

A WEB-BASED
INVENTORY MANAGEMENT SYSTEM FOR MOTORCYCLE SPARE PARTS AND ENGINE OILS
(CASE STUDY: DANI MOTORCYCLE SPARE PARTS AND ENGINE OILS RETAIL SHOP)

By
OKOLONG CHARLES
BU/UP/2023/1816
0780221388/0793836568, okolongcharles8@gmail.com

Department of Computer Studies
Faculty of Science and Education

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Supervisor
DR. LUKYAMUZI ANDREW.
Department of Computer Studies
Faculty of Science and Education:
April, 2026.

DECLARATION

I **OKOLONG CHARLES** do hereby declare that this dissertation is as a result of effort and has not been submitted to any institution of higher learning before for an academic award and should not be reproduced without my consent

Sign  Date 24th/08/2024

OKOLONG CHARLES

BU/UP/2023/1816

SUPERVISOR'S APPROVAL

This study project, a web-based inventory management system for motorcycle spare parts and engine oils has been done under my supervision as the university supervisor and submitted with my approval.

Sign  Date. 24th/08/26

DR. LUKYAMUZI ANDREW

SUPERVISOR

DEDICATION

This project work is dedicated to the ALMIGHTY GOD for making me being able to start up and successfully finish in sound health. Also to my parents as well for being supportive in the cause of this project work both financially and spiritually, to all my church members for the spiritual support with the sincere prayers they made for me to attain this success and to my dear sister ABBO TINA for being supportive and kind to me during the cause of this project work. May the almighty God bless you all abundantly

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TABLE OF CONTENT

Declaration.....	Error! Bookmark not defined.
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ABSTRACT.....	10
1.0 CHAPTER ONE	12
1.1 Background of the Study.....	12
1.2 Statement of the Problem	13
1.3 Main Objective of the Study	13
1.4 Specific Objectives	14
1.5 Significance of the Study	14
1.6 Scope of the Study	15
CHAPTER TWO: LITERATURE REVIEW	17
2.1 Introduction	17
2.2 Digital Transformation in Small and Medium Enterprises (SMEs).....	17
2.3 Management Information Systems (MIS) in Retail.....	17
2.4 Inventory Management Systems in Small Retail Businesses	18
2.4.1 Types of Inventory Management Systems.....	18
2.5 Features of Effective Inventory Management Systems.....	18
2.6 Challenges in Current Inventory Management Systems for Small Ugandan Retail Shops	19
2.7 Benefits of an Automated Web-Based Inventory Management System.....	19
2.8 Theoretical Framework.....	20
CHAPTER THREE: METHODOLOGY.....	21
3.1 Introduction	21
3.2 Area of Study.....	21
3.3 Study Population and Sampling	21
3.4 System Development Methodology	22
3.5 Data Collection Techniques	22

3.5.1 Interview Method	23
3.5.2 Questionnaires.....	23
3.5.3 Observation Method.....	23
3.5.4 Review of Existing Literature	24
3.6 Data Analysis and Presentation	24
3.6.1 Qualitative Data Analysis	24
3.6.2 Quantitative Data Analysis.....	24
3.7 System Design Tools	25
3.8 System Software Implementation and Tools.....	25
CHAPTER FOUR: SYSTEM DESIGN AND IMPLEMENTATION.....	26
4.1 Introduction	26
4.2 Current System Study	26
4.3 Strengths of the Current System.....	26
4.4 Weaknesses of the Current System	27
4.5 System Requirements	27
4.5.1 Functional Requirements.....	28
4.5.2 Nonfunctional Requirements.....	28
4.6 System Design	29
4.6.1 System Context Diagram.....	29
4.6.2 Data Flow Diagram (DFD).....	29
4.6.3 Entity Relationship Diagram (ERD).....	30
4.6.4 Use Case Diagram	30
CHAPTER FIVE: PRESENTATION OF RESULTS.	32
5.1 Introduction	32
5.2 Login Interface Design.....	32
5.3 Admin User Management Interface	33
5.4 New Product Registration Interface	34
5.5 Dashboard and Inventory Summary Interface.....	34
5.6 Sales Recording Interface.....	35
5.7 Stock Management and Adjustment Interface.....	35
5.8 Reporting and Analytics Interface.....	36
5.9 System Testing	37

5.9.1 Unit Testing	37
5.9.2 Integration Testing.....	37
5.9.3 Security Testing	37
CHAPTER SIX: DISCUSSION, CONCLUSIONS, RECOMMENDATIONS AND FUTURE WORK.....	38
6.1 Introduction.	38
6.2 Discussion of Results.....	38
6.2.1 Determination of System Requirements.	38
6.2.2 System Design.	38
6.2.3 System Implementation.....	38
6.2.4 System Testing	38
6.3 Conclusion.....	38
6.4 Recommendations	39
6.5 Limitations.....	39
6.6 Future Work.....	40
REFERENCES	
APPENDICES	
APPENDIX 1: QUESTIONNAIRE (DATA COLLECTION TOOL)	
APPENDIX 2: FOCUS GROUPS (OPEN ENDED QUESTIONS)	

LIST OF TABLES

TABLE 1: SAMPLE SIZE REPRESENTATION.....	23
TABLE 2: SYSTEM USERS AND THEIR REUIREMENTS.....	31

LIST OF FIGURES

FIGURE 1: SYSTEM CONTEXT DIAGRAM	33
FIGURE 2; DATA FLOW DIAGRAM.	33
FIGURE 3: SYSTEM ENTITY RELATIONSHIP DIAGRAM	34
FIGURE 4: USE CASE DIAGRAM	35
FIGURE 5: LOGIN INTERFACE	36
FIGURE 6: ADMIN USER MANAGEMENT INTERFACE	37
FIGURE 7: NEW PRODUCT REGISTRATION INTERFACE.....	37
FIGURE 8: SYSTEM DASHBOARD AND INVENTORY SUMMARY INTERFACE.....	38
FIGURE 9: POINT OF SALE (POS) INTERFACE.....	39
FIGURE 10: STOCK ADJUSTMENT INTERFACE	39
FIGURE 11: SALES AND STOCK REPORTS INTERFACE	40

LIST OF ACRONYMS

CSS	Cascading Style Sheet
DFDs	Data Flow Diagrams
E RD	Entity Relationship Diagram
IMS	Inventory Management System
HTML	Hyper-Text Mark Language
ICT	Information and Communication Technology
IS	Information System
IT	Information Technology
MYSQL	MY-Structured Query Language
PHP	Hyper-Text Processor
RAD	Rapid Application Development
SDLC	System Development Life Cycle

Keywords: Inventory management system, web-based system, motorcycle spare parts, small retail business, stock tracking, low-stock alerts

ABSTRACT

This research report presents the development and evaluation of a web-based inventory management system designed specifically for Dani Motorcycle Spare Parts and Engine Oils Shop, a small retail business located in Tuba, Molo Sub-county along the Tororo-Mbale highway in Uganda. The shop previously operated entirely on a manual, paper-based inventory system, which resulted in frequent stockouts, overstocking of slow-moving items, time-consuming stock-taking processes, poor record-keeping, and an inability to generate accurate financial reports for informed decision-making.

The main objective of this study was to develop a web-based system that enables the shop owner to efficiently manage stock levels, record sales and purchases, track suppliers, generate business reports, and receive automated low-stock alerts. The study employed qualitative research methods, including interviews, observation, questionnaires, and literature review, to gather functional requirements from the shop owner, staff, and customers.

The system was developed using the Rapid Application Development (RAD) methodology within the Structured System Analysis Design Method (SSADM) framework, utilizing WAMPP (Apache, MySQL, PHP), HTML, CSS, JavaScript, and Visual Studio Code as the integrated development environment. The system significantly improved operational efficiency, reduced stockouts, enhanced financial management, and provided the shop owner with actionable business intelligence.

1.0 CHAPTER ONE

1.1 Background of the Study

Globally, small and medium-sized enterprises (SMEs) in the retail sector have increasingly adopted digital solutions to manage their operations, with inventory management being a critical area for technological intervention. In developed economies, businesses of all sizes utilize sophisticated inventory management systems that integrate with point-of-sale, accounting, and customer relationship management platforms, enabling real-time stock tracking, automated reordering, and data-driven decision-making (Adamu, 2022; Crockett et al., 2018). These systems have proven essential for reducing operational costs, minimizing stockouts, and improving customer satisfaction.

In Africa and specifically Uganda, the adoption of digital inventory management systems in small retail shops remains slow and fragmented. While larger distributors and some urban retailers have implemented such systems, the vast majority of small-scale spare parts shops, particularly those in rural towns, continue to rely on manual processes. These shops, which serve as critical nodes in the motorcycle transport ecosystem, manage their inventory using physical ledgers, mental records, or basic spreadsheets. For instance, while some businesses in Kampala have started using simple point-of-sale software, shops in smaller towns like Morukiswa, Nagongera, Mulanda, and Tororo still predominantly use paper-based stock cards and manual calculations to track their inventory (Jonathan et al., 2019).

Although some attempts have been made to introduce digital tools to Ugandan SMEs, these efforts have been hampered by factors such as high costs, complexity, and a lack of solutions tailored to the specific needs of small businesses. Existing systems, where they exist, often suffer from critical weaknesses. They may be designed for large-scale enterprises and are therefore too complex and expensive for a small shop. They often lack critical features such as low-stock alerts, which are essential for preventing stockouts, or they operate offline without the ability to generate simple sales reports that a small business owner needs to understand their profitability. Furthermore, these systems rarely come with adequate training or local technical support, leading to low adoption rates as shop owners revert to familiar manual methods (Crockett et al., 2018).

The proposed Web-Based Inventory Management System for Dani Motorcycle Spare Parts and Engine Oils Shop addresses these gaps by providing a comprehensive, affordable, and user-friendly platform designed specifically for the needs of a small retail business in a Ugandan

town. Unlike complex, generic solutions, this system is tailored to the specific inventory challenges of a motorcycle spare parts shop. It uniquely combines core inventory management functions with features like automatic low-stock alerts via SMS or in-app notifications, ensuring the owner can reorder popular items before they run out. The system provides a simple, intuitive dashboard that displays key business metrics such as total stock value, best-selling items, and items nearing expiry, offering insights that are currently unavailable. It also features secure digital recording of all sales and purchases, generating real-time reports that simplify tax compliance and business planning. Additionally, the system includes customer management features to track frequent buyers and their preferences, enabling personalized service and fostering customer loyalty.

1.2 Statement of the Problem

The current inventory management system at Dani Motorcycle Spare Parts and Engine Oils Shop was entirely manual and paper-based, which proved inefficient, error-prone, and limiting to business growth. Before this research intervention, the shop owner faced significant challenges, including frequent stock outs of popular spare parts and engine oils due to a lack of real-time visibility into stock levels. This led to lost sales and customer dissatisfaction (Wallin et al., 2006). Conversely, overstocking of slow-moving items tied up scarce capital in inventory that risked becoming obsolete (Kenton, 2021; Zipkin, 2000). The manual process of stock-taking was tiresome and time-consuming, often requiring the shop to close for a full day to physically count items. Record-keeping was done in exercise books, making it difficult to track sales history, identify fast-moving items, or generate accurate financial reports for decision-making (Toomey, 2000). Discrepancies between physical stock and recorded stock were common due to calculation errors, misplaced receipts, or unrecorded sales, resulting in financial losses and a lack of accountability.

The lack of a centralized and secure digital system hindered efficient inventory control, delayed the identification of sales trends, and compromised financial management (Jonathan et al., 2019). There was therefore a critical need for a web-based Inventory Management System which would automate stock tracking, streamline operations, and provide the owner with the tools needed to make informed business decisions, ultimately improving efficiency, profitability, and customer service.

1.3 Main Objective of the Study

To develop a web-based Inventory Management System for Dani Motorcycle Spare Parts and Engine Oils Shop that enables the owner to efficiently manage stock levels, record sales and purchases, track suppliers, generate business reports, and receive automated low-stock alerts.

1.4 Specific Objectives

1. To review literature and determine the functional requirements for an inventory management system for a small-scale motorcycle spare parts retail shop.
2. To design a web-based inventory management system based on identified requirements and the specific operational needs of Dani Motorcycle Spare Parts and Engine Oils Shop.
3. To implement the proposed system using suitable modern technologies (XAMPP, PHP, MySQL, HTML, CSS, JavaScript).
4. To test and validate the system to ensure its usability, reliability, security, and accuracy in managing inventory data.

1.5 Significance of the Study

The current manual inventory management practices at Dani Motorcycle Spare Parts and Engine Oils Shop present significant challenges that hinder operational efficiency and business profitability. The owner manually records stock purchases in exercise books, tracks sales on scraps of paper, and calculates remaining stock through periodic physical counts. This process is not only time-consuming but also prone to errors, leading to stockouts of high-demand items like engine oil and brake pads, and overstocking of slow-moving parts. The lack of accurate sales data makes it impossible to calculate daily profits, identify best-selling products, or plan for future purchases. Suppliers may go unpaid or be overpaid due to poor record-keeping, and the shop's financial health remains a mystery, limiting its potential for growth and access to credit.

Upon completion, this study will provide the following benefits to Dani Motorcycle Spare Parts and Engine Oils Shop and the broader community of small-scale retailers:

- Centralized Digital Inventory Management:** The system will provide a single, secure platform to record all stock items, including details like name, category, supplier, purchase price, selling price, quantity on hand, and expiry date for oils.
- Real-Time Stock Tracking:** The owner can view current stock levels at any time, from any device with an internet connection, enabling quick responses to customer inquiries and preventing sales of out-of-stock items.
- Automated Low-Stock Alerts:** The system will automatically generate alerts (e.g., on the dashboard, via SMS) when stock levels for critical items fall below a pre-defined minimum threshold, prompting timely reordering.
- Efficient Sales and Purchase Recording:** A simple, intuitive interface will allow the owner to quickly record daily sales and new stock purchases. Each transaction will be time-stamped and linked to the respective stock item, creating a complete audit trail.
- Comprehensive Reporting Dashboard:** The system will provide a clear dashboard showing key performance indicators such as total sales for the day/week/month, current inventory value, list of best-selling items, and items with low stock or nearing expiry. This data will empower the

owner to make informed business decisions. Supplier and Debt Management: The system will store supplier contact information and track outstanding payments, helping the owner manage supplier relationships and negotiate better terms. Improved Customer Service: By quickly checking stock availability and having a record of popular items, the owner can serve customers more efficiently and ensure that high-demand parts are always in stock. Simplified Financial Management: Accurate sales and purchase records will make it easier to calculate profits, prepare for tax obligations, and demonstrate the business's financial performance to potential lenders or partners.

This research will therefore contribute valuable data, methodological insights, and open new avenues for academic inquiry in information systems, entrepreneurship and development studies by: Filling a literature gap; There is a wealth of literature on inventory systems in large manufacturing firms, but very little focused on the unique constraints of micro, small and medium enterprises in the Ugandan retail sector, especially in non-metropolitan areas and this research will provide primary data on a contextualized case study of digital adoption in a small Ugandan town detailing the specific technological, social and economic barriers faced. A foundation for future technological innovation; this research will also serve as a baseline for more advanced studies, future researchers can build upon it to explore; integration with mobile money APIs, investigating how the web-based system can be directly integrated with mobile money platforms (like MTN MoMo or Airtel Money) to automate sales reconciliation, a critical feature for the Ugandan market where cash is still dominant.

1.6 Scope of the Study

This study focused on the development and implementation of a web-based inventory management system for Dani Motorcycle Spare Parts and Engine Oils Shop, a small retail business located in Tuba, Molo Sub-county along the Tororo-Mbale highway in Uganda.

It covered the design, development, testing, and deployment of a system that enables the shop owner to digitally manage all core inventory operations. The system allows for the management of stock items, recording of sales, recording of purchases, tracking of suppliers, generation of sales and inventory reports, and the setting of automated low-stock alerts.

Depth of Investigation: The study examined the challenges associated with the traditional manual inventory system, the benefits of digital transformation in small retail businesses, and the feasibility of implementing a cost-effective, web-based platform for inventory management.

Sample Size: The system was tested with the owner and staff members of Dani Motorcycle Spare Parts and Engine Oils Shop, as well as regular customers, to evaluate its effectiveness, usability, and impact on business operations.

Geographical Location: The study was conducted at Dani Motorcycle Spare Parts and Engine Oils Shop located in Tuba, Molo sub-county along the Tororo-Mbale highway, focusing on the inventory management activities within this single retail outlet.

Time Frame: The research, system development, and testing were carried out over a period of three weeks, covering requirement analysis, system design, development, testing, and deployment.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on inventory management systems, digital transformation in small and medium-sized enterprises (SMEs), and retail management information systems. It examines the role of technology in transforming stock control, sales tracking, and administrative processes in small businesses, with specific focus on inventory management systems. The chapter also examines challenges associated with manual inventory systems and highlights the benefits of automated systems in managing retail operations.

2.2 Digital Transformation in Small and Medium Enterprises (SMEs)

Digital transformation in SMEs involves the integration of digital technology into all areas of business operations, fundamentally changing how businesses operate and deliver value to customers. According to the literature, SMEs worldwide are adopting digital solutions to improve efficiency, enhance customer experience, and remain competitive. In the retail sector, this transformation is often centered around inventory and point-of-sale systems (Jonathan et al., 2019).

The COVID-19 pandemic accelerated digital adoption in many sectors, including retail, demonstrating the feasibility and benefits of online and automated systems for business continuity. Research by Ojukwu Emmanuel Ifeanyi (2013) shows that digital inventory systems can reduce stockouts by up to 80% and improve inventory turnover rates significantly compared to manual processes. This finding was particularly relevant to the current study, as Dani Motorcycle Spare Parts and Engine Oils Shop experienced frequent stockouts under the manual system.

2.3 Management Information Systems (MIS) in Retail

Management Information Systems (MIS) are a subset of information systems designed to provide managers with timely, accurate, and relevant information to support planning, monitoring, and decision-making. In a retail context, MIS generate structured reports based on data collected from transaction processing systems, such as sales and inventory data.

For small retail shops, an effective MIS can play a significant role in monitoring stock levels, managing sales, allocating resources, and evaluating business performance. It enables the owner to track sales trends, identify fast-moving items, and make informed decisions that improve business profitability and efficiency. A web-based inventory management system can be considered a specialized retail MIS, as it supports the management and monitoring of stock levels, sales outcomes, and supplier performance.

2.4 Inventory Management Systems in Small Retail Businesses

Inventory management is a critical operational process for any retail business. For small shops, it ensures that they have the right products, in the right quantity, at the right time to meet customer demand while minimizing holding costs. Traditional inventory processes involve manual stock-taking, paper-based ledgers, and mental records—a system that becomes increasingly difficult to manage as the business grows (Adamu, 2022).

2.4.1 Types of Inventory Management Systems

- **Paper-Based Ledgers:** This is the most traditional method, where the owner records purchases, sales, and stock counts in exercise books. While simple to start, these systems are prone to errors, difficult to analyze, and offer no real-time visibility. They are vulnerable to loss, damage, and theft (Ojukwu Emmanuel Ifeanyi, 2013). The current study confirmed that Dani Motorcycle Spare Parts and Engine Oils Shop operated entirely on this type of system prior to the intervention.
- **Spreadsheet-Based Systems:** Some small businesses use spreadsheets like Microsoft Excel for tracking inventory. While better than paper, these systems require manual data entry, lack real-time updates, cannot send automated alerts, and are prone to file corruption or formula errors.
- **Web-Based Inventory Systems:** Modern web-based systems provide centralized data storage, real-time stock tracking, automated alerts, and detailed reporting. They can be accessed from any device with an internet connection and are often scalable to accommodate business growth. This is the type of system developed in the current study.

2.5 Features of Effective Inventory Management Systems

Research on retail management systems (Prabhash & Raju, 2019) identifies key features of effective inventory management systems for small businesses:

- Centralized product database with item details (name, price, quantity)
- Real-time stock level visibility
- Low-stock and expiry alerts
- Sales and purchase transaction recording
- Reporting and analytics (e.g., sales reports, best-sellers, stock value)
- Supplier management
- User-friendly interface with role-based access (e.g., owner, staff)

These features were incorporated into the system developed for Dani Motorcycle Spare Parts and Engine Oils Shop.

2.6 Challenges in Current Inventory Management Systems for Small Ugandan Retail Shops

The literature revealed that many small retail shops in Uganda continue to rely on manual or paper-based systems to manage their inventory. These manual systems are associated with several challenges:

- **Difficulty in Tracking Stock Levels:** The lack of a centralized system results in stockouts of popular items and overstocking of slow-moving ones, both of which negatively impact cash flow and profitability (Adamu, 2022; Prabhash & Raju, 2019).
- **Poor Documentation and Record-Keeping:** Manual ledgers make it difficult to track sales history, reconcile stock discrepancies, or provide accurate data for financial planning.
- **Delayed and Inaccurate Decision-Making:** Without real-time data, the owner cannot quickly identify which items are profitable or which suppliers are most reliable.
- **Time-Consuming Stock-Taking:** Physical stock counts are required to determine stock levels, a process that is laborious, often inaccurate, and forces the business to halt operations.
- **Data Loss and Inconsistencies:** Paper-based systems are prone to data loss from fire, water damage, or simple misplacement. Records can be inconsistent, making it hard to retrieve historical sales data.
- **Lack of Accountability:** Without a digital record of sales and purchases, it is difficult to track staff performance or identify potential theft or errors.
- **Limited Storage Space for Physical Records:** Over time, the accumulation of paper receipts and ledgers becomes a storage challenge.

These challenges were all observed at Dani Motorcycle Spare Parts and Engine Oils Shop during the initial requirements gathering phase of this study.

2.7 Benefits of an Automated Web-Based Inventory Management System

Web-based inventory systems offer numerous advantages over manual approaches. These include improved accuracy of records, enhanced decision-making through real-time data, secure digital storage of transaction history, and automated alerts (Adamu, 2022; Jonathan et al., 2019).

Electronic systems allow the shop owner to interact with their inventory data through a centralized platform, reducing delays and improving transparency. Automated tracking of sales and stock levels ensures timely reordering and enables the owner to monitor business performance effectively. Studies indicate that small business owners who adopt electronic inventory systems experience improved efficiency, better customer service, and increased profitability (Crockett et al., 2018; Jonathan et al., 2019).

By adopting an automated web-based inventory management system, a small retail shop like Dani Motorcycle Spare Parts and Engine Oils Shop can significantly reduce administrative burden, minimize stock-related losses, and enhance the overall effectiveness and profitability of the business (Ojukwu Emmanuel Ifeanyi, 2013).

2.8 Theoretical Framework

This study was guided by two main theories. The first was the Technology Acceptance Model (TAM), developed by Davis (1989), which posits that perceived usefulness and perceived ease of use determine an individual's intention to use a technology. This framework informed the system design process, ensuring that the developed system would be both useful to the shop owner and easy to operate given his limited prior exposure to digital inventory systems.

The second was the Systems Theory, which views an organization as a set of interrelated components working together to achieve a common goal. This theory informed the understanding that inventory management does not operate in isolation but interacts with sales, purchasing, and customer service functions. The developed system therefore integrated these components into a unified platform.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes the methods that were used to achieve the objectives of the study. It describes how data was collected using literature review, interviews, observation, and focus groups, and how collected data was analyzed to aid the system development.

The method chosen for data collection of this project was qualitative, which proved the best and most efficient approach for collecting complete information from a small population and the business owner. Qualitative methods are for conducting research that relies on open-ended exploration of people's actions, words, thoughts, and intentions. The qualitative methods employed included observation, focus groups, and interviews.

This study aimed to develop an inventory management system to enhance real-time stock tracking, sales management, and data security at Dani Motorcycle Spare Parts and Engine Oils Shop.

3.2 Area of Study

The study was conducted at Dani Motorcycle Spare Parts and Engine Oils Shop located at Tuba, Molo sub-county along the Tororo-Mbale highway in Uganda. The shop is situated in a trading center representative of the many small retail outlets found in Ugandan rural and peri-urban areas.

The institution (shop) was selected due to its critical role in the local motorcycle transport economy and the clear need for an efficient inventory management solution. Before this research, the business owner relied entirely on a manual system and had expressed interest in adopting a digital solution.

The research focused on examining the shop's inventory processes, which were predominantly managed through manual stock cards and mental records. This context presented an ideal opportunity to assess the limitations of the existing system and to explore how a digitalized inventory system could improve business operations and customer service.

3.3 Study Population and Sampling

The population of the study consisted of the business owner, staff, and customers of Dani Motorcycle Spare Parts and Engine Oils Shop who were directly involved in inventory management or purchasing processes. The research involved a total of one (1) business owner, one (1) staff member, and five (5) regular customers. These participants were considered key stakeholders within the business environment and provided valuable insights into the limitations of the existing system and requirements for the proposed web-based inventory management system.

Participant	Male	Female
Business owner	1	—
Staff	—	1
Regular customers	3	2
Total	4	3

Table 1: Participants' table

A purposive sampling method was used to select the business owner and staff, as they were the primary users of the inventory system. A convenience sampling method was used for selecting regular customers based on their availability and willingness to participate.

3.4 System Development Methodology

The development of the proposed Inventory Management System followed a systematic approach that ensured the system met the needs of the business owner, staff, and customers. The methodology involved gathering relevant data, analyzing requirements, designing the system, and implementing it in a structured manner using the Rapid Application Development (RAD) approach within the Structured System Analysis Design Method (SSADM) framework.

RAD is an agile methodology that prioritizes iterative prototyping and user feedback over rigid planning, aimed at shortening the transition from planning to implementation. The four stages under RAD were followed:

- 1. Requirement Determination:** Analysts engaged with the shop owner and staff to identify pain points, such as physical stock counting and lack of real-time sales data.
- 2. Design:** This iterative phase involved creating system mockups. The user provided input on the interface for adding new stock items, recording sales, and viewing the inventory dashboard.
- 3. Implementation:** This phase involved the actual coding and construction of the information system based on the approved design.
- 4. Testing:** The final stage where the system was checked for user satisfaction, ensuring it effectively generated low-stock alerts and accurate sales reports.

3.5 Data Collection Techniques

To gather relevant information for system design and development, the following data collection techniques were employed: interviews, observation, questionnaires, and literature

review. These methods were selected to ensure a comprehensive understanding of the current inventory processes and user requirements.

3.5.1 Interview Method

Interviews involving direct, face-to-face interactions between the researcher and participants were conducted to gather detailed information regarding their experiences, expectations, and challenges with the current inventory system. Interviews proved particularly effective for understanding user needs, workflows, and system requirements in depth.

Advantages of interviews realized in this study included:

- The researcher was able to probe and follow up on interesting points for further clarification.
- The method facilitated understanding of participant experiences, expectations, and suggestions for improvement.
- Participants expressed their thoughts and opinions freely.
- In this study, interviews were conducted with the business owner, staff, and regular customers to obtain insights into the current inventory management system, highlight pain points, and identify requirements for the proposed web-based system.

3.5.2 Questionnaires

Questionnaires were distributed to a small group of customers to understand their purchasing habits and their perceptions of the shop's service quality, particularly regarding stock availability. The questionnaires contained structured and semi-structured questions that allowed for both quantitative and qualitative data collection.

Advantages of using questionnaires in this study included:

- Anonymity and confidentiality encouraged respondents to provide honest and unbiased answers.
- Data quantification allowed for statistical analysis and clearer communication of findings.
- The method was cost-effective and allowed for collecting information from multiple respondents efficiently.

3.5.3 Observation Method

Observation was employed to validate the findings from interviews and provide direct insights into the current inventory system. This method allowed the researcher to identify inefficiencies and practical challenges, including:

- Time taken to manually count stock

- The process of recording a sale in a ledger
- How the owner checks for stock availability when a customer asks for an item
- Communication gaps between the owner and customers regarding stock

By observing real-time activities, the study captured contextual nuances that were not fully expressed in interviews, ensuring that the proposed web-based inventory system addressed real user needs and workflow bottlenecks.

3.5.4 Review of Existing Literature

A review of existing literature was conducted to develop a theoretical and practical understanding of web-based inventory management systems. This review involved analyzing academic journals, books, research papers, and credible online sources to:

- Understand best practices in managing inventory digitally
- Identify common challenges and limitations associated with manual systems
- Explore trends, success factors, and potential pitfalls in the implementation of web-based inventory platforms for small businesses.

3.6 Data Analysis and Presentation

Data analysis involved systematically processing and examining collected data to derive meaningful insights, while data presentation referred to the clear and concise display of findings to communicate results effectively.

3.6.1 Qualitative Data Analysis

The qualitative data collected through interviews and observations was analyzed using qualitative analysis methods. This approach focused on understanding the underlying reasons, motivations, and processes behind participant behaviors and responses. In this method:

- Collected data was organized according to the method of collection
- Responses were coded and categorized into themes to identify patterns, common challenges, and user needs
- The analysis focused on interpreting the findings in the context of the current inventory system, highlighting inefficiencies, gaps, and opportunities for improvement

3.6.2 Quantitative Data Analysis

Quantitative data collected through questionnaires was analyzed using numerical and statistical methods. Data was organized into structured formats such as tables, charts, and graphs. Visual representations including bar graphs and pie charts were used to present trends, frequencies, and distributions clearly.

3.7 System Design Tools

The following design tools and diagrams were employed during the system design phase:

- System Architecture Diagram: Provided a structured layout and behavior of system components, illustrating how the shop owner, staff, and customers interact with the system via a web browser on a phone or computer.
- Context Diagram: Provided a high-level view showing the system as a single process interacting with external entities: Shop Owner (manages stock, records sales, views reports), Staff (records sales, checks stock), and Suppliers (receive orders, provide stock).
- Data Flow Diagram (DFD): Mapped the internal movement of data, tracking a sales transaction from the point of sale, through the reduction of stock quantity, to the generation of a daily sales report.
- Use-Case Diagram: Modeled the various functions that users perform within the system:

3.8 System Software Implementation and Tools

The Inventory Management System was developed as a web-based application utilizing the WAMPP/XAMPP stack for local development and testing.

- Operating System: Windows OS, which managed hardware and software resources and provided the environment for local server hosting and code execution.
- Development Environment (IDE): Visual Studio Code was used as the primary code editor for writing PHP logic, HTML structures, and JavaScript functionalities.
- Web Server & Local Environment: XAMPP/WAMPP served as the local cross-platform web server to interpret PHP scripts and manage the system locally.
- Database Management System: MySQL, a relational database management system, was used to store product details (name, price, quantity), sales records, purchase records, and supplier information. phpMyAdmin was used for database administration.
- Frontend Technologies: HTML and CSS were used for structuring the inventory forms and styling the user interface. JavaScript was used to handle client-side validation for a smoother user experience.
- Backend Technology: PHP, the server-side scripting language, was used to handle business logic, process sales and purchase transactions, and communicate with the MySQL database.
- Web Browser: Google Chrome and Microsoft Edge were used for debugging and viewing the application.

CHAPTER FOUR: SYSTEM DESIGN AND IMPLEMENTATION

4.1 Introduction

This chapter describes the study of the current (manual) inventory system at Dani Motorcycle Spare Parts and Engine Oils retail shop, its strengths and weaknesses, the proposed system requirements (Functional and Non-Functional), and the detailed System Design (Context Diagram, Data Flow Diagram, ERD, Use Case Diagram).

4.2 Current System Study

The Current Inventory management System at Dani Motorcycle Spares is a manual, paper-based inventory management system. The shop owner, Dani, acts as the primary administrator, stock controller, and salesperson. Stock records are kept in several exercise books and ledgers. When new spare parts (e.g brake pads, chains, spark plugs) or engine oils (e.g 2T, 4T, gear oil) are received from suppliers in Kampala or Mbale, their quantities and purchase prices are manually written into a stock-in- ledger. When a customer purchases an item, the sale is recorded in a separate sales book, and the stock ledger is manually adjusted by scratching out the old quantity and writing a new one.

The system has been in existence since the shop opened three years ago. The shop is a single, small retail space, but all inventory items are stored on open shelves, and their records are kept in a single file or book with no logical organization or automation. Currently, the shop relies entirely on manual stock-taking, which is a time-consuming procedure, often done only once a month, leading to frequent stock-outs or overstocking. The existing system lacks real-time updates, automation, and reporting capabilities, leading to significant inefficiencies in handling inventory data.

4.3 Strengths of the Current System

- The current manual system gives the shop owner a direct, physical feel for the inventory, allowing him to visually inspect parts.
- It does not require any specific ICT skills or knowledge to record a sale or a new stock delivery.
- It has very low initial setup cost, requiring only a pen and a notebook.
- It allows for direct, face-to-face interaction with customers, explaining product features in detail.

4.4 Weaknesses of the Current System

- **Difficulty in Retrieval:** Finding the exact stock level or sales history for a specific part, like a Yamaha brake shoe, is extremely difficult and time-consuming, requiring manual flipping through many pages.
- **Lack of Real-time Data:** The owner cannot know the current stock level without physically counting items or mentally calculating from the last known record. He cannot access stock status from home or while away from the shop.
- **Prone to Errors:** Manual recording is highly susceptible to mathematical errors in calculating totals, stock balances, and daily sales. Human errors in writing item names or quantities are common.
- **Data Loss and Damage:** Paper records can be easily lost, torn, stained with engine oil, or fade over time, leading to permanent loss of valuable business data.
- **No Low-Stock Alerts:** The system provides no automatic notification when stock levels for popular items like Super 2T oil fall below a critical threshold, leading to missed sales.
- **Poor Decision Making:** The owner cannot easily generate reports on which products sell fastest (e.g. TVS chain sprocket vs Bajaj air filter), making it difficult to make informed purchasing decisions.
- **Time-Consuming Stock-taking:** Monthly physical stock-taking requires the shop to close for a full day as every item must be manually counted and cross-referenced with the ledger.

4.5 System Requirements

Using data collected through interviews and observation at Dani Motorcycle Spares, the following functional and non-functional requirements were identified.

System user	Summary of Role	Key requirements for the user
Shop owner (Administrator)	The owner (Dani) manages all aspects of the business, including users, products, and reports	Login securely, add/edit/delete product categories (e.g Engine Oils, Brake Parts), add/edit/delete products, manage supplier information, view all sales and stock levels, generate sales and stock reports, add/edit/delete system users.

Shop Attendant (shop supplier)	A staff member whose primary role is to record sales, check stock and supply a given spare part for customers	Login, view current stock levels of all items, search for a specific spare part, record a new sale (which automatically updates stock), view daily sales summary, request a stock replenishment.
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Table 2: System Users and their Requirements for Dani Motorcycle Spares

4.5.1 Functional Requirements

The Functional Requirements describe the specific services the new web-based system will provide:

- The system shall allow the owner to register, update, and delete product information (e.g., product name, category, compatible motorcycle models, unit price, current quantity).
- The system shall automatically calculate the total cost of a sale and update the corresponding product quantity in real-time after a successful transaction.
- The system shall allow users to search for any spare part or engine oil by name, category, or compatible motorcycle model (e.g Honda CG125).
- The system shall generate a low-stock alert report when the quantity of any product falls below a predefined minimum threshold (e.g 5 units).
- The system shall be able to generate daily, weekly, and monthly sales reports, as well as a current stock valuation report.

4.5.2 Nonfunctional Requirements

- User-friendly: The system shall have a simple, intuitive interface that requires minimal training for a shop attendant with basic computer skills.
- Security: The system shall ensure high security by requiring unique usernames and passwords. Unauthorized users shall not be able to access, view, or modify the database. The owner shall have exclusive rights to modify product details.
- Reliability & Availability: The system should be available 24/7 during shop operating hours. It shall have a backup and recovery mechanism (e.g., daily database backup) in case of a server failure or power outage.
- Performance: The system shall respond to most user actions (search, record sale, generate report) in less than 3 seconds, even with a growing database of products.

- Offline Capability (Future consideration): While primarily web-based, the system should be designed to handle occasional internet interruptions, perhaps by caching critical data.

4.6 System Design

System Design is the process of defining the architecture, modules, interfaces, and data for the system to satisfy the specified requirements. This is represented using several design tools.

4.6.1 System Context Diagram

This is the highest-level Data Flow Diagram, showing the entire inventory system as a single process. It illustrates the system's boundaries and its interaction with external entities: the Shop Owner, the Shop supplier and the Customer (who indirectly triggers a sale).

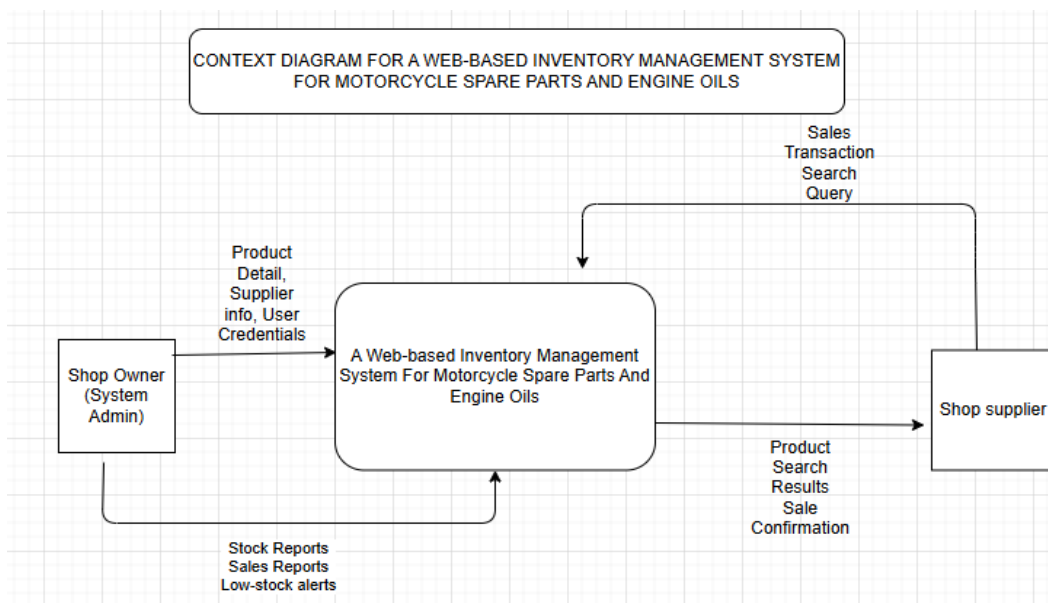


Figure 1: system context Diagram for Dani Motorcycle Spares.

4.6.2 Data Flow Diagram (DFD)

The DFD breaks down the main process into sub-processes, showing how data moves between them. Key processes include: Manage Products, Process Sale, Generate Reports, and Manage Suppliers.

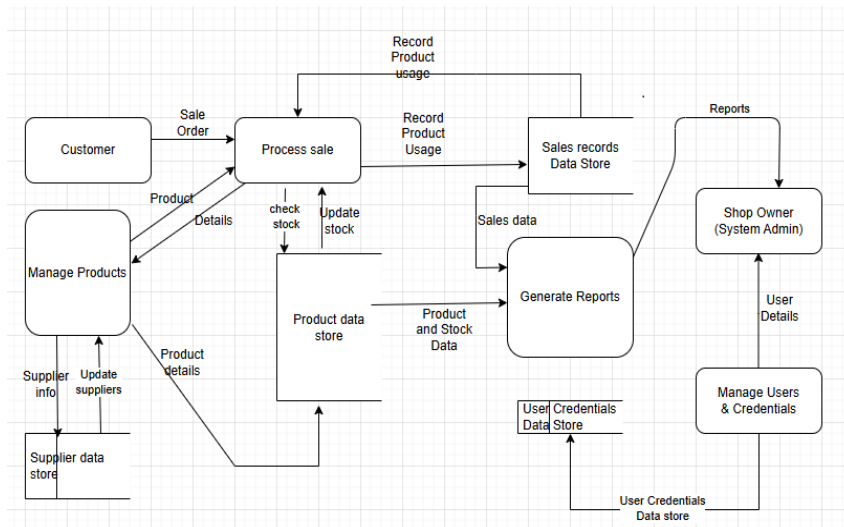


Figure 2: Data Flow diagram for Dani Motorcycle Inventory Management System.

4.6.3 Entity Relationship Diagram (ERD)

The ERD is a graphical representation of the logical structure of the system's database, showing the entities (tables) and their relationships.

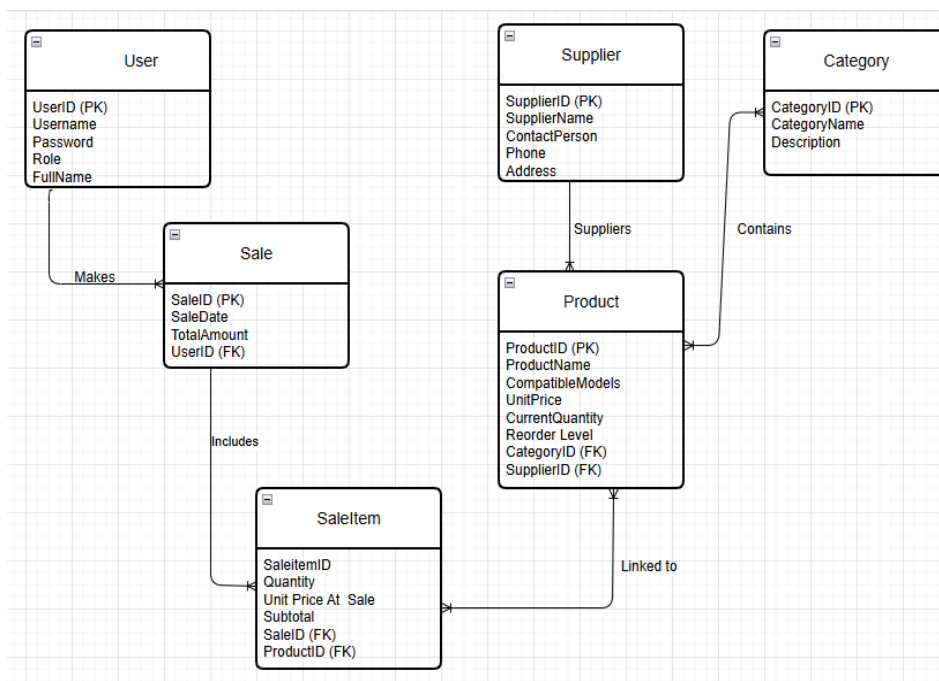


Figure 3: System Entity Relationship Diagram for Dani Motorcycle Spares

4.6.4 Use Case Diagram

The Use Case diagram represents the functionalities of the system from the user's perspective. It shows the different actors (Shop Owner, Shop Attendant) and the actions they can perform.

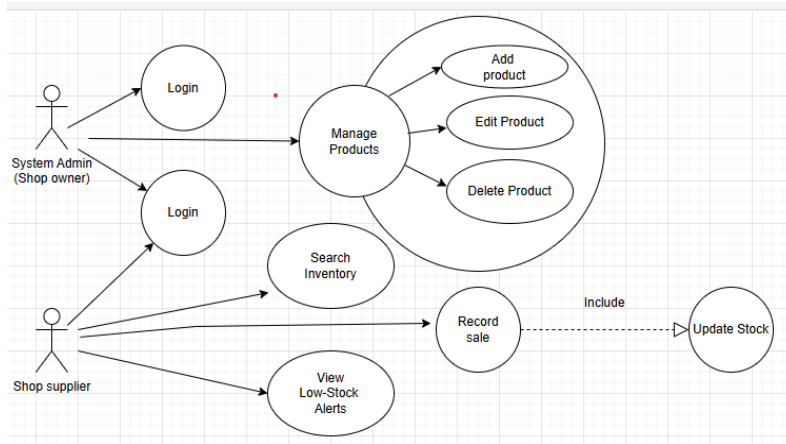


Figure 4: Use Case Diagram for Dani Motorcycle Spares Inventory Management System.

CHAPTER FIVE: PRESENTATION OF RESULTS.

5.1 Introduction

This chapter presents the actual implementation and testing of the web-based inventory management system for Dani Motorcycle Spares. It shows the key user interfaces, including the login page, product management, sales recording, reporting, and the testing strategies employed.

The system was successfully implemented as a web-based application using PHP for backend logic, MySQL for the database, HTML/CSS for structure and styling, and JavaScript for client-side validation. XAMPP was used as the local development server.

5.2 Login Interface Design

The login interface is the first point of entry for all users and contains the key system portals, that is; System administrator (Shop owner), customers and the shop suppliers as clearly shown below. It authenticates users to ensure the security of the inventory data.

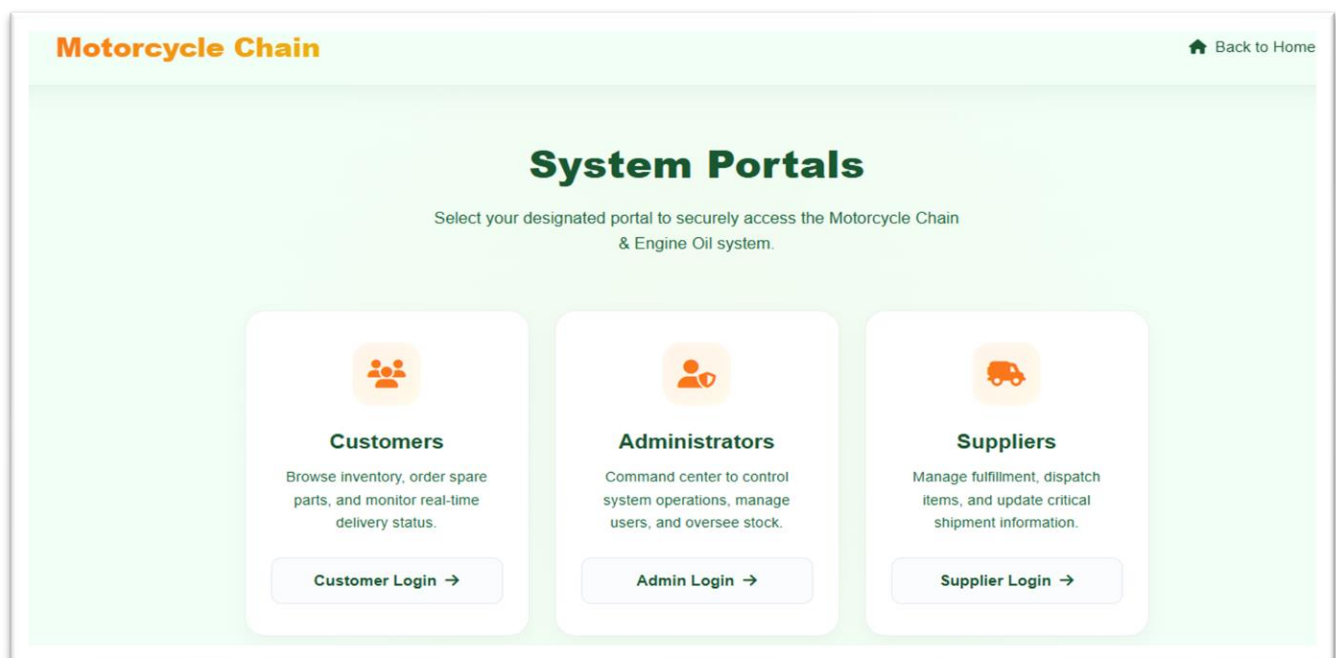


Figure 5

Figure 5: Login Interface for Dani Motorcycle Spares and Engine Oils Inventory Management System

5.3 Admin User Management Interface

This interface is only accessible to the Shop Owner (System Admin). It allows him to create, view, edit, and deactivate accounts for shop attendants. The admin Panel contains other key system components as shown below.

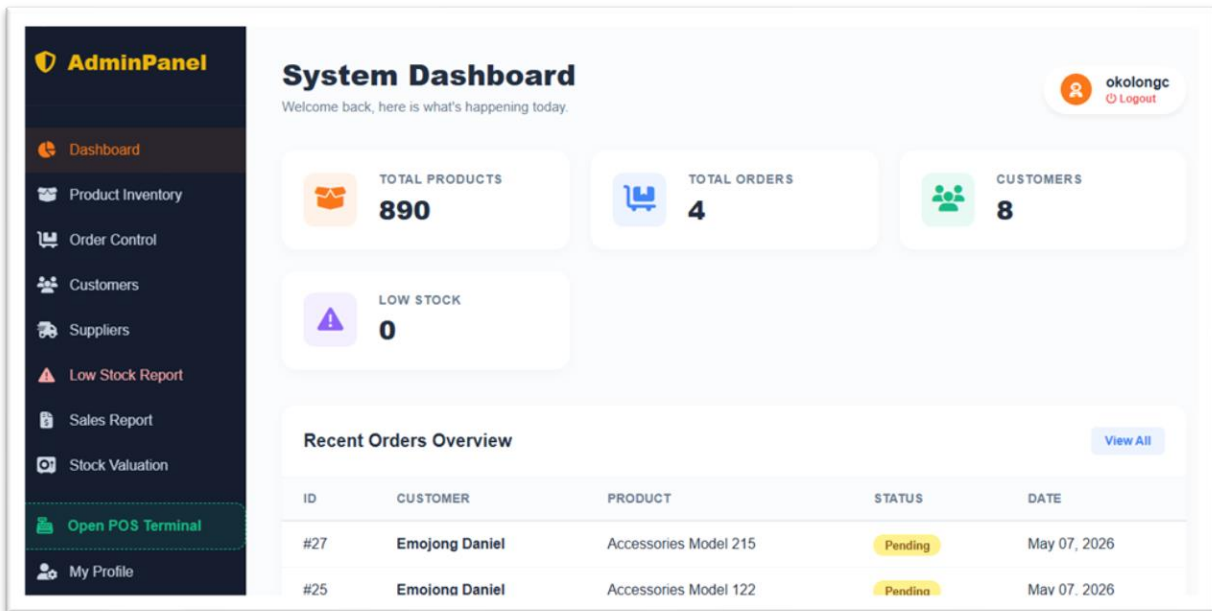
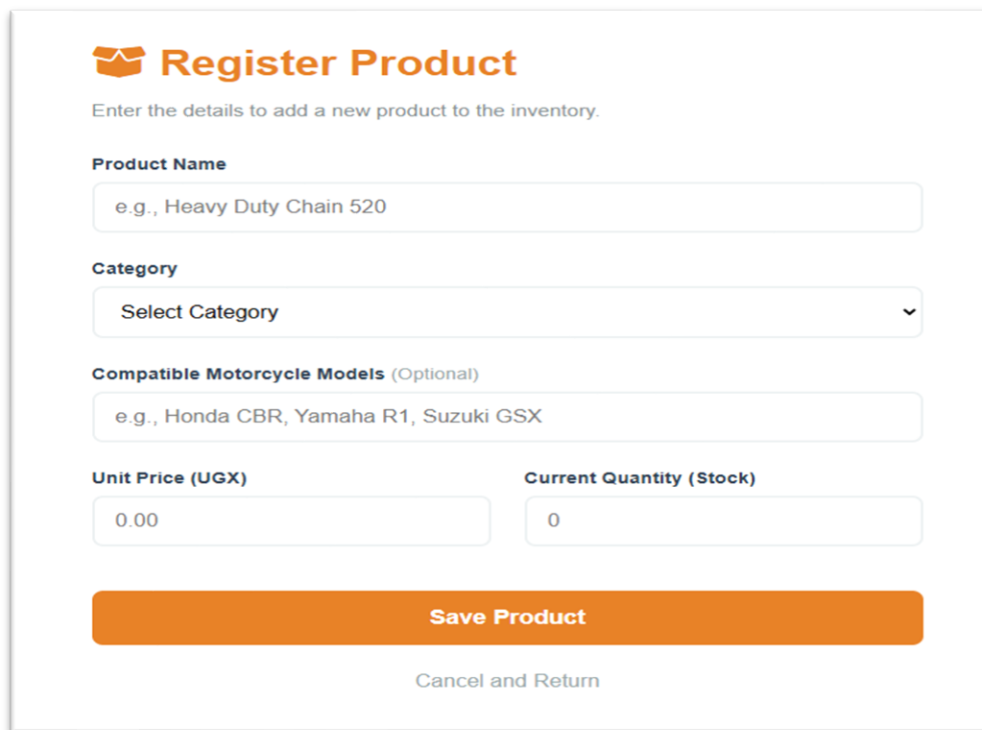


Figure 6: Admin Command Center Interface for Dani Motorcycle spares & Engine Oils Inventory Management System.

5.4 New Product Registration Interface

This interface enables the owner to add new spare parts or engine oils to the inventory database.



The image shows a web form titled "Register Product" with an orange icon of a box. Below the title is a subtitle: "Enter the details to add a new product to the inventory." The form contains several input fields: "Product Name" with a placeholder "e.g., Heavy Duty Chain 520", "Category" with a dropdown menu showing "Select Category", "Compatible Motorcycle Models (Optional)" with a placeholder "e.g., Honda CBR, Yamaha R1, Suzuki GSX", "Unit Price (UGX)" with a placeholder "0.00", and "Current Quantity (Stock)" with a placeholder "0". At the bottom, there is a large orange button labeled "Save Product" and a smaller link labeled "Cancel and Return".

Figure 7: New Product Registration Interface.

5.5 Dashboard and Inventory Summary Interface

After login, the user (system admin) is presented with a dashboard that provides a quick overview of the shop's status.

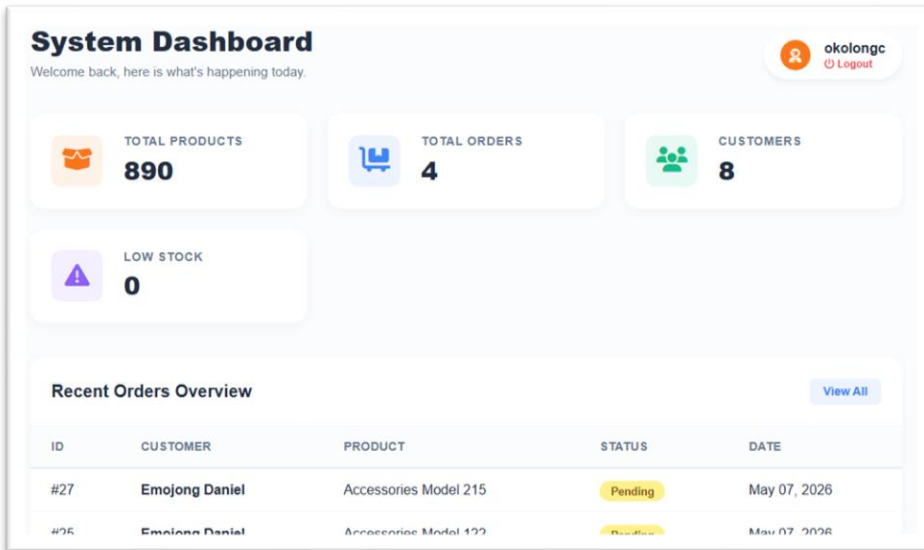


Figure 8: System Dashboard and inventory summary Interface

5.6 Sales Recording Interface

This is the primary interface for the shop attendant. It is designed for speed and ease of use to process customer transactions quickly.

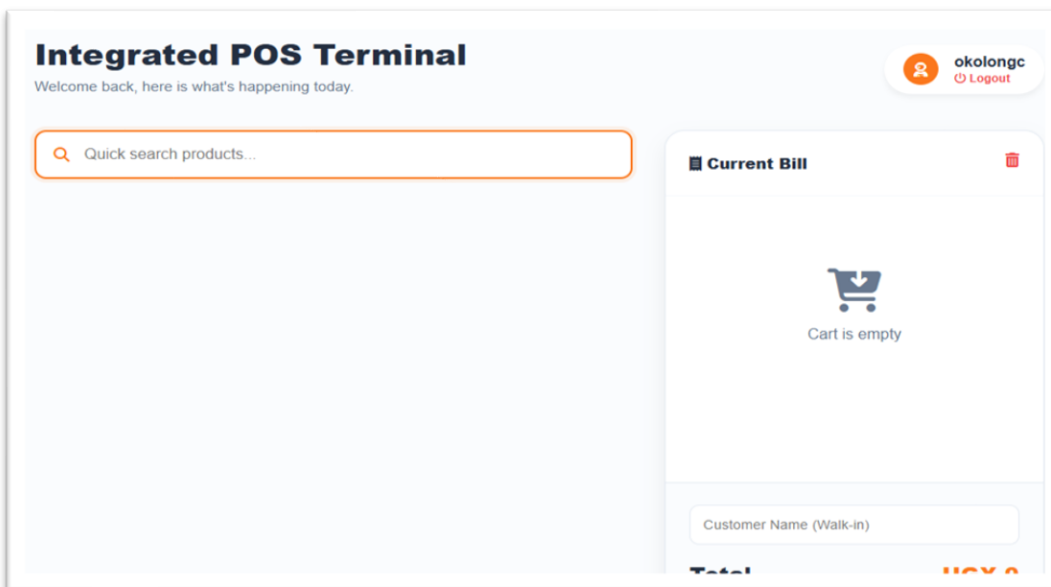


Figure 9: Point of Sale (POS) Interface

5.7 Stock Management and Adjustment Interface

This interface allows the owner to perform stock adjustments, such as adding new stock from a supplier or correcting a damaged item.

Product Inventory

Welcome back, here is what's happening today.

okolongc
Logout

Inventory List

+ Add New Product

ID	NAME	CATEGORY	COMPATIBLE MODELS	PRICE	STOCK	ACTIONS
#1048	Chain Model 998	Chain	N/A	UGX 118,807	125	
#1046	Engine Oil Model 996	Engine Oil	N/A	UGX 128,237	82	
#1041	Lubricants Model 991	Lubricants	N/A	UGX 65,471	119	
#1039	Brakes Model 989	Brakes	N/A	UGX 114,780	176	

Figure 10: Stock Adjustment Interface

5.8 Reporting and Analytics Interface

This interface allows the owner to generate various business intelligence reports.

Detailed Sales Report

Welcome back, here is what's happening today.

okolongc
Logout

TOTAL REVENUE
UGX 706,240

TOTAL ITEMS SOLD
25

Successful Transactions

ORDER ID	DATE	CUSTOMER	PRODUCT	QTY	TOTAL COST
#27	May 07, 2026	Emojong Daniel	Accessories Model 215	2	UGX 159,144
#25	May 07, 2026	Emojong Daniel	Accessories Model 122	9	UGX 0
#23	May 07, 2026	Emojong Daniel	Accessories Model 202	6	UGX 0

Figure 11: Sales and Stock Reports Interface

5.9 System Testing

System testing is a technique used to evaluate the system; it is focused on how the users interact with the front end of the system. In order to discover the weaknesses and strength of the system, the following testing strategies were used.

5.9.1 Unit Testing

This is a method where individual units of source code are tested to determine if they are ready for use. A unit is a smallest testable part of an application. A system was tested unit by unit with the presence of the shop owner in order to enable the developer to identify each part of the program to show that individual parts function correctly.

5.9.2 Integration Testing

All components were tested together. A complete transaction flow was tested: a user logs in, searches for a product , adds it to the cart, completes the sale, verifies that the product's Current Quantity in the database has decreased correctly. The report generation module was tested to ensure it pulled accurate data from the sales and product tables.

5.9.3 Security Testing

Several security tests were performed:

- Authentication: Attempting to log in with incorrect usernames and passwords was unsuccessful. The system rejected all invalid attempts.
- Authorization: A test account with the attendant role was unable to access the User Management or Product Registration pages. If an attendant tried to manually type the URL for the admin page, they were redirected to the dashboard with an access denied message.

CHAPTER SIX: DISCUSSION, CONCLUSIONS, RECOMMENDATIONS AND FUTURE WORK.

6.1 Introduction.

This chapter summarizes the project, discussing what was achieved against the set objectives for Dani Motorcycle Spares. It provides conclusions drawn from the findings, offers recommendations for the shop owner, and outlines areas for future work.

6.2 Discussion of Results.

The study managed to achieve the four main objectives of the project that generated the themes that is; requirements determination, system design, implementation and system testing. The study resulted to the development of the web-based inventory management system through the following;

6.2.1 Determination of System Requirements.

The study successfully identified the specific needs of a small motorcycle spare parts shop through interviews and observation. Key requirements like low-stock alerts, product search by compatibility, and simple sales recording were determined from the analysis of the manual system's weaknesses.

6.2.2 System Design.

The system was successfully designed using standard tools. The Context Diagram, DFD, ERD, and Use Case Diagrams provided a clear blueprint for development. The ERD, in particular, ensured a robust database structure to manage products, categories, suppliers, sales, and users efficiently.

6.2.3 System Implementation.

The design of the web-based inventory management system with two parts that is the front-end and the back-end was successfully implemented through the use of different implementation software tools such as PHP, HTML, JavaScript, wampp server with its databases linked by MYSQL query language that provides an efficient storage of motor spare records.

6.2.4 System Testing

All system components were tested. Unit testing confirmed that individual functions worked correctly. Integration testing validated the end-to-end flow of a sale and its effect on stock levels. Security testing confirmed that authentication and authorization mechanisms were effective in preventing unauthorized access.

6.3 Conclusion

Based on the findings, it was established that the manual inventory system at Dani Motorcycle Spares is highly inefficient, prone to errors, and lacks the capability to provide real-time information crucial for a growing retail business. The manual process leads to stock-outs,

overstocking, and lost sales opportunities. The use of ICT resources, specifically a web-based inventory management system, is currently lacking.

Therefore, this project concludes that Dani Motorcycle Spares and similar small retail shops must adopt a computerized, web-based inventory management system. The developed system successfully addresses the core problems by automating stock updates, enabling quick product search, providing low-stock alerts, and generating valuable sales reports. This adoption is essential for the success and growth of the business, allowing it to enjoy the various advantages of ICT for inventory control.

6.4 Recommendations

For the successful adoption of the new system, the following is recommended for Dani Motorcycle Spares:

- **Staff Training:** The owner (Dani) and any shop attendant (shop supplier) must be thoroughly trained on how to use the system, focusing on the POS interface for sales and the product search function.
- **Data Entry:** A one-time, accurate data entry exercise is required to digitize the current inventory. This should involve a full physical stock-take to establish accurate Current quantity for all products in the system.
- **Hardware Upgrade:** The shop should acquire a reliable computer or tablet and a small receipt printer. An affordable smartphone could also be used for basic access. A stable power source (solar backup is recommended) and a basic internet connection are necessary.
- **Backup Policy:** The owner should implement a simple backup policy, such as manually exporting the MySQL database to a USB drive or cloud storage every week.

6.5 Limitations

The researcher encountered several constraints during the project:

- **Financial Constraints:** The project was self-sponsored. Limited funds prevented the deployment of the system on a paid, live web hosting server. The system was demonstrated on a local server (WAMPP).
- **Time Constraints:** The one-semester time frame was insufficient to implement more advanced features like integration with mobile money payment APIs or a full customer relationship management (CRM) module.

- Technical Literacy: The primary user (Dani) had very low computer literacy. Significant time was spent during the requirements phase explaining basic ICT concepts, and the interface had to be designed to be exceptionally simple.
- Data Collection: The shop owner was often busy with customers, making it difficult to schedule long interview sessions for detailed requirements gathering.

6.6 Future Work

The current system is a solid foundation. Future improvements and expansions could include:

- Mobile Money Integration: Adding a feature to directly record payments received via mobile money (e.g, MTN MoMo, Airtel Money) and automatically reconcile them with sales.
- Barcode Scanning: Implementing barcode generation for each product and using a simple USB barcode scanner to speed up the POS process and reduce data entry errors.
- Customer Database: Adding a module to register customers, track their purchase history, and run simple loyalty programs (e.g, buy 10 engine oils, get 1 free).
- Automated Reordering: The system could be enhanced to automatically generate a purchase order (PO) as a PDF or send an email/SMS to a predefined supplier when a product's stock falls to its reorder level.
- Sales Analytics Dashboard: Creating a more advanced dashboard with graphical charts (e.g, bar charts of top-selling products, line charts of sales trends) to provide deeper business insights.
- Multi-Shop Support: Expanding the system's architecture to support a parent company with multiple retail branches, allowing for centralized inventory management and stock transfers between shops.

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APPENDICES

Appendix A: Project Budget

This appendix presents the estimated cost of developing A web-based Inventory Management System.

Budget Estimate

Item	Description	Estimated cost (UGX)
Software	XAMPP, VS code, etc (Open source)	0
Hardware	Laptop (already owned)	0
Internet	Data for research and testing	100,000
Transport	Travel to case study location	150,000
Stationary	Printing, binding etc	50,000
Contingency	Miscellaneous	50,000
Total		350,000

Appendix B: Project Schedule.

Phase	Duration(days)	Start date	End date
Requirements determination	40	Jan 1	Feb 11
Design	20	Feb 12	March 7
Implementation	24	March 1	March 24
Testing	10	March 15	March 30

Appendix C: Guide Questions

This appendix contains the guiding questions used during interviews with the shop owner, staff, and customers. Questionnaires, observation, and literature review questions are also included.

Interviews (Shop Owner, Staff, Customers)

Guiding Questions:

1. How do you currently manage your inventory (stock) at the shop?
2. What challenges do you face with your current method (e.g., stockouts, overstocking)?
3. How do you track sales and know which items are selling well?
4. How do you know when to reorder a specific spare part or engine oil?
5. What information would you find most useful from an inventory system?
6. How do you currently store and retrieve records of purchases from suppliers?

Questionnaires (Mainly Customers)

Guiding Questions:

1. How often do you purchase spare parts or engine oils from this shop?

A · Daily

☐

B · Weekly

C · Monthly

D · Occasionally

2. Have you ever come to this shop to find the item you wanted was out of stock?

A · Yes, frequently

☐

B · Yes, occasionally

C · Rarely

D · Never

3. How important is it to you that the shop has the item you need in stock?

A · Very important

☐

B · Somewhat important

C · Not important

4. Would you recommend this shop to others based on product availability?

A · Yes

☐

B · No

C · Maybe

5. Any additional comments about the shop's service?

6. How often do you visit this shop for spare parts?

7. Have you ever found an item you needed to be out of stock?

8. How would you rate the shop owner's ability to know if an item is in stock?

9. What features would make your shopping experience better?

Observation

Observation Checklist:

1. How the owner/staff checks for stock availability.
2. The process of recording a sale (time taken, tools used).
3. Communication between owner and customer regarding price and availability.
4. Record-keeping practices (manual files, notebooks).
5. Challenges faced during stock-taking or locating items.

Literature Review

Guiding Focus Questions:

1. What existing systems are used to manage inventory in small retail shops?

2. What challenges are associated with manual inventory systems?
3. What technologies are commonly used in inventory management systems for SMEs?

Thank you for your co-operation