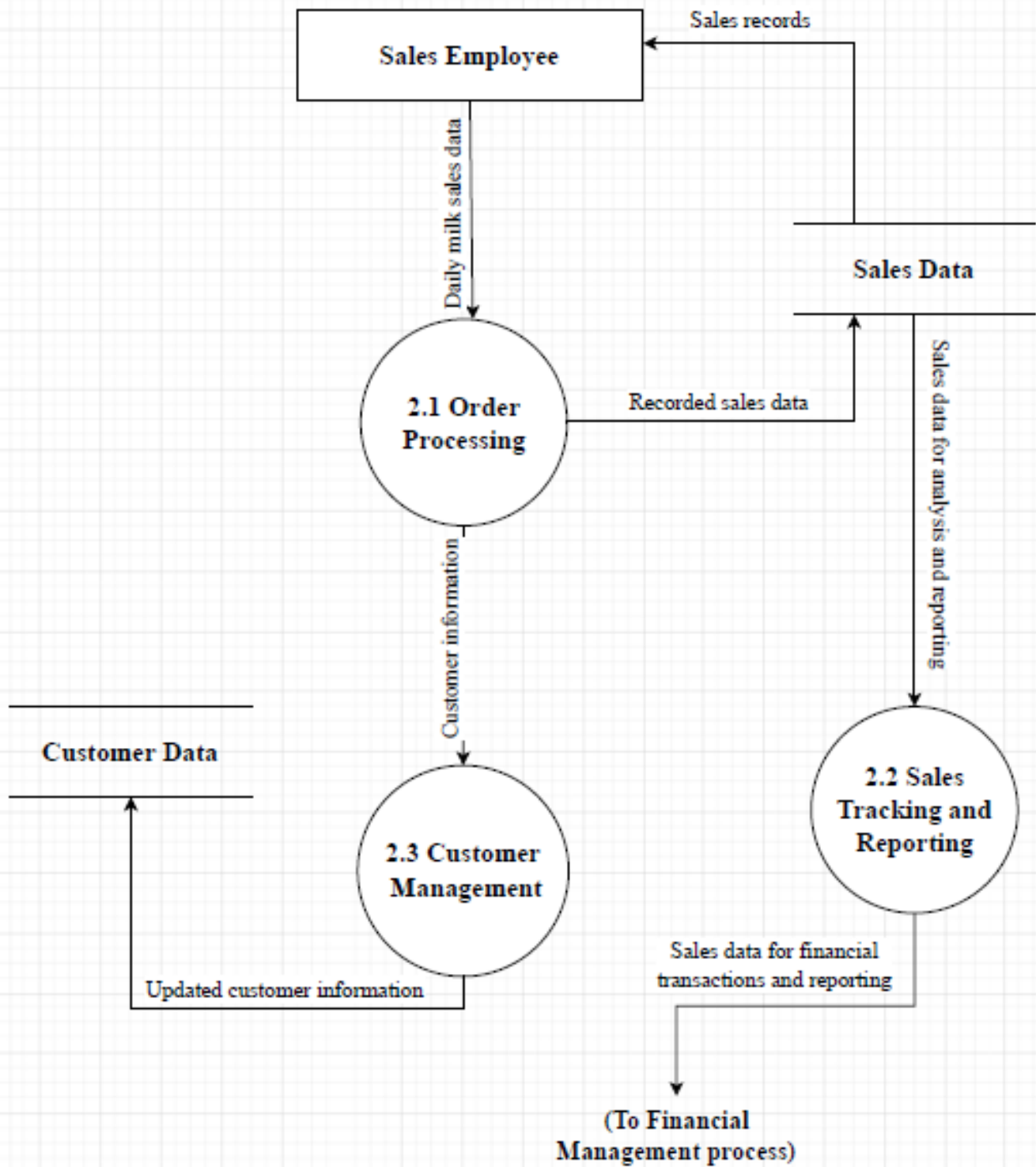
4.8) Data flow diagrams :

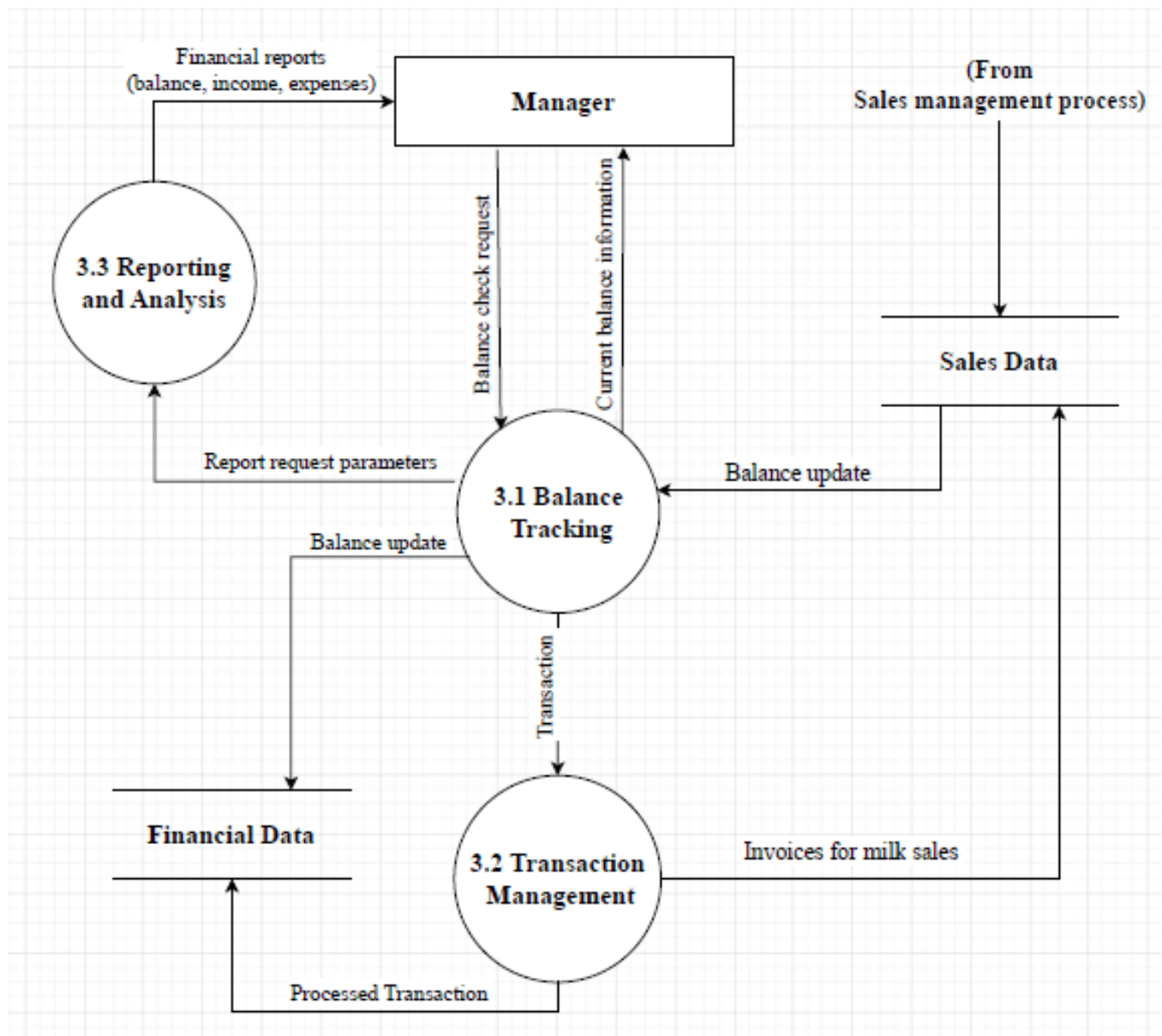
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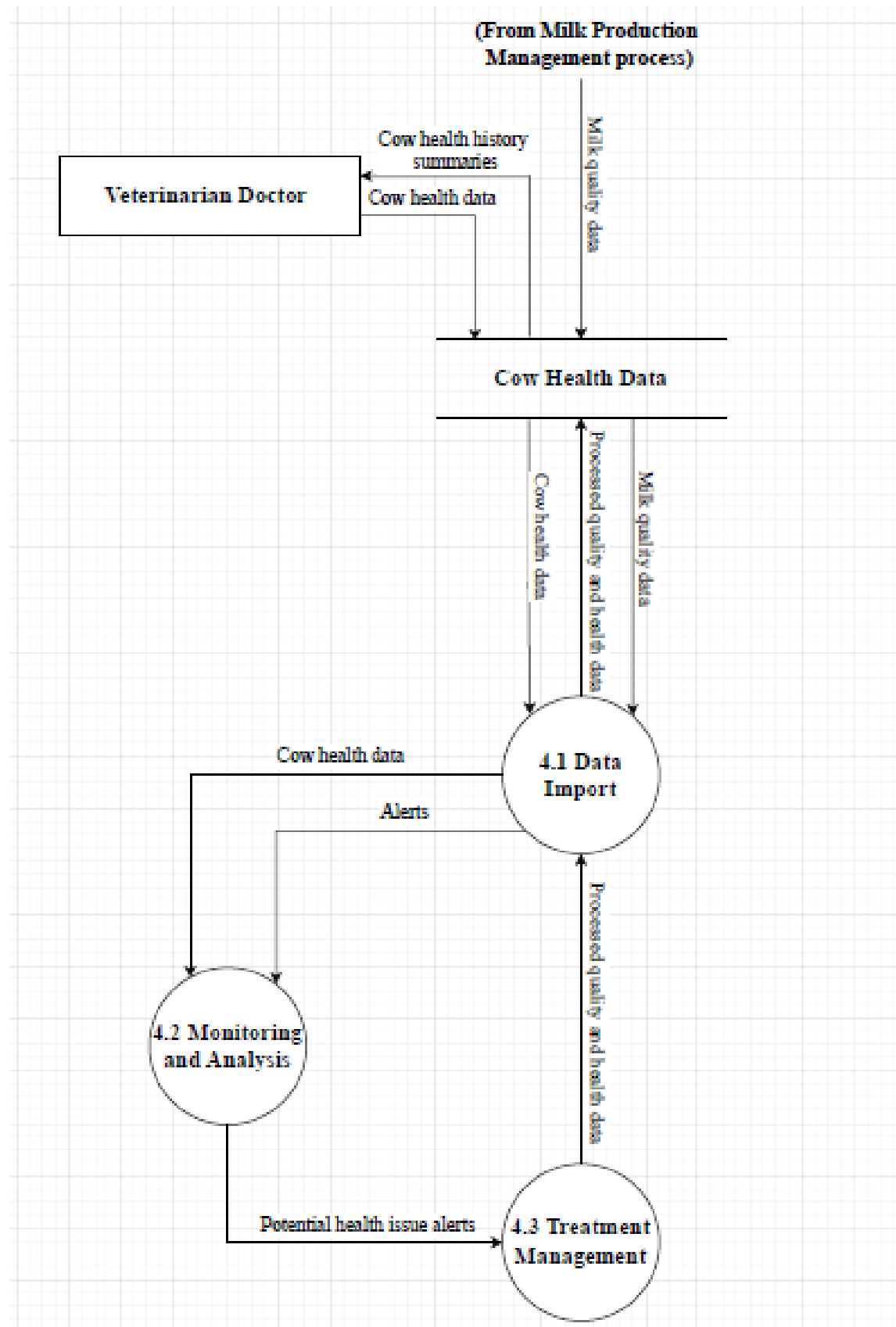


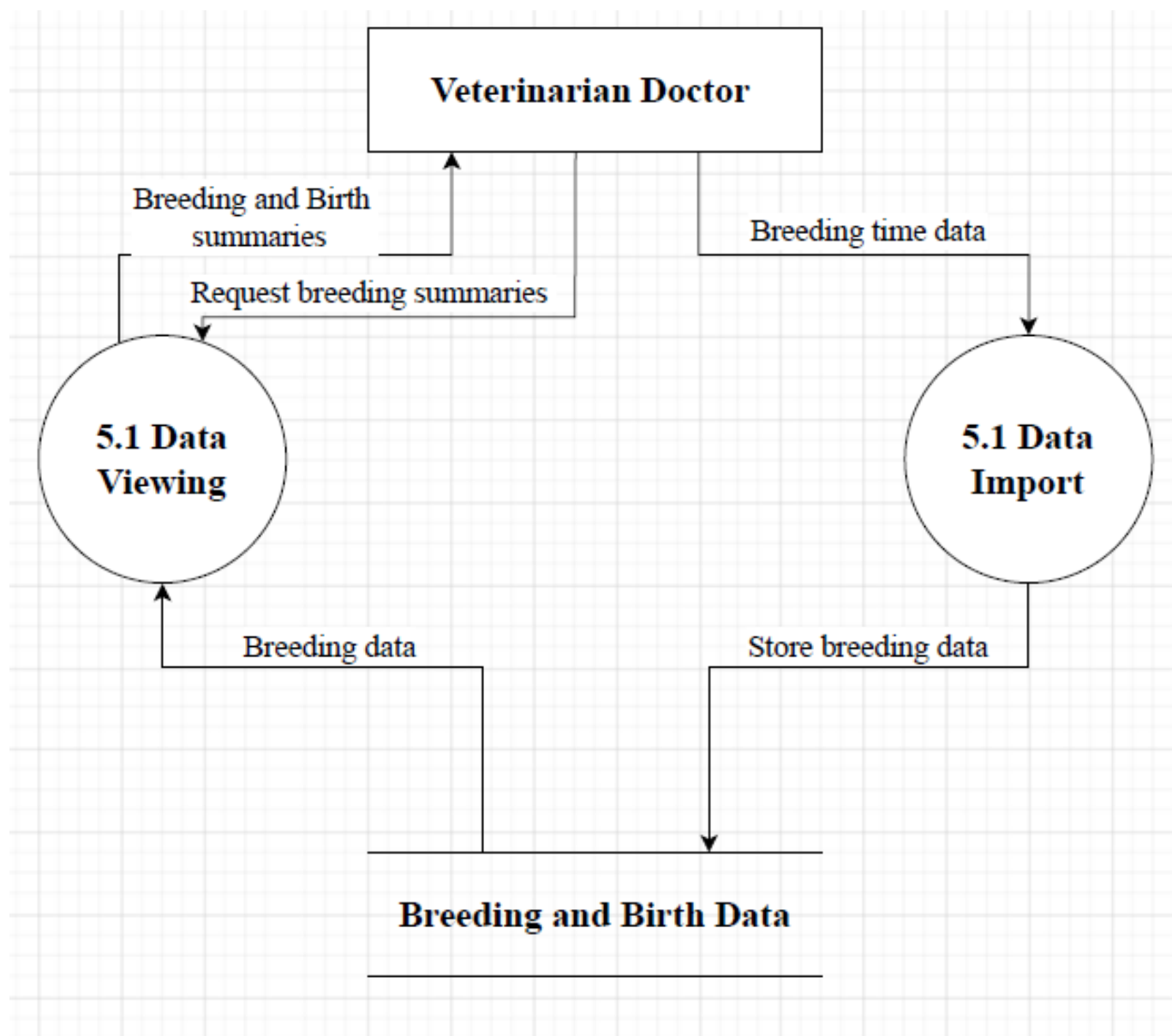
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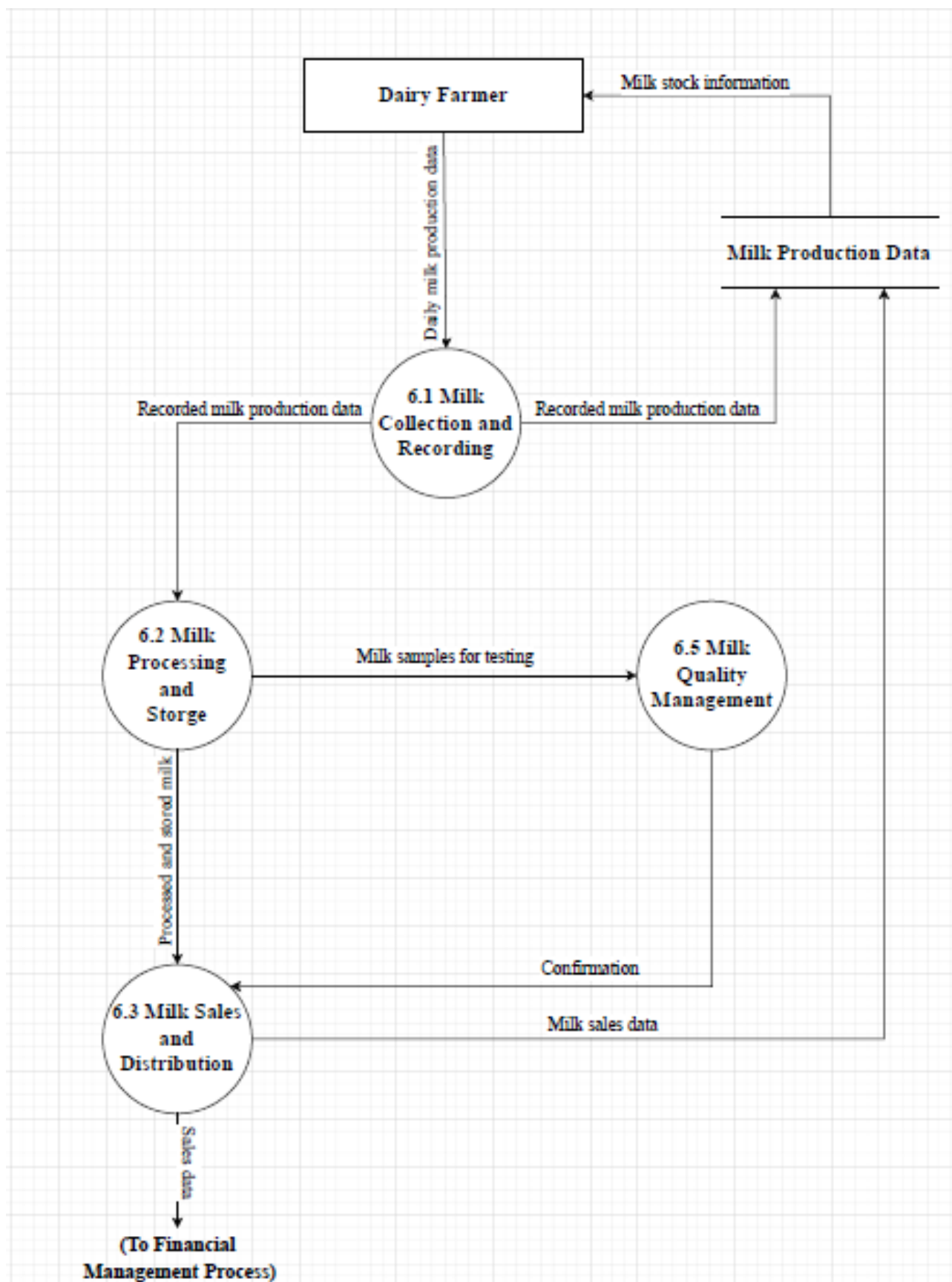












5. System Requirements specification

5.1) System purpose:

The Dairy Farm Management System is designed to facilitate the efficient management and organization of various aspects within a dairy farm setting. This comprehensive system encompasses modules that handle breeding, cow management, employee information, expenditures, health records, income tracking, milk sales, and milk production. The primary purpose of this system is to streamline farm operations, enhance data visibility, and empower farm managers and employees to make informed decisions

5.2) System scope:

The Dairy Farm Management System has a comprehensive scope, covering various facets of dairy farm operations. The system is designed to manage, organize, and optimize processes related to breeding, cow management, employee information, expenditures, health records, income tracking, milk sales, and milk production. Below are the key components within the system scope:

1) Breeding Management:

- Tracking and managing breeding-related information, including heat dates, breeding dates, pregnancy dates, expected calving dates, and other relevant details.
- Recording and maintaining historical data on breeding events for individual cows.

2) Cow Management:

- Centralizing information about each cow, including ear tag details, color, breed, age, weight at birth, and pasture information.
- Associating each cow with a specific breed for efficient categorization.

3) Employee Information:

- Maintaining a centralized database of employee details, including names, dates of birth, gender, contact information, and addresses.

- Providing a platform for easy access to and management of employee records.

4) Expenditure Tracking:

- Capturing and categorizing expenditures related to the dairy farm, such as dates, purposes, amounts, and the corresponding employees responsible for the expenditures.
- Offering insights into the farm's financial transactions and expenditure patterns.

5) Health Monitoring:

- Monitoring and documenting health-related events for each cow, including reproductive events, diagnoses, treatments, costs, and veterinarian details.
- Supporting proactive health management and timely interventions.

6) Income Recording:

- Recording and categorizing sources of income for the dairy farm, including dates, purposes, amounts, and the associated employees responsible for income generation.
- Enabling a clear overview of the farm's financial inflows.

7) Milk Sales Management:

- Managing and tracking milk sales transactions, including sale dates, unit prices, client details, associated employees, quantities sold, and total amounts.
- Facilitating efficient sales tracking and customer management.

8) Milk Production Tracking:

- Recording and monitoring daily milk production for each cow, including morning, noon, and evening quantities, as well as the total milk produced on specific dates.
- Providing insights into milk production trends and facilitating resource allocation.

5.3) System overview:

5.3.1) System context:

The Dairy Farm Management System operates within dairy farm environment, connecting animal health & breeding, milk production & sales, employee tasks & finances. Its purpose is to automate and optimize operations, improve milk quality and output, manage costs and comply with regulations. Primarily used by farm owners and workers, it interacts with vet services, processors and regulators, relying on hardware and software within the farm network, potentially expanding with sensors and internet access for future growth.

5.3.2) System functions:

The Dairy Farm Management System encompasses a range of functions aimed at efficiently managing and optimizing various aspects of dairy farm operations. These functions are designed to provide a comprehensive and user-friendly solution for farmers and farm managers.

1) Livestock Management:

- Create and maintain individual records for each cow, capturing details such as identification, breed, age, and color
- Track breeding cycles, including heat dates, breed dates, and pregnancy information
- Monitor the overall health and well-being of each animal.

2) Milk Production Tracking:

- Record and analyze daily milk production for each cow. Capture morning, noon, and evening milk yields.
- Calculate and display the total milk production for specific dates.

3) Financial Management:

- Track farm expenses, including feed costs, veterinary services, and general operational costs.
- Record income transactions related to milk sales and other revenue sources.

4) Employee Management:

- Maintain records of farm staff, including names, date of birth, gender, and contact information.

5) Health Monitoring:

- Record and track health events for each cow, including reproductive events, diagnoses, and treatments.
- Capture veterinary information including the name of the veterinarian and associated costs.

6) Data Analytics and Reporting:

- Provide insights through data analytics tools for trends in milk production, and revenue.
- Generate reports on financial performance, health status, and breeding patterns.

7) Breeding and Calving Management:

- Manage breeding and calving cycles for the entire herd.
- Monitor the reproductive health of individual cows.

8) Milk Sales and Client Management:

- Record sales transactions for milk products, including sales date, unit price, and client information.
- Manage client details, including names and contact information.

9) User Authentication and Access Control:

- Implement secure user authentication for different roles (admin, employees).
- Control access levels based on roles to ensure data security.

5.3.3) User characteristics :

User characteristics in a dairy Management System can be diverse, with various stakeholders, each serving specific functions, often depending on their roles, locations, and types of devices. Below are some key types of users and their characteristics

1) Admin:

- Role
 - Administrator with overarching control and system management responsibilities.
- Characteristics:
 - Manages user accounts and authentication.
 - Configures system settings and preferences.
 - Monitors system health, security, and backups.
 - Has access to all functionalities and data within the system

2) Employee:

- Role
 - Frontline user responsible for day-to-day farm operations.
- Characteristics:
 - Enters and updates individual cow records, including health events and milk production.
 - Performs tasks assigned by the admin or farm manager, such as feeding, cleaning, and maintenance.
 - Access is limited to functionalities related to daily farm activities.
 - Benefits from an easy-to-use interface for efficient data entry.

5.4. System Functional requirements:

Functional requirements for the Diary Management System outline the specific capabilities and features the system must possess to effectively manage airport operations. These requirements are critical to ensure the system meets its intended objectives. Below are some key functional requirements applicable to the system operation:

1) User Authentication and Authorization:

- The system have a secure user authentication mechanism.
- Admin users are expected to have access to part of system functionalities.
- Employee users have restricted access based on their roles.

2) Livestock Management:

- The system allow the creation and maintenance of individual records for each cow.
- Users are able to input and update information such as identification, breed, age, and color.
- The system should support tracking breeding cycles, including heat dates, breed dates, and pregnancy information.

3) Milk Production Tracking:

- The system should capture and analyze daily milk production for each cow.
- Users are able to record morning, noon, and evening milk yields.
- The system should calculate and display the total milk production for specific dates.

4) Financial Management:

- The system should enable the recording of farm expenses, including feed costs, veterinary services, and operational costs.
- Users are able to record income transactions related to milk sales and other revenue sources.

- Financial reports and analytics should be generated for better financial planning.

5) Employee Management:

- The system should maintain records of farm staff, including names, roles, contact information, and work schedules.

6) Health Monitoring:

- The system should allow the recording and tracking of health events for each cow.
- Users should be able to record reproductive events, diagnoses, treatments, and associated costs.

7) Data Analytics and Reporting:

- Comprehensive reports should be generated on financial performance, milk production.

8) Breeding and Calving Management:

- The system should manage breeding and calving cycles for the entire herd.

9) Milk Sales and Client Management[:

- The system should record sales transactions for milk products, including sales date, unit price, and client information.
- Admin and Employee users should be able to manage client details, including names and contact information.

5.5. System Non-Functional requirements :

Non-functional requirements for the Dairy Management System specify the characteristics and constraints that define how the system operates, rather than what it does. These requirements are crucial for ensuring the system's performance, security, and usability. Here are some non-functional requirements

1) **Performance:**

- The system should respond to user requests within a maximum of 2 seconds.
- It should support a minimum of 100 concurrent users without significant performance degradation.

2) **Scalability:**

- The system should be scalable to accommodate an increase in the number of cows, employees, and data volume.
- It should support future expansion of the farm without a significant impact on performance.

3) **Reliability:**

- The system should have an uptime of at least 99.5%.
- It should provide data backup and recovery mechanisms to ensure data integrity in case of system failures.

4) **Security:**

- User authentication and authorization should follow industry-standard security practices.
- All sensitive data, including financial and health records, should be encrypted during transmission and storage.
- The system should have role-based access control to restrict unauthorized access to sensitive functionalities.

5) **Usability:**

- The user interface should be intuitive and user-friendly, requiring minimal training for users.
- The system should provide clear and informative error messages to assist users in troubleshooting.

6) **Maintainability:**

- The system should be designed with modular and well-documented code for ease of maintenance and future enhancements.
- Updates and patches should be deployable with minimal downtime.

7) **Data Integrity:**

- The system should employ mechanisms to ensure the accuracy and consistency of data.
- Data validation rules should be in place to prevent the entry of invalid or inconsistent information.

8) **Data Privacy:**

- The system should comply with relevant data protection and privacy regulations.
- Personal and sensitive data should be handled with strict confidentiality.

9) **Response Time:**

- The system should maintain a consistent response time, even during peak usage periods.
- Database queries and transactions should be optimized for efficiency.

10) **Auditability:**

- The system should log user activities and system events for auditing purposes.
- Logs should be accessible to authorized administrators.

6. Data Dictionary

- Breed Table

Field Name	Data Type	Field Length	Constraint	Description
BrlId	INT	---	Primary Key	Breed Id, Auto generated.
HeatDate	DATE	---	Not Null	Date when the cow is in heat.
BreedDate	DATE	---	Not Null	Date of breeding.
PregDate	DATE	---	Not Null	Date of pregnancy.
DateCalved	DATE	---	Not Null	Actual calving date.
Remarks	VARCHAR	100	Not Null	Additional comments or remarks.
CowId	INT	---	Foreign Key	Cow Id, Auto generated.
VetId	INT	---	Foreign Key	Staff Id, Auto generated.

- Cow Table

Field Name	Data Type	Field Length	Constraint	Description
CowId	INT	---	Primary Key	Cow Id, Auto generated.
CowName	VARCHAR	50	Not Null	Name of the cow.
EarTag	VARCHAR	50	Not Null	Ear tag identifier.
Color	VARCHAR	50	Not Null	Color of the cow.
Breed	INT	---	Not Null	Breed of the cow .
WeightAtBirth	INT	---	Not Null	Weight of the cow at birth.
DateOfBirth	DATE	---	Not Null	Date of birth of the cow.

- Staff table

Field Name	Data Type	Field Length	Constraint	Description
StaffId	INT	---	Primary Key	Staff Id, Auto generated.
StaffName	VARCHAR	50	Not Null	Name of the staff member.
DateOfBirth	DATE	---	Not Null	Date of birth of the staff member.
Gender	VARCHAR	50	Not Null	Gender of the staff member.
StaffType	VARCHAR	50	Not Null	Role of the staff member.

- **STF_Cow**

Field Name	Data Type	Field Length	Constraint	Description
StaffId	INT	---	Primary Key	Staff Id, Auto generated.
CowId	INT	---	Primary Key	Cow Id, Auto generated.

- **STF_Address**

Field Name	Data Type	Field Length	Constraint	Description
StaffId	INT	---	Primary Key	Staff Id, Auto generated.
Address	VARCHAR	50	Primary Key	Address of the staff member.

- **STF_PhoneNo**

Field Name	Data Type	Field Length	Constraint	Description
StaffId	INT	---	Primary Key	Staff Id, Auto generated.
Phone	VARCHAR	50	Primary Key	Phone number of the staff member.

- **Expenditure Table**

Field Name	Data Type	Field Length	Constraint	Description
ExpId	INT	---	Primary Key	Expenditure Id, Auto generated.
ExpDate	DATE	---	Not Null	Date of the expenditure.
ExpPurpose	VARCHAR	50	Not Null	Purpose or description of the expenditure.
ExpAmount	INT	---	Not Null	Amount spent.
SalesManId	INT	---	Foreign Key	Staff Id, Auto generated.

- **Examination Record Table**

Field Name	Data Type	Field Length	Constraint	Description
RebId	INT	---	Primary Key	Report Id, Auto Generated.
CowId	INT	---	Foreign Key	Cow Id, Auto generated.
VetId	INT	---	Foreign Key	Staff Id, Auto generated.
RepDate	DATE	---	Not Null	Date of the health report.
Event	VARCHAR	50	Not Null	Health event.
Diagnosis	VARCHAR	50	Not Null	Diagnosis of the health condition.
Treatment	VARCHAR	50	Not Null	Treatment administered.
Cost	INT	---	Not Null	Cost of the health event.
Expld	INT	---	Foreign Key	Expenditure Id, Auto generated.

- **Income Table**

Field Name	Data Type	Field Length	Constraint	Description
IncId	INT	---	Primary Key	Income Id, Auto Generated.
IncDate	DATE	---	Not Null	Date of the income.
IncPurpose	VARCHAR	50	Not Null	Purpose or description of the income.
IncAmt	INT	---	Not Null	Amount of income.
SalesId	INT	---	Foreign Key	Sales Id, Auto generated

- **Sales table**

Field Name	Data Type	Field Length	Constraint	Description
Sid	INT	---	Primary Key	Sale Id, Auto Generated.
Incomeld	INT	---	Foreign Key	Income Id, Auto Generated.
ClientId	INT	---	Foreign Key	Client Id, Auto Generated
SalesManId	INT	---	Foreign Key	Staff Id, Auto generated
Date	DATE	---	Not Null	Date of the milk sale.
Uprice	INT	---	Not Null	Unit price of milk.
Quantity	INT	---	Not Null	Quantity of milk sold.

- **Milk Table**

Field Name	Data Type	Field Length	Constraint	Description
MId	INT	---	Primary Key	Milk Id, Auto Generated.
CowId	INT	---	Foreign Key	Cow Id, Auto generated.
FarmerId	INT	---	Foreign Key	Staff Id, Auto generated.
AmMilk	INT	---	Not Null	Morning milk production.
NoonMilk	INT	---	Not Null	Noon milk production.
PmMilk	INT	---	Not Null	Evening milk production.
DateProd	DATE	---	Not Null	Date of milk production.

- **Client Table**

Field Name	Data Type	Field Length	Constraint	Description
ClientId	INT	---	Primary Key	Client Id, Auto Generated.
SalesManId	INT	---	Foreign Key	Staff Id, Auto generated.
ClientName	VARCHAR	50	Not Null	Name of the client.

- **CLNT_PhoneNo**

Field Name	Data Type	Field Length	Constraint	Description
ClientId	INT	---	Primary Key	Client Id, Auto Generated.
ClientPhone	VARCHAR	50	Primary Key	Phone number of the client.

- **CLNT_Address**

Field Name	Data Type	Field Length	Constraint	Description
ClientId	INT	---	Primary Key	Client Id, Auto Generated.
ClientAddress	VARCHAR	50	Primary Key	Address of the client.

- **CLNT_MGR**

Field Name	Data Type	Field Length	Constraint	Description
ClientId	INT	---	Primary Key	Client Id, Auto Generated.
ManagerId	INT	---	Foreign Key	Manager Id, Auto Generated.

- **Manager Table**

Field Name	Data Type	Field Length	Constraint	Description
ManagerId	INT	---	Primary Key	Manager Id, Auto Generated.
ManagerName	VARCHAR	50	Not Null	Name of the Manager.
Gender	VARCHAR	50	Not Null	Manager Gender.

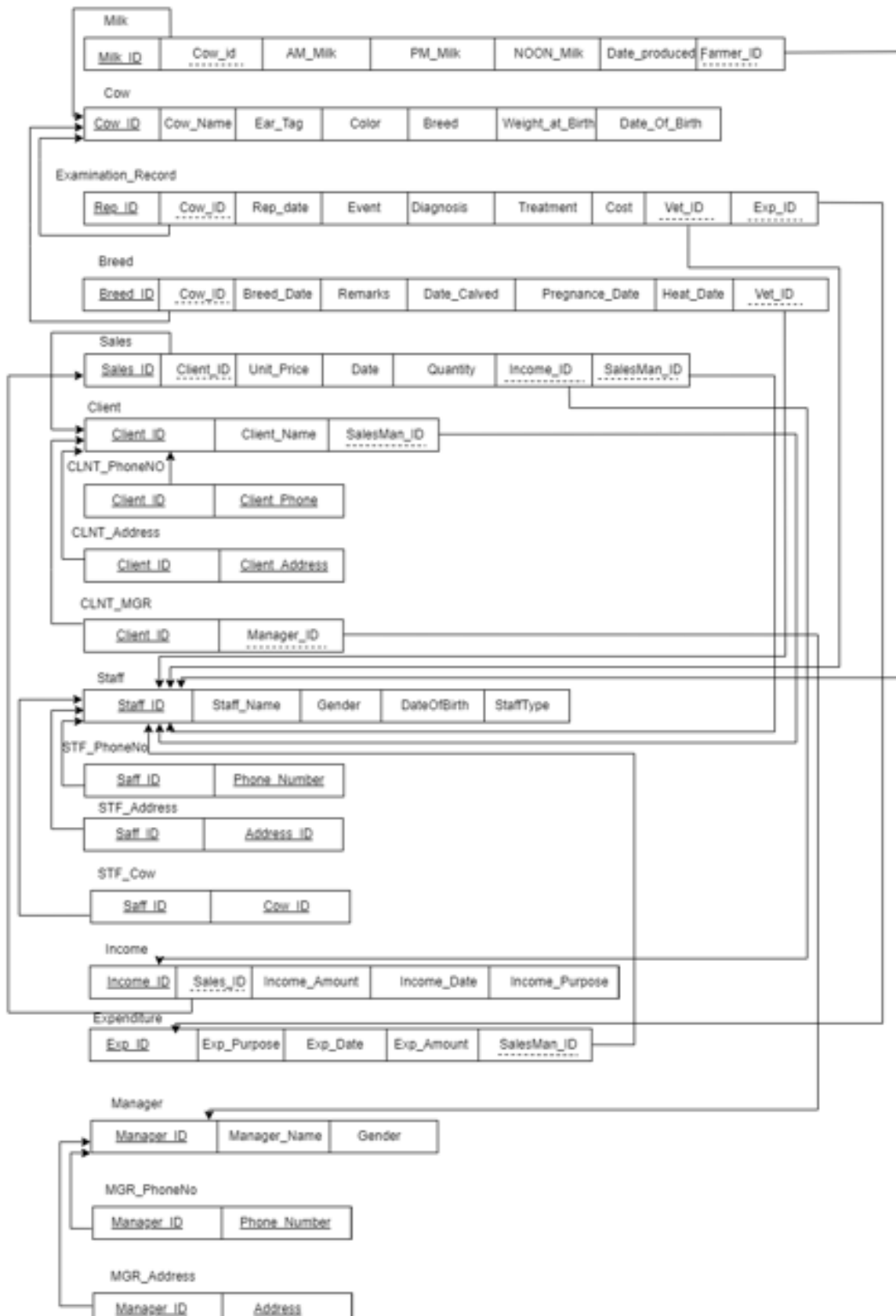
- **MGR_PhoneNo**

Field Name	Data Type	Field Length	Constraint	Description
ManagerId	INT	---	Primary Key	Client Id, Auto Generated.
PhoneNumber	VARCHAR	50	Primary Key	Manager Phone Number.

- **MGR_Address**

Field Name	Data Type	Field Length	Constraint	Description
ManagerId	INT	---	Primary Key	Client Id, Auto Generated.
Address	VARCHAR	50	Primary Key	Manager Address.

7. Mapping



8. Schema

