

**KABARAK UNIVERSITY**

**SCHOOL OF COMPUTER SCIENCE AND BIOINFORMATICS**

**RESEARCH PROPOSAL**

**TOPIC:**

**FISH FARMING MANAGEMENT SYSTEM**

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**REG NO: CS/MG/2965/09/19**

A research proposal submitted to the institute of undergraduate studies and research for partial fulfilment of the requirements for the Degree in Computer Science

**February 2024**

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# **DECLARATION**

I hereby declare that this project is my original work based on my creativity and research and that it has never been submitted for any academic award in any learning institution.

NAME: JESSE JACKSON ODHIAMBO

REG NO: CS/MG/2965/09/19

SIGNATURE: ………………………………. DATE: …………………………...

# **RECOMMENDATION**

The entitled project is presented under my supervisor.

NAME: DR . ANDREW KIPKEBUT

DEPARTMENT OF COMPUTER SCIENCE AND IT

SIGNATURE: …………………………….. DATE: ……………………………………

# **DEDICATION**

I thank God for his help and guidance without which this project would not have been possible. I owe my mother for her support, especially financially. Friends Shadrack and Martin for their care and my course mates who turned to guide me through the process, encouragement and support have been the key factors in any achievement I have made.

# **ACKNOWLEDGEMENT**

I am grateful to my supervisor Dr.Andrew Kipkebut for his expert knowledge, excellent supervision and most of all motivation and support. I am also grateful to my lecturers for their expertise during course work interaction. Furthermore, I take this opportunity to thank all the students who gave insights and guidance towards this project.

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# **ABSTRACT**

This research project aims to develop a cutting-edge Fish Farming Management System tailored to the unique needs of fishermen operating along the shores of Lake Victoria. The proposed system will encompass a range of functionalism, streamlining the entire fishing process from breeding and harvesting to storage and sales of both fish and fish products.

Growing up in the Lakeside community and actively participating in fishing activities has provided first hand insight into the challenges faced by fishermen in efficiently managing their operations. The current lack of a robust and tailored management system has led to inefficiencies in crucial aspects of the fishing industry, hindering the overall productivity and economic sustainability of the communities dependent on fishing as a primary economic activity. This research project aims to address these challenges by leveraging technology to create a user-friendly and comprehensive management system. The system will incorporate features such as real-time monitoring of fish stocks, automated breeding and harvesting schedules, efficient storage solutions, and a streamlined sales and distribution module. By providing an integrated platform, the proposed system intends to empower fishermen with the tools necessary to optimize their operations, enhance productivity, and maximize economic returns. The significance of this project extends beyond the shores of Lake Victoria, as the developed Fish Farming Management System can serve as a model solution for regions globally engaged in fishing activities. The proposed system aligns with the broader goal of fostering sustainable fisheries management, contributing to economic development, and improving the livelihoods of communities dependent on the fishing industry.

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# **CHAPTER 1**

# **INTRODUCTION**

## **1.0 Introduction**

In this introductory chapter, we delve into the background of this study, whereby it lays down the problem statement of this study and taking note of challenges fishermen face while practising fishing along the shores of Lake Victoria. It also identifies the knowledge gaps that evolve from a global perspective down till the Kenyan context. This chapter also outlines the objectives of this study from the main to the very specific objectives forming research questions that are in line with the objectives. Additionally, this chapter makes clear the scope of the study, the limitations faced and the significance or justification of the study to address the various challenges faced by fishermen along the shores of Lake Victoria, setting the stage for a comprehensive exploration of the proposed Fish Farming Management System.

## **1.1Background of the study**

The Lake Victoria region stands as a vital hub for fishing activities, providing sustenance and livelihoods to countless communities. However, the inefficiencies in the current fish farming practices present substantial challenges. Having been an active participant in these activities, I have personally witnessed the struggles faced by fishermen in managing the entire process – from breeding and harvesting to storage and sales.

These challenges include inadequate breeding practices, sub-optimal harvesting methods, and deficiencies in storage and sales processes. The existing systems fall short in addressing the unique dynamics of the fishing industry, leading to operational bottlenecks and hindered economic growth in the Lakeside communities. The need for a comprehensive Fish Farming Management System becomes apparent, seeking to streamline and optimize these processes for greater efficiency and sustainability.

This research project aims to bridge the existing gaps by developing a tailored management system, specifically designed to meet the demands of the Lake Victoria fishing community. By addressing the intricacies of fish farming through technology and strategic management, this study aspires to contribute not only to the local context but also serve as a blueprint for enhancing fishing practices in similar regions globally. Through an exploration of the current literature and a critical analysis of the challenges at hand, this background sets the foundation for a focused investigation into the development and implementation of an innovative Fish Farming Management System.

## **1.2 Statement of the problem**

The fishing communities along the Lake Victoria shores confront a host of challenges that impede the seamless operation of fish farming activities, forming the core of the imperative to develop a Fish Farming Management System. These challenges, discerned through personal experience and observation, underscore the pressing need for intervention.

One of the primary issues lies in the realm of breeding practices, where existing methods lack optimization, resulting in diminished yields and an unsustainable fish population. Additionally, suboptimal harvesting techniques contribute to unnecessary waste and inefficiencies, compromising the economic viability of fishing operations. Inadequate storage facilities further exacerbate the problem, leading to post-harvest losses that impact the quality and market value of the fish and fish products. The absence of a cohesive sales and marketing strategy further restricts fishermens’ ability to maximize profits and access broader markets. Moreover, a conspicuous absence of technological integration hampers the industry's capacity to leverage advancements for enhanced efficiency and informed decision-making.

This research endeavours to tackle these pressing issues by crafting and implementing a bespoke system. Beyond rectifying existing problems, the goal is to establish a foundation for sustainable and technologically enhanced fish farming practices in the Lake Victoria region. Through this investigation, we aspire to contribute not only to the specific development and economic prosperity of the fishing communities but also to provide a scalable model for analogous regions grappling with similar challenges.

## **1.3 Objective of the study**

### **1.3.1 General Objectives**

The overarching goal of this research is to develop and implement a comprehensive Fish Farming Management System tailored to the specific needs of fishermen along the Lake Victoria shores. This system aims to revolutionize the fishing process, enhancing efficiency and sustainability across all stages, from breeding and harvesting to storage and sales of both fish and fish products.

### **1.3.2 Specific objectives**

(I)To optimize breeding practices: Enhance strategies for a sustainable and robust fish population.

(II)To develop a technological system for improving harvesting techniques: Implement innovative methods to minimize waste and maximize economic viability.

(III) To upgrade storage facilities: Design modern facilities to reduce post-harvest losses and maintain product quality.

## **1.4 Research Questions**

1. How can breeding practices be optimized to ensure a sustainable and robust fish population?
2. What technological solutions can be developed to improve harvesting techniques and minimize waste in fishing operations?
3. In what ways can storage facilities be upgraded to reduce post-harvest losses and maintain the quality of fish and fish products?

## **1.5 Significance of the study**

The significance of this study is paramount, given the acute challenges confronting fishermen along the Lake Victoria shores. The planned development of a customized Fish Farming Management System holds profound importance as it directly addresses the identified problems within the fishing industry. This research is poised to bring tangible benefits to the local community, offering solutions to inefficiencies in breeding, harvesting, storage, and sales processes. By doing so, it is expected to uplift the livelihoods of the fishing community, contributing significantly to the economic development of the Lake Victoria region.

Beyond its local impact, the study holds broader global relevance. The envisioned Fish Farming Management System, once developed and implemented, could serve as a replicable model for similar regions globally. This potential for scalability amplifies the significance of the research, positioning it as a source of valuable insights and solutions for communities worldwide grappling with analogous challenges in the fishing sector.

Furthermore, the integration of technology into fish farming practices, a key aspect of the proposed system, adds a layer of significance by showcasing how traditional industries can benefit from modern advancements. This not only enhances operational efficiency for the local community but also contributes to the broader discourse on the role of technology in optimizing and advancing traditional sectors.

Economically, the anticipated improvements in breeding, harvesting, and marketing strategies are poised to boost profits for fishermen. This, in turn, is expected to foster economic growth within the local fishing communities, potentially serving as a catalyst for broader regional development. In summary, the significance of this study lies in its potential to address immediate challenges, serve as a model for global adoption, showcase the integration of technology, and contribute to economic prosperity in the Lake Victoria region and beyond.

## **1.6 Scope and Limitation of the study**

\*\*1.6 Scope and Limitation of the Study\*\*

\*\*Scope: \*\*

This study focuses specifically on the development and implementation of a Fish Farming Management System tailored to the unique needs of fishermen along the Lake Victoria shores. The scope encompasses the optimization of breeding practices, improvement of harvesting techniques, upgrade of storage facilities, enhancement of sales and marketing strategies, and the integration of technology for operational efficiency. The geographical focus is on the Lake Victoria region, with insights drawn from the local fishing community serving as the foundation for system development.

\*\*Limitations: \*\*

While the Fish Farming Management System aims to address critical challenges in the fishing industry, certain limitations should be acknowledged. Firstly, it is important to note that the system, as developed in this study, may not achieve full scalability. It is intended primarily for testing and prototype purposes, and its applicability to a large-scale, real-world scenario may encounter challenges not explored within the scope of this research.

Additionally, due to time constraints, the study may face limitations in collecting all necessary and sufficient data. The comprehensive nature of fish farming operations involves multifaceted aspects, and the depth of data collection may be constrained by the time allocated for the research. As a result, certain nuances and intricacies of the fishing industry may not be fully captured, potentially impacting the depth of the system's insights and recommendations.

Despite these limitations, this study aims to provide valuable insights, practical solutions, and a foundation for future research endeavours in the realm of optimizing fish farming practices. The acknowledgment of these limitations underscores the importance of considering the findings within the defined scope and recognizing the potential for further refinement and expansion in subsequent studies.

## **1.7Basic Assumption**

In this study, we operate under certain assumptions to frame our research approach. We assume the presence of technologically competent individuals to operate the proposed Fish Farming Management System successfully. Additionally, our assumptions include the system's relevance to the local fishing community, the feasibility of integrating technology into their practices, and the availability of necessary resources for development and testing. We also assume a suitable testing environment representative of the Lake Victoria region and adequate data availability. While recognizing operational limitations, these assumptions guide our research with the goal of providing practical insights and solutions tailored to the local context.

# **CHAPTER 2**

# **LITERATURE REVIEW**

## **2.1 Introduction**

This chapter will review various existing literature relevant to each objective of this research, from the general objective to the specific objectives. This chapter will also dwell on knowledge already existing in relation to the study of the problem; the gaps identified in the reviews and how they are linked to this proposed system. Additionally, this chapter will show how these gaps identified will be addressed and implemented in this proposed system. The reviews linked to the study objectives include:

## **2.2 General Objectives**

For breeding Practices, existing literature provides insights into various breeding techniques such as selective breeding and genetic manipulation. Studies have demonstrated the effectiveness of these techniques in improving growth rates and disease resistance in farmed fish species (Smith et al., 2018). Research has focused on automated harvesting systems, remote sensing technologies, and real-time monitoring devices. These technologies offer opportunities for precision harvesting, minimizing stress on fish and reducing damage during capture. Studies have explored various storage techniques, including ice storage, refrigeration, and solar-powered cold storage units. Proper handling and storage practices are crucial for preserving fish freshness and minimizing spoilage (Nguyen et al., 2019). Literature on market analysis, value chain management, and consumer preferences provides insights into effective sales and marketing strategies for fish and fish products.

Identified Gaps:

1. Adaptation of Breeding Techniques: There is a lack of research specifically tailored to the Lake Victoria region. Research is needed to adapt advanced breeding techniques to local fish farming contexts, considering the unique environmental and socio-economic factors of the region.
2. Integration of Harvesting Technologies: While harvesting technologies have been studied, there is limited research on their integration into small-scale fisheries in the Lake Victoria region. The socio-economic feasibility and adaptation of these technologies to local contexts require further investigation.
3. Design and Implementation of Storage Facilities: Research on the development and implementation of storage facilities optimized for the Lake Victoria context is lacking. There is a need for comprehensive guidelines and standards for designing modern storage facilities tailored to the needs of small-scale fisheries in the region.
4. Understanding Sales and Marketing Dynamics: Existing literature on sales and marketing strategies lacks focus on the Lake Victoria region. Further research is needed to understand the specific challenges and opportunities in marketing fish and   
   and fish products in this context.

To address these gaps, this proposed system of a comprehensive Fish Farming Management System (FFMS) tailored to the Lake Victoria region fishermen, will take these steps in the development and implementation.

1. Research and Development: Conduct research to adapt advanced breeding techniques, integrate harvesting technologies, and design storage facilities specifically optimized for the Lake Victoria context. This research should consider environmental, socio-economic, and infrastructural factors unique to the region.
2. Stakeholder Engagement: Engage with local fishermen, government agencies, and industry stakeholders to ensure that the FFMS meets the specific needs and challenges faced by fishermen along the Lake Victoria shores.
3. Pilot Testing and Evaluation: Implement pilot projects to test the effectiveness and feasibility of the FFMS components in real-world settings. Evaluate the performance of the system and gather feedback from stakeholders for further refinement.
4. Capacity Building: Provide training and capacity-building programs to empower local fishermen with the knowledge and skills required to effectively utilize the FFMS. This includes training in breeding practices, harvesting techniques, storage management, and sales and marketing strategies.
5. Sustainability and Continual Improvement: Ensure that the FFMS is designed for long-term sustainability, considering environmental conservation and socio-economic development goals. Continuously monitor and evaluate the system, incorporating feedback and making improvements as needed.

By addressing these knowledge gaps and following the proposed foundation for development and implementation, the (FFMS) can revolutionize the fishing process along the Lake Victoria shores, enhancing efficiency and sustainability across all stages of fish farming operations.

## **2.3 To optimize breeding practices: Enhance strategies for a sustainable and robust fish population.**

To develop and implement a Fish Farming Management System (FFMS) aimed at optimizing breeding practices and enhancing strategies for a sustainable and robust fish population, several key components need to be considered. Understanding of fish biology, including reproductive behaviour, breeding cycles, and factors influencing population dynamics. Knowledge of current fishery management practices, including regulations, monitoring techniques, and conservation efforts. Familiarity with genetic principles related to breeding programs, such as selective breeding and genetic diversity. Awareness of environmental factors affecting fish populations, including habitat degradation, pollution, climate change, and invasive species. Knowledge of technological tools and methodologies for data collection, analysis, and monitoring in fisheries management.

Identified Gaps:

1. Limited integration of genetic considerations into existing fishery management practices.
2. Insufficient utilization of advanced technologies, such as genetic sequencing and biometric analysis, in fish population assessment and breeding programs.
3. Inadequate understanding of the long-term impacts of climate change and habitat degradation on fish populations.
4. Lack of comprehensive strategies for maintaining genetic diversity and resilience within fish populations.
5. Challenges in implementing adaptive management approaches that can respond effectively to changing environmental conditions and fishing pressures.

To address these gaps, this proposed system of a comprehensive Fish Farming Management System (FFMS) tailored to the Lake Victoria region fishermen, will take these steps in the development and implementation.

1. Establish a multidisciplinary research approach involving biologists, geneticists, ecologists, fishery managers, and policymakers to address knowledge gaps and develop comprehensive solutions.
2. Conduct targeted research to improve understanding of fish genetics, reproductive biology, and the influence of environmental factors on population dynamics.
3. Develop and implement advanced genetic techniques, such as marker-assisted selection and genomic sequencing, to enhance breeding programs and maintain genetic diversity within fish populations.
4. Integrate environmental monitoring data, including habitat assessments and climate projections, into fishery management decision-making processes.
5. Implement adaptive management strategies that allow for flexibility in response to new information and changing conditions, including real-time monitoring and adjustment of fishing quotas and habitat restoration efforts.
6. Collaborate with stakeholders, including fishing communities, conservation organizations, and government agencies, to ensure the successful implementation of the FFMS and garner support for sustainable fishing practices.

By addressing these components and leveraging existing knowledge while filling identified gaps, the proposed (FFMS) can serve as a robust framework for optimizing breeding practices and enhancing the sustainability of fish populations.

## **2.4 To upgrade storage facilities: Design modern facilities to reduce post-harvest losses and maintain product quality.**

To develop a Fish Farming Management Systems (FFMS): There is existing knowledge on various aspects of fish farming management systems, including water quality management, feeding strategies, disease control, and production optimization. Knowledge exists on different types of storage facilities for fish products, such as cold storage, freezing, and refrigeration units, as well as packaging materials and techniques to maintain product quality and reduce post-harvest losses. There are existing technologies used in the fish farming industry, including monitoring systems, automation, and data analytics, which can be integrated into a FFMS for efficient management and operation. There are established best practices for fish farming and post-harvest handling to ensure product quality and safety, including proper handling, storage, and transportation procedures.

Identified Gaps:

1. Integration of Technologies: There may be a lack of integration of modern technologies into existing fish farming management systems, particularly in storage facilities, leading to inefficiencies and increased post-harvest losses.
2. Infrastructure: Some fish farms may lack adequate infrastructure for modern storage facilities, including access to reliable electricity, proper insulation, and space constraints.
3. Cost-Effectiveness: The cost-effectiveness of implementing modern storage facilities in fish farms may not be well understood, including initial investment costs, operational expenses, and potential return on investment.
4. Training and Education: There may be a gap in the training and education of fish farmers and stakeholders on the use of modern storage facilities and FFMS, including proper operation, maintenance and troubleshooting.

To address these gaps, this proposed system of a comprehensive Fish Farming Management System (FFMS) tailored to the Lake Victoria region fishermen, will take these steps in the development and implementation.

1. Needs Assessment: Conduct a needs assessment to identify specific requirements and challenges faced by fish farmers regarding storage facilities and overall management.
2. Research and Development: Conduct research to identify innovative solutions and technologies that can be incorporated into the design of modern storage facilities and FFMS.
3. Pilot Projects: Implement pilot projects to test the feasibility and effectiveness of proposed solutions in real-world settings, collecting data on performance, cost-effectiveness, and user feedback.
4. Stakeholder Engagement: Engage with fish farmers, industry experts, government agencies, and other stakeholders to gather input, build partnerships, and ensure buy-in for the development and implementation of FFMS.
5. Training and Capacity Building: Develop training programs and educational materials to train fish farmers and stakeholders on the use of modern storage facilities and FFMS, emphasizing best practices for efficient operation and maintenance.

Overall, the development and implementation of the proposed FFMS should be guided by a comprehensive understanding of existing knowledge, identification of gaps, and a systematic approach to address challenges and leverage opportunities for upgrading storage facilities in the fish farming industry.

# **CHAPTER THREE**

# **METHODOLOGY**

## **3.0 Introduction**

This chapter outlines the research design method used in this research and the justification of that design method that will be employed. It also outlines the different data collection methods used in this research describing the entire process used in conducting the actual research. In addition this chapter also touches on the feasibility study of the research, including but not limited to economic, technical, schedule and behavioural feasibility. This chapter also outlines the location and population of the study and the different sampling procedures and sizes. This chapter also outlines the model used in designing the system stating its advantages and disadvantages.

## **3.1 Methods of data collection**

The success of this research project relies on the thorough and meticulous collection of data from diverse sources to provide a comprehensive understanding of the fish farming practices along the Lake Victoria shores. The methods of data collection have been carefully selected to capture both quantitative and qualitative insights, ensuring a robust foundation for the subsequent analysis

### **3.1.1 Survey**

Structured surveys will be conducted among fishermen along Lake Victoria shore in Kisumu to gather quantitative data regarding their current fish farming practices and the challenges they face. The surveys will include close-ended questions with predefined response options, facilitating efficient data processing and statistical analysis. A pilot survey will precede the main data collection to refine the questionnaire based on feedback.

### **3.1.2 Observation**

Direct observations of fish farming fishing activities will be conducted to supplement self-reported data. This method will provide a real-time understanding of the daily operations, infrastructure, and challenges faced by fishermen. Observational data will be recorded systematically, capturing both the routine and exceptional aspects of fish farming practices.

### **3.1.3 Questionnaires**

Questionnaires are forms that contain sets of questions that their main goal is to collect information from the respondents. There are two types of questionnaires: the open ended and close ended questionnaire, this method is going to enable the researcher to collect information regarding the existing system and collect the information effectively and efficiently. The researcher will be required to give out those forms to the fish keepers and fishermen and they will be able to give their correct answer either by choosing the correct one from the available options or by expressing their thoughts in that paper. After then the researcher should analyse the feedback then identify any common answer that will enable the researcher to have a certain direction to change once the pattern has been identified.

### **3.1.4 Existing Records and Documentation**

Relevant documents and records, such as historical catch data, government reports, and existing fishery management records, will be reviewed. This secondary data will contribute to a comprehensive understanding of the historical context and regulatory frameworks influencing fish farming in the region.

## **3.2 Feasibility study**

A feasibility study is conducted to analyse and identify the best system to be developed that meets performance requirements. This consists of identifying, describing, and evaluating the Lake Victoria Management system which leads to selecting the best system which can be used by the locals. This study is conducted to analyse whether the system is really feasible for development or not.

### **3.2.1 Economic Feasibility**

Economic feasibility is conducted to determine if the system is going to be beneficial to the locals and whether there are available resources to develop the system. To also analyse costs that can be incurred when trying to implement this system. This will help the developer know what amount is needed to develop such a system and the required resources with their availability so that the system cannot be planned without the required resources.

### **3.2.2 Technical Feasibility**

Technical feasibility will be conducted to assess whether the existing technological resources and expert levels in the institution are supportive enough for the new coming system. To know the various tools for development and if they are going to be available for the system to be developed within the required time.

### **3.2.3 Operational Feasibility**

This study is conducted to determine whether the system will operate as designed and operate effectively once developed. It is also used to determine how the locals are going to accept the system and their interactivity levels with the new system to the local authority, financiers, and the locals. The researcher can also gauge the friendliness level of the new system when the locals are going to use it.

### **3.2.4 Schedule Feasibility**

Schedule feasibility is conducted to estimate the time the system can be developed and how long it will take for it to be implemented. To ensure the system will be completed within a given time as planned on schedule then a project plan activity will be developed for the activities to be done against time allocated for each activity. Following this schedule strictly the system can be developed and implemented as it was planned within the specified time.

### **3.2.5 Behavioural Feasibility**

Behavioural feasibility is going to see the user attitude or behaviour towards the system. It is also going to determine how the students are going to interact with the new developed system. This study will determine if the system that has been developed, it can be easy to use or easy to access. If the locals react well to the developed system, then the system will play its role well.

## **3.3 Designing the system**

When designing the system, the following models will be used.

### **3.3.1 Waterfall model**

Waterfall model is always the most used model when it comes to designing systems. It is a traditional model. In waterfall model there are five phases

1. Planning
2. Analysis
3. Design
4. Implementation
5. Maintenance

This model cannot move to the next step until everything to be done in the previous or current state is done, hence it doesn’t give room for one to go back. It is also suitable for small models.

Advantages

1. Waterfall model saves a lot of time since once a step is completed; it goes to the next step.
2. It always works for small projects hence the requirements are easy to get and understand making it function effectively.
3. This model allows the system to be tested easily.
4. The management of the system is going to be easy because of the rigidity of the method.

Disadvantages

The resources are supposed to be outlined upfront and available for the system to be used. It is not customer intensive; you can’t include customer requirements since it has specific timing. It is a process to see the product and one must go through a process to be able to see the product. It doesn’t allow one to go back after a stage to do revision or reflection.

## **3.4 SYSTEM DIAGRAMS**

### **3.4.1 Use Case Diagram**

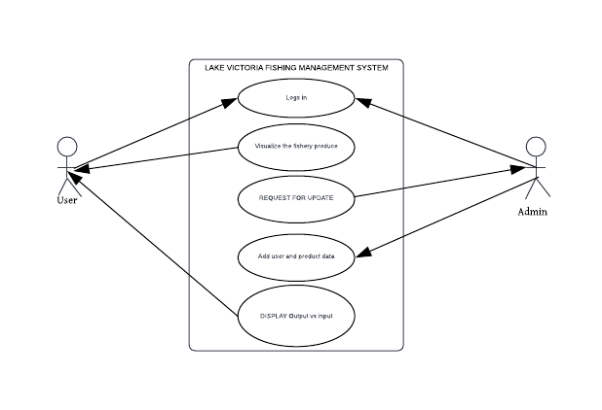


Figure 1: Use Case Diagram

### **3.4.2 Data Flow Diagram**

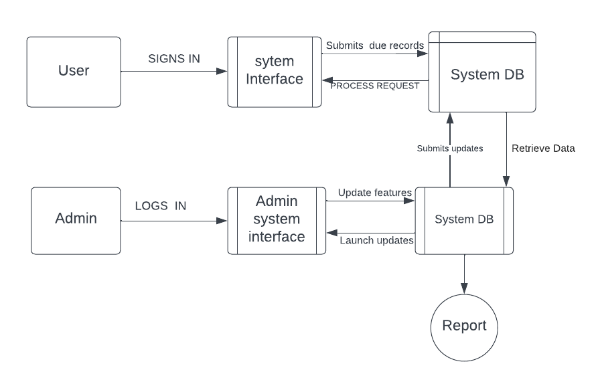


Figure 2: Data Flow diagram

### **3.4.3 Context Diagram**

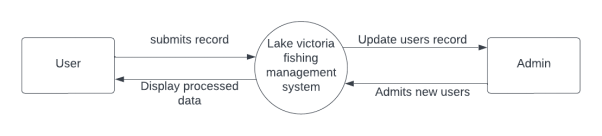


Figure 3: Context Diagram

## **3.5 System Testing**

Software testing is the process of executing a program with the intention of finding errors in the system. This activity of process testing is aimed at evaluating an attribute and the capabilities of the system or program and determining that it meets the requirements.

The system on completion will be tested based on functional and non-functional requirements.

Each module of the existing system will be required to be tested individually to make sure it is error free and free from bugs. Testing will require the users who are the fish farmers and local fishermen to be around and technical personnel who are developing the system.

The technical personnel will require several users who are willing to install the working version of the system (prototype) and have the knowledge of programming, reports from the tests conducted will be documented and used for future references and act as a training guide for new users and management.

The main reasons for testing software

1. Ensure the system is error free and out of defects
2. After testing ensure students are satisfied and the system is reliable
3. To develop a quality system.

The following are types of tests that will be performed:

### **3.5.1 Goal-based Testing**

This type of testing is done to determine if the developed system is meeting its primary function and why it has been developed. Example if it’s the Lake Victoria management system is it meeting the expectations of the admin that is to view the responses given in by the Users and that the system is developed that to get to give feedback there are different steps one has to take and filling the required fields such as user-names, passwords. After conducting the goal-based system then the system might be ready to function.

### **3.5.2 Acceptance Testing**

This type of testing will be conducted to see whether the system will meet users, management, and the authorities' specific requirements.

### **3.5.3 Security Testing**

Security testing this type of testing involves testing of the developed software to identify any gaps from security required by management point of view. For instance, the system will be tested to check if the security measures were working as required. Example, the user's password should have a certain combination and length with an encryption option. The data that will be provided by the users should not be accessed by anyone except the management or the authorized administration. Security testing can also be done to test the number of users who can use the system at once by this the system developer can look for a specific number of users who can install and sign into the system and them determine if the system can still work if there are many users using it at once.

# **CHAPTER FOUR: SYSTEM IMPLEMENTATION AND DEPLOYMENT**

**4.1 Introduction**

This chapter describes the development and implementation of the Fish Farming Management System (FFMS) designed specifically for fishermen along the Lake Victoria shores. The chapter details the system requirements, design process, implementation strategies, and testing protocols. Emphasis is placed on how the system meets the needs identified in the objectives, with each component addressing challenges in breeding practices, harvesting techniques, storage management, and sales optimization.

**4.2 System Architecture**

The system architecture represents the structural design of the system, outlining the interactions between the front end, back end, and database. This architecture is intended to support scalability, security, and a user-friendly interface.

*Insert System Architecture Diagram Here*

**Explanation**: The architecture diagram illustrates how each component communicates within the system, highlighting the separation between the user-facing front end and the back-end processes that handle data and authentication.

**4.3 Front-End Development**

Front-end development focuses on building an intuitive and interactive user interface using [mention front-end technologies, e.g., HTML, CSS, JavaScript, and React].

* **Code Snippets**:

html

Copy code

<div class="welcome-banner">

<h1>Welcome to the Application</h1>

<button class="start-btn">Get Started</button>

</div>

css

Copy code

.welcome-banner {

background-color: #e0e0e0;

padding: 30px;

text-align: center;

}

**Explanation**: This snippet shows the code for a welcome banner that engages users upon entering the application.

* **JavaScript Example for Interactivity**:

javascript

Copy code

document.querySelector('.start-btn').addEventListener('click', function() {

alert('Welcome to your Dashboard!');

});

**Explanation**: This JavaScript function enhances user experience by creating an interactive alert when the "Get Started" button is clicked.

**4.4 User Interface Design**

User interface (UI) design emphasizes ease of use, visual consistency, and accessibility. This project follows [mention design principles or frameworks, e.g., Material Design principles] to ensure a visually appealing, easy-to-navigate interface.

*Insert UI Design Samples*

**Explanation**: The design elements showcase the use of intuitive icons, clean typography, and user-friendly layouts, supporting a positive user experience.

**4.5 User Interface Modules**

This section describes the core UI modules developed, using screenshots and explanations for each major component.

* **Example: User Profile Module**: *Insert Screenshot of User Profile Module*

html

Copy code

<div class="profile-section">

<img src="profile-pic.jpg" alt="User Picture">

<h2>User Name</h2>

<p>User bio information displayed here.</p>

</div>

**Explanation**: The profile module is designed to give users easy access to their personal details, with a responsive layout that adapts across devices.

* **Dashboard Module**: *Insert Screenshot of Dashboard* **Explanation**: The dashboard provides a summarized view of user activities and relevant metrics, organized into easily accessible sections.

**4.6 Back-End Development**

The back-end development process involves implementing server-side logic, API endpoints, and database interactions. The backend is powered by [mention backend frameworks, e.g., Django, Node.js].

**4.6.1 Database Design Models**

The database design model shows the structure of tables, relationships, and attributes essential to data management and retrieval.

*Insert Database Schema Diagram*

**Explanation**: The schema provides a clear view of data organization, ensuring efficient access, integrity, and consistency across the system.

**4.6.2 Tables and Data Models**

The system's database is implemented using [mention database management system, e.g., MySQL, PostgreSQL], with the following tables to manage user data, transactions, and activities.

* **Example Table Structure**:

| **Column** | **Data Type** | **Description** |
| --- | --- | --- |
| user\_id | INT | Primary key for user table |
| username | VARCHAR | Username of the user |
| email | VARCHAR | Email of the user |

* **Sample Data Model (CSV/ARTFF)**:
  + A sample data model CSV file contains pre-structured data entries that support database operations.

**4.6.3 Code Testing**

Testing procedures, including unit tests, integration tests, and end-to-end tests, were implemented to ensure each module functions as expected.

* **Example Unit Test Code**:

python

Copy code

def test\_get\_user():

user = get\_user(1)

assert user.name == "Sample User"

**Explanation**: This unit test verifies that the get\_user function accurately retrieves a user’s details by ID, ensuring database integrity.

**4.7 Deployment Methods**

Deployment of the system involves using [mention deployment platform or method, e.g., AWS, Heroku, Docker containers] to ensure reliability, scalability, and performance in a live environment.

* **Steps for Deployment**:
  1. **Environment Setup**: Configure server environments with necessary dependencies.
  2. **Containerization**: Package the application into containers for efficient deployment.
  3. **Deployment to Production**: Deploy containers on a cloud platform or production server.

**Explanation**: Containerization allows for easy scaling and portability, making the application deployment efficient and manageable.

**4.8 Conclusion and Future Work**

This chapter covered the system's implementation, detailing the front end, back end, database design, and deployment. Future improvements may include [mention potential future work, e.g., adding more data analytics capabilities, enhancing UI/UX features, or migrating to a more scalable database system].

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# **APPENDICES**

1. Budget of this proposed proposal

|  |  |  |
| --- | --- | --- |
| items | specifications | amount |
| laptop | Mac Air (13-inch,2017)  Processor 1.8 GHz dual core intel core i5  Graphics intel HD Graphics 6000 1536 MB | 100,000 |
| Internet | Safaricom faiba 4G | 10,000 |
| Total |  | 110,000 |

1. Project schedule

|  |  |  |  |
| --- | --- | --- | --- |
|  | MAY | JUNE | JULY |
| Project research |  |  |  |
| Data collection |  |  |  |
| Requirement gathering |  |  |  |
| Prototype design and testing |  |  |  |