FACULTY OF INFORMATION TECHNOLOGY AND

COMMUNICATION STUDIES

DEPARTMENT OF INFORMATION TECHNOLOGY STUDIES

UNDERGRADUATE WORK

PROPOSAL

Development of an Internet of things-based Inventory Management System for Vanessa Derrick Logistics (VDL) Fulfillment

BY

BOAKYE-YIADOM KWEKU -10298655

HAYFORD PRINCE CHARLES – 10299689

JOANITA SAKORDIE ADDO -10303523

PHILOMINA ESI DZIFA AGBOADO 10303724

GROUP: 75

THIS PROJECT PROPOSAL IS SUBMITTED TO THE DEPARTMENT OF INFORMATION TECHNOLOGY STUDIES OF THE FACULTY OF INFORMATION TECHNOLOGY AND COMMUNICATION STUDIES OF THE UNIVERSITY OF PROFESSIONAL STUDIES, ACCRA, IN PARTIAL FULFILLMENT FOR A BACHELOR OF SCIENCE DEGREE IN INFORMATION TECHNOLOGY MANAGEMENT

NOVEMBER 2025

TABLE OF CONTENTS

ABSTRACT

This study presents the development of an Internet of Things technology based for inventory management for the Dome Branch of Vanessa Derrick Logistics (VDL) Fulfilment. The branch uses traditional stock counting to manage inventory which result in frequent inaccuracies, operational delays and a lack of reliable data on stock. The research employed a system development and descriptive research methodology to identify current operational challenges and create an Internet of Things system tailored to the company's situation. Data were gathered from warehouse employees and administrators through interviews, questionnaires, observations, and detailed requirements analysis. The new system incorporates Radio Frequency Identification technology, various sensors, and a real time monitoring dashboard to automate stock detection. Key capabilities of the system include automatic item identification, instant inventory updates, low stock notifications, anomaly alerts, and improved item picking routes. The Technology Acceptance Model (TAM) is used to evaluate user acceptance and the system’s usability by assessing its perceived usefulness and ease of use.

CHAPTER ONE

1.0 Introduction

1.1 Background

In today's global marketplace, inventory management has become a vital backbone of every organization. It involves the process of tracking, controlling, and monitoring goods from procurement to final sale. According to Atnafu (2018), inventory management systems ensure that the right quantity of items is available at the right time, minimizing waste, cost, and delays. Globally, industries have realized that poor inventory management causes stock outs, overstocking, and customer dissatisfaction (Mashayekhy, 2022).

Production management module of the system can manage product categories of system production; Warehouse management (Huynh et al., 2014) includes inventory management and out of storage management function, the former monitoring products in stock information, the latter shipment handling according to processed orders. Internet of Things allows organizations to track stock levels in real-time, monitor environmental conditions, and predict demand with high accuracy (Ugbebor, 2024). Based on the data about the inventory quantity and location, machine learning, a component of IoT-based inventory management solution architecture (Lin, 2012; Gubbi et al., 2013), can forecast the number of raw materials needed for the upcoming production cycle.

However, inventory systems are not without challenges. The good side includes real-time visibility, faster delivery, and better decision-making (Kawa, 2021), while the bad side involves high setup cost, network reliability issues, and a shortage of technical skills (Mashayekhy, 2022)

From a global perspective, large economies such as the USA, China, and Germany are already implementing smart inventory systems integrated with robotics and cloud computing. In Africa, several countries like Kenya, South Africa, and Nigeria are experimenting with Internet of Things

adoption in logistics and warehouse management, although challenges such as poor infrastructure and internet connectivity persist (Ugbebor, 2024). In Ghana, most firms still rely on manual or semi-automated systems, which limit efficiency and transparency. Studies reveal that poor inventory management practices contribute to loss of revenue, delays in order fulfilment, and reduced customer satisfaction (Opoku et al., 2021).

Therefore, designing and implementing a smart inventory management system leveraging Internet of Things is crucial for Ghanaian firms especially VANESSA DERRICK LOGISTICS Fulfilment.

1.2 Problem Statement

Inventory management is a critical function in every organization, as it ensures that the right quantity of products is available to meet customer demand while minimizing waste and costs. Traditional inventory systems often rely on manual data entry and periodic stock counts, which are prone to human error and delay (Mashayekhy, 2022). While these systems can help track goods, they fail to provide real-time updates, resulting in poor decision-making, financial losses, and reduced customer satisfaction. An analysis of issues involved in assessing inventory management systems reveals that inventory management often holds a process, planning, information and organizational dimension (Corbey and Jansen, 1993; Alfaro and Tribo, 2003; Abdul-Jalbar et al., 2003; Lutz et al., 2003). Internet of Things devices can automatically sense, track, and report inventory movement, enabling real-time visibility and automation (Ugbebor, 2024).

In Africa these challenges are even more pronounced. Most organizations continue to use semi-automated or paper-based inventory systems that make it difficult to synchronize stock information across suppliers and customers (Ugbebor, 2024). As a result, firms often experience late deliveries,

inaccurate records, and inefficiencies that reduces competitiveness in African supply chain (Opoku et al.,2021; Adjei & Mensah, 2022).

In Ghana,= companies rely on manual spreadsheets or outdated software that cannot provide real-time visibility into vendor stock levels. This gap makes it difficult to ensure efficient coordination between vendors, warehouses, and customers.

To address this persistent gap, this study proposes the design and implementation of a smart inventory management system leveraging Internet of Things technology, called “Inventory Eye”.

1.3 Study Objective

1.3.1 General Objective

To design a smart inventory management system leveraging Internet of Things technology for VDL Fulfilment.

1.3.2 Specific Objective

Based on general objectives this study has four specific objectives

a. To assess the current inventory management system of VDL Fulfilment to identity prospect and challenges of VDL Fulfilment’s existing inventory management system.

b. To develop administrative policies and procedures that support the smooth integration of an Internet of Things based inventory system (Inventory Eye) into daily operations.

c. To design an Internet of Things based system that can automatically monitor and update inventory information in real time.

d. To test the performance and reliability of the “Inventory Eye” system in improving inventory management operations.

1.4 Scope of the Project

This study focuses on the design and implementation of a smart inventory management system, known as Inventory Eye, which leverages Internet of Things technology to enhance operational efficiency. The research will primarily cover both administrative and technical aspects of inventory management. Administratively, the study will examine the existing inventory management practices, identify operational challenges, and evaluate how smart technologies can improve efficiency, coordination, and decision-making. The focus will be on how management policies and employee readiness influence the adoption and success of digital inventory systems.

The technical scope will cover system architecture design, software development, testing, and of performance in terms of speed, reliability, accuracy.

Geographically, the study will be conducted in Ghana, focusing on VANESSA DERRICK LOGISTICS Fulfilment. The study will not cover the entire supply chain but will limit itself to inventory monitoring, vendor coordination, and order fulfilment processes. The time scope will focus on system design and testing within a defined operational period. Internet of Things sensors like radio frequency identification systems, sensors for tracking items or product and quick response codes for real-time stock tracking, automated alerts, and a central database for synchronizing inventory information between vendors and logistics units. The technical scope will cover system architecture design, software development, testing, and of performance in terms of

speed, reliability, and accuracy.

1.5 Significance of the Study (Non-IT and IT related)

a. The study will help ensure that inventory recorded are accurate by minimizing the variation between the quantity of goods stored in the warehouse and the quantity of goods recorded in the system.

b. The study will improve the efficiency of staff by reducing delays caused by traditional stock counting.

c. The system will automatically monitor inventory as well as give update on stock levels with the use of Internet of Things (IoT) devices such as RFID tags and sensors.

d. The system will provide a flexible technology base that the company can easily expand and add new feature to suit future technology initiatives.

1.6 Limitations of the Project

This study has drawbacks despite its significance. First and foremost, the use of Internet Things technology such as Radio Frequency identification tags, sensors, and network equipment may require capital for purchase, which could affect the full implementation of the system.

Moreover, the system's performance depends on a good internet connectivity. In areas with poor network, data will not be effectively generated

In addition, the study will be limited by the technical skills of staffs. Employees must acquire training before they can use the system comfortably. Finally, the study focuses mainly on a particular branch. This means that study is restricted to the Dome branch and

the findings represent work challenges related to inventory management.

1.7 Structure of the Study

The study is grouped into five main chapters, each chapter focusing on a specific part of the study.

Chapter One presents the introduction of the study, which include background, problem statement, research objectives, research question, scope of the study, significance of the study, and limitations of the study.

Chapter Two highlights relevant literature, including theoretical review, research variables, contextual background of the study area, existing systems, and technological as well as proposed systems.

Chapter Three outlines the research design, population, sampling and sampling technique, data collection instrument, and system development methodology, crystallization of the problem, requirements of the proposed system and design of the system

Chapter Four discusses the implementation of the proposed systems and testing.

Chapter Five presents the summary, conclusions, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The integration of technology into inventory management has revolutionized operational efficiency in logistics and the IoT played a crucial raise in it. This chapter is focused on the application of the Technology Acceptance Model (TAM) and other technology adoption theories to the Inventory Eye IoT-based system which aims to address continuous challenges within the Vanessa Derrick Logistics (VDL) Dome branch.

2.2 Theoretical Review

The theoretical review outlines the core concepts that guides the design and implementation of a smart inventory management system for VDL. The key theory relevant to this theory is the Technology Acceptance Model (TAM).

Technology Acceptance Model

The Technology Acceptance Model, developed by Davis (1989), is one of the most widely used theories to explain how users accept and use new technologies. According to TAM, there are two main factors that determine user acceptance. Thus, Perceived Usefulness (PU), the degree to which a person believes that using a system will improve their job performance and Perceived Ease of Use (PEOU), the degree to which a person believes that using a system will be free of effort. In the context of this study, TAM helps to explain how administrators and warehouse staff are likely to adopt and use the Inventory Eye system. Consequently, the more employees realize that the system will make their task to easier to perform; the higher is the probability that they will use it and accept the technology as being useful (Dillon & Morris, 1996). If it helps them monitor stock

in real time, reduces manual work and easy to operate, they are more likely to accept and continuously use it. Researchers such as (Venkatesh & Davis, 2000) & (Gefen, 2003) have shown that perceived usefulness strongly predicts technology adoption in organizational environments

By applying this theory, this study ensures that the system design prioritizes user satisfaction, efficiency, and simplicity, making technology adoption smoother in a developing country context. Despite its frequent use, leading the original proposers to attempt to redefine it several times. Criticisms of TAM as a "theory" include its questionable estimation value, limited explanatory and predictive power, unimportant, and lack of any practical value.

2.3 Review of Research Variables

This chapter presents a comprehensive review of existing academic literature on inventory management practices, the integration of Internet of Things (IoT) technologies in warehousing, and the application of intelligent systems within supply chain operations. It also explores the major theoretical frameworks that explain how organizations adopt, implement, and utilize technological innovations in Supply Chain Management (SCM). Together, these strands of literature form the foundation for understanding the relevance and potential impact of an IoT-based intelligent inventory management system.

The review begins with traditional and contemporary inventory management approaches, examining how organizations maintain stock accuracy, minimize operational inefficiencies, and improve service delivery. It highlights common limitations of manual and paper-based systems such as errors, delays, and limited visibility which are directly reflected in the operational workflow of the VDL Dome Branch. These limitations are seen in the branch's dependence on

physical stock-taking, slow updates, and inconsistencies between recorded and actual inventory levels.

Next, the literature on IoT enabled warehousing is surveyed, emphasizing how technologies such as RFID tags, sensors, barcode automation, wireless networks, and cloud platforms transform inventory operations. Scholars consistently show that IoT improves real-time visibility, enhances tracking, reduces human error, and supports predictive decision-making. These benefits strongly align with the needs of the VDL Dome Branch, where the absence of real-time monitoring contributes to stock discrepancies, slow fulfilment cycles, and disrupt the flow of goods or services resulting in delays and inefficiencies

The review also examines intelligent systems such as automated data analytics, machine learning, and smart dashboards which help organizations interpret warehouse data and optimize decisions. For a facility like the VDL Dome Branch, these technologies can provide timely alerts, automate routine tasks, and ensure accurate reporting, eventually strengthening the branch's fulfilment reliability.

Finally, the chapter assesses technology adoption theories, including the Technology Acceptance Model (TAM), Diffusion of Innovation (DOI), and the Technology Organization Environment (TOE) framework. These theories help explain the factors influencing the willingness and readiness of an organization like the VDL Dome Branch to adopt an IoT-based solution. Understanding these factors such as perceived usefulness, organizational capacity, staff readiness, and environmental pressures helps identify potential barriers and enablers to implementation.

Through this review, the chapter identifies a clear research gap: although IoT and intelligent systems have been widely studied globally, there is limited localized research on their application within medium-scale logistics facilities in Ghana, particularly in operational contexts similar to the VDL Dome Branch. Addressing this gap justifies the need for developing an IoT-based intelligent inventory management system tailored to the branch's operational challenges.

2.4 Contextual background of the study area

Vanessa Derrick Logistics (VDL) Fulfilment is a limited company founded in the year 2019 by Vanessa Omari. It has over 5 branches in Ghana and operates as a medium-scale logistics and warehousing facility serving customers in Ghana. The warehouse stores a diverse range of products including fast moving consumer goods and bulky goods for both retail and wholesale shops. The 500 square meter warehouse has over 90 shelves and has the capacity to store over 2000 goods. Current operations involve manual stock-taking and paper-based processes, which contribute to common challenges such as inaccurate stock records, slow fulfilment, and limited visibility of real-time inventory status. Before items are brought into the warehouse, vendors contact VDL through email or calls to verify whether there's enough space for the storage of their products before they are sent in. While items leaving the warehouse are delivered based on a customer's contact via email or call. As a result of the inaccuracy and manual stock-taking of records, VDL Fulfillment faces stockouts often and become slow during peak hours. Due to the increase of incoming goods, orders and handling of different varieties of goods, there is a need for a change in the operational structure of VDL Fulfillment. The introduction of an inventory management system will be used to communicate with vendors and customers on incoming and outgoing products, take stock-counting and records of available products and delivered products.

2.5 Review of Existing Systems and Technologies

These are some types of systems that businesses use to manage their stock:

a. Manual Systems: Writing things down in books or using Excel and this actually slows down work.

b. Barcode Systems: some businesses use barcodes to scan items. This is a cheaper way of managing stock

c. RFID Systems: business use tags that can be read automatically without scanning one by one. This technology is fast and accurate, but it's very expensive.

d. Warehouse Management Systems (WMS): This is a big software tools like Odoo that help manage warehouse operations.

2.6 Proposed System

The solution is to build a smart inventory system using Internet of Things (IoT) technology to help manage stock at Vanessa Derrick Logistics.

Main things our system will do:

a. Automatically detect items using RFID tags.

b. The system will show a real-time information on a dashboard for staff and managers.

c. The system will send alerts when stock is low, close to expiry, or if something unusual happens.

d. Help staff pick items faster by suggesting the best route in the warehouse.

2.7 Chapter Summary

This chapter reviewed relevant literature to designing an Internet of Things based technology for Inventory Management. The chapter relies on the Technology Acceptance Model, which explains how users adopt new technology based on perceived usefulness and ease of use. Technology Acceptance Model helped predict how Vanessa Derrick Logistics Fulfilment warehouse staff and managers would accept the proposed “Inventory Eye” system, especially if it is beneficial, easy to operate, and improves work efficiency.

The review also examined key research variables. Studies on inventory management shows the challenges of manual stock counting which include errors, delays, and stock inconsistencies at Vanessa Derrick Logistics Fulfilment Dome branch. It then explored Internet of Things technologies which include sensors, Radio Frequency Identification tags and wireless networks. These tools provide real time visibility, improve tracking accuracy, reduce manual work, and support predictive decision making.

Intelligent systems like smart dashboards, automated analytics, and alert-based monitoring were discussed to show how they can enhance warehouse decision making and streamline operations. Such technologies are especially relevant for Vanessa Derrick Logistics Fulfilment Dome Branch, to manage stock accurately

CHAPTER THREE

RESEARCH METHODOLODY

3.1 INTRODUCTION

This chapter describes the steps that need to be taken to develop and evaluate the "Inventory Eye" Intelligent Inventory Management System based on the Internet of Things (IoT) for Vanessa Derrick Logistics (VDL) Fulfillment. The methodology describes the steps, instruments and methods used to make sure that the study is carried out in a systematic manner, as well as consistent with the project's aims. In this chapter, research design, population and sampling techniques, data collection processes and the system development methodology are described. It also offers a crystallized understanding in the operation of VDL Fulfillment, which form the foundation for defining the system requirements and design architecture. The combination of qualitative inquiry with an Agile software development methodology, is intended to create a comprehensive investigation of the organizational challenge as well technological innovation that is being developed to solve the problem.

3.2 Research Design

The study will adopt a Qualitative Research Approach, A qualitative approach is chosen because the core objective is to gain an in-depth understanding and rich description of a specific, contemporary phenomenon (the business need/problem) within its real-life context (Yin, 2018). Unlike quantitative research, which focuses on statistical generalization, this approach prioritizes the contextual depth necessary to formulate actionable and tailored business solutions. The research design that will be adopted in the study is interview. Interview will help us gather in depth information about inventory management at Vanessa Derrick Logistics, Fulfilment. Information

will include the company's specific inventory practice and workflow, user experience, current problems faced by the company, challenges relating to potential implementation of the study.

3.3 Population

The target population is defined as the complete group of individuals, objects or events that share a common characteristic, which the researcher aims to study and analyze in order to draw conclusions (Jilcha Sileyew, 2020; Garg, 2016).

Due to its size, it employs between 75 and 100 people in a variety of roles. Twenty employees will be the study's target population because of their roles in VDL.

3.4 Sample and Sampling Techniques

A purposive sampling technique will be employed to select participants. This non-probability sampling method allows the researcher to deliberately choose individuals who possess specialized knowledge or experience concerning the study topic (Creswell & Poth, 2018).

The sample size will consist of approximately participants, distributed as follows: 20

CEO 1

IT OFFICER 1

LOGISTICS OFFICER1

INVENTORY SUPERVISOR 1

INVENTORY ASSOCIATE 3

VENDOR RELATIONS OFFICER 1

CUSTOMER SERVICE OFFICER 2

ACCOUNTS OFFICER 1

RIDERS 4

DRIVERS 4

Purposive sampling is suitable because not every employee is directly involved in inventory management or Internet of Things technology integration. Selecting only those with relevant roles ensures the quality and reliability of responses.

3.5 Data Collection and Instruments

The study will employ both primary and secondary data collection instruments

3.6 System Development Methodology

In developing a system for VANESSA DERRICK LOGISTICS, the software development approach to be used is an Agile methodology due to its emphasis on flexibility, engagement and quality assurance. The methodology details the steps, techniques and tools that will be used achieve the specific objectives of the project.

a. Requirements gathering

Objective: For the system to meet the needs of stakeholders, their requirements need to be captured

Method: Conduct stakeholder interviews and workshops

Tools/Technology:

Google forms: For collecting feedback and wants from various stakeholders

b. Design and Prototyping

Objective: To design and prototype the architecture and features of the system

Method: View system architecture which includes IoT and user interfaces

Tools/Technology:

Prototyping tools: InVision and Axure

c. Iteration Planning

Objective: Arrange the development process into feasible increment for better delivery

Method: Develop a product backlog so that prioritized list of tasks to be completed would be known

Tools/Technology:

Agile management tools: ClickUp and Jira to organize task and workflows

d. Development

Objective: Build system features in phases, ensuring continuous integration and functionality

Method: Conducting code reviews often as well as integrate testing

Tools/Technology:

Version control: Using either git or GitHub for source code management and maintenance

e. Testing and Validation

Objective: Ensuring software quality systematic testing of component and overall system performance

Method: Undergo unit tests, integration tests and user acceptance testing (UAT) with stakeholders' collaboration

Tools/Technology:

Testing frameworks (Jest): This makes it possible for a unit test to be conducted

Appium: This makes it possible for an integration testing to be conducted

User testing: This makes it possible to gather user feedback during UAT

f. Deployment

Objective: Launch the system gradually to users while making sure it meets system standards

Method: Roll out features gradually by monitoring system performance, post deployment for user feedback and issue identification

Tools/Technology:

Cloud Service: Using Microsoft Azure for hosting and deployment activities

Monitoring tools: Use Prometheus or Grafana for tracking performance and usage.

Feedback tools: Use Google Analytics to analyze user behavior through feedbacks

g. Maintenance and Evolution

Objective: Keep improving the system based on user feedback and technological

advancement

Method: Regulate frequent updates, bug fixes and enhancements based on user insights and performance data

Tools/Technology:

Collaboration tool: Microsoft Teams for regular or often communication

3.7 Crystallization of the Problem

The inventory management sector faces significant challenges, particularly for VANESSA DERRICK LOGISTICS Fulfilment, a medium-scale logistics provider in Ghana. Traditional inventory management systems have proven inadequate in addressing the complexities of modern supply chains, and this crystallization identifies key issues that impact inventory management at VDL Fulfilment.

Key Issues Identified

Three main challenges stand out. First, the reliance on traditional inventory management processes leads to inefficiencies. VDL Fulfilment's dependence on manual stock counts and data entry not only consumes time but also increases the likelihood of human error, thereby hindering real-time tracking and decision-making.

Secondly, there are frequent discrepancies between actual stock levels and recorded data, resulting in inaccurate stock records. This inconsistency can lead to problems such as stock outs or overstocking, which ultimately affect operational efficiency and customer satisfaction.

Finally, a lack of real-time visibility exacerbates these challenges. Without immediate access to inventory updates, the logistical team struggles to respond effectively to customer demands, leading to delays in order fulfillment and a decline in service quality.

Proposed Solutions

To address these challenges, two pivotal solutions have been proposed. The first is the implementation of the "Inventory Eye" system, which leverages Internet of Things (IoT) technologies like RFID tags and sensors. This system would automate stock monitoring and provide real-time updates on inventory levels and locations, thereby eliminating discrepancies and improving accuracy.

The second solution focuses on enhancing workforce readiness through training and support. By equipping staff with the necessary skills to effectively use the new system, VDL Fulfilment can ensure a smoother transition and better integration of the technology, ultimately leading to improved operational efficiency and customer satisfaction.

By tackling these key issues with targeted solutions, VANESSA DERRICK LOGISTICS Fulfilment has the opportunity to transform its inventory management practices and enhance its overall performance in the competitive logistics landscape.

3.8 Requirements of the Proposed System

The "Inventory Eye" system is designed to address the inventory management challenges faced by VANESSA DERRICK LOGISTICS Fulfilment. Below are the key requirements categorized into functional, technical, and operational aspects.

Functional Requirements

a. Real-Time Inventory Tracking

- Utilize IoT technologies (e.g., RFID tags and sensors) to automatically detect and update item quantities and locations in the warehouse.

b. Automated Alerts

- Generate notifications for low stock levels, items approaching expiration, and any unusual inventory movements.

c. User Dashboard

- Provide a centralized dashboard that displays real-time inventory data, analytics, and operational insights to staff and management.

d. Inventory History Logs

- Maintain detailed logs of all inventory movements, including additions, removals, and adjustments, allowing for auditing and analysis.

e. Vendor Coordination

- Facilitate seamless communication between the inventory system and suppliers to streamline reordering processes and improve stock management.

f. Search and Reporting

- Implement search functionality for quick access to inventory information and generate custom reports on stock levels and order fulfillment metrics.

g. User Role Management

- Allow for role-based access control, enabling different levels of permissions for inventory staff, managers, and administrators.

h. Integration with Existing Systems

- Ensure compatibility with existing logistics and inventory management software used by VDL Fulfilment for data synchronization and operational continuity.

Non-Functional Requirements

a. Performance

- The system must be able to handle a minimum number of concurrent users and transactions per second without degrading performance.
- Response times for user actions (e.g., data retrieval, updates) should not exceed a predefined threshold (e.g., 2 seconds).

b. Scalability

- The architecture must support scalability to accommodate future growth in inventory size, transaction volume, and additional features or functionalities.

c. Reliability and Availability

- The system should have an uptime of 99.9%, ensuring it is constantly available for users, with minimal downtime for maintenance.

d. Security

- Implement robust security measures to protect sensitive inventory data, including data encryption, secure user authentication, and regular security audits.

e. Usability

- The user interface should be intuitive and easy to navigate, minimizing the learning curve for staff and promoting efficient interaction with the system.

f. Compatibility

The system must be compatible with various devices and browsers to ensure accessibility for all users, including mobile devices used on the warehouse floor.

g. Maintainability

- The system should be designed for easy maintenance and updates, allowing for regular enhancements and bug fixes without significant downtime.

h. Data Integrity

- Ensure that data entered into the system is accurate and consistent, with mechanisms in place to detect and prevent errors during data entry and processing.

3.9 Design of the System

The "Inventory Eye" system is designed to modernize inventory management for VANESSA DERRICK LOGISTICS Fulfilment. With a web-based architecture using React Native for the front end and Node.js for the back end, the platform ensures a user-friendly experience for staff and administrators. The system consists of modular components to facilitate efficient inventory tracking, management, and reporting.

3.9.1 System Architecture

The proposed platform follows a three-tier architecture structure:

a. Presentation Layer (Front-End)

- **User Interface (UI):** Interactive dashboards for both inventory staff and administrators.
- **Inventory Overview Pages:** Displays current stock levels, locations, and alerts.
- **Order Management Pages:** Allows for tracking and managing orders.
- **Login and Registration Forms:** Secure access for staff and admin roles.
- **Technologies Used:** Built using React Native for cross-platform compatibility, ensuring a seamless experience on both web and mobile devices.

b. Application Layer (Back-End)

- **Authentication Logic:** Manages login and access controls.
- **Inventory Management Logic:** Handles inventory updates, alerts, and tracking processes.
- **Order Processing Logic:** Manages the flow of orders from initiation to fulfillment.

- **Analytics and Reporting:** Provides insights on inventory levels and user activities.
- **Technologies Used:** Developed using Node.js, utilizing Express as the web framework for efficient server-side logic and API management.

c. Data Layer (Database)

- **User Accounts:** Stores login credentials and role-based access information.
- **Inventory Data:** Stores details of items, quantities, locations, and status.
- **Order Records:** Maintains logs of orders placed and their status.
- **Analytical Data:** Stores analytics for user activity and inventory performance.
- **Database Implementation:** Utilized MongoDB for flexible data storage, enabling easy access and manipulation of JSON-like data structures.

3.9.2 System Modules

a. User Authentication Module

- Allows both staff and administrators to register, log in, and securely access the system.

b. Dashboard Module

- Displays vital information including:
  - Current inventory levels
  - Alerts for low stock and expiration
  - Notifications for orders and issues

c. Inventory Management Module

- Contains structured content such as:
  - Detailed views of inventory items
  - Information on item locations and quantities
  - Alerts for stock discrepancies and reporting capabilities

d. Order Processing Module

- Facilitates:
  - Creation and tracking of orders
  - Updates on order status
  - Notifications for fulfillment

e. Progress Tracking Module

- Monitors:
  - Completed inventory updates
  - Order fulfillment progress
  - Time spent on tasks

f. Admin Management Module

- Provides administrators with the capability to:
  - Update inventory and order data
  - Monitor system performance and user activity
  - Manage user accounts and permissions

g. Feedback and Evaluation Module

- Allows users to submit feedback on:
  - System usability
  - Inventory data accuracy
  - Any encountered issues or suggestions for improvement

3.9.3 Data Flow Summary

A simplified flow of how data moves within the system:

a. User logs into the system → System checks credentials against the database.

b. User accesses dashboard → Inventory data is retrieved from the database.

c. User adds or updates inventory → The system saves changes and alerts are generated if necessary.

d. User processes an order → Order details are stored in the database and notifications are sent.

e. Admin updates inventory data → Changes reflect immediately across the platform for all users.

f. User provides feedback → Feedback is captured and stored for future improvement.

3.9 PROJECT TIMELINE

The proposed time timeline for the project is as follows;

GANNT CHART

Activities	Nov,2025	Dec,2025	Jan,2026	Feb,2026	Mar,2026	Apr,2026	May,2026	Jun,2026
Proposal Dev/Submission								
Interview Adminstaration								
Data Analysis								
System Development								
Submission of draft thesis								
Final Submission								

3.11 Project Budget

Item	Cost Estimated (GHS)
Material and Documentation printing	180
Transportation Expenses	100
Miscellaneous	200
Internet Bundle	400
TOTAL	880

4.0 REFERENCES

Afum, E., Issau, K., Agyabeng-Mensah, Y., Baah, C., Dacosta, E., Essandoh, E., & Agyenim Boateng, E. (2023). The missing links of sustainable supply chain management and green radical product innovation between sustainable entrepreneurship orientation and sustainability performance. Journal of Engineering, Design and Technology, 21(1), 167-187. https://doi.org/10.1108/JEDT-05-2021-0267

Atnafu, D., & Balda, A. (2018). The impact of inventory management practice on firms' competitiveness and organizational performance: Empirical evidence from micro and small enterprises in Ethiopia. *Cogent Business & Management*, *5*(1). https://doi.org/10.1080/23311975.2018.1503219

Baxter, Pamela & Jack, Susan. (2010). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. Qualitative Report. 13. 10.46743/2160-3715/2008.1573. https://doi.org/10.46743/2160-3715/2008.1573

Garg, R. (2016). Methodology for research I. Indian Journal of Anaesthesia, 60(9), 640. https://doi.org/10.4103/0019-5049.190619

Jilcha Sileyew, K. (2020). Research Design and Methodology. In Cyberspace. https://doi.org/10.5772/intechopen.85731

Opoku, R. K., Fiati, H. M., Kaku, G., Ankomah, J., & Agyemang, F. O. (2020). Inventory management practices and operational performance of manufacturing firms in Ghana. Advances in Research, 21(10), 1-18.https://doi.org/10.4102/jtscm.v16i0.609

Palinkas, L.A., Horwitz, S.M., Green, C.A. et al. Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. Adm Policy Ment Health 42, 533–544 (2015). https://doi.org/10.1007/s10488-013-0528-y

Tejesh, B. & Neeraja, S... (2018). Warehouse inventory management system using IoT and open-source framework. Alexandria Engineering Journal. 57. 10.1016/j.aej.2018.02.003. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=citation+on+inventory+management+system+using+IoT+devices+&btnG=#d=gs_qabs&t=1764020979265&u=%23p%3DbJZNBrEmRZkJ