



TECHNICAL UNIVERSITY OF KENYA

FACULTY OF APPLIED SCIENCES AND TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATICS

ELECTRONICS REPAIR SHOP MANAGEMENT SYSTEM

PROJECT TITLE PRESENTED BY:

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DECLARATION

I declare that this project work as presented in this paper is my original work and has not been presented anywhere else for any degree, diploma or award.

Signature: _____ Date: _____

ACKNOWLEDGEMENT

I would like to take this opportunity to thank God for granting me good health, wisdom and knowledge to undertake this project. My sincere gratitude to my supervisors for their continuous support, guidance and motivation as I was doing my research. I would also want to greatly thank my family for their financial and moral support. Lastly, I would like to thank my friends and classmates for their support during the research period and their helpful insight too.

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ABBREVIATIONS

SMEs -Small and medium-sized enterprises

POS – Point of Sale

1.CHAPTER ONE: INTRODUCTION

1.1 Introduction

Repair shops are an important part of the electronics industry, providing repair services for a wide range of electronic devices. However, managing a repair shop can be a challenging task, especially when it comes to managing inventory, tracking repair progress, and invoicing customers. The proposed project aims to address these challenges by providing a web-based application that streamlines the repair process, manages inventory, and provides accurate invoicing and reporting.

The proposed project will create a centralized database of customer information and repair history, enabling repair shops to provide better customer service and track repair progress. Customers will track their repair status online and receive real time updates on repair progress. It will also provide an inventory management system that enables shops to manage stock levels, streamline purchasing, and reduce stock-outs. Accurate and timely invoicing will be provided, helping to maintain good customer relationships and avoid billing errors. Comprehensive reporting will enable management to make data-driven decisions for business growth.

The current manual process of tracking repairs does not provide clients with real-time information about the status of their repairs, it is time consuming and outdated which causes significant delays due to high number of clients. This causes significant frustrations and dissatisfaction on the client's side. The current method is unable to meet the growing demand. The system will improve customer service by providing a more transparent and convenient repair process and increase revenue for the service center by increasing customer satisfaction and loyalty.

The Electronic Repair Shop Management System project is a long-term investment that will provide benefits to repair shops and service centers over time. It will help them to streamline their operations, reduce costs, and increase revenue.

1.2 Background Study

Repair shops are an essential part of the electronics industry, providing repair services for a wide range of electronic devices such as smartphones, laptops, and televisions. The electronics repair industry has been growing steadily over the past decade, as more people rely on their smartphones for both personal and professional use. In Kenya today a vast majority of the population depends on their electronic devices for their day to day lives whether for personal use or enterprise. Many people own electronic gadgets, therefore electronic business will always boom in Kenya. Machines cannot operate forever; therefore, they will have to

breakdown more often. In Kenya, the electronics repair industry has been growing steadily in recent years due to the increase in electronic device usage. According to a report by TechnoServe, the electronics repair market in Kenya was valued at \$140 million in 2018 and is expected to grow at a rate of 8% annually (TechnoServe, 2019).

As the number of electronics in circulation increases, so does the demand for repair services. However, managing a repair shop in Kenya can be a challenging task, especially when it comes to managing inventory, tracking repair progress, and invoicing customers. Traditional methods of managing these tasks can be time-consuming and error-prone. According to a survey by Cognitum Research, 67% of small and medium-sized enterprises (SMEs) in Kenya reported that they still use manual processes for managing inventory (Cognitum Research, 2019).

To address these challenges, electronic repair shops in Kenya have started to adopt management systems that help them streamline their business operations. These systems can help repair shops manage inventory, track repair progress, and generate accurate invoicing and reporting. One study found that the adoption of an electronic repair shop management system in Kenya led to a 25% increase in productivity and a 50% reduction in inventory levels (Ndung'u et al., 2020).

The proposed Electronic Repair Shop Management System project aims to address these challenges by providing a web-based application that streamlines the repair process, manages inventory, and provides accurate invoicing and reporting. The system will create a centralized database of customer information and repair history, enabling repair shops to provide better customer service and track repair progress. It will also provide an inventory management system that enables shops to manage stock levels, streamline purchasing, and reduce stock-outs. Accurate and timely invoicing will be provided, helping to maintain good customer relationships and avoid billing errors.

There is existence of foreign phone repair tracking systems in the market include RepairShopr, Cell Smart POS, and Cell Store. In Kenya, Tech Garage implemented the first electronic repair tracking system in Kenya in 2014 ([Business Daily, 2016](#)) which grew their business expeditiously.

These systems offer similar features such as repair request creation and tracking, customer management, and reporting and analytics. However, there is still room for improvement in terms of user experience, customization options, and integration with third-party services such as payment gateways and messaging providers.

1.3 Problem Statement

The electronic repair industry in Kenya is growing, but repair shop owners face challenges in managing their operations efficiently. Traditional methods of managing inventory, tracking repair progress, and invoicing customers can be time-consuming and error-prone. Additionally, repair shops often lack a centralized database of customer information and repair history, leading to poor customer service and difficulty tracking repair progress. These challenges can lead to inefficiencies, decreased productivity, and ultimately, loss of business. The proposed Electronic Repair Shop Management System project aims to address these challenges by providing a web-based application that streamlines the repair process, manages inventory, and provides accurate invoicing and reporting.

1.4 Objectives

The objectives of the proposed Electronic Repair Shop Management System are:

- To develop a web-based application that streamlines the repair process for electronic repair shops in Kenya.
- To provide accurate and timely updates to customers to enable them to track repair progress.
- To create a centralized database of customer information and repair history to enable repair shops to provide better customer service and track repair progress.
- To provide an inventory management system that enables repair shops to manage stock levels, streamline purchasing, and reduce stock-outs.

1.5 Justification

Electronic Repair Shop Management System project is a justified investment for repair shops that want to improve their efficiency, customer service, and competitive advantage. It will provide long-term benefits and enable them to make data-driven decisions for business growth.

The application will be accessible from any device with an internet connection, allowing clients to stay informed about the status of their repairs at any time. The application will improve communication, increase transparency, and provide real-time updates about the status of repairs, improving the overall repair experience for clients.

1.6 Scope of Study

The Electronic Repair Shop Management System project will focus on developing a web-based application that streamlines the repair process for electronic repair shops in Kenya. The system will have the following modules:

- Customer management: This module will enable repair shops to create and manage a centralized database of customer information, including contact details, repair history, and billing information.
- Repair management: This module will enable repair shops to manage the repair process, including tracking repair progress, and generating repair reports.
- Inventory management: This module will enable repair shops to manage inventory levels, track stock levels for customer and spare parts.
- Invoicing and billing: This module will enable repair shops to generate accurate and timely invoices for services provided and track payments.
- Reporting: This module will enable repair shops to generate comprehensive reports that provide insights into business performance, repair trends, and customer behavior.

The system will be developed to run on any standard web browser and will be compatible with desktop and mobile devices. The project will also not involve any marketing or sales activities.

The system will be designed to be user-friendly and intuitive, with a focus on providing a streamlined user experience

1.7 Limitations

While the proposed system has many potential benefits for both customers and the service center, there are also some limitations that should be considered:

- Hardware Limitations: The system relies on the availability of compatible hardware.
- Connectivity Limitations: The system relies on stable and reliable internet connectivity to function properly.
- Language Limitations: The system is only designed to support a limited set of languages, which may pose a challenge for non-English speaking customers.
- Cost: The system may come with a cost associated with its development, maintenance, and use, which may not be feasible.

By acknowledging these limitations, strategies can be developed to minimize their impact on the success of the system. Ultimately, the success of the system will depend on its ability to address the needs and challenges of the service center and customers, while balancing the limitations and constraints of the project.

1.8 Project Risk and Mitigation

- **Technical Risks:** There is a risk of technical issues arising during the development and implementation of the system, such as bugs, compatibility issues, or security vulnerabilities.
Mitigation: Testing will be conducted at every stage of the development process to identify and resolve any technical issues. Also follow best practices for secure coding and use appropriate tools and technologies to ensure the system is secure and stable.
- **Data Risks:** A risk that the system may be vulnerable to data breaches or cyber-attacks, which can lead to loss of customer data or sensitive information.
Mitigation: Best practices will be enforced for data security and implement appropriate security measures such as encryption, firewalls, and regular backups,
- **Resource Risks:** There is a risk of resource constraints, such as lack of funding that may impact the development and implementation of the system.
Mitigation: Carefully manage the project budget and timeline, and allocate resources effectively.
- **User Acceptance Risks:** There is a risk that the system may not meet the expectations or needs of its intended users, resulting in low adoption rates or negative feedback.
Mitigation: User research and testing will be conducted at every stage of the development process to ensure that the system meets the needs and preferences of its target users. User training and support will be provided to ensure that users are comfortable with the system and its features.

1.9 Project Schedule

This project will take a minimum of six months to develop and come up with a full and working solution in form of a system.

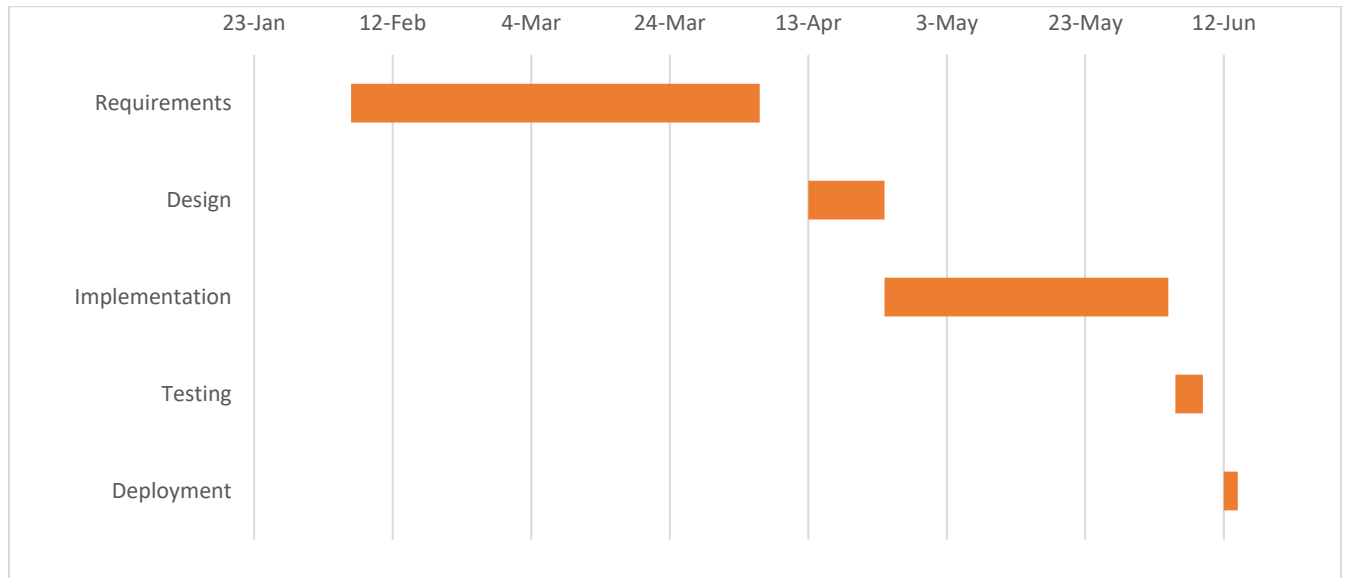


Figure 1

1.10 Cost And Requirements

Table 1

	ITEM	QUANTITY	UNIT VALUE	TOTAL
1	Laptop	1 Dell i-5	40,000	40,000
2	Wi-Fi	10mbps	3,000	3,000
3	Cloud Storage	1 Terabyte	10,000	10,000
4	Mouse	1 Dell-Bluetooth	600	600
	Total Cost			53,600

CHAPTER TWO: LITERATURE REVIEW

Electronic repair shops require efficient management of repairs, customer data, and inventory to provide quality service to their clients. This literature review examines existing systems, tools and methodologies used, gaps in the systems, and proposed solutions.

2.1 Review Of Existing Systems

2.1.1 RepairShopr

The RepairShopr is a cloud-based management system with features such as ticket management, inventory tracking, and customer management. The system also provides a point-of-sale system for tracking payments (RepairShopr, n.d.).

Overall, RepairShopr has received positive reviews from users, with many praising its ease of use and range of features. Its ticketing system has been particularly popular, as it allows users to easily manage and track customer requests.

Pros

- It is reliable and easy to use and navigate
- Great for communicating through ticket flows and tracking time spent on jobs
- The contact management and customer history function are beneficial (Capterra, n.d)

Cons

- Terrible service when requested for issue fix. Inventory system not to par.
- Changes in functionality after an update
- The customer support is poor with very long response times
- Some of the features are limited and payment gateway options are somewhat limited.

2.1.2 RepairDesk

RepairDesk is a cloud-based point-of-sale (POS) system designed for use in the cell phone repair industry. It offers features such as appointment scheduling, inventory management, customer relationship management, invoicing, and payment processing.

RepairDesk's user-friendly interface and intuitive design make it easy to use, even for those with limited technical knowledge. RepairDesk's inventory management features, which allow them to easily track stock levels and receive alerts when items need to be restocked. The system's appointment scheduling and customer relationship management features have also been well-received, with users noting that they help to streamline operations and improve customer service. (Software Advice,2020)

Pros

- Online booking
- Integrations to payment
- Easy and straight forward.
- Customer service on point.
- Price-point. (Software Advice)

Cons

- RepairDesk has a lot of bugs that are inexcusable in a top dollar POS system. Simple things like changing a price, logging in, adding new devices all have a lot of bugs that require refreshing the page and evening re-logging in. (Software Advice,2020)
- Mapping to parts is hard. (Software Advice,2020)
- Some parts of the interface are not visually appealing or easy to manage. Example: customer text message interface and notifications, Inventory reports. (Software Advice,2020)

2.1.3 Cell Store

CellStore is a cloud-based (POS) system designed for use in the cell phone repair industry. CellStore connects the various aspects of running a shop together including sales, repairs, customer management, inventory management, reporting and more.

Cell store's inventory management features have been particularly well-received, with users praising its ability to help them track stock levels and reorder supplies when needed. Users have also appreciated CellStore's appointment scheduling, Ease of use, quality (online service) and customer relationship management features, which help them to manage customer requests and improve communication.(GetApp, 2023)

Pros

- Quick and changes are instant. Also features that are requested and added if other users also find it useful. (GetApp, 2019)
- The software is so easy to use. (Capterra, n.d)
- Can be customized for your individual needs

Cons

- Some payment methods not supported. (GetApp, 2019)
- Customer support is not good.
- No mobile app or standalone options. Some updates were more confusing and felt like the software was going backwards. lack of limited feature requested are present. (G2.com, 2019)

2.2 Tools and Methodologies Used in Existing Systems

Most electronic repair shop management systems use web-based technologies. The systems are built using technologies such as PHP, MySQL, and JavaScript. For instance, RepairShopr is built using PHP and MySQL. The system has a responsive user interface that works well on desktop and mobile devices (RepairShopr, n.d.).

RepairDesk, on the other hand, uses React, a JavaScript library for building user interfaces, which allows for a fast and responsive user interface. The system uses Node.js runtime environment, Express.js which allows for fast and efficient server-side processing, and MongoDB for its backend (RepairDesk, n.d.).

CellStore's system is built using modern web technologies, such as HTML, CSS, and JavaScript, and it is hosted on the Amazon Web Services (AWS) cloud platform. CellStore's frontend is built

using the React JavaScript library. The system's backend is built using the Node.js runtime environment and the Express web application framework.

2.3 Gaps in The Existing Systems

The existing electronic repair shop management systems have some limitations. For instance:

RepairShopr has terrible service when requested for issue fix. Inventory system not to par.

RepairDesk has a lot of bugs that are inexcusable in a top dollar POS system. Simple things like changing a price, logging in, adding new devices all have a lot of bugs that require refreshing the page and evening re-logging in. Also, some parts of the interface are not visually appealing or easy to manage. Example: customer text message interface and notifications, Inventory reports. (Software Advice,2020)

CellStore customer support is not good and has limited payment gateways. (Capterra, n.d)

Additionally, some systems do not provide adequate data analytics tools for performance analysis. Others lack customizability, making it difficult to adapt to the specific needs of individual repair shops.

2.4 Proposed Solution

Proposed Solutions:

One solution is to integrate local payment gateways for convenience of our client's clients.

We will also provide quality and reliable customer support.

Another solution is to develop data analytics tools that provide comprehensive insights into repair shop operations. Customizability can be achieved through developing open-source electronic repair shop management systems

These solutions can lead to improved functionality, customizability, and better performance analysis of repair shops.

CHAPTER THREE: METHODOLOGY

Methodology refers to the specific procedures that are usually adopted in research in order to help collect, identify, select, assemble and analyze information about their particular area of study. This chapter will focus on the methodology that I intend to use in my project and the various tools that will be used to analyze the data

3.1 Methodology and Tools

3.1.1 Methodology

The methodology adopted for the electronic repair shop management system project is the waterfall model. The waterfall model is a linear sequential approach that involves a sequence of phases that must be completed in a specific order. The phases include requirements gathering, design, implementation, testing, and maintenance.

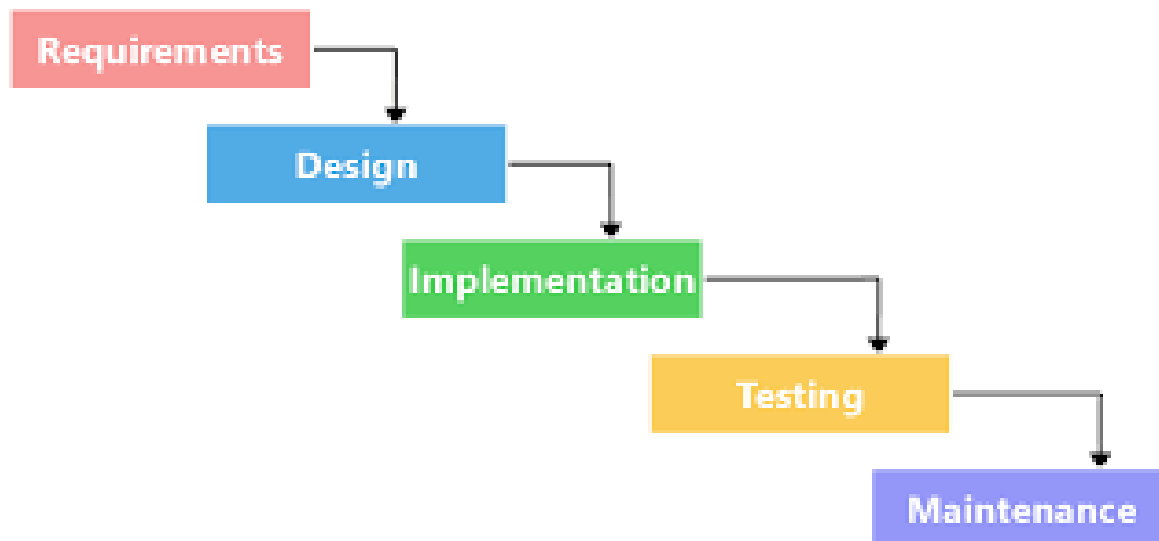


Figure 2

Requirements.

The Waterfall methodology depends on the belief that all project requirements can be gathered and understood upfront. Written requirements, usually contained in a single document, are used to describe each stage of the project, including the costs, assumptions, risks, dependencies, success metrics, and timelines for completion.

Design.

Here, developers design a technical solution to the problems set out by the product requirements, including scenarios, layouts, and data models. First, a higher-level or logical design is created that describes the purpose and scope of the project, the general traffic flow of each component, and the integration points. Once this is complete, it is transformed into a physical design using specific hardware and software technologies.

Implementation.

Once the design is complete, technical implementation starts. This might be the shortest phase of the Waterfall process because painstaking research and design have already been done. In this phase, programmers code applications based on project requirements and specifications, with some testing and implementation taking place as well. If significant changes are required during this stage, this may mean going back to the design phase.

Verification or testing.

Before a product can be released to customers, testing needs to be done to ensure the product has no errors and all of the requirements have been completed, ensuring a good user experience with the software.

Deployment and maintenance.

Once the software has been deployed in the market or released to customers, the maintenance phase begins. As defects are found and change requests come in from users, a team will be assigned to take care of updates and release new versions of the software.

This approach is suitable for this project since:

- It provides a structured approach that ensures that all aspects of the project are addressed in a logical sequence.
- Can catch design errors during the analysis and design stages, which helps to avoid writing faulty code during the implementation phase.
- With the structured approach, it is easier to measure progress according to clearly defined milestones.

3.1.2 Tools

3.1.2.1 Gantt chart

Using a Gantt chart allows you to map subtasks, dependencies and each phase of the project as it moves through the waterfall lifecycle.

3.1.2.2 Use-Case Diagrams

Describe the high-level functions and scope of a system. These diagrams also identify the interactions between the system and the external world who are users represented by actors. The use cases and actors in use-case diagrams describe what the system does and how the actors use it, but not how the system operates internally. This diagram will represent the actions and steps that the actor will take to get the benefit of interacting with the system.

These diagrams will be designed using an open-source tool called Lucidchart.

3.1.2.3 Flowcharts

They will be used to show the breakdown of the systems processes e.g. from the time a user signs up, to them being registered if successful etc. into logical parts that are going to be easily understood by the users. They communicate the steps in a project efficiently. Elements that may be included in a flowchart are a sequence of actions, materials or services entering or leaving the process (inputs and outputs), decisions that must be made, people who become involved, time involved at each step, and/or process measurements.

They will be drawn using an open-source tool for drawing flow charts called Lucidchart.

3.1.2.4 Data Flow Diagram

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination.

The design of these diagrams will be done using an open-source tool called visual paradigm.

3.2 Source of Data

Primary sources

Primary data refers to information obtained firsthand on the variables of interest for the specific purposes of study. The sources I will employ will include:

- Interviews with the electronic repair shop staff and management to understand their current process, challenges, and requirements for a management system.
- Surveys of customers to understand their feedback, suggestions, and complaints about the repair shop's services.
- Observation of the repair shop's daily activities to understand the workflow, resource utilization, and bottlenecks.

Secondary sources

Secondary data refers to information that is gathered from sources that already exist. Some of the sources I will imply to get this data will include:

- Industry reports on the electronics repair market, trends, and forecasts.
- Research papers on electronic repair shop management systems and the ir effectiveness.
- Competitor analysis reports to understand the strengths, weaknesses, opportunities, and threats of similar management systems in the market.
- Online forums and reviews to understand the customer perspective and expectations of electronic repair shop management systems. This will provide insights into the features that should be included in the proposed system.

3.4 Data Collection Methods

The data collection methods that will be used in this project include interviews, surveys, and observations.

3.4.1 Interviews

Interviews will be conducted with the owners and employees of electronic repair shops to gather information on the specific requirements of the system.

3.4.2 Surveys

Surveys will be conducted with customers to obtain feedback on their experiences with electronic repair shops.

3.4.3 Observation

Observations will be made in electronic repair shops to identify the specific processes that need to be streamlined by the system.

3.5 Resources Required

Hardware Specifications

- Laptop – Used as the working platform for the project
- Processor speed – Intel (R) Core i5 ,2.60GHz
- Memory requirements – Minimum of 4 GB RAM.
- Hard disk capacity – Minimum of 500 GB.

Software Specifications

- Software development tools – Visual Studio Code
- Software configuration management tools – Include GitHub and bitbucket to track changes in the software.
- Operating System – Windows 10.

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