ELGON AGRO POULTRY FARM MANAGEMENT SYSTEM

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S21/MUC/BSIT/008

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE AWARD OF A DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY OF UGANDA CHRISTIAN UNIVERSITY

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UGANDA CHRISTIAN UNIVERSITY

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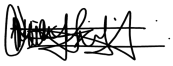
Declaration

I NABENDE ENOS WILLIAM of S21/MUC/BSIT/008, sincerely declare to the best of my knowledge that I am the sole writer of this report and no one has ever submitted this work in Uganda Christian University or any other learning institution

Sign: 

Date: 15th, August,2024

Approval

I hereby certify that this research, conducted by Nabende Enos William (S21/Muc/Bsit/008), is an original work that has been thoroughly developed and reviewed under my supervision. It is now ready for submission to the Department of Computing, Technology, Engineering and Design for further consideration and academic evaluation.

Signature:……  …… Date: …01/10/2024.....

DR. EILU EMMANUEL

(SUPERVISOR)

Acknowledgement

I would like to express my gratitude to Uganda Christian University for giving me this opportunity to this information technology knowledge training, and skills as a fulfillment of the requirement for the degree of Bachelor of Science in Information Technology.

Throughout this education journey, I am very honored and lucky width the encouragement and guidance from my Head of department Mr. Mutemere Joseph, all my lecturers who have been with me from the very start plus the non-teaching staff.

I thank the staff of J-Hub for being supportive and sparing the time to share their knowledge in various fields.

In addition, I offer sincere thanks to my fellow students for making learning an interesting teamwork adventure.

Abstract

As a requirement for a student to acquire a Bachelor’s degree in information technology, he/she has to undergo graduating in order to gain experience necessary in the field and for the job market. This is at least done from a known organization which deals with some coming beyond mere theoretical work and to satisfy this requirement, I trained with Uganda Christian university.

his project report presents the design and development of a poultry management system for efficient stock, sales, and expense management. The system aims to address the challenges faced by poultry farms in Uganda, including inefficient stock management, inadequate sales management, poor expense management, limited data analysis, and regulatory compliance issues.

The project was carried out at Uganda Christian University as a requirement for the completion of a Bachelor's degree in Information Technology. The system was designed and developed using a combination of technologies, including e.g. PHP, MySQL, and HTML.

The system features a comprehensive stock management module, a sales management module, an expense management module, and a data analytics module. The system also ensures regulatory compliance with relevant laws and regulations in Uganda.

During the project, I acquired various skills, including software development, data analysis, and problem-solving. I also developed soft skills, such as teamwork, communication, and time management.

The system was tested and evaluated, and the results show that it can improve the efficiency and productivity of poultry farms in Uganda. The system can be used by poultry farmers, farm managers, and other stakeholders in the poultry industry.

This project contributes to the body of knowledge in the field of information technology and poultry management, and it has the potential to make a positive impact on the poultry industry in Uganda.

Contents

Chapter One

Introduction

Chapter One of this project presents the background information to the study, highlighting the problem statement, objectives, scope, and significance of the study.

Background to the Study

The poultry industry is a significant contributor to the global food supply, with millions of people relying on poultry products as a source of protein. However, poultry farms face numerous challenges in managing their daily operations, which can lead to inefficiencies, reduced productivity, and increased costs. Some of the key challenges faced by poultry farms include Inefficient Stock Management: Poultry farms struggle to maintain accurate records of their stock, including the number of birds, breed, age, and health status. This can lead to difficulties in tracking bird movement, identifying health issues, and making informed decisions about breeding and culling, Inadequate Sales Management: Poultry farms often lack a systematic approach to managing sales, leading to difficulties in tracking orders, managing customer relationships, and optimizing pricing strategies, Poor Expense Management: Poultry farms face challenges in managing their expenses, including feed, labor, and equipment costs. This can lead to difficulties in controlling costs, identifying areas for cost reduction, and making informed decisions about investments, Limited Data Analysis: Poultry farms often lack access to real-time data and analytics, making it difficult to identify trends, optimize operations, and make data-driven decisions, Regulatory Compliance: Poultry farms must comply with a range of regulations, including those related to animal welfare, environmental sustainability, and food safety. Failure to comply with these regulations can result in fines, reputational damage, and even business closure. In light of these challenges, there is a growing need for a poultry management system that can streamline stock, sales, and expense management, while also providing real-time data and analytics to support informed decision-making. Such a system would enable poultry farms to improve Stock Management: Accurately track bird movement, health, and breeding, enabling data-driven decisions about breeding, culling, and health interventions enhance Sales Management: Streamline order management, customer relationships, and pricing strategies, leading to increased sales and revenue, optimize Expense Management: Control costs, identify areas for cost reduction, and make informed decisions about investments, leading to improved profitability, support Regulatory Compliance: Ensure compliance with regulatory requirements, reducing the risk of fines, reputational damage, and business closure, improve Data Analysis: Provide real-time data and analytics, enabling poultry farms to identify trends, optimize operations, and make data-driven decisions, by implementing a poultry management system that addresses these

challenges, poultry farms can improve their overall performance, increase efficiency, and reduce costs. This, in turn, can lead to increased productivity, profitability, and competitiveness in the market, the proposed system will provide a comprehensive solution for poultry farms, enabling them to manage their stock, sales, and expenses in a more efficient and effective manner. The system will include features such as: Stock Management Module: A comprehensive module for tracking bird movement, health, and breeding. Sales Management Module: A module for managing orders, customer relationships, and pricing strategies. Expense Management Module: A module for controlling costs, identifying areas for cost reduction, and making informed decisions about investments. Data Analytics Module: A module for providing real-time data and analytics to support informed decision-making. Regulatory Compliance Module: A module for ensuring compliance with regulatory requirements. By implementing this system, poultry farms can overcome the challenges they face and achieve improved performance, increased efficiency, and reduced costs.

1.2 Problem Statement

Elgon Agro Poultry Farm faces significant challenges in managing its daily operations, including inefficient stock management, inadequate sales management, poor expense management, limited data analysis, and regulatory compliance issues. These challenges lead to reduced productivity, increased costs, and decreased profitability, ultimately affecting the overall performance and sustainability of the farm. Therefore, there is a need for a comprehensive poultry management system that can streamline stock, sales, and expense management, provide real-time data and analytics, and ensure regulatory compliance, in order to improve the efficiency, productivity, and profitability of poultry farms."

1.3 Main Objective

The general objective is to design and develop a poultry management system that can efficiently track and monitor sales, stock, and expense management plus customer feedback

1.3.1 Specific Objectives

i. To study the current practices and challenges faced by poultry farms in managing their daily operations.

ii. To design a poultry management system that can track efficiently track sales, stock, and expense management plus customer feedback

iii. To develop the designed poultry management system using various programming languages like PHP, MySQL, and JavaScript among others using Visual Studio code and xamp platforms.

iv. To test and validate the poultry management system to ensure it meets the user requirements and improves farm productivity.

1.4 Scope

The poultry management system designed and developed will be used by poultry farms to manage their daily operations, efficiently track and monitor sales, stock, and expense management plus customer feedback. The system can be used by farms of various sizes and can be customized to meet specific farm needs.

1.5 Significance

The poultry management system offers the following advantages:

i. It enables farmers to track and manage that can efficiently track and monitor sales, stock, and expense management plus customer feedback, reducing manual errors and improving productivity.

ii. The system provides real-time data and analytics, enabling farmers to make informed decisions and improve farm performance.

iii. The system automates routine tasks, reducing labor costs and improving farm efficiency.

iv. The system generates reports and alerts, enabling farmers to identify potential issues and take corrective action promptly.

Chapter Two

Literature Review

2.0 Introduction

Chapter One presented the background information to the study highlighting the objectives, scope, and significance of the study. This chapter is about the literature review of poultry management systems. It specifies what a poultry management system is, what it needs, and how it works for its enhancement.

2.1 Poultry Management System

According to Smith (2005), a Poultry Management System is an Information system that tracks poultry events and summarizes information, supports adequate management reporting, policy decisions, fiduciary responsibilities, and preparation of auditable reports.

2.2 Types of Management Information Systems

2.2.1 Poultry Farm Management Information Systems (PFMIS)

According to Johnson (2003), it is an Information system that tracks poultry events and summarizes information. The PFMIS supports adequate management reporting, policy decisions, fiduciary responsibilities, and preparation of auditable reports. The Poultry Farm Management Information System provides poultry information to all poultry managers within an organization including the farm manager. The farm manager analyzes historical and current poultry activity, projects future poultry needs, and monitors and controls the use of resources over time using the information developed by the MIS department.

2.2.2 Breeding and Hatching Management Information Systems

According to Brown (1925), a breeding and hatching management system collects poultry data from breeding and hatching operations such as egg production data, and then converts the information to analysis reports.

2.2.3 Feed Management Systems

According to Davis (2008), a feed management system performs mathematical operations (manipulations) on input data to transform it into the output instance (audio/video/graphic/numeric, or text) form as desired by a system user. Basically, data is unorganized facts that can be converted into useful information. This process of converting facts to information is processing. Practically all naturally occurring processes can be viewed as examples of data processing systems.

2.3 Poultry Health Management

According to Hall (2000), poultry health management is a systematic way of recording, reporting, and analysis of poultry health transactions of a poultry farm in an organization. The purpose is to provide the information that is needed for sound economic decision-making.

Poultry health management allows the farm to analyze the poultry health performance of the farm, and look at statistics such as mortality rates.

2.4 Poultry Farm Accounting Systems

According to Lee (2003), are organized set of manual and computerized accounting methods, procedures, and controls is established to gather, record, classify, analyze, summarize, interpret, and present accurate and timely financial data for management decisions.

2.4.1 Internal Poultry Farm Accounting Systems

According to Martin (2000), internal poultry farm accounting is intended for managers within a poultry farm, to provide them with an economic basis to make informed business decisions that would allow them to be better equipped in their management and control functions.

2.4.2 External Poultry Farm Accounting System

According to Martin (2000), external poultry farm accounting concerns with the preparation of financial statements for decision-makers, such as the owners, suppliers, banks, government, and agencies, customers, and other stakeholders outside the enterprise. External poultry farm accounting makes use of the accounting information from the internal poultry farm accounting system.

2.5 Poultry Production Management Systems

According to Morris (2002), there are systems that collect poultry data from poultry operations such as egg production data, and then convert the information into analysis reports.

The poultry production management system takes existing operational data and creates informative reports such as egg production analysis that is product and time-specific, analysis of the cost of feed and labor, and comparisons of budgeted expenses. For example, a cost-accounting system can provide the direct and indirect cost of producing eggs, allowing the farm to determine a price for them that is profitable.

The poultry production management system helps in budgeting by classifying and calculating costs and estimating costs and revenues for the future. Poultry production management systems find ways to manage farm resources. It makes it possible for the management to understand the needs of a poultry farm and those different departments' objectives. In general, it helps in managing the internal operations of a poultry farm.

2.6 Related Systems

2.6.2 Broiler Management Information System (BMIS)

According to Bartel (1996), a Broiler Management Information System is an information system that tracks broiler events and summarizes broiler information. In its basic form, a BMIS is little more than a poultry management system configured to operate.

According to Lee (2013), Broiler Farm Management Information System is an information system that tracks broiler farm events and summarizes broiler farm information. It provides a comprehensive 'at a glance' picture of a broiler farm's operations and resources to help broiler farm managers ensure their farm's funding and resources are put to the best possible use.

Buyinzika utilizes the Broiler Management Information System (BMIS) to manage their broiler farm operations. This system enables them to monitor and control their broiler farm performance, detect potential fraud, and access financial and operational performance data. (Kagona, 2021)

Broiler management information system modules include;

- Augmented Reality (AR), Used in processing plants to guide trimmers in cutting chicken carcasses and removing defective parts of the meat.
- Terahertz Spectroscopy, used to identify male eggs immediately after laying, allowing for significant cost savings within the broiler industry.
- 3D Printing, used to print prosthetics and parts on-site, reducing costs and increasing efficiency.
- IoT and Wearable Sensors, used to monitor bird health and well-being, providing insights into natural behaviors and inefficiencies in diet.
- RFID Tags are used to track and monitor individual birds, providing data on their health, growth, and behavior.
- LED Lighting Systems are used to create a consistent lighting environment that stimulates better growth efficiencies in birds and reduces costs.
- Data Analytics and Machine Learning are used to analyze data from various sources, providing insights into bird health, growth, and behavior, and predicting disease outbreaks.
- Cloud Computing and APIs, used to store and process large amounts of data, and integrate with third-party services and systems.

How BFMIS works

BFMIS stores, organizes and makes access to broiler farm information easy. It not only stores all the broiler farm information relating to current and past years' production, but also stores the approved budgets for these years, details on feed and vaccine usage, as well as

complete inventories of broiler farm assets (e.g., equipment, land, and buildings) and liabilities (debt).

Strengths of BFMIS

- Increased ability to undertake central control and monitoring of broiler farm operations.
- It allows for increased access to information on broiler farm performance.
- Internal control to prevent and detect potential and actual fraud.
- It allows access to information on the broiler farm's financial and operational performance.

Weaknesses of BFMIS

- Inadequate planning.
- Poor communications between implementers, donors, and farm managers.
- Shortage of management capacity and resources.
- Changes in system design documents without full agreement.

In conclusion, the BFMIS stores, organizes, and makes access to broiler farm information easy to access thus enhancing management on the farm.

2.6.3 Layer Management Information System (LMIS)

According to Tooley and Guthrie (2003), a Layer Management Information System is an integrated double-entry accounting system that enables poultry farms to manage all their key poultry farm management processes. It provides a comprehensive 'at a glance' picture of a poultry farm's poultry farm management and resources to help poultry farm managers ensure their poultry farm's funding and resources are put to the best possible use.

According to Hall (2012), a Layer Farm Management Information System is an information system that tracks layer farm events and summarizes layer farm information. It provides a comprehensive 'at a glance' picture of a layer farm's operations and resources to help layer farm managers ensure their farm's funding and resources are put to the best possible use.

Farm Up uses a customized version of the Layer Management Information System (LMIS). This system helps them to manage their layer farm operations efficiently, track bird health and production performance, and make data-driven decisions to improve their overall operation.

Here are the technologies used in a Layer Management Information System (LMIS).

- Cloud Computing: Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), or IBM Cloud to store and process large amounts of data.
- Database Management Systems: MySQL, PostgreSQL, Microsoft SQL Server, or MongoDB to store and manage data.

- Web Development Frameworks: HTML5, CSS3, JavaScript, React, Angular, or Vue.js to build the web-based platform.
- Mobile App Development: Native iOS and Android apps or cross-platform frameworks like React Native, Flutter, or Xamarin to build mobile apps.
- Internet of Things (IoT): Sensors, RFID tags, and automated feeding systems to collect data from the farm.
- Data Analytics: Tableau, Power BI, D3.js, or Apache Spark to analyze data and provide insights.
- Machine Learning: TensorFlow, PyTorch, or Scikit-learn to predict layer behavior, detect anomalies, and provide recommendations.
- APIs and Integrations: RESTful APIs, GraphQL, or SOAP to integrate with third-party services like weather APIs, veterinary software, and supply chain management systems.
- Security and Authentication: Encryption, firewalls, access controls, and authentication protocols like OAuth or JWT to ensure data security and integrity.
- Networking and Communication: Wi-Fi, cellular connectivity, or satellite communication to enable real-time data transmission and remote access.
- GPS and GIS: Global Positioning System (GPS) and Geographic Information System (GIS) to track farm locations and monitor bird movement.
- Automation and Control Systems: Automated feeding systems, climate control systems, and egg collection systems to automate farm operations.
- Reporting and Visualization Tools: Reporting tools like JasperReports, Pentaho, or Crystal Reports generate reports and dashboards.
- Business Intelligence Tools: Business intelligence tools like OLAP, data mining, or predictive analytics to analyze data and provide insights.
- Artificial Intelligence: Artificial intelligence (AI) and natural language processing (NLP) to provide chatbots, voice assistants, or predictive maintenance.
- These technologies work together to provide a comprehensive Layer Management Information System that helps farmers to optimize their operations, reduce costs, and improve productivity.

How LFMIS works

LFMIS stores organizes, and makes access to layer farm information easy. It not only stores all the layer farm information relating to current and past years' production, but also stores the approved budgets for these years, details on feed and vaccine usage, as well as complete inventories of layer farm assets (e.g., equipment, land, and buildings) and liabilities (debt).

Modules of the Broiler Management Information System (BMIS)

- Flock Management Module: This module manages flock details, including flock ID, bird type, age, and population.
- Bird Placement Module: This module records bird placement data, including bird arrival, bird weight, and bird distribution.

- Feeding Module: This module manages feeding data, including feed type, feed quantity, and feeding schedules.
- Growth Monitoring Module: This module tracks bird growth, including weight gain, feed conversion ratios, and mortality rates.
- Mortality Module: This module records mortality data, including cause of death, mortality rates, and post-mortem analysis.
- Vaccination Module: This module manages vaccination schedules, including vaccine type, dosage, and administration dates.
- Medication Module: This module manages medication administration, including medication type, dosage, and administration dates.
- Weight and Grade Module: This module records bird weight and grade data, including average weight, weight range, and grade distribution.
- Culling Module: This module manages culling data, including culling reasons, culling rates, and culling schedules.
- Inventory Management Module: This module manages inventory levels of feed, medicines, vaccines, and other supplies.
- Financial Management Module: This module manages financial transactions, including sales, purchases, and expenses.
- Reporting and Analytics Module: This module provides insights and analytics on farm performance, including key performance indicators (KPIs) such as mortality rates, feed conversion ratios, and bird growth rates.
- Alert and Notification Module: This module sends alerts and notifications to farmers and farm managers when certain conditions are met, such as low feed inventory or high mortality rates.
- Farm Operations Module: This module manages farm operations, including farm schedules, task assignments, and equipment maintenance.
- Employee Management Module: This module manages employee records, including training, attendance, and task assignments.
- Supply Chain Management Module: This module manages the supply chain, including procurement, logistics, and distribution of goods and services.
- Quality Control Module: This module ensures quality standards are met, including bird health, feed quality, and product quality.
- Compliance Module: This module ensures compliance with regulatory requirements, including animal welfare, environmental, and food safety regulations.
- Data Import/Export Module: This module allows for data import and export, including integration with other systems and devices.
- Security Module: This module manages system security, including user access, authentication, and authorization.
- These modules work together to provide a comprehensive Broiler Management Information System that helps farmers and integrators to optimize their operations, reduce costs, and improve productivity.

Strengths of LFMIS

- Increased ability to undertake central control and monitoring of layer farm operations.
- It allows for increased access to information on layer farm performance.
- Internal control to prevent and detect potential and actual fraud.
- It allows access to information on the layer farm's financial and operational performance.

Weaknesses of LFMIS

- Inadequate planning.
- Poor communications between implementers, donors, and farm managers.
- Shortage of management capacity and resources.
- Changes in system design documents without full agreement.

In conclusion, the system enables poultry farms to manage all their key poultry farm management processes concerning the chickens and their eggs.

2.6.4 Poultry Feed Mill Management Information System (PFMMIS)

According to Bartel (2017), the Poultry Feed Mill Management Information System is an information system that tracks poultry feed mill events and summarizes poultry feed mill information. It provides a comprehensive 'at a glance' picture of a poultry feed mill's operations and resources to help poultry feed mill managers ensure their mill's funding and resources are put to the best possible use.

SR Kuku employs the Poultry Feed Mill Management Information System (PFMMIS) to manage their poultry feed mill operations. This system helps them to optimize feed production, track inventory, and monitor feed quality, ensuring that their poultry farms receive high-quality feed.

The technologies used by the Poultry Feed Mill Management Information System (PFMMIS) include:

- ERP (Enterprise Resource Planning) system: This technology is used to examine all factors, like materials pricing and nutrition targets, to determine the most affordable, balanced feed rations.
- Data analysis: This technology is used to analyze data and formulate better ratios, track data, and allow better feed formulation from the data records available.
- Feed mill inventory management system: This technology is used to track data and allow better feed formulation from the data records available, and to plan production and subsequently plan for the ingredient requirement.
- Integrated poultry management software: This technology is used to integrate real-time data and planning capabilities to master formulation challenges, and to detect and capture excessive moisture or any form of leakage in the inventory, preventing additional losses.

- Feed mill management software: This technology is used to solve persistent issues in feed mills, such as tracking and maintaining vital stock inventory, and to help detect and capture excessive moisture or any form of leakage in the inventory, preventing additional losses.
- These technologies work together to provide a comprehensive Poultry Feed Mill Management Information System that helps feed mill owners to optimize their operations, reduce costs, and improve productivity.

How PFMMIS works

PFMMIS stores organizes, and makes access to poultry feed mill information easy. It not only stores all the poultry feed mill information relating to current and past years' production, but also stores the approved budgets for these years, details on feed formulation and production, as well as complete inventories of poultry feed mill assets (e.g., equipment, land, and buildings) and liabilities (debt).

A Layer Management Information System (LMIS) is a specialized system designed to manage layer farms, and its modules may vary depending on the specific implementation. Here are some common modules for an LMIS:

- Flock Management Module: This module manages flock details, including flock ID, bird type, age, and population.
- Egg Production Module: This module records egg production data, including egg count, egg weight, and egg quality.
- Layer Health Module: This module manages layer health data, including vaccination schedules, disease outbreaks, and mortality rates.
- Feeding Module: This module manages feeding data, including feed type, feed quantity, and feeding schedules.
- Nutrition Module: This module manages nutritional data, including nutrient levels, feed formulation, and nutrient tracking.
- Egg Quality Module: This module records egg quality data, including egg grading, egg weight, and egg quality parameters.
- Candling Module: This module manages candling data, including egg candling results, egg defects, and egg grading.
- Packing Module: This module manages egg packing data, including egg packing schedules, egg packing rates, and egg packing quality.
- Inventory Management Module: This module manages inventory levels of feed, medicines, vaccines, and other supplies.
- Financial Management Module: This module manages financial transactions, including sales, purchases, and expenses.
- Reporting and Analytics Module: This module provides insights and analytics on farm performance, including key performance indicators (KPIs) such as egg production, feed conversion ratios, and mortality rates.

- Alert and Notification Module: This module sends alerts and notifications to farmers and farm managers when certain conditions are met, such as low feed inventory or high mortality rates.
- Farm Operations Module: This module manages farm operations, including farm schedules, task assignments, and equipment maintenance.
- Employee Management Module: This module manages employee records, including training, attendance, and task assignments.
- Supply Chain Management Module: This module manages the supply chain, including procurement, logistics, and distribution of goods and services.
- Quality Control Module: This module ensures quality standards are met, including egg quality, feed quality, and product quality.
- Compliance Module: This module ensures compliance with regulatory requirements, including animal welfare, environmental, and food safety regulations.
- Data Import/Export Module: This module allows for data import and export, including integration with other systems and devices.
- Security Module: This module manages system security, including user access, authentication, and authorization.
- Breeder Management Module: This module manages breeder data, including breeder selection, breeder performance, and breeder replacement.
- These modules work together to provide a comprehensive Layer Management Information System that helps farmers and integrators optimize their operations, reduce costs, and improve productivity.

Strengths of PFMMIS

- Increased ability to undertake central control and monitoring of poultry feed mill operations.
- It allows for increased access to information on poultry feed mill performance.
- Internal control to prevent and detect potential and actual fraud.
- It allows access to information on the poultry feed mill's financial and operational performance.

Weaknesses of PFMMIS

- Inadequate planning.
- Poor communications between implementers, donors, and mill managers.
- Shortage of management capacity and resources.
- Changes in system design documents without full agreement.

In conclusion, this system deals with store organizes, and makes access to poultry feed mill information easy

2.6.5 Breeder Management Information System (poultry. care, n.d.)

A poultry breeder management system is one that covers the entire breeder life cycle from placement, feed program, and egg collection to hatchery in fully integrated business modules like purchase, sales, inventory, and accounts. This daily breeder farm data can be captured on a farmer's smartphone with easy to use the mobile application, track birds' health, and production performance using analysis reports and graphs, improve the efficiency of overall operation, and grow your profit

The Breeder Management Information System (MIS) would typically incorporate a range of technologies to manage and streamline various aspects of breeding operations. While the exact technologies used can vary depending on the specific requirements and scale of the system, here are some common components and technologies that might be employed:

- Database Management Systems (DBMS). Relational Databases: MySQL, PostgreSQL, SQL Server, NoSQL Databases: MongoDB, Cassandra
- Data Integration and ETL Tools. ETL (Extract, Transform, Load) Tools: Apache Nifi, Talend, Informatica. Data Integration Platforms: MuleSoft, Dell Boomi
- Application Development. Programming Languages. Java, Python, C#, PHP, JavaScript, Frameworks:Spring (Java), Django (Python), .NET (C#), Laravel (PHP), Node.js (JavaScript)
- Web Technologies, Frontend Frameworks: React, Angular, Vue.js, Backend Frameworks: Express.js (Node.js), Flask (Python), ASP.NET (C#)
- Cloud Services and Infrastructure. Cloud Providers: Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), Services: AWS RDS, Azure SQL Database, Google Cloud Firestore.
- Data Analytics and Reporting. Business Intelligence (BI) Tools: Tableau, Power BI, Looker, Data Analytics Tools: Apache Spark, Hadoop, Pandas (Python).
- Machine Learning and Artificial Intelligence. ML Frameworks: TensorFlow, PyTorch, Scikit-learn, AI Services: AWS SageMaker, Azure Machine Learning, Google AI Platform
- Integration and Middleware. APIs and Microservices: RESTful APIs, GraphQL, gRPC, Middleware: Apache Kafka, RabbitMQ
- Security and Compliance. Identity and Access Management: OAuth, JWT, LDAP, Security Tools: SSL/TLS, Encryption Libraries, Firewalls
- DevOps and CI/CD. Version Control: Git, GitHub, GitLab, CI/CD Tools: Jenkins, CircleCI, Travis CI, Containerization: Docker, Kubernetes
- Mobile Technologies. Mobile Development Frameworks: React Native, Flutter, Xamarin
- User Experience (UX) and User Interface (UI). Design Tools: Adobe XD, Figma, Sketch

How does the work

The Breeding Information Management System (BIMS) is an online resource designed to assist breeders in managing their breeding programs. Here are the key features of BIMS.

Functionality: BIMS allows breeders to store, manage, archive, and analyze their private breeding program data. It's a secure, open-source system that integrates phenotypic and genotypic data with public data.

Control: Individual breeders have complete control over their own breeding data. They can import/export data, perform data analysis, and archive information.

Support. BIMS is supported by the USDA NIFA National Research Support Program 10 (NRSP10) project.

Access: You can create an account or log in to BIMS here.

Strengths:

- Data Management. BIMS efficiently stores, manages and analyzes breeding program data. It allows breeders to track phenotypic and genotypic information.
- Customization. Breeders have control over their data, including importing/exporting and archiving.
- Secure. BIMS is a secure, open-source system.
- Support: It's supported by the USDA NIFA National Research Support Program 10 (NRSP10) project.

Weaknesses

- Single Breed Bias. The trend toward using a single breed (e.g., Angus) dominates the market. However, crossbreeding can enhance efficiency by blending strengths from various breeds.
- Lack of Balance. Overreliance on one breed may not align with diverse production and marketing goals.
- Suboptimal Decisions. Failing to consider breed differences and environmental constraints can lead to suboptimal breeding choices.

In conclusion A poultry breeder management system covers the entire breeder life cycle from placement, feed program, and egg collection to hatchery in fully integrated business modules like purchase, sales, inventory, and accounts.

2.6.6 HATCHERY Management Information System (www.poultry.care, n.d.)

Poultry Hatchery Module to Manage Egg Setting to Chick Pullout with CV Test, Candling, and Break-open Reports

Poultry hatchery Management Information System manages egg receipt to chick allocation which tracks setting and hatching data with CV test for eggs as well as for chicks, candling to estimate infertility, and break-open testing to measure DIS. Chick inventory feature helps to directly allocate chicks to farmer (CBF) or sell to external parties. Per chick cost unit economics

report and other key features are integrated with business modules like purchase, sales, inventory, and accounts to manage seamless business operation. Capture daily setter/hatcher temperature and humidity data on farmer's smartphone with easy to use mobile application measures hatching quality.

Kukuchick uses a customized version of the Hatchery Management Information System to manage their hatchery operations. This system enables them to track egg receipt to chick allocation, monitor setting and hatching data, and ensure accountability for their hatchery processes.

Technologies used in the include but are not limited to the following;

- Database Management Systems (DBMS). SQL Databases: MySQL, PostgreSQL, Oracle
- NoSQL Databases. MongoDB, Cassandra
- IoT (Internet of Things). Sensors: Temperature, humidity, water quality sensors (pH, ammonia, nitrate, etc.)
- Actuators: Automated feeding systems, water pumps, ventilation systems
- Data Analytics and Reporting. Business Intelligence Tools: Power BI, Tableau
- Analytics Platforms. Apache Hadoop, Spark
- Software Development Frameworks.
- Backend. Django, Flask, Spring Boot
- Frontend. React, Angular, Vue.js
- Cloud Computing. Cloud Storage and Services. AWS (Amazon Web Services), Google Cloud Platform (GCP), Microsoft Azure
- Edge Computing:To process data closer to the source, reducing latency
- Networking Technologies. Local Area Network (LAN): For internal communication between devices and systems
- Networked Water Quality Monitors, Hatcheries are adopting supervisory control and data acquisition (SCADA) systems, which use computers, networked data communications, and graphical interfaces to control devices and process data.
- InWater Technologies, for instance, incorporates SCADA concepts into its Point4 water quality monitoring product line. The system's remote interface units (RUIs) control devices and maintain operation even if the SCADA system fails1.
- Robotics, Automation through robotics streamlines hatchery operations reduces labor costs and improves efficiency.
- Vard Aqua Sunndal AS's Exact Feeding Robot minimizes dust generated during manual feeding, enhancing water quality and fish health. The robot calculates feed quantities based on biomass data and uses RFID tracking for optimal feed dispersion1.
- AI, Remote Sensing, and Mobile Integration, Innovasea's biomass camera, powered by AI, assesses fish weight and length in tanks. It calculates overall biomass, aiding efficient feeding formulas. Mobile integration allows remote control of devices, and data collected are stored in the cloud

How it works.

- Egg Tracking and Allocation, when eggs arrive at the hatchery, the HMIS records batch information, egg quality, and quantity.
- The system allocates eggs to specific setters based on breed, age, and fertility.
- Efficient allocation ensures optimal incubation conditions for consistent hatching results.
- Incubation Monitoring, the HMIS continuously monitors incubators (setters and hatchers) for temperature, humidity, and ventilation.
- It alerts hatchery staff if any parameters deviate from the desired range.
- Real-time monitoring ensures optimal conditions for embryo development.
- Chick Quality Assessment, during hatching, the system tracks chick development and quality.
- It assesses factors like chick weight, uniformity, and health.
- Consistent chick quality leads to better performance in broiler or layer flocks.
- Data Analytics and Reporting, the HMIS generates reports on hatch rates, chick quality, and overall performance. Owners and managers can analyze trends, identify bottlenecks, and make informed decisions.
- Historical data helps improve future hatchery processes.
- Inventory Management, the system tracks egg inventory, chick production, and supplies (such as vaccines and feed). It ensures efficient resource utilization and minimizes wastage.
- Financial Tracking, HMIS provides financial insights, including cost analysis, revenue, and profitability. Owners can make strategic decisions based on accurate financial data.

Strengths:

- Accurate Data, HMIS provides more accurate data compared to paper-based systems. It ensures reliable information for decision-making1.
- Timely Availability, HMIS offers faster documentation retrieval, enabling efficient management of hatchery operations.
- Opportunities, Competition in the industry and government policies create opportunities for immediate HMIS implementation.

Weaknesses:

- Slow transition. the shift from old systems to HMIS can be slow due to challenges like extra funding needs and a lack of skilled personnel.
- Infrastructure. Inadequate infrastructure to support the system hinders implementation.
- Cultural Factors. Existing culture and communication gaps across organizations pose obstacles to HMIS adoption.

Inconclusion the Poultry hatchery Management Information System manages egg receipt to chick allocation which tracks setting and hatching data with CV test for eggs and provides accountability for the hatchery processes

2.6.7 Slaughter Management Information System. (poultry.care, n.d.)

Poultry Slaughter Module in the Processing Plant to Produce Live Birds into Meat

The poultry slaughter Management Information System gives traceability from farm to farm with accurate shelf-life tracking and stock management for better monitoring in the processing plant. It improves farm processing plant yield analysis with proper planning, predicting & forecasting with fully integrated business modules like purchase, sales, inventory, and accounts. It enables the processing plant stack-holders to capture daily processing data on smartphones with ease to use mobile application, track stock availability in chiller and frozen storages using reports, improve overall operation efficiency, and grow farm profit.

The Slaughter Management Information System (SMIS) is designed to streamline and manage processes

Technologies used by Slaughter Management Information System (parteroi)

- Automated Slaughterhouse, these facilities use advanced technologies, including robots, non-destructive sensing, data transmission, and real-time process monitoring.
- Grading devices and quality measurement processing machines are introduced for meat.
- Traceability Systems, numbering, and Bar Code Systems: These help achieve full traceability of products by assigning unique identifiers to each item.
- Electronic and Biological Marking Systems: Combining electronic tags (e.g., RFID) and biological markers (e.g., DNA) enhances traceability and monitoring.
- Robotics and Automation:
- Gohbot: A poultry house robot that navigates using imaging sensors and machine learning. It detects floor eggs, monitors environmental conditions, and has an overall cost of under $6,000.
- ChickenBoy: An autonomous ceiling-suspended robot that assesses ambient conditions, health, welfare, and equipment failures in poultry houses.
- Woody Breast Detection: Uses machine vision and high-speed cameras to detect and sort breast fillets without damaging them.
- 3D Bird Deboning Cutting Virtual Reality: Generates cutting trajectories for automated poultry processing systems3.
- Software Solutions:
- Slaughterhouse Management Software: Comprehensive systems manage animal receiving, slaughter, deboning, packing, inventory, sales, and distribution4.
- Remember that the choice of technologies depends on the specific needs, scale, and regulatory requirements of the slaughterhouse.

Strengths:

- Traceability. The system provides end-to-end traceability, allowing quick identification of products during recalls.

- Efficiency. It streamlines processes, optimizes resource allocation, and minimizes waste.
- Compliance. Automated quality checks ensure adherence to food safety regulations.
- Financial Visibility. Integration with financial data provides real-time insights into performance.

Weaknesses:

- Implementation Challenges. Setting up the system can be complex and require significant investment.
- Maintenance. Regular updates and maintenance are essential for optimal performance.
- User Adoption. Training staff to use the system effectively may be a challenge.

In conclusion, the poultry slaughter Management Information System gives traceability from farm to farm with accurate shelf-life tracking and stock management for better monitoring in the processing plant and farm at large.

2.6.8 Egg Management Information System (EMIS) (scribd)

The egg management information system is a software application designed to help egg farmers, producers, and distributors manage their egg production, inventory, and distribution processes more efficiently. The system aims to improve the accuracy, transparency, and timeliness of egg-related data, reducing errors, and increasing profitability.

Technologies used in the egg management information system include;

- Database Management Systems (DBMS). Relational Databases: MySQL, PostgreSQL, SQL Server, NoSQL Databases: MongoDB, Cassandra
- Data Integration and ETL Tools. ETL (Extract, Transform, Load) Tools: Apache Nifi, Talend, Informatica, Data Integration Platforms: MuleSoft, Dell Boomi
- Application Development. Programming Languages: Java, Python, C#, PHP, JavaScript, Frameworks: Spring (Java), Django (Python), .NET (C#), Laravel (PHP), Node.js (JavaScript)
- Web Technologies. Frontend Frameworks: React, Angular, Vue.js, Backend Frameworks: Express.js (Node.js), Flask (Python), ASP.NET (C#)
- Cloud Services and Infrastructure. Cloud Providers: Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), Services: AWS RDS, Azure SQL Database, Google Cloud Firestore
- Data Analytics and Reporting. Business Intelligence (BI) Tools: Tableau, Power BI, Looker, Data Analytics Tools: Apache Spark, Hadoop, Pandas (Python)
- Internet of Things (IoT). IoT Platforms: AWS IoT, Azure IoT Hub, Google Cloud IoT, Sensors and Devices: Temperature and humidity sensors, RFID tags for tracking
- Machine Learning and Artificial Intelligence. ML Frameworks: TensorFlow, PyTorch, Scikit-learn, AI Services: AWS SageMaker, Azure Machine Learning, Google AI Platform

- Integration and Middleware. APIs and Microservices: RESTful APIs, GraphQL, gRPC, Middleware: Apache Kafka, RabbitMQ
- Security and Compliance Identity and Access Management: OAuth, JWT, LDAP, Security Tools: SSL/TLS, Encryption Libraries, Firewalls
- DevOps and CI/CD. Version Control: Git, GitHub, GitLab,CI/CD Tools: Jenkins, CircleCI, Travis CI Containerization: Docker, Kubernetes.
- Mobile Technologies. Mobile Development Frameworks: React Native, Flutter, Xamarin
- User Experience (UX) and User Interface (UI), Design Tools: Adobe XD, Figma, Sketch
- Specialized Software and Tools. Inventory Management Software: Oracle NetSuite, SAP, Microsoft Dynamics. Quality Control Systems SPC (Statistical Process Control) software, QA/QC tools. Supply Chain Management: Supply chain optimization tools, logistics software

How it works

- An Egg Management System typically involves several components to optimize egg production and farm management:
- Data Collection, Sensors and monitoring devices track various parameters, including temperature, humidity, feed consumption, and egg production.
- Data is collected from individual birds, feeders, waterers, and environmental conditions.
- Health Monitoring, the system detects signs of illness or stress in birds. Alerts are generated for timely intervention, preventing disease outbreaks.
- Feed Management, algorithms calculate optimal feed quantities based on factors like bird age, weight, and production stage. Precise feeding improves egg quality and reduces wastage.
- Egg Collection, automated nests collect eggs. Eggs are sorted, graded, and stored appropriately.
- Inventory Control, the system tracks feed, medication, and other supplies. Inventory levels are managed to avoid shortages.
- Performance Analytics, data analysis provide insights into egg production trends, bird health, and resource utilization. Farmers make informed decisions based on these analytics.

Modules

The system consists of the following modules;

- Egg Production Module. Records egg production data, including date, time, and quantity of eggs laid, Tracks egg quality, including weight, size, and grade, Monitors egg production trends, and alerts users to any deviations.
- Inventory Management Module. Manages egg inventory, including storage locations, quantities, and expiration dates, Tracks egg movement, including receiving, storing, and shipping, Generates reports on inventory levels, stock turnover, and expiration dates.

- Order Management Module. Manages customer orders, including order placement, fulfillment, and tracking, Automates order processing, including picking, packing, and shipping, Generates reports on order status, customer satisfaction, and sales trends.
- Supply Chain Management Module. Tracks egg shipments, including transportation, storage, and delivery, Monitors supply chain performance, including on-time delivery, quality, and cost, Identifies bottlenecks and opportunities for improvement in the supply chain.
- Quality Control Module. Tracks egg quality control data, including testing results and
- certifications, Monitors quality control trends, and alerts users to any deviations Generates reports on quality control performance and compliance.
- Reporting and Analytics Module. Provides real-time reporting and analytics on egg production, inventory, orders, and supply chain performance, Offers customizable dashboards and reports to meet specific business needs, and enables data-driven decision-making and process improvement.

Key Functionalities of an EMIS

- Inventory Management. tracking egg production and inventory levels, Managing stock levels, reordering, and forecasting demand.
- Quality Control. monitoring egg quality parameters (size, weight, shell integrity), and Ensuring compliance with health and safety standards.
- Supply Chain Management. tracking egg shipments and deliveries, and managing relationships with suppliers and distributors.
- Data Collection and Analysis. Collecting data from various sources (sensors, manual entry), analyzing data to optimize production, and identifying trends.
- Reporting and Dashboards. Generating reports on production, inventory, and sales, providing real-time dashboards for decision-makers.
- Automation and IoT Integration. Using IoT devices to automate data collection and monitor environmental conditions, Integrating with automated feeding and egg collection systems.
- Automated Egg Collection Systems: These systems, including belt, rod, chain, or elevator systems, gently collect eggs, reduce breakage rates, save time, and prevent broken eggs from entering the system.
- Smart Egg Incubators. These advanced machines offer precise environmental control, resulting in healthier chicks and improved hatching rates.
- Artificial Intelligence (AI). AI tools analyze data to identify early signs of illness in birds, enabling rapid intervention and reducing disease risks.
- Sustainable Nutrition Practices. Innovations in feed formulations enhance bird health and contribute to eco-friendly and cost-effective operations.
- Blockchain Technology. Blockchain ensures transparent tracking of eggs' journeys from farm to table, ensuring food safety and traceability.
-

Strengths of an Egg Management Information System (EMIS)

- Enhanced Efficiency.

a) Automates routine tasks such as data collection, inventory tracking, and reporting, reducing the need for manual labor and minimizing human errors.
b) Streamlined Operations. Integrates various processes such as production, quality control, and supply chain management, leading to more streamlined and efficient operations.
c) Improved Data Accuracy,
d) Real-Time Data. Provides real-time data on production, inventory levels, and environmental conditions, enabling better decision-making.
e) Centralized Database. Consolidates data from various sources into a centralized database, ensuring consistency and accuracy.
f) Better Inventory Management, Stock Control. Helps maintain optimal inventory levels, reducing the risk of overstocking or stockouts.
g) Demand Forecasting. Uses historical data and analytics to forecast demand, enabling better planning and resource allocation.

- Quality Control.

a) Monitoring: Continuously monitors egg quality parameters (size, weight, shell integrity) to ensure compliance with health and safety standards.
b) Traceability: Provides traceability of eggs from production to distribution, enhancing quality control and recall management.

- Enhanced Decision-Making.

a) Analytics and Reporting. Offers advanced analytics and customizable reports, providing insights into production efficiency, sales trends, and operational bottlenecks.
b) Dashboards. Provides real-time dashboards for quick access to critical information, aiding in timely decision-making.

- Cost Savings.

a) Reduced Waste. Optimizes production and inventory processes, reducing waste and associated costs.
b) Labor Savings. Decreases the need for manual labor through automation and integration.

- Scalability.

a) Adaptability. This can be scaled to accommodate growing production needs or expanded to include additional functionalities as the business grows.

Weaknesses of an Egg Management Information System (EMIS)

- Initial Implementation Costs

a) High Investment. The initial setup, including software purchase, hardware installation, and customization, can be expensive.
b) Training Cost. Requires investment in training staff to use the new system effectively.

- Complexity

a) Integration Challenges. Integrating the EMIS with existing systems and processes can be complex and time-consuming.

b) User Resistance. Employees may resist changes to established workflows, leading to a slower adoption rate.

- Maintenance and Upkeep.

a) Ongoing Costs. Continuous maintenance, updates, and technical support can incur ongoing costs.
b) Technical Issues. System failures or bugs can disrupt operations and require technical expertise to resolve.

- Data Security and Privacy

a) Vulnerability. Storing sensitive data in a centralized system can make it vulnerable to cyberattacks and data breaches.
b) Compliance. Ensuring compliance with data protection regulations (e.g., GDPR) can be challenging and requires constant vigilance.

- Dependency on Technology.

a) System Downtime: Reliance on the EMIS means that any downtime or technical issues can significantly disrupt operations.

- Power and Connectivity: Requires a reliable power supply and internet connectivity, which may be an issue in certain locations.
- Customization Limitations.

a) Flexibility. Off-the-shelf solutions may not fully meet specific business needs, requiring additional customization.
b) Vendor Dependency. Dependence on vendors for customization and support can lead to delays and increased costs.

- Data Overload

a) Complex Data Management. Handling large volumes of data can be overwhelming and requires effective data management practices.
b) Decision Paralysis. Access to vast amounts of data can lead to decision paralysis if not properly filtered and analyzed.

- Scalability Issues

a) Performance. As the system scales, it may face performance issues if not designed to handle increased load.
b) Cost. Scaling the system to accommodate growth can be expensive.

Inconclusion the Egg Management Information System (EMIS) application designed to help egg farmers, producers, and distributors manage their egg production, inventory, and distribution processes more efficiently.

Comparison table for the related systems

SYSTEM	STRENGTH	WEAKNESS	TECHNOLOGY
BFMIS	Central control and monitoring of broiler farm operations. Increased access to information on broiler farm performance. Increased ability to undertake central control and monitoring of broiler farm operations. It allows for increased access to information on broiler farm performance. Internal control to prevent and detect potential and actual fraud. It allows access to information on the broiler farm's financial and operational performance.	• Inadequate planning. • Poor communications between implementers, donors, and farm managers. • Shortage of management capacity and resources. • Changes in system design documents without full agreement. • Expensive to maintain • Require skilled personnel to operate	Web-based Augmented Reality, Terahertz Spectroscopy, 3D Printing, IoT and Wearable Sensors, RFID Tags, LED Lighting Systems, Data Analytics and Machine Learning, Cloud Computing and APIs
LFMIS	Central control and monitoring of layer farm operations. Increased access to information on layer farm performance. Increased ability to undertake central control and monitoring of layer farm operations. It allows for increased access to information on layer farm performance.	• Inadequate planning. • Poor communications between implementers, donors, and farm managers. • Shortage of management capacity and resources.	Cloud Computing, Database Management Systems, Web Development Frameworks, Mobile App Development, IoT, Data Analytics, Machine Learning, APIs and Integrations, Security and Authentication, Networking and Communication, GPS and GIS, Automation and Control Systems, Reporting and

	Internal control to prevent and detect potential and actual fraud. It allows access to information on the layer farm's financial and operational performance. Internal control to prevent and detect potential and actual fraud. It allows access to information on the layer farm's financial and operational performance.	• Changes in system design documents without full agreement. • Expensive to maintain • Require skilled personnel to operate	Visualization Tools, Business Intelligence Tools, Artificial Intelligence
PFMMIS	Central control and monitoring of poultry feed mill operations. Increased access to information on poultry feed mill performance. Increased ability to undertake central control and monitoring of poultry feed mill operations. It allows for increased access to information on poultry feed mill performance. Internal control to prevent and detect potential and actual fraud. It allows access to information on the poultry feed mill's financial and operational performance.	• Inadequate planning • Shortage of management capacity and resources. • Changes in systemdesign documents without full agreement. • Expensive to maintain • Require skilled personnel to operate	Web-based ERP system, Data Analysis, Feed mill inventory management system Integrated poultry management software, Feed mill management software

Breeder Management Information System (BIMS)	Covers the entire breeder life cycle from placement, feed program, and egg collection to hatchery in fully integrated business modules, allows for tracking birds' health and production performance, improves the efficiency of overall operation, and grows profit	• Single Breed Bias. • Lack of Balance. • Suboptimal Decisions.	Web-based Database Management Systems, Data Integration and ETL Tools, Application Development, Web Technologies, Cloud Services and Infrastructure, Data Analytics and Reporting, Machine Learning and Artificial Intelligence, Integration and Middleware, Security and Compliance, DevOps and CI/CD, Mobile Technologies, User Experience (UX) and User Interface (UI)
Hatchery Management Information System	Manages egg receipt to chick allocation which tracks setting and hatching data with CV test for eggs as well as for chicks, candling to estimate infertility, and break-open testing to measure DIS, provides accountability for the hatchery processes	• Slow transition. • Infrastructure. • Cultural Factors.	Database Management Systems, IoT (Internet of Things), Data Analytics and Reporting, Software Development Frameworks, Cloud Computing, Edge Computing, Networking Technologies, Robotics, Automation, AI, Remote Sensing, and Mobile Integration
Slaughter Management Information System	Provides traceability from farm to farm with accurate shelf-life tracking and stock management for better monitoring in the processing plant, improves farm processing plant yield analysis with proper planning, predicting & forecasting with fully integrated business modules like	• Implementation Challenges • Maintenance. • User Adoption	Web-based Automated Slaughterhouse, Grading devices and quality measurement processing machines, Traceability Systems, Electronic and Biological Marking

	purchase, sales, inventory, and accounts		Systems, Robotics and Automation, Software Solutions
Egg Management Information System (EMIS)	customer satisfaction, reduced costs, compliance, tracks egg production data, manages egg inventory, manages customer orders, tracks egg shipments, tracks egg quality control data, provides real-time reporting and analytics on egg production, inventory, orders, and supply chain performance	• Initial Implementation Costs • Complexity • Maintenance and Upkeep. • Data Security and Privacy • Dependency on Technology. • Customization Limitations. • Data Overload • Scalability Issues	Web-based Database Management Systems, Data Integration and ETL Tools, Application Development, Web Technologies, Cloud Services and Infrastructure, Data Analytics and Reporting, IoT, Machine Learning and Artificial Intelligence, Integration and

2.8 Conclusion This chapter mainly described the literature review of the poultry management information systems where I gathered information about other related systems, how they function, and the enhancements needed in order to improve the current broiler or layer management system, such as optimizing bird health, reducing mortality rates, and increasing farm productivity, and not forgetting the Poultry Feed Mill Management Information System (PFMMIS).

Chapter Three

Research Methodology

2.0 Introduction

This chapter outlines the research methodology employed in the development of the Poultry Farm Management System. The methodology is structured around four key component; research patterns, data collection approaches, analysis techniques, and system design and implementation tools. Specifically, this chapter explains how these components were carefully selected and applied to achieve the specific objectives of the proposed system, ensuring a rigorous and systematic approach to the research and development process that addresses the unique needs and challenges of poultry farm management.

3.1 System Study and Analysis

To determine the system and user requirements, fact-finding techniques were employed to gather information about the existing poultry farm management system. This involved identifying system inputs, outputs, and processes to understand what the proposed system was expected to achieve. The findings from this study informed the development of a system that meets the specific needs of poultry farm management.

3.2 Data collection techniques

3.2.1 Interview

An interview is a qualitative research method used to collect primary data. It involves asking one or more people about their opinions on a company, a product, or a topic. This method allows researchers to obtain detailed information that might not be available through other research methods.

3.2.2 Observation

Observational data collection provides descriptions of the setting (e.g., comfort, privacy), any activities taking place in that setting, the participants, and their interactions with others. For example, a researcher might observe a process, such as enrolling a client in a program. Observational data would also include the activities of the program staff member and of the applicant, the length of the process, and the tone and quality of the interactions between the staff member and the applicant (e.g., friendly and helpful, encouraging or discouraging).

3.2.3 Reviewing Existing Documents

Document review is a way of collecting data by reviewing existing documents. The documents may be internal to a program or organization (such as records of what components of an asthma management program were implemented in schools) or may be external (such as records of

emergency room visits by students served by an asthma management program). Documents may be hard copy or electronic and may include reports, program logs, performance ratings, funding proposals, meeting minutes, newsletters, and marketing materials.

3.2.4 Questionnaires

A questionnaire is a research tool featuring a series of questions used to collect useful information from respondents. These instruments include either written or oral questions and comprise an interview-style format. Questionnaires may be qualitative or quantitative and can be conducted online, by phone, on paper or face-to-face, and questions don't necessarily have to be administered with a researcher present.

Questionnaires feature either open or closed questions and sometimes employ a mixture of both. Open-ended questions enable respondents to answer in their own words in as much or as little detail as they desire. Closed questions provide respondents with a series of predetermined responses they can choose from.

3.3 Data Analysis Methods

Data analysis is the practice of working with data to glean useful information, which can then be used to make informed decisions. (Coursera Staff, 2024)

3.4 System Analysis and Design

System analysis and design as a problem-solving approach was used to identify, define, and solve problems on the Elgon poultry farm. It involved a systematic and structured methodology to analyze the existing system, identify the problems, and design a new system or modify the existing one to meet the farm's goals and objectives.

3.5 System Implementation

The system implementation phase is a crucial stage in the system development and design life cycle. It's the phase where the design specifications are translated into a working system. During this phase, the design documents, specifications, and prototypes created in the previous phases are used to build the actual system. This involves:

i. Coding. Writing the code for the system in a programming language, using the design specifications as a guide.
ii. Component development. Creating the individual components of the system, such as databases, user interfaces, and algorithms.
iii. System integration. Combining the individual components into a cohesive system.
iv. Testing. Verifying that the system meets the requirements and works as expected.
v. Debugging. Identifying and fixing errors or bugs found during testing.
vi. Deployment. Installing the system in its production environment.

The primary goals of this phase are to:

i. Create a working system that meets the requirements and specifications.
ii. Ensure the system is reliable, efficient, and scalable.
iii. Minimize errors and bugs.
iv. Meet the project timeline and budget constraints.
v. Deliverables of the system implementation phase

The main deliverables of this phase are.

i. A working system that meets the requirements.
ii. System documentation, including user manuals and technical guides.
iii. Test plans and test cases.
iv. Deployment scripts and installation guides.

3.6 System Testing and Validation

Testing.

Testing is the process of evaluating a system or its components to determine whether they meet the specified requirements and work as expected. The primary goal of testing is to identify defects, errors, or bugs in the system, and to ensure that it behaves as intended.

Testing involves executing a set of test cases, which are designed to cover various scenarios, inputs, and conditions. The testing process typically involves:

i. Test planning. Identifying the scope, approach, and resources required for testing.
ii. Test case development. Creating test cases to cover specific requirements, scenarios, or functionality.
iii. Test data management. Preparing and managing test data to support testing.
iv. Test environment setup. Configuring the test environment to mimic the production environment.
v. Test execution. Running the test cases and observing the system's behavior.
vi. Defect reporting. Identifying and reporting defects or errors found during testing.
vii. Defect fixing. Fixing the defects and re-testing the system.

Validation.

Validation is the process of evaluating a system or its components to ensure that they meet the specified requirements, user needs, and expectations. The primary goal of validation is to confirm that the system is fit for purpose and meets the intended goals.

Validation involves evaluating the system's performance, functionality, and usability to ensure that it meets the specified requirements and user expectations. Validation activities may include:

i. Requirements validation. Verifying that the system meets the specified requirements and user needs.

ii. User acceptance testing (UAT). Involving end-users to validate that the system meets their expectations and needs.
iii. Performance testing. Evaluating the system's performance, scalability, and reliability.
iv. Usability testing. Assessing the system's usability, accessibility, and user experience.
v. Compliance testing. Verifying that the system meets regulatory, industry, or organizational standards.
vi. meets the intended goals.

3.6.3 Conclusion

In conclusion, this chapter has provided a comprehensive overview of the research methodology employed in this study. The chapter has elaborated on the research patterns, data collection approaches, analysis techniques, and tools utilized in designing and implementing the Poultry Management System. The methodologies discussed have laid the foundation for the successful collection and analysis of data, which will inform the develop RESEARCH PROPOSAL

Chapter Three

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3.4.1 System Analysis

System analysis is the process of studying the existing system, identifying the problems, and defining the requirements for a new system. It involves problem definition (identifying the problems and opportunities for improvement in the existing system.), feasibility study (Determining whether a new system is feasible and worth pursuing.), Requirements gathering (Collecting data and information about the existing system and the requirements for the new system.) and analysis of the existing system (Studying the existing system, including its strengths, weaknesses, opportunities, and threats (SWOT analysis)).

Functional and Non-Functional Requirements: An Overview

In the context of system analysis and design, requirements refer to the descriptions of what a system must do or possess to meet the needs of its users. There are two main types of requirements: functional and non-functional.

Functional Requirements

Functional requirements describe the specific tasks or functions that a system must perform to meet the user's needs. They define what the system must do, how it must do it, and what it must produce. Functional requirements are often described in terms of user interactions, data processing, and system outputs.

Examples of Functional Requirements for a Poultry Management System

Sales management. The system must be able to manage the sales of the products sold in their respective categories (hens or eggs) within the farm.

Performance tracking. The system must be able to track the performance of the farm in relation to the profits and losses that is to say on a monthly basis.

Stock Management: The system must be able to manage the total stock in and out of the farm including the comprised stock.

Production management. The system must be able to update and manage the farm products available on the farm such as eggs, broilers, and layers including their number and how old the eggs may be for example one to two weeks eggs laid, egg weight, and egg quality.

Inventory management. The system must be able to keep up-to-date information on the total inventory on the farm

Non-Functional Requirements for a Poultry Management System

Non-functional requirements describe the constraints or qualities that a system must possess to meet the user's needs. They define how the system must perform, respond, or behave in certain situations. Non-functional requirements are often described in terms of system performance, security, usability, and maintainability.

Examples of Non-Functional Requirements for a Poultry Management System

Security. The system must ensure that only authorized personnel have access to sensitive data, such as payment records and stock for example the administrators.

Performance. The system must be able to handle a minimum of 10,000 records and generate reports within 30 seconds.

Usability. The system must be easy to use, with an intuitive interface that requires minimal training for farm staff.

The system must be available 24/7, with a maximum downtime of 1 hour per month for maintenance and updates.

Scalability. The system must be able to scale to accommodate an increase of 20% in bird population within the next 6 months.

3.4.2 System Design

System design is the process of creating a detailed design of the new system, including its components, architecture, and specifications. It involves:

Logical design. Creating a conceptual design of the system, including its components and relationships.

Physical design. Creating a detailed design of the system, including its architecture, hardware, software, and network components.

User interface design. Designing the user interface, including the layout, navigation, and user experience.

System testing and validation. Testing and validating the system to ensure it meets the requirements and works as expected.

How System Analysis and Design is Carried Out

The system analysis and design process typically involves the following steps:

Planning. Defining the project scope, goals, and objectives.

Analysis. Gathering data and information about the existing system and identifying the problems and opportunities for improvement.

Design. Creating a detailed design of the new system, including its components, architecture, and specifications.

Implementation. Building and testing the new system.

Maintenance. Maintaining and updating the system to ensure it continues to meet the organization's goals and objectives.

Tools and Techniques

System analysts and designers use various tools and techniques to carry out the analysis and design process, including:

Flowcharts. Visual representations of the system's processes and workflows.

Data flow diagrams. Visual representations of the system's data flows and processes.

Entity-relationship diagrams. Visual representations of the system's data structures and relationships.

Use cases. Descriptions of the system's functional requirements from the user's perspective.

Prototyping. Creating a working model of the system to test and validate its design.

By following a structured approach to system analysis and design, organizations can ensure that their systems are designed to meet their goals and objectives, and are efficient, effective, and easy to use.

Process Modeling.

Process modeling is a technique used in system design to visualize, analyze, and improve business processes. It involves creating a graphical representation of the steps involved in a process, including the activities, tasks, and flows of data and materials. Process modeling helps to identify inefficiencies, bottlenecks, and areas for improvement in a process. This was obtained by use of data flow diagrams which showcased the various entities of the system and its processes

Tools for Process Modeling

i. Flowcharts. This tool is used for the graphical representation of processes, showing the sequence of steps and the flow of data and materials.

ii. Swimlane diagrams. A type of flowchart that shows the roles and responsibilities of different teams or individuals involved in a process.

iii. BPMN (Business Process Model and Notation). A standardized notation tool used for modeling business processes, and also used to create diagrams that are easy to understand and communicate.

iv. UML (Unified Modeling Language) Activity Diagrams. A type of diagram used to model business processes, showing the flow of activities and the interactions between them.

v. Data Modeling. Data modeling is a technique used in system design to organize and structure data in a way that is easy to understand and use. It involves creating a conceptual representation of the data entities, attributes, and relationships within a system. Data modeling helps to ensure that data is consistent, accurate, and easily accessible. It was achieved with the help of Entity-Relationship Diagrams.

Tools for Data Modeling

Entity-Relationship Diagrams (ERDs): this was used to carry out a graphical representation of data entities, attributes, and relationships and also to model the structure of a database.

Class Diagrams such as the UML diagram were used to model the structure and relationships of data entities, including classes, attributes, and methods.

Data Flow Diagrams (DFDs). Is a graphical representation of the flow of data through a system, used to model the data processing and storage requirements.

Object-Relational Mapping (ORM) Tools. These are tools used to map data entities and relationships to a relational database management system.

Aspects of System Design.

These include but are not limited to the following;

i. Architectural Design. It is the overall structure and organization of the system, including the relationships between components and subsystems.

ii. Component Design. Is the design of individual components or modules within the system, including their interfaces and interactions.

iii. Interface Design. Is basically the design of user interfaces, including the layout, navigation, and user experience plus scalability.

iv. Data Design. Is the design of the data structures and databases used to store and manage data within the system.

v. Network Design. Is a design of the network infrastructure and communication protocols used to connect components and subsystems.

vi. Security Design. Is the design of security mechanisms and protocols used to protect the system and its data from unauthorized access or malicious attacks.

vii. Performance Design. Is the design of the system's performance characteristics, including its speed, capacity, and scalability.

viii. Usability Design. It involves the design of the system's usability features, including its ease of use, accessibility, and user experience.

3.5 System Implementation

The system implementation phase is a crucial stage in the system development and design life cycle. It's the phase where the design specifications are translated into a working system. During this phase, the design documents, specifications, and prototypes created in the previous phases are used to build the actual system. This involves:

i. Coding. Writing the code for the system in a programming language, using the design specifications as a guide.

ii. Component development. Creating the individual components of the system, such as databases, user interfaces, and algorithms.

iii. System integration. Combining the individual components into a cohesive system.

iv. Testing. Verifying that the system meets the requirements and works as expected.

v. Debugging. Identifying and fixing errors or bugs found during testing.

vi. Deployment. Installing the system in its production environment.

The primary goals of this phase are to:

i. Create a working system that meets the requirements and specifications.

ii. Ensure the system is reliable, efficient, and scalable.

iii. Minimize errors and bugs.

iv. Meet the project timeline and budget constraints.

v. Deliverables of the system implementation phase

The main deliverables of this phase are.

i. A working system that meets the requirements.

ii. System documentation, including user manuals and technical guides.

iii. Test plans and test cases.

iv. Deployment scripts and installation guides.

3.5.1 Implementation Tools

PHP (Hypertext Preprocessor). Is a popular, open-source, and widely-used programming language specifically designed for web development. It's a server-side scripting language that allows developers to create dynamic web pages, web applications, and websites that interact with databases.

HTML is a set of instructions that a web browser uses to render a web page. It's made up of a series of elements, represented by tags (<>), plus other components that are used to define different parts of a web page, such as;

Headings (<h1>, <h2>, etc.). When a web browser loads an HTML document, it reads the HTML code and uses it to render the web page. The browser interprets the HTML elements and applies the corresponding styles, layouts, and behaviors to create the visual representation of the web page.

CSS (Cascading Style Sheets). Is a styling language used to control the layout and visual styling of web pages written in HTML or XML. It's a crucial part of web development and is used to create visually appealing and user-friendly interfaces. Therefore, it is a set of rules, known as styles, that are applied to HTML elements to control their layout, appearance, and behavior. It's used to separate the presentation of a web page from its structure, making it easier to maintain and update. When a web browser loads an HTML document, it also loads the associated CSS styles. The browser then applies the CSS styles to the corresponding HTML elements, using a process called the "cascade". This means that styles can be applied in a hierarchical manner, with more specific styles overriding more general ones.

SQL (Structured Query Language). Is a programming language designed for managing and manipulating data in relational database management systems (RDBMS). It's not a general-purpose programming language like Python or Java, but rather a domain-specific language for working with databases. SQL is a standard language for accessing, managing, and modifying data in relational databases. It's used to perform various operations, such as; Creating and modifying database structures (e.g., tables, indexes, views), Inserting, updating, and deleting data in tables, Querying data to retrieve specific information Manipulating data using aggregate functions, and grouping

3.6 System Testing and Validation

Testing.

Testing is the process of evaluating a system or its components to determine whether they meet the specified requirements and work as expected. The primary goal of testing is to identify defects, errors, or bugs in the system, and to ensure that it behaves as intended.

Testing involves executing a set of test cases, which are designed to cover various scenarios, inputs, and conditions. The testing process typically involves:

i. Test planning. Identifying the scope, approach, and resources required for testing.

ii. Test case development. Creating test cases to cover specific requirements, scenarios, or functionality.

iii. Test data management. Preparing and managing test data to support testing.

iv. Test environment setup. Configuring the test environment to mimic the production environment.

v. Test execution. Running the test cases and observing the system's behavior.

vi. Defect reporting. Identifying and reporting defects or errors found during testing.

vii. Defect fixing. Fixing the defects and re-testing the system.

Validation.

Validation is the process of evaluating a system or its components to ensure that they meet the specified requirements, user needs, and expectations. The primary goal of validation is to confirm that the system is fit for purpose and meets the intended goals.

Validation involves evaluating the system's performance, functionality, and usability to ensure that it meets the specified requirements and user expectations. Validation activities may include:

i. Requirements validation. Verifying that the system meets the specified requirements and user needs.

ii. User acceptance testing (UAT). Involving end-users to validate that the system meets their expectations and needs.

iii. Performance testing. Evaluating the system's performance, scalability, and reliability.

iv. Usability testing. Assessing the system's usability, accessibility, and user experience.

v. Compliance testing. Verifying that the system meets regulatory, industry, or organizational standards.

vi. meets the intended goals.

3.6.3 Conclusion

In conclusion, this chapter has provided a comprehensive overview of the research methodology employed in this study. The chapter has elaborated on the research patterns, data collection approaches, analysis techniques, and tools utilized in designing and implementing the Poultry Management System. The methodologies discussed have laid the foundation for the successful collection and analysis of data, which will inform the development of an effective and efficient system that meets the needs of poultry farmers and stakeholders.ment of an effective and efficient system that meets the needs of poultry farmers and stakeholders.

Chapter Four: System Study, Analysis, and Design

4.1 Study of the Existing System

The existing poultry farm management system is a manual system that relies on paper-based records and manual data entry. The system is prone to errors, and data retrieval is time-consuming. During the research, I conducted interviews, and observations, and reviewed existing documents to gather data about the existing system.

4.1.1 Workflow for the Poultry Farm Management Processes

The existing system involves the following processes:

- Registration of new birds
- Vaccination and medication management
- Feeding and nutrition management
- Egg production and sales management
- Bird health monitoring and disease management
- Financial management and accounting
-

The use case diagram for these processes is shown in Figure 4.1.

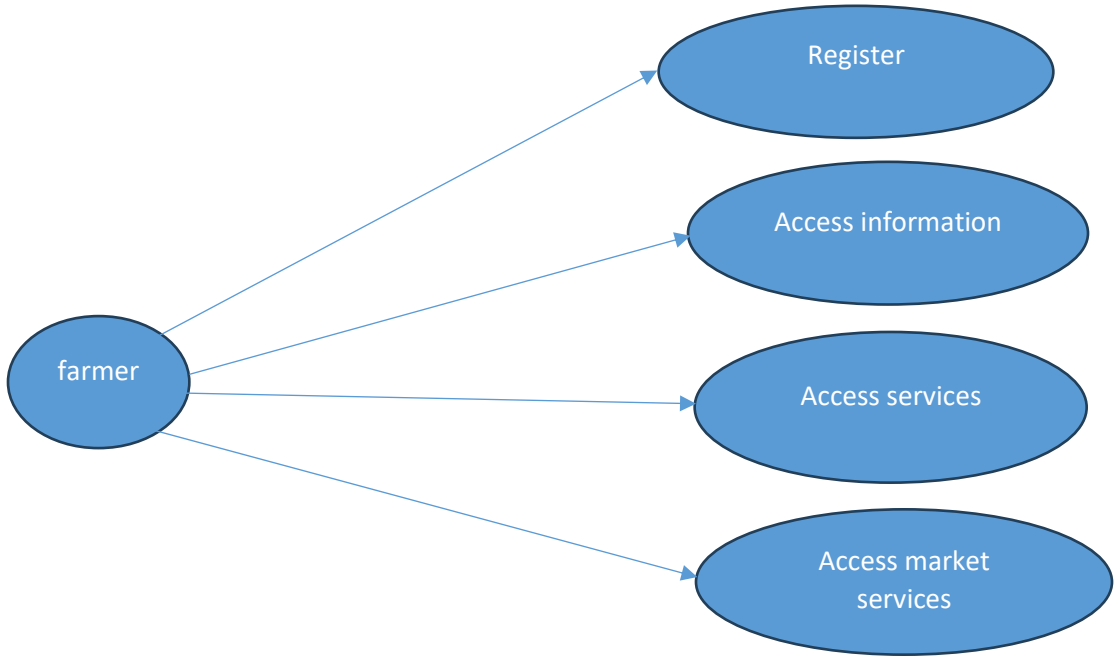
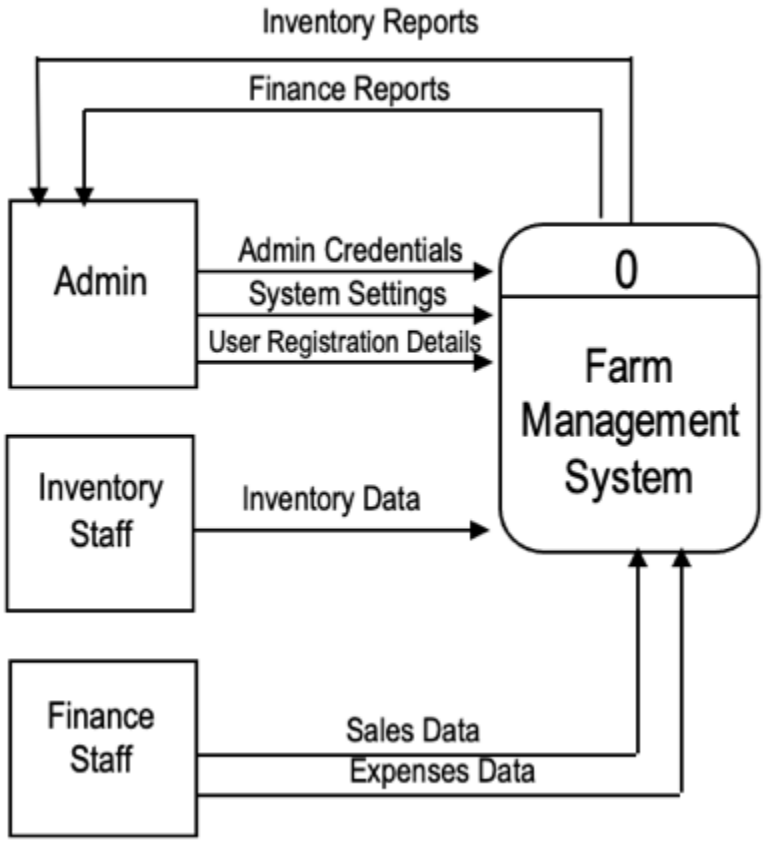


Figure 4.1: Flow chart for the poultry farm management system



4.1.2 Strengths of the Existing System

- The existing system allows for manual tracking of bird inventory and egg production.
- The system allows for manual recording of vaccination and medication schedules.
- The system allows for manual tracking of feeding and nutrition schedules.

4.1.3 Weaknesses of the Existing System

- The existing system is prone to errors and inaccuracies.
- Data retrieval is time-consuming and labor-intensive.
- The system does not provide real-time data and analytics.
- The system does not allow for automated reporting and decision-making.

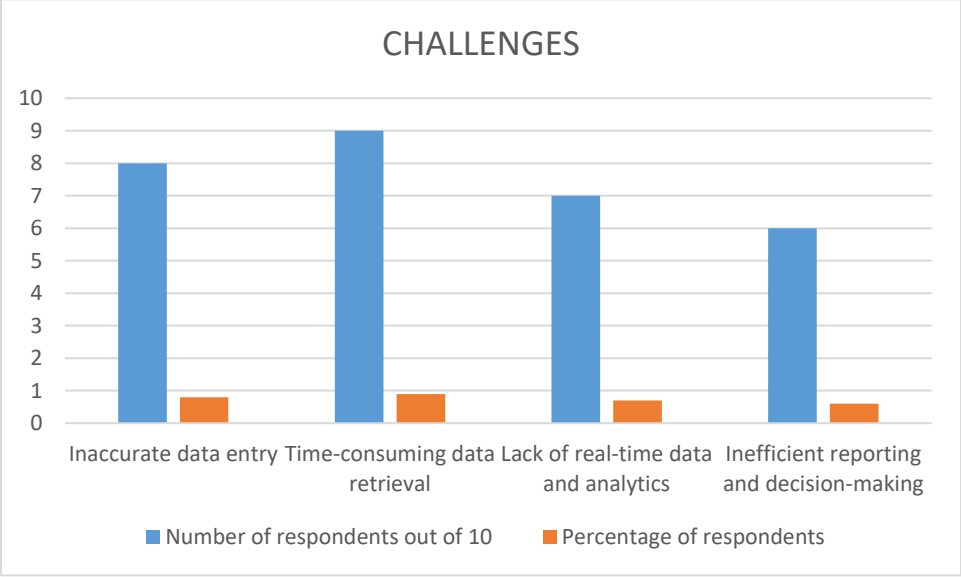
4.2 Data Analysis Results

I collected data through surveys, interviews, and observations to identify the challenges associated with the existing system. The results are shown in Table 1.

Table 1: Challenges associated with the existing system

Challenges	Number of respondents out of 10	Percentage of respondents
Inaccurate data entry	8	80%
Time-consuming data retrieval	9	90%
Lack of real-time data and analytics	7	70%
Inefficient reporting and decision-making	6	60%

4.2.2 The Graphical Representation of the Challenges faced by the current Elgon Agro poultry farm management system.



4.2.1 User Requirements

The user requirements for the poultry farm management system are:

- The system should provide accurate and real-time data and analytics.
- The system should allow for automated reporting and decision-making.
- The system should be user-friendly and easy to use.
- The system should provide secure data storage and retrieval.
- The system should authenticate users.

4.2.2 Functional Requirements

The functional requirements for the poultry farm management system are:

- The system should allow for automated bird inventory and egg stock tracking.
- The system should allow for automated recording of analytics on the bird and egg sales.
- The system should allow for automated tracking of farm expenses.
- The system should provide real-time data and analytics on the farm's total sales.

4.2.3 Non-Functional Requirements

The non-functional requirements for the poultry farm management system are:

- The system should be scalable and flexible to accommodate increasing data volumes.
- The system should provide secure data storage and retrieval.
- The system should be user-friendly and easy to use.
- The system should provide fast data processing and retrieval.

4.2.4 System Requirements

The system requirements for the poultry farm management system are:

- Hardware: The system should run on a server with a minimum of 4GB RAM and 80 GB of storage.

Table 1: Hardware requirements

Hardware component	System requirement	Justification
Processor	Intel Pentium IV or above	Pentium IV has the new technology (Hyper Threading) and the number of pins as well as cache memory has been increased.
Processor speed	800MHZ or above	This has enough speed, or clock rate to run the online financial transfer Management System.
Disk space	80 GB or above	This is enough disk space or storage size for the data stored in the database of the online financial transfer Management System.

- Software: The system should run on a Windows-based operating system with a MySQL database management system, and Apache server.
- Network: The system should have a secure and reliable network connection plus a local host initially.
- *Table 2: Software requirements*

Software Component	System Requirement	Justification

Operating System for the server	Windows NT or above	Windows NT adopts a new layered device-driver architecture that provides many advantages in terms of flexibility, maintainability, and portability.
The operating system for the client's PC	Windows XP	Windows XP can be used on personal computers, including home and business desktops, laptops, and media centers.
Web Server	Apache Web Server Version 1.3	This is a web server software notable for playing a key role in the initial growth of the World Wide Web.
Web Browser	Opera Mobile Emulator	It is the default browser shipped with Windows XP and is also made available for Windows NT 4.0.
Database Management System	MySQL server version 3:23.48	MySQL is an open-source relational database management system (RDBMS) that runs as a server providing multi-user access to several databases.

4.3 System Design

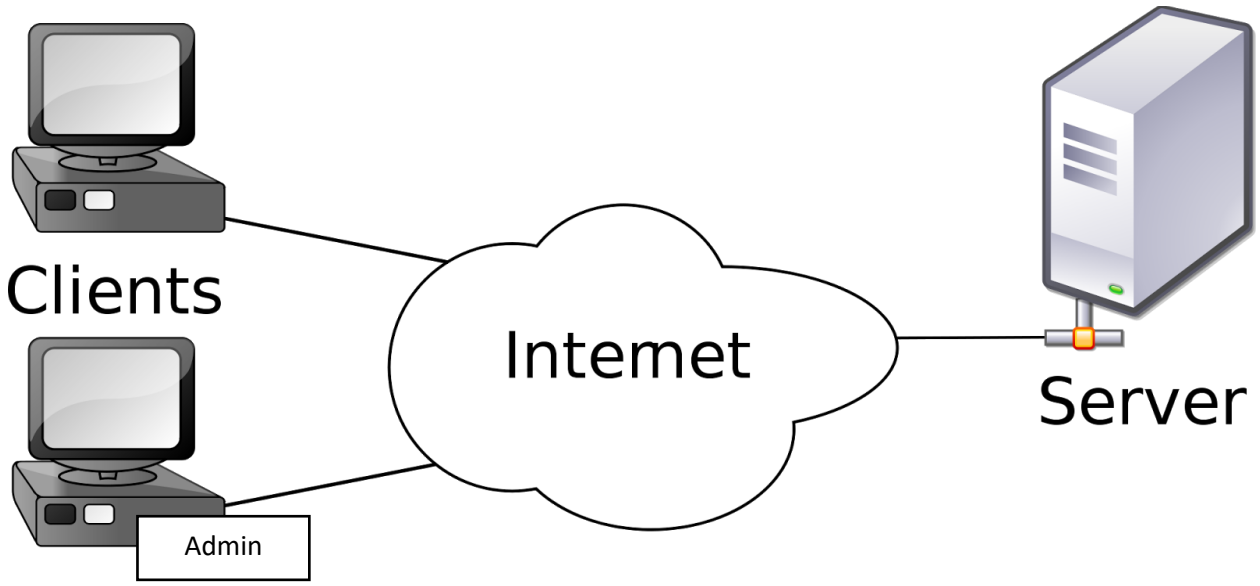
The system design for the poultry farm management system involves the following components:

- Data collection and storage
- Data processing and analysis
- Reporting and decision-making
- User interface and user experience
-
-
-

4.3.1 Architectural Design

The architectural design for the poultry farm management system is shown in Figure 4.2.

Figure 4.2: Architectural design for the poultry farm management system



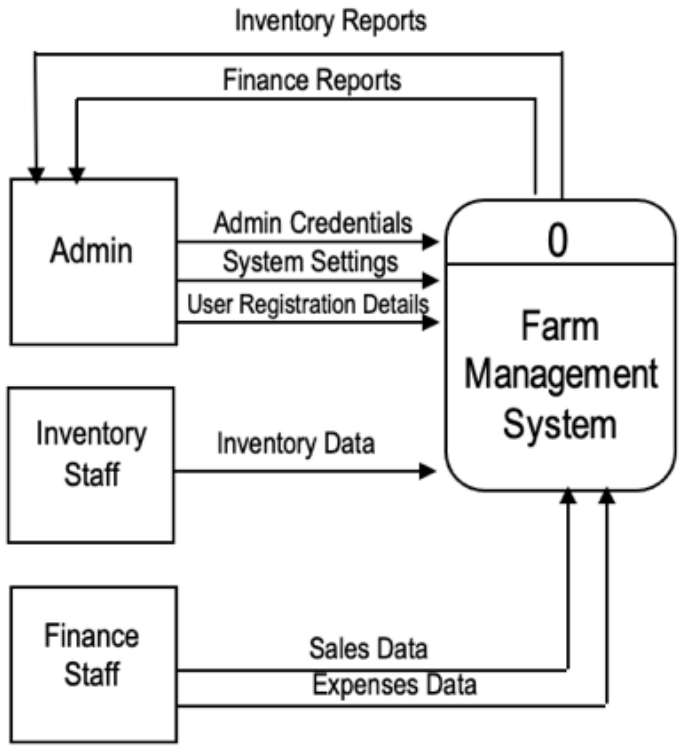
4.3.2 Process Modeling

The process modeling for the poultry farm management system involves the use of data flow diagrams (DFDs) to illustrate the flow of data through the system.

4.3.3 Data Flow Diagrams (DFDs)

The DFDs for the poultry farm management system are shown in Figures 4.3-4.5.

Figure 4.3: Context diagram for the poultry farm management system



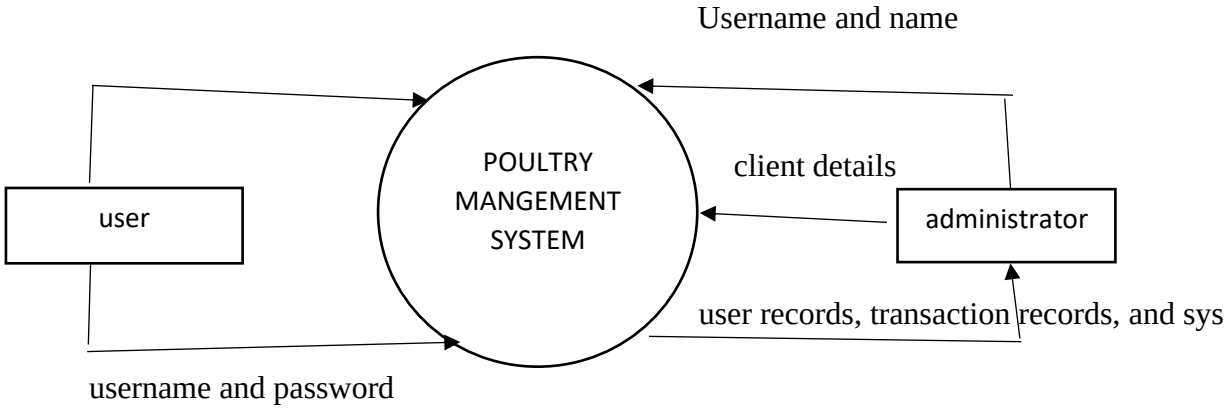


Figure 4.4: Level 1 DFD for the poultry farm management system

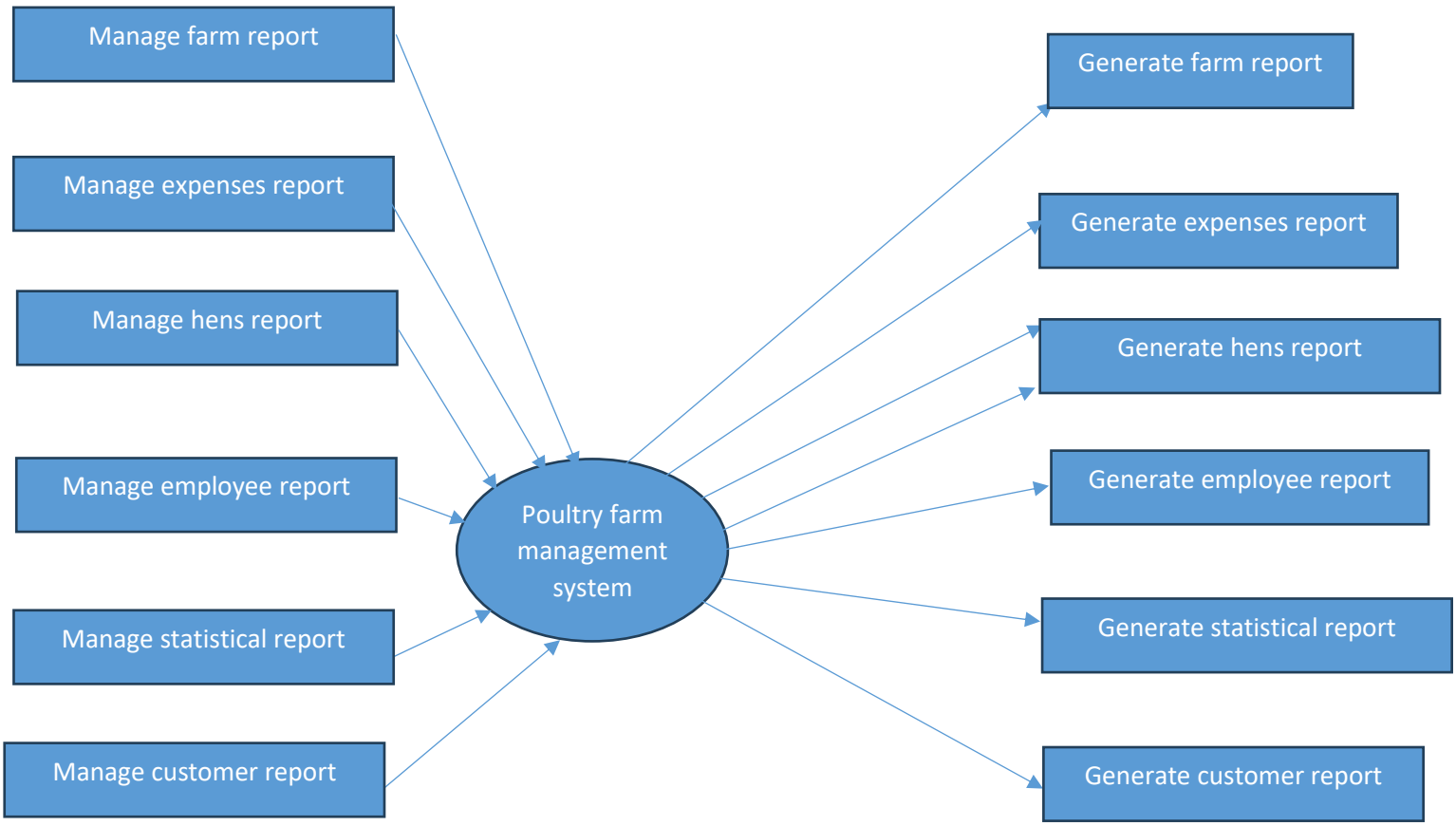
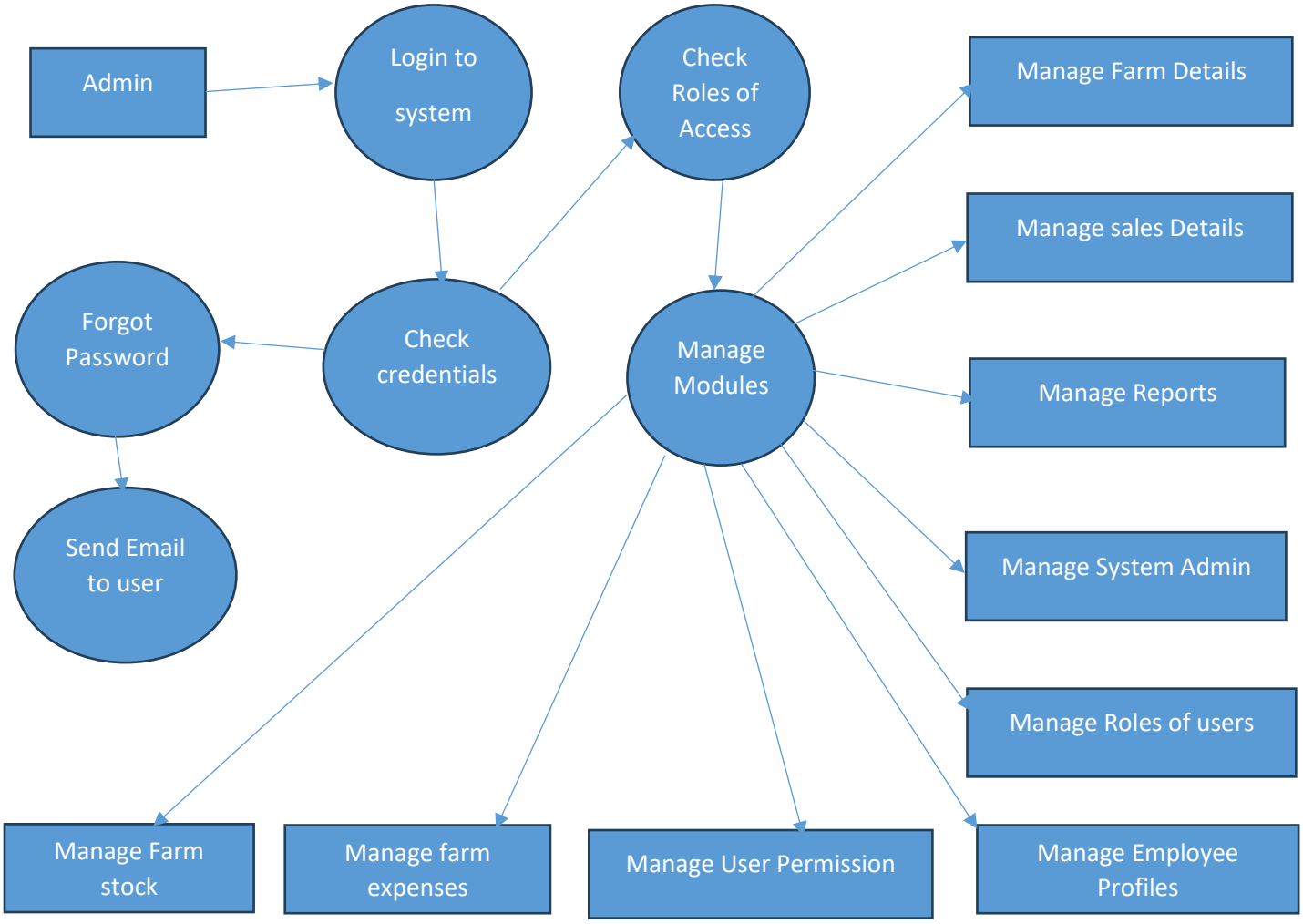


Figure 4.5: Level 2 DFD for the poultry farm management system.



4.3.5 Mapping of ERD to Relational Schema

Description of the Level 1 DFD

This subsection contains tables describing all the design objects used in developing the system. They include Processes, Data flows, Data stores, and External entities.

Description of Processes

Table 5: Description of Processes

Process	Description
Authentication Process	Verification of usernames and passwords of farm staff
Stock Management Process	Manages stock levels of poultry and supplies
Sales Process	Records sales of poultry and poultry products
Expense Management Process	Tracks and records farm expenses
Stock Replenishment Process	Automates stock replenishment based on minimum levels
Sales Reporting Process	Generates sales reports for management

Description of Data Stores

Table 6: Description of Data Stores

Data Store	Description
Staff Data	Store staff's passwords and usernames
Stock Data Store	Stores stock levels of poultry, feed, and supplies
Sales Data	Store sales records of poultry and poultry products
Expense Data	Stores farm expense records
Supplier Data	Stores supplier information for stock replenishment

Description of External Entities

Table 7: Description of External Entities

Entity	Description
Farm Staff	Manages stock, sales, and expenses
Supplier	Supplies poultry and supplies to the farm
Customer	Purchases poultry and poultry products from the farm
Bank	Handles farm financial transactions

Government Agency	Regulates and monitors farm activities

Identification of Entities and their Attributes

Table 8: Identification of Entities and their Attributes

Entity	Description	Attributes
Stock	Inventory of poultry, and supplies	stock_id, type, quantity, unit_price
Sales	Records of poultry and poultry product sales	sales_id, date, stock_id, quantity, total_amount
Expense	Records of farm expenses	expense_id, date, type, amount
Supplier	Information of suppliers	supplier_id, name, address, contact
Customer	Information of customers	customer_id, name, address, contact
Bank Transaction	Records of farm financial transactions	transaction_id, date, type, amount

4.3.5 Modeling Relationships between Entities

Entity	Description	Attributes
stock	Refers to the total products of the farm	Id, date, product name, quantity, rate, total
Sales	Products sold out	Id, Product_name, Product pricing, Unit pricing, quantity, action, Date time, Total sales, Overall sales
expenses	Costs incured	1d, Name, Email, Phone, Product, Quantity, delivery, message, Created at
categories	Types products sold on the farm	Id, category, code, Posting_date
products	Actual product names sold on the farm	id pk, products, product_name , product_category fk,

		product_price
orders	Request made by customers	Id, name, email, phone, ,product, Quantity, Delivery, Message, created_at
invoices	Receipt for customer payment in relation to the orders	id pk, invoice number , customer name , customer number, payment mode, payment date, posting date,

Figure 4.6: Relationship between Farm and Stock. The farm consists of stocks which is obtained from one or more sources

Figure 4.7: Relationship between Farm and Sale Request made by customers

These can be one or more requests and bookings

Figure 4.8: Relationship between Farm and Customer A farm can have one or more customers, and a customer can purchase from one or more farms.

Figure 4.9: Relationship between Farm and Supplier A farm may have one or more suppliers, and a supplier can supply to one or more farms.

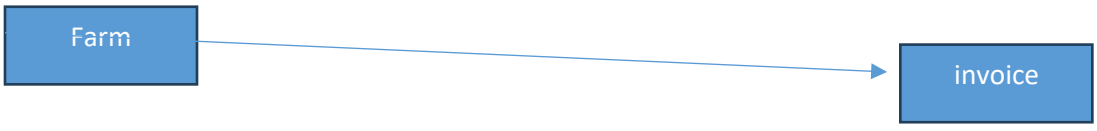
Figure 4.10: Relationship between Farm and Expense A farm incurs one or more expenses, and one and only one expense is associated with a farm.

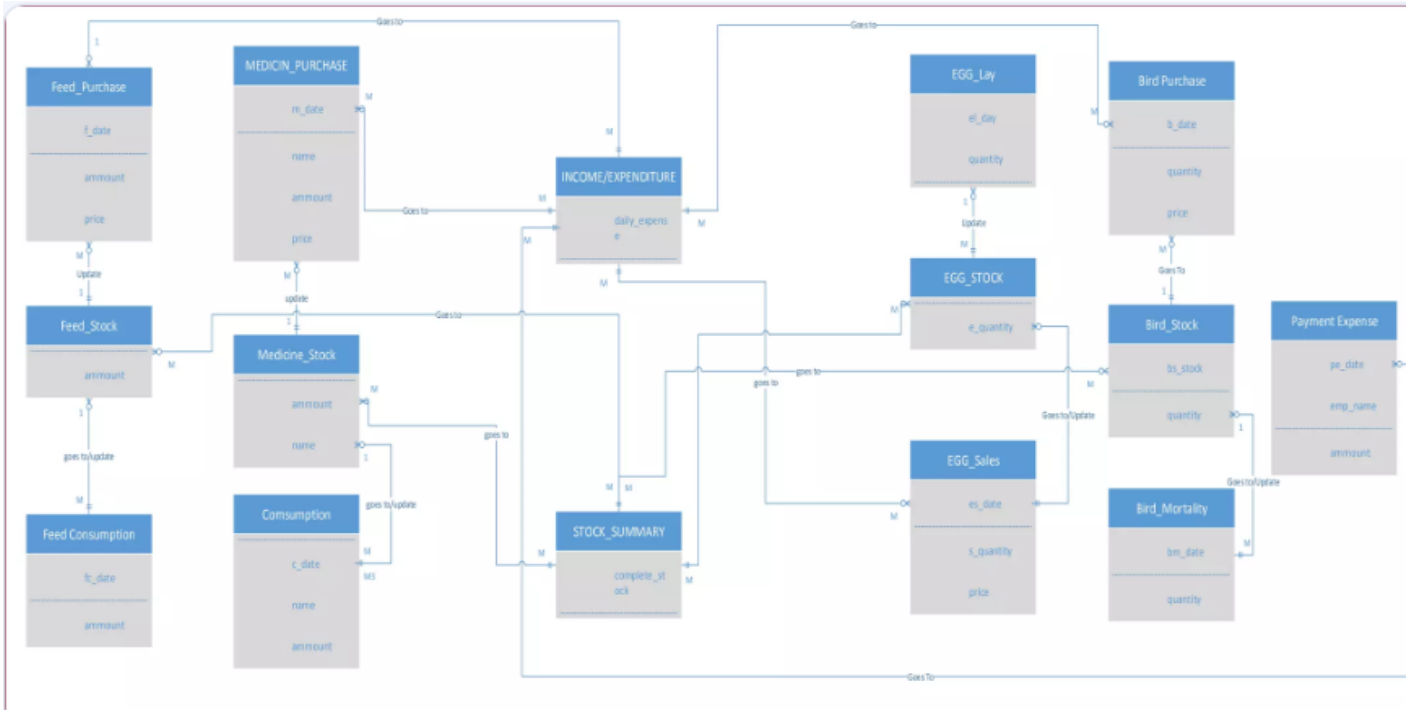
Figure 4.11: Relationship between Farm and Expense A farm has the category types of all the commodities they sale and have on the farm.

Figure 4.12: Relationship between Farm and products A farm keep tracks of all the products they sale this can be one or more.

Figure 4.13: Relationship between Farm and orders. A farm attains orders from customers and provides services to them accordingly. These can be one or more.

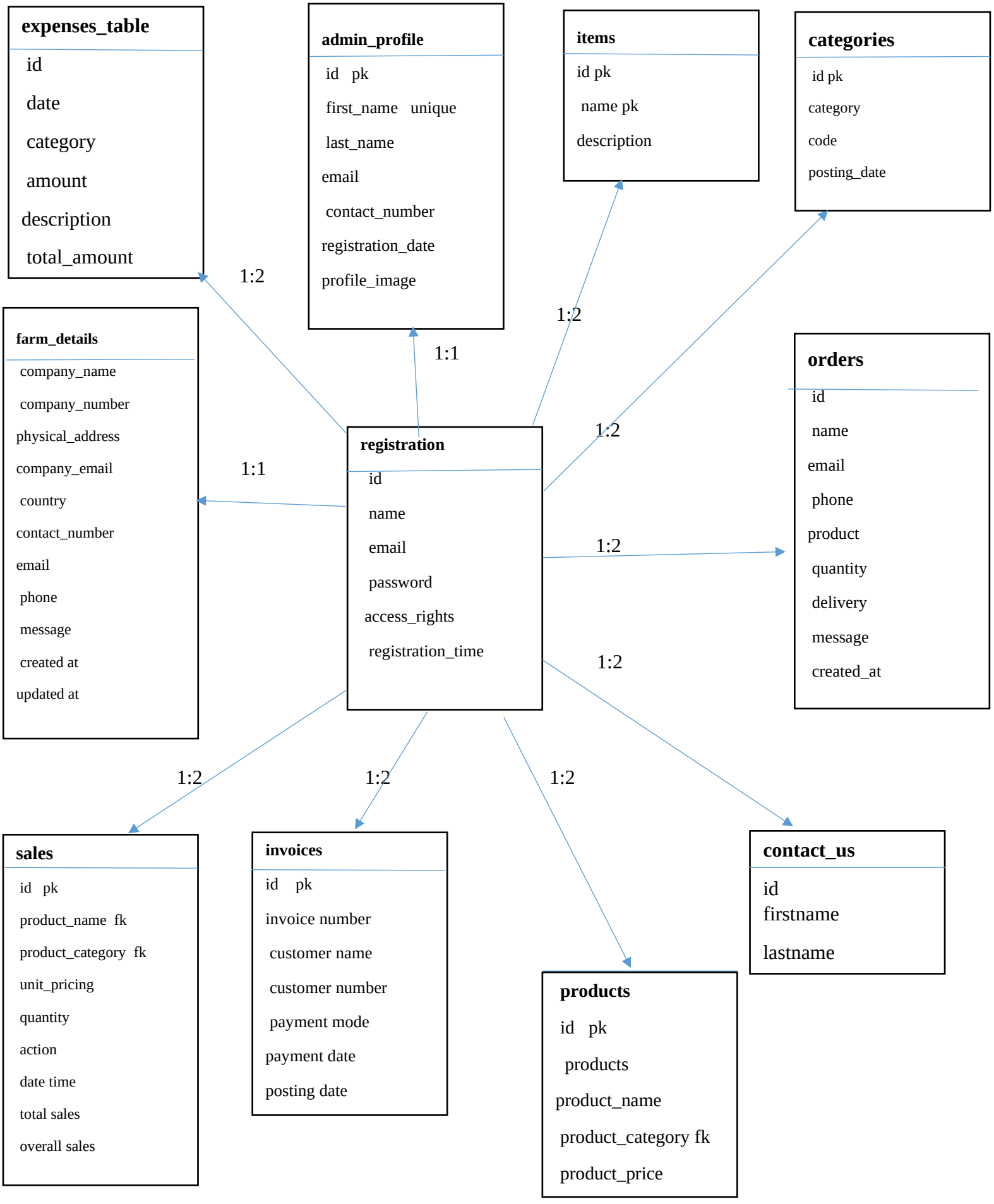
Figure 4.14: Relationship between Farm and Invoices A farm saves all the invoices of clients who have purchase commodities and provides them with invoices receipts for confirmation.





4.3.4 Entity Relationship Diagram (ERD)

The ERD for the elgon agro poultry farm management system is shown in Figure 4.6.


expenses_table
id
date
category
amount
description
total_amount
admin_profile
id pk
first_name unique
last_name
email
contact_number
registration_date
profile_image
items
id pk
name pk
description
categories
id pk
category
code
posting_date
farm_details
company_name
company_number
physical_address
company_email
country
contact_number
email
phone
message
created at
updated at
registration
id
name
email
password
access_rights
registration_time
orders
id
name
email
phone
product
quantity
delivery
message
created_at
1:2
1:1
1:2
1:1
1:2
1:2
1:2
1:2
1:2
sales
id pk
product_name fk
product_category fk
unit_pricing
quantity
action
date time
total sales
overall sales
invoices
id pk
invoice number
customer name
customer number
payment mode
payment date
posting date
products
id pk
products
product_name
product_category fk
product_price
contact_us
id
firstname
lastname

4.3.5 Mapping of ERD to Relational Schema

Table 4.1: categories Table

Field Name	Data Type	Constraint
id	int(11)	Primary Key, Not null
category	varchar(255)	Not null
code	varchar(255)	Not null
Posting_date	date(5,2)	Not null

Table 4.2: products Table

Field Name	Data Type	Constraint
id	int(16)	Primary Key, Not null
Product_name	varchar(255)	Not null
Product category	Varchar(255)	Not null
Product price	decimal(10,2)	Not null
Posting date	date	Not null

Table 4.3: stock register Table

Field name	Type	Constraints
id	Int(11)	Primary key, Not null
date	date	Not null
Product_name	Varchar(255)	Not null
quantity	Int(11)	Not null
rate	Decimal(10,2)	Not null
Total stock	Int(255)	Not null

Table 4.4: Sales Table

Field name	Type	Constraints
id	Int(11)	Primary key, Not null
Product_name	Varchar(255)	Not null

Product pricing	Varchar(255)	Not null
Unit pricing	Decimal(10,2)	Not null
quantity	Int(11)	Not null
action	Varchar(255)	Not null
Date time	Date time	Not null
Total sales	Decimal(10,2)	Not null
Overall sales	Decimal(10,2)	Not null

Table 4.5: Invoice Table

Field name	Type	Constraints
id	Int(11)	Primary key Not null
Invoice number	Varchar(10)	Not null
customer name	Varchar(50)	Not null
Customer number	Varchar(20)	Not null
Payment mode	Varchar(20)	Not null
Payment date	date	Not null

Table 4.6: items Table

Field name	Type	Constraints
id	Int(11)	Primary key Not null
name	Varchar(255)	Not null
description	text	Not null

Table 4.7: orders Table

Field name	Type	Constraints
1d	Int(11)	Primary key Not null
name	Varchar(50)	Not null
email	Varchar(100)	Not null
phone	Varchar(20)	Not null
product	Varchar(50)	Not null
quantity	Int(11)	Not null
delivery	Varchar(50)	Not null
message	text	Not null
Created at	timestamp	Not null

Table 4.8: expenses Table

Field name	Type	Constraints
id	Int(11)	Primary key Not null
date	date	Not null
category	Varchar(255)	Not null

amount	Decimal(10,2)	Not null
description	text	Not null
Total _amount	Decimal(10,2)	Not null

4.4 Conclusion

In summary, this chapter has presented the study of the existing poultry farm management system, analysis of the requirements for the system, process and data modeling, and system design. The system design includes the architectural design, process modeling, data flow diagrams, entity relationship diagrams, and mapping of ERD to relational schema. The system requirements include hardware, software, and network requirements. The system is designed to provide accurate and real-time data and analytics, automated reporting and decision-making, and secure data storage and retrieval.

Chapter Five: System Implementation, Testing, and Validation

This chapter describes the implementation of the design models of the Poultry Farm Management System, which focuses on sales, expenses, stock management, and accountability. The system provides a comprehensive solution for managing the day-to-day activities of a poultry farm, ensuring efficient operations and accurate record-keeping.

5.1 System Functions

The Poultry Farm Management System provides the following functions to its users:

5.1.1 Functions provided to all users

- Authentication and security: Users are prompted to enter their usernames and passwords to access the system services.
- Viewing of sales, expenses, and stock reports: Users can view reports on sales, expenses, and stock levels to stay informed about the farm's performance.

5.1.2 Functions provided to farm owners

- Viewing of financial reports: Farm owners can view detailed financial reports, including income statements, balance sheets, and cash flow statements.
- Online queries: Farm owners can perform online queries about their farm's performance, including sales, expenses, and stock levels.

5.1.3 Functions provided to farm workers

- Data entry: Farm workers can enter data on sales, expenses, and stock movements, ensuring accurate and up-to-date records.
- Viewing of stock levels: Farm workers can view current stock levels, enabling them to make informed decisions about inventory management.

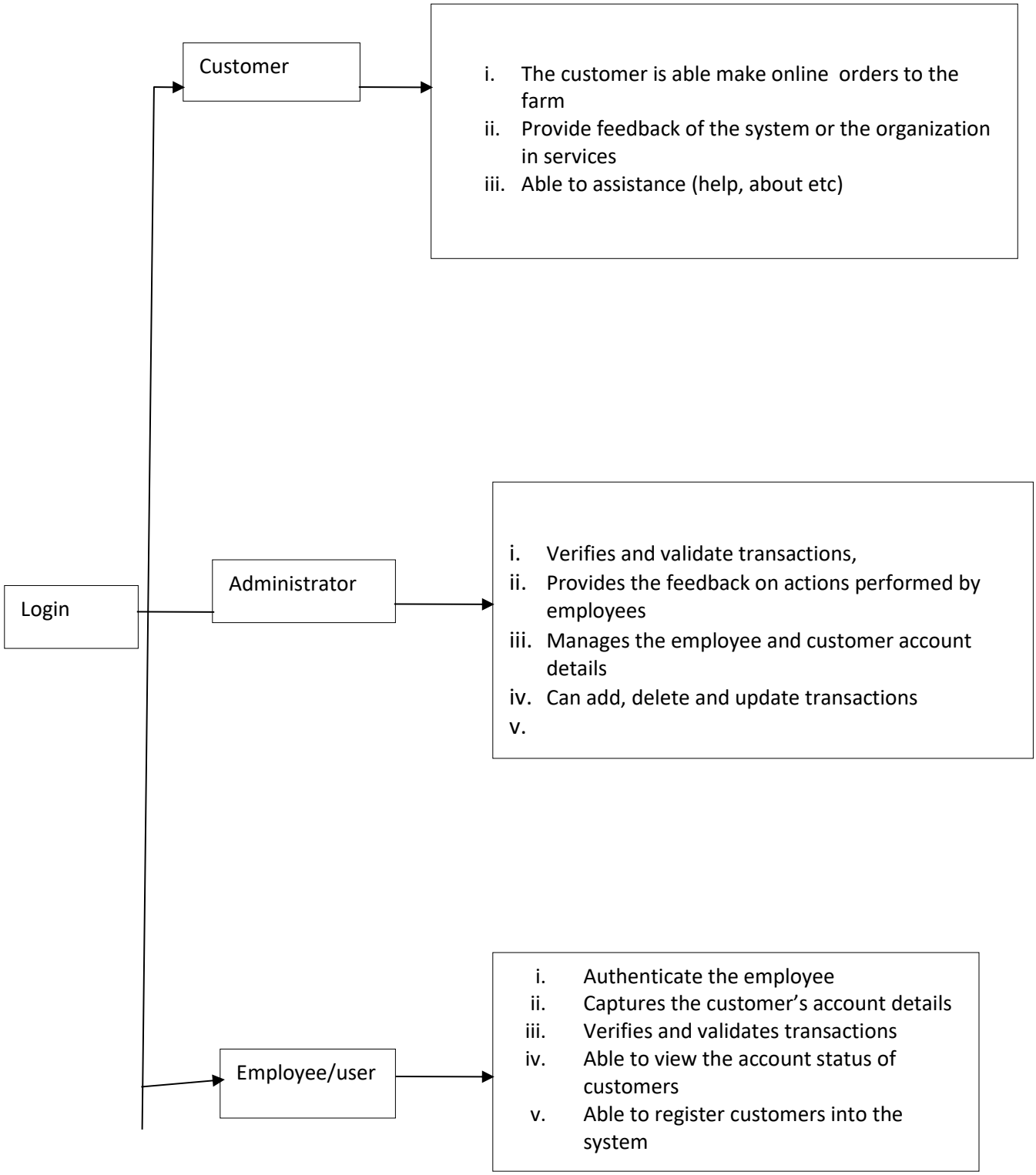
5.1.4 Functions provided to the manager/administrator

- System administration: The manager can manage user accounts, configure system settings, and perform backups and restores.
- Sales and expenses management: The manager can manage sales and expenses, including creating invoices, tracking payments, and recording expenses.
- Stock management: The manager can manage stock levels, including tracking inventory movements, monitoring stock levels, and optimizing inventory levels.

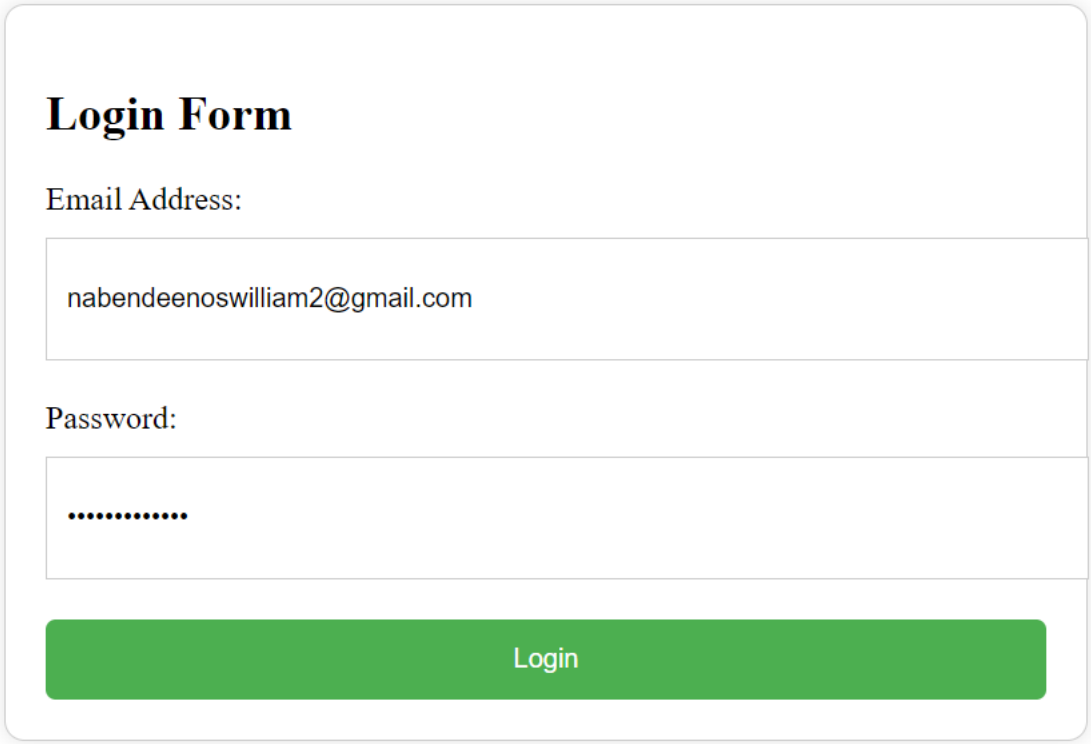
- Accountability: The manager can track and monitor all transactions, ensuring accountability and transparency in the farm's operations.

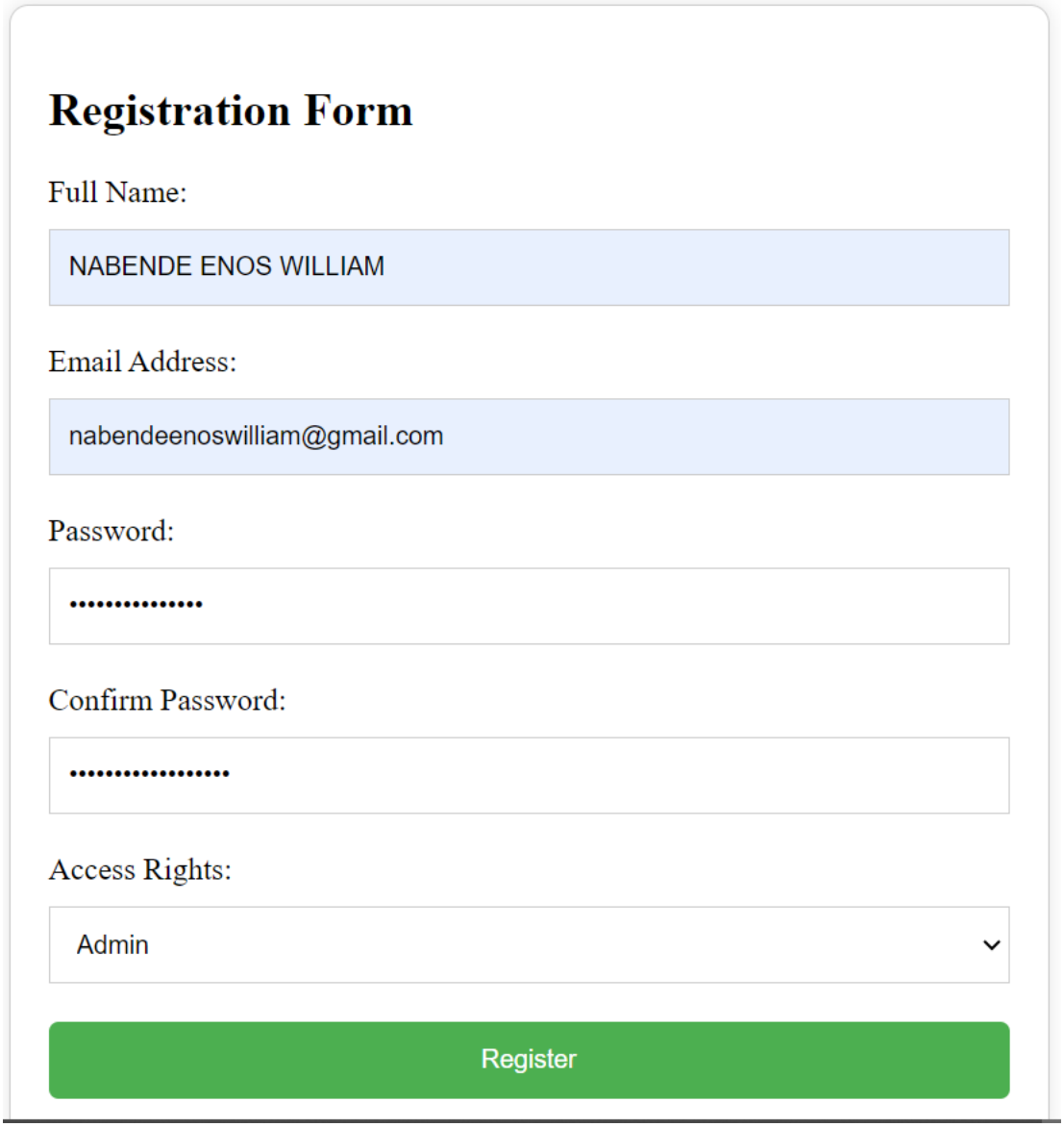
5.2 System Map

Figure 5.1: System Map showing functions provided by the system to each user



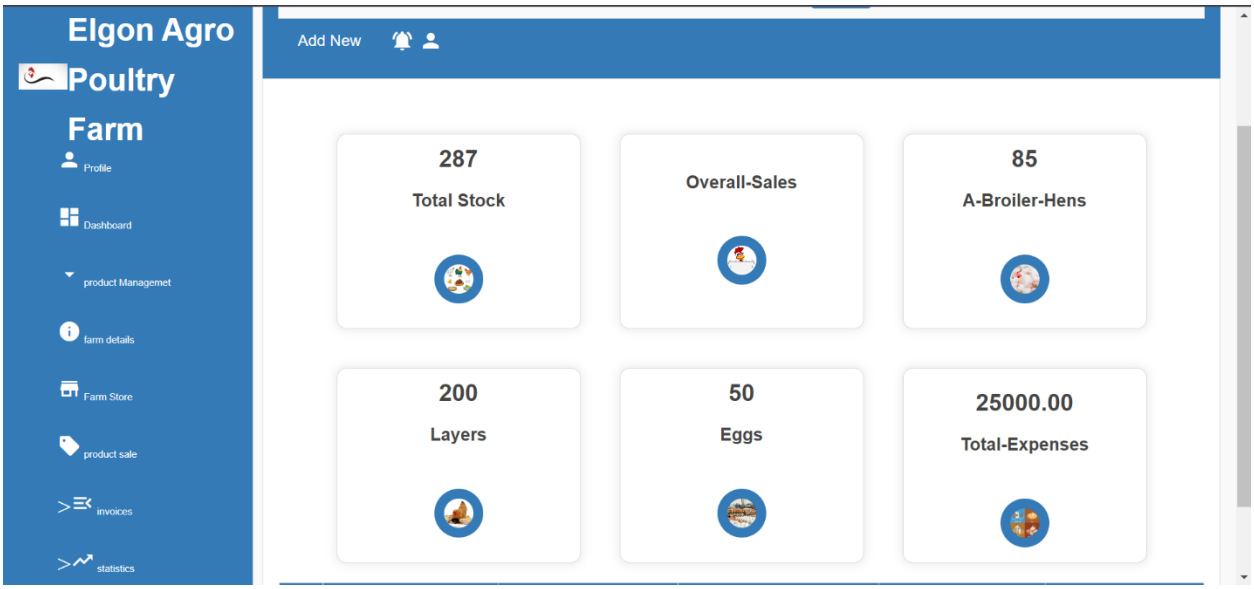
5.3 Sample Screenshots





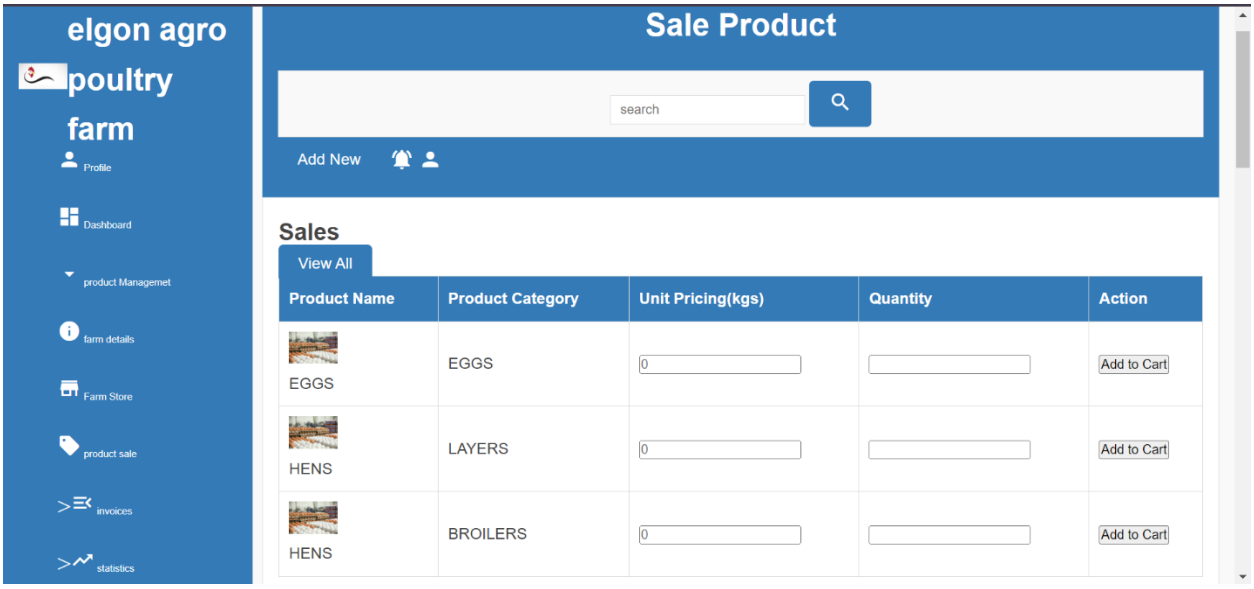
5.3.1 System home page

Figure 5.2: Shows the homepage that allows all farm officials to login into the system in order to access their pages and perform their tasks.



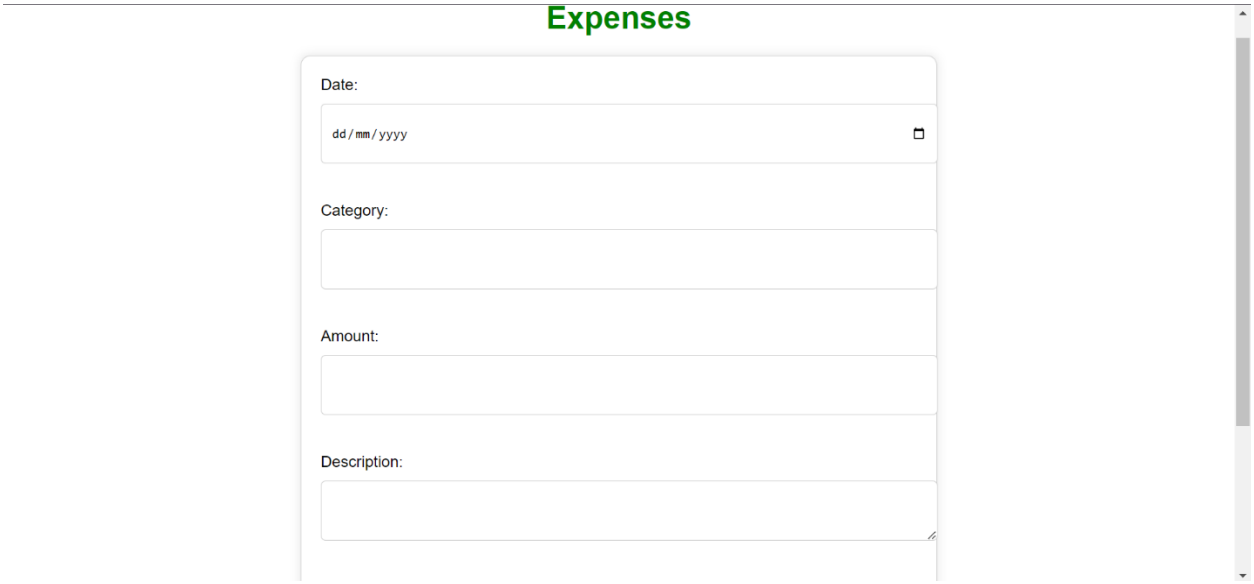
5.3.2 Sales entry page

Figure 5.3: Shows the sales entry page where farm workers can enter sales data, including date, quantity, and price.



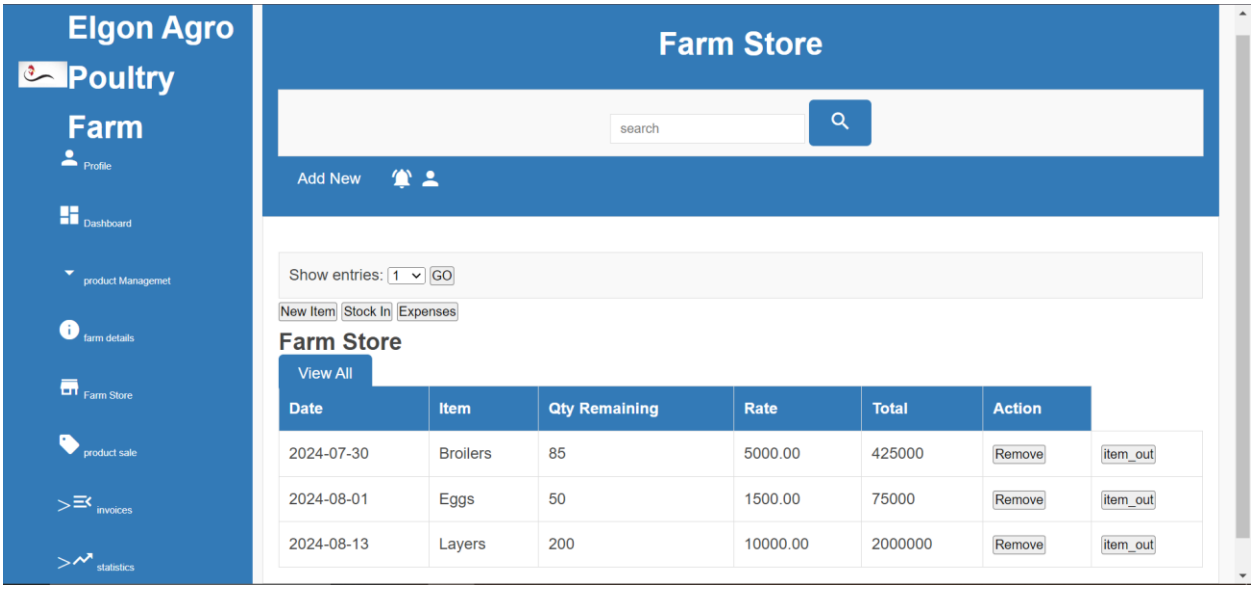
5.3.3 Expenses entry page

Figure 5.4: Shows the expenses entry page where farm workers can enter expense data, including date, category, and amount.



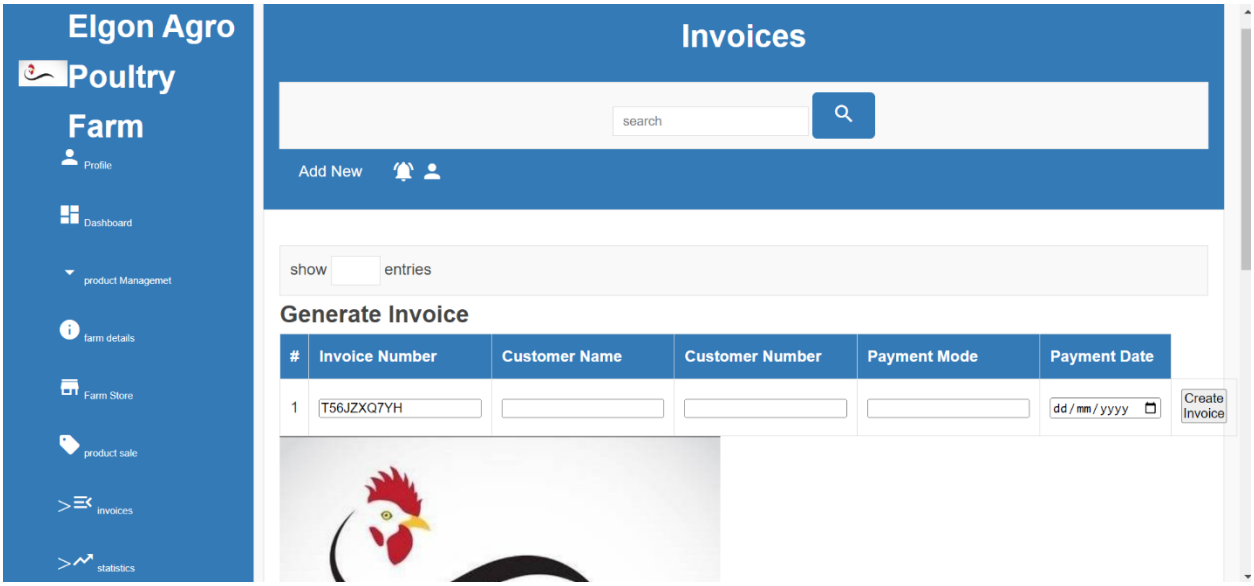
5.3.4 Stock management page

Figure 5.5: Shows the stock management page where the manager can view current stock levels, track inventory movements, and optimize inventory levels.



5.3.5 Financial reports page

Figure 5.6: Shows the financial reports page where farm owners can view detailed financial reports, including income statements, balance sheets, and cash flow statements.



5.4 System Testing and Validation Results

I carried out system testing to identify errors and ensure that the system behaves as expected. We also performed system validation to ensure that the system meets the defined user needs and requirements.

5.4.1 System Testing Results

The Poultry Farm Management System was tested to identify errors and ensure that it behaves as expected. The faults were corrected, and the process was repeated until the system was proven to be working according to users' specifications and performance requirements.

5.4.2 Validation Results

The Poultry Farm Management System was presented to different users to gather feedback about the system's performance and whether it meets their needs and user requirements. The process involved checking the input and output data of the system to ensure that they are complete and accurate, especially in the area of database management.

5.5 Conclusion

In summary, this chapter described the system functions provided to all users, including farm owners, farm workers, and managers or administrators, and the various screenshots used in the system. Testing and validation were performed to ensure that the system is error-free and meets the specified user requirements. The Poultry Farm Management System provides a comprehensive solution for managing the day-to-day activities of a poultry farm, ensuring efficient operations and accurate record-keeping.

Chapter Six:

Summary, Recommendations, and Conclusion

6.1 Summary

The Poultry Farm Management System has successfully achieved its objectives, providing a comprehensive solution for managing sales, expenses, stock management, and accountability. The system automates the manual processes, enabling farm owners to view sales reports, expenses, and stock levels online. The system ensures accountability and transparency in the farm's operations, with the administrator having overall privileges.

6.2 Recommendations

Further research is recommended to address any weaknesses in the system and to adapt to the evolving needs of poultry farms. The development of similar systems for other poultry farms in the country is also recommended, to enable them to transition from manual systems to online management of sales, expenses, and stock.

6.3 Future Work

The system can be extended to include the following features:

i. Integration with accounting software to provide a comprehensive financial management solution.
ii. ii. Development of a mobile application to enable farm owners and workers to access the system on the go.
iii. iii. Implementation of data analytics to provide insights on sales trends, expense patterns, and stock optimization.

6.4 Conclusion

The Poultry Farm Management System has successfully achieved its objectives, providing a robust solution for managing sales, expenses, stock management, and accountability. The system's strengths lie in its ability to provide accurate and timely information, enabling farm owners to make informed decisions. The system's online platform ensures transparency and accountability in the farm's operations, making it an essential tool for poultry farm management.

References

Books

1. Boz, I., & Erdem, H. (2012). *Poultry Management: A Complete Guide for the Poultry Farmer*. Springer.

   Provides a comprehensive overview of poultry farm management, including systems for tracking inventory, sales, and expenses.

2. Kumar, P., & Sinha, R. (2019). *Modern Poultry Management: Techniques and Strategies*. Wiley.

   Discusses contemporary methods and strategies for managing poultry farms effectively, including technological advancements.

Journal Articles

3. Chen, Y., & Zhang, L. (2017). "Design and Implementation of an Integrated Poultry Management System." *Journal of Agricultural Informatics*, 8(3), 45-58.

   Explores the design and implementation of integrated management systems in poultry farming.

4. Ghosh, R., & Singh, P. (2020). "Automated Systems in Poultry Farming: A Review." *International Journal of Poultry Science*, 19(4), 212-225.

   Reviews the use of automated systems in poultry farms and their impact on management efficiency.

Conference Papers

5. Jain, S., & Sharma, M. (2018). “Development of a Web-Based Poultry Farm Management System.” In *Proceedings of the International Conference on Agricultural Engineering and Technology*. IEEE.

   Presents a case study on the development of a web-based system for poultry farm management.

6. Khan, A., & Ali, M. (2021). “Real-Time Data Analytics in Poultry Farm Management: A New Approach.” In *Proceedings of the Annual Conference on Agricultural Technology*. ACM.

   Discusses the integration of real-time data analytics in poultry management systems.

Standards and Guidelines

7. ISO 9001:2015. *Quality Management Systems – Requirements*. International Organization for Standardization.

   Provides guidelines on quality management systems that can be applied to developing poultry farm management systems.

8. FAO (2015). *Poultry Production and the Environment: Proceedings of a Workshop*. Food and Agriculture Organization.

   Offers insights into best practices in poultry production and management with an emphasis on environmental considerations.

Online Resources

9. Poultry Hub. (2024). “Best Practices for Poultry Farm Management.” Retrieved from PoultryHub.com.

   Online resource providing best practices and case studies in poultry farm management.

10. TechTarget. (2024). “Understanding Data Flow Diagrams for System Design.” Retrieved from TechTarget.com.

    Provides a detailed explanation of data flow diagrams, useful for understanding system design and modeling.

Software Documentation

11. MySQL Documentation. (2024). *MySQL Reference Manual*. Oracle Corporation.

Offers comprehensive documentation on MySQL, which is essential for understanding the database management aspect of the system.

12. Apache Software Foundation. (2024). *Apache HTTP Server Documentation*. Apache Software Foundation.

    Provides guidelines and documentation for the Apache server used in the system's architecture.

Appendices

Appendix I: Interview Schedule Sample Questions

General Information:

Can you describe your role and responsibilities at the poultry farm?

How long have you been using the current poultry farm management system?

Current System Usage:

What specific tasks do you perform using the existing manual system?

How do you handle data entry and retrieval with the current system?

Strengths and Weaknesses:

What do you consider to be the main strengths of the current system?

What challenges or difficulties have you encountered with the current system?

Data Management:

How do you track and manage bird inventory, vaccination schedules, and egg production?

How do you record and retrieve data on feeding, health monitoring, and financial transactions?

User Experience:

How easy is it to use the current system for your tasks?

Are there any specific features or functions you feel are missing or could be improved?

Requirements and Expectations:

What improvements would you like to see in a new system?

How important is real-time data and automated reporting to your daily operations?

Future Considerations:

Are there any additional features or functionalities that you would find beneficial in a new system?

How do you envision the new system enhancing your workflow and efficiency?

Appendix II: Questionnaires

General Information:

Name:

Position:

Duration with the company:

Current System Evaluation:

Rate the ease of use of the current system (1-5):

Rate the accuracy of data entry (1-5):

Rate the efficiency of data retrieval (1-5):

Are there any specific features you find useful? (Yes/No) If yes, please specify:

Challenges:

What are the most common issues you face with the current system? (Select all that apply)

Data inaccuracies

Time-consuming data retrieval

Lack of real-time data

Difficulties in reporting

Other (please specify):

Requirements for New System:

What features would you like in the new system? (Select all that apply)

Real-time data and analytics

Automated reporting

User-friendly interface

Secure data storage

Other (please specify):

Feedback:

Any additional comments or suggestions for improving the system?

Appendix III: The System Validation Questionnaire

User Satisfaction:

How satisfied are you with the new system's performance? (Very Satisfied / Satisfied / Neutral / Dissatisfied / Very Dissatisfied)

Does the new system meet your needs? (Yes/No) If no, please specify:

Functionality:

Are all the required features functioning as expected? (Yes/No) If no, please list the issues:

How would you rate the accuracy of the data provided by the system? (1-5):

Usability:

How easy is it to navigate the new system? (1-5):

Have you experienced any difficulties using the system? (Yes/No) If yes, please describe:

Data Handling:

Is the data entry process more efficient than before? (Yes/No)

Is data retrieval faster and more reliable with the new system? (Yes/No)

Reporting:

Are the reports generated by the system accurate and useful? (Yes/No)

How would you rate the new system's reporting capabilities? (1-5):

Overall Experience:

How would you rate your overall experience with the new system? (1-5):

Any additional comments or suggestions for improvement?

Appendix IV: Pseudocode

Pseudo code for administrator

Start;

Customer enters username and Password

If username or Password is invalid return an error Message

Else

Access the admin account

Pseudo code for an Employee

Start;

If employee enters a username and password;

If the username or password is invalid return an error Message

Else

Return customer registration page

Employee enters customer details for the new account

If the customer is already holding an account, return the deposit page

Else

Accesses the user account.