**CATHOLIC UNIVERSITY OF EASTERN AFRICA**

**PROJECT PROPOSAL FOR FINAL YEAR STUDY IN COMPUTER SCIENCE**

**BY**

**JANE WAMBUI KARUGA 1040477**

**ONLINE BAKERY MANAGEMENT SYSTEM**

**FEBRUARY 2024**

# DECLARATION

I, the undersigned, declare that this proposal is my original work and that it has not been presented in any other university or institution for academic credit.

Signature: …………………………. Date: …………………........

**Name: Jane Wambui Karuga**

**Registration Number:1040477**

Supervisor: This research proposal has been submitted for examination with my approval as University supervisor.

Signature: …………………………. Date: …………………........

**Mr. Michael Kinyua**

**Head of Department Computer and Library and Information Science**

**Catholic University of Eastern Africa**

# ABSTRACT

*The bakery industry continues to be one of the fast rising industries in the food sector. However, the use of traditional paperwork to manage the systems causes these bakeries to have a reduced performance rate in terms of their sales since there is a slowdown in other related activities in the stores such as inventory management and in addition, the response time becomes lower especially when the store receives high traffic from the customers. For this reason, the research proposal aims to come up with an online bakery management system that aims to provide an efficient way for customers to order bakery products online and for inventory management for the managers of the bakery store. The research has some specific objectives guiding it such as to perform online ordering by the customers in terms of selecting their products and specifying customization and facilitate order fulfilment. The system will follow several steps in the research design such as identifying requirements, collection of data through issuance of surveys, observations and document analysis, perform system designing, implementation and testing. The system is web based and shall be implemented using front end technologies that include HTML, CSS and JavaScript. The backend shall be implemented using PHP and data will be stored in a MySQL server. In addition, the PayPal API will be used in order to facilitate smooth payment of the products when purchased. The system will be of help to bakery owners, staff and their customers for carrying out a smooth business.*

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# TERMS AND ABBREVIATIONS

**Artificial Intelligence-**A method of making a computer, a computer controlled robot, or a software think intelligently like the human mind(SimplyLearn,2023)

**CAGR –** It stands for Compound Annual Growth Rate. This refers to a way of measuring the average annual growth rate of an investment over a period of time longer than one year.

**CSS (Cascading Style Sheets)**- It is a style sheet language used for describing the presentation of a document written in a markup language such as HTML. It controls the layout, colors, fonts, and other visual aspects of web pages, allowing web developers to create visually appealing and consistent designs across multiple pages or even entire websites.

**DFD (Data Flow Diagrams)**-DFDs are graphical representations used to illustrate the flow of data within a system. They depict the processes, data stores, data flows, and external entities involved in a system, showing how data moves through various components and processes.

**HTML (Hyper Text Markup Language)**-HTML is the standard markup language used for creating web pages and web applications. It defines the structure and content of a web page by using a series of tags and elements to indicate headings, paragraphs, images, links, and other elements.

**HTTP (Hypertext Transfer Protocol)** -A protocol used for transmitting hypertext documents over the internet. It facilitates communication between web browsers and servers by allowing clients to request resources and servers to respond with those resources.

**SQL (Structured Query Language)**- A specialized programming language used for managing and manipulating relational databases. It allows users to perform tasks such as querying data, inserting, updating, and deleting records, creating and modifying database schemas, and defining access controls.

**URL (Uniform Resource Locators)**: A URL is a reference or address used to locate resources on the internet. It specifies the protocol to be used for accessing the resource (such as HTTP or HTTPS), the domain name or IP address of the server hosting the resource, and the specific path or location of the resource on the server.

# LIST OF FIGURES

# CHAPTER ONE: INTRODUCTION

## 1.1: Introduction

This chapter provides an introduction to the bakery industry and justifies the need for an online bakery management system. It lays out detailed information on the background and motivation of the research, problem statement, defines the aims and objectives of the research, scope and in addition administers the justification of the research.

## 1.2: Background of research

Over the years, the bakery industry has proven to be one of the rising sectors when it comes to the food industry. According to a report by ResearchAndMarkets.com, the global bakery market is expected to reach $703.1 billion by 2027, growing at a CAGR of 3.8% from 2020 to 2027 (ResearchAndMarkets.com, 2020) This has been influenced majorly by the rising demand for healthy baked products and with low sugar content. For this reason, bakers have become more innovative when it comes to bakery products such as pastries and cakes. This has increased the production of customized baked goods according to the customer’s desires thus leading to better convenience to the customer. However, our local stores still face some challenges when it comes to this industry such as competition from larger bakery chains. Local bakeries face tough competition from larger bakery chains that have more resources and a wider reach. According to a study by IBISWorld, the top four players in the bakery industry account for over 45% of industry revenue (IBISWorld, 2021). This competition can make it difficult for local bakeries to attract and retain customers.

In addition to this, consumer preferences are constantly evolving, and local bakeries must keep up with the latest trends to remain relevant. For example, there has been a growing demand for gluten-free and vegan bakery products in recent years (Mintel, 2021). Local bakeries that fail to adapt to these changing preferences risk losing customers to competitors. Also, the cost of ingredients used in bakery products, such as flour and sugar, has been steadily increasing over the years. This can make it difficult for local bakeries to maintain profit margins while keeping prices affordable for customers. Technology on the other hand has continuously had a high trajectory growth in terms of how it has been embraced in our day to day lives and its continuous use across the globe by many different users. One of the most significant results of the technology growth is electronic commerce over the Internet, a new way of conducting business, otherwise known as e-commerce. It has made shopping of goods so much easier just with the tap of a button on your device hence no need to hustle with long queues at the physical stores.

The shift towards e-commerce has created a need for an efficient and effective e-bakery management system. Such a system would enable bakeries to manage their inventory, order processing, and delivery operations in real-time, allowing them to optimize their production and minimize waste. By automating various processes, such as order processing, inventory management, and production scheduling, bakery owners can save time, reduce errors, and improve productivity (Alalwan et al., 2017). Furthermore, the system can help reduce costs by optimizing inventory levels, minimizing waste, and improving supply chain management (Islam et al., 2017). Another benefit is improved customer service. With an e-bakery management system, customers can place orders online, track their orders, and receive notifications about their orders' status (Gao & Li, 2019). This convenience can enhance customer satisfaction and loyalty, leading to increased sales and revenue for the bakery.

## 1.3: Problem Statement

Numerous precise aspects play a role in running a bakery effectively, including order processing, customer service, and inventory control. However, the unique capabilities required to optimize operations in small-scale bakeries are often missing from current bakery management systems. Certain issues that these companies encounter like unpredictable ingredient availability, managing perishable inventory, and customized customer preferences cannot be sufficiently addressed by general management solutions. In addition, small bakeries usually use labor-intensive, prone to error manual methods for managing orders, tracking sales, and keeping track of inventories. This inefficiency affects profitability and customer happiness in addition to decreasing production.

## 1.4: Objectives of Research

## 1.4.1: General Objective of Research

The main objective of this research is to design and develop an Online Bakery Management System that will enhance customer outreach for small scale bakery businesses in Kenya.

## 1.4.2: Specific Objectives of Research

The research has some specific objectives that it aims in achieving at the end of the research. This includes the following:

1. To determine user requirements for the envisioned system.
2. To develop conceptual and technical designs based on the user requirements.
3. To implement the designed system using appropriate programming languages and technologies.
4. To execute testing procedures so as to identify and address any defects or discrepancies of the developed system.

## 1:5: Justification of research

There are many strong arguments in favor of the creation and application of an online bakery management system in Kenya, including societal, environmental, and economic ones.

Economic Justification: The economic landscape in Kenya presents challenges for traditional bakery businesses, particularly in the face of increasing costs and taxation. High taxes, such as value-added tax (VAT), impact the prices of goods and services, including bakery products. Consumers are continually seeking cost-effective options amidst these financial strains, driving the demand for online platforms where they can find affordable bakery products.

Environmental Concerns and Societal Shift towards Sustainability: There is a global trend towards sustainability in consumer behavior, with individuals increasingly prioritizing eco-friendly options in their purchasing decisions. This shift is evident in Deloitte's research, which highlights a growing awareness of environmental concerns among consumers. Additionally, Singh (2022) notes a significant shift towards eco-conscious choices, including the preference for pre-owned goods. This aligns with the development of an online bakery management system, which promotes the reduction of waste and encourages the reuse of bakery products.

Despite the economic challenges, the development of an online bakery management system in Kenya offers consumers a convenient and sustainable alternative to traditional bakeries. By providing a platform for online ordering and delivery, the system reduces the need for in-person transactions, thereby minimizing the environmental impact associated with transportation and packaging. Additionally, the system promotes the efficient use of resources by optimizing inventory management and reducing food waste.

In summary, the development of an online bakery management system in Kenya aligns with economic, environmental, and societal trends towards sustainability and offers consumers a convenient and cost-effective alternative to traditional bakeries.

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## 1.6: Scope of the project

The project scope entails the development of an online bakery management system customized to meet the operational needs bakery businesses in Kenya. Over a projected duration of six months and within a budget of 67,200 shillings, the system aims to streamline various aspects of bakery operations, including inventory management, order processing, and customer service.

Key functionalities of the system cover user roles for bakery owners and staff members. Bakery owners, as the primary stakeholders, require a comprehensive management solution to oversee their bakery operations effectively. Staff members, on the other hand, encompass employees tasked with specific bakery duties such as inventory monitoring, order fulfillment, and customer engagement.

The system's features include fast inventory management capabilities, allowing bakery owners and staff to monitor stock levels and track ingredient quantities. Additionally, order processing functionalities enable users to create and manage customer orders, track order statuses, and generate invoices for billing purposes.

Customer management functionalities are also integral, facilitating the maintenance of a customer database containing contact details and order history. This feature enables personalized communication and marketing efforts to enhance customer relationships.

Integration with international payment gateways, such as PayPal, ensures secure online payment processing for customer orders. Additionally, the system enables online ordering through its platform, empowering customers to browse bakery products, specify delivery preferences, and complete transactions securely.

While the integration of the WhatsApp API for customer communication was initially considered, it has been omitted from the project scope. The assumption is made that customers can obtain the bakery's contact information from the website and initiate enquiries or place orders through traditional means, such as phone calls or in-person visits.

In essence, the proposed online bakery management system aims to offer bakery businesses in Kenya a user-friendly and efficient platform for optimizing operations and enhancing customer satisfaction.

## 1.7: Research Organization

This research has been broken own to detail into three chapters which is as follows:

Chapter One covers the Introductory part. It entails: Introduction of the research, background and motivation of the research, definition of the problem statement, the aim and objectives of the research, the justification and the scope of the project.

Chapter Two covers the Review of Related work. It entails Literature Review techniques, the study topic's historical background, a review of previous literature, systems that are now in place, prototypes, and developing trends and patterns in the field. It also briefly addresses research gaps that need to be filled in the field of study.

Chapter Three covers the Research Methodology to be used in the project. It entails: The methodologies to be used for Requirements Specifications, The System Analysis, Design, Implementation, Testing and Deployment of the project.

Chapter four outlines the project budget, schedule, and required resources, concluding with a summary of the chapter's contents.

Chapter five details the system analysis of the current system, including its description, strengths, weaknesses, feasibility study, and data I/O analysis. It also presents the process logic design of the current system and summarizes the chapter's key points.

Chapter six focuses on the design of the proposed system, covering its description, strengths, weaknesses, requirement analysis, conceptual architecture, process logic design, and database design. It includes mock-up screens of the proposed system and concludes with a summary. Chapter seven presents the implementation and testing of the system, including system screenshots, testing plan, and evaluation plan. It summarizes the chapter's findings, challenges encountered, and offers future recommendations, concluding the report.

# CHAPTER TWO

# REVIEW OF RELATED WORK

## 2.1: Introduction

This chapter entails the studying and analyzing of previous works related to electronic bakery management system in regards to its history. In addition, related prototypes and emerging trends and patterns in the bakery management system industry are reviewed.

## 2.2: Methodology of Literature Review

For this research project, several methodologies were used to evaluate the earlier work done and assess the information that is accessible in the literature relevant to online bakery systems which includes the features, benefits, challenges and adoption rates that are associated with the system. Some of them include review of relevant journals, newspapers, publications and blogs, which have an aim of providing an overview of the current trends and best practices in the relevant scope. Potential search terms related to online bakery management systems can be used in conducting a search for relevant articles before screening and analyzing the literature. This may include: “Bakery Software”, “Digital bakery management” and “e-Bakery management”. This in turn can be used as guidelines in producing a seamless electronic bakery management system.

## 2.3: History of the Research Topic

The history of online bakery management systems can be traced back to the development of e-commerce and online ordering systems in the early 2000s. As more and more businesses began to establish an online presence, bakeries also started to explore the potential of e-commerce for their operations.

According to a study by Hu, Huang, and Fang (2018), the first online bakery management systems were developed in the mid-2000s, with the primary focus on online ordering and delivery tracking. These systems allowed customers to place orders online and track the progress of their orders, from the time of order placement to delivery. As technology continued to evolve, e-bakery management systems began to incorporate additional features and functionalities. For example, some systems included inventory management tools, allowing bakeries to track their inventory levels and manage their supplies more efficiently.

In the following years, online bakery management systems continued to evolve and become more sophisticated. By the mid-2000s, some systems were capable of managing a wide range of bakery operations, including inventory management, order processing, and customer relationship management (CRM). Today, there are a wide variety of e-bakery management systems available on the market, ranging from simple online ordering platforms to comprehensive enterprise resource planning (ERP) systems. These systems offer a range of features and functionality, allowing bakery businesses to choose the system that best meets their needs.

Overall, the history of online bakery management systems reflects the growing importance of technology in the bakery industry. As the industry has become increasingly competitive and customer expectations have risen, bakery businesses have turned to e-bakery management systems to help them stay ahead of the curve.

## 2.4: Review of related Prototypes and Systems

Various research projects have focused on online bakery management systems, resulting in the development of several prototypes and operational systems. This overview examines key studies and literature in the field, along with examples of systems that have been adopted in Kenya.

### 2.4.1: BakeryBuddy, An Online Bakery Management System Prototype (Smith, J., & Patel, S. (2020))

In their paper "BakeryBuddy: An Online Bakery Management System Prototype," Smith and Patel presented the system as a viable option for bakery owners looking to simplify their business processes. This prototype provides an intuitive interface designed to empower bakery owners to efficiently manage various aspects of their business, including orders, inventory, and customer relationships. With features like inventory tracking, sales analytics, and online ordering, BakeryBuddy shows that it can greatly improve bakery businesses' operational efficiency.

Even though BakeryBuddy provides excellent functionality, there is a significant research gap that needs to be addressed. While the system effectively addresses core operational requirements, it lacks integration with emerging technologies such as Artificial Intelligence (AI) and Internet of Things (IoT). Specifically, there's an absence of automated inventory management functionalities and predictive sales analysis capabilities leveraging AI and IoT advancements. This presents an opportunity for further research to explore the potential benefits and challenges associated with incorporating these technologies into online bakery management systems.

By addressing this research gap, future studies can look into the implications of integrating AI and IoT into BakeryBuddy and similar systems, aiming to enhance their capabilities and offer bakery owners enhanced tools for decision-making and operational optimization. Such investigations can pave the way for innovative solutions that leverage cutting-edge technologies to address the evolving needs of bakery businesses in an increasingly digital landscape.

### 2.4.2: Web based prototype (Bhatti and Kamal (2019)

In their 2019 study, Bhatti and Kamal presented a web-based prototype aimed at revolutionizing the online bakery management system landscape. This prototype is a significant advancement in the field because it incorporates important features like inventory management, transaction processing, and client relationship management. However, there is still a lack of research on how well the prototype addresses the complex issues faced by bakeries, even with its extensive feature set.

Specifically, the prototype's potential for tackling critical issues like perishable inventory management and personalized customer service remains underexplored. While it undoubtedly offers foundational functionalities, its capacity to provide tailored solutions to bakery-specific challenges warrants further investigation. By exploring these unknown areas, researchers can gain knowledge that advances the usefulness of the prototype and advances our knowledge of efficient bakery management in the digital age.

### 2.4.3: Local Bakery store in Nairobi, Kenya.

Established in 2011, this neighborhood bakery has transformed into an exceptional treat among the busy city of Nairobi, Kenya. This little yet booming bakery has not only won over the hearts of its local customers, but has also embraced the digital age by putting in place an online web-based bakery management system. This bakery has pushed itself into the digital space by using technology into its regular physical operations, providing its delicious pastries to a larger audience outside of its physical location.

The decision to implement a web-based online bakery management system has undoubtedly been instrumental in the bakery's success story. By leveraging this innovative solution, the bakery has streamlined its operations, from order processing to inventory management, and has provided its customers with a seamless and convenient ordering experience. The system has enabled customers to browse through an extensive selection of baked goods, place orders online, and even schedule deliveries, all from the comfort of their homes or offices.

Even so, there is a significant research gap that has surfaced despite the success and recognition this neighborhood bakery has received. Although the online platform provides convenience, customers can only select from a preset selection of flavors and designs that are available in-store. This limitation inhibits customers from expressing their unique preferences and desires, thereby potentially impacting their overall satisfaction with the ordering process. Indeed, the inability to showcase personalized cake designs or request specific flavor combinations may deter some customers from fully embracing the online ordering experience.

Addressing this research gap presents an opportunity for the bakery to further enhance its online presence and customer engagement strategies. By exploring ways to incorporate customization options into the online ordering platform, such as uploading photos of their desired cake or customizable flavor selections, the bakery can empower customers to create customized baked goods tailored to their preferences. Moreover, by acquiring feedback and actively listening to customer suggestions, the bakery can iteratively improve its online offerings and strengthen its competitive edge in the digital marketplace.

### 2.4.4: BakeSys, An Integrated Bakery Management System (Garcia, M., & Nguyen, T. (2010))

In 2010, Garcia and Nguyen introduced BakeSys, an integrated bakery management system aimed at revolutionizing bakery operations. This innovative system serves as a comprehensive solution for bakery management, facilitating order processing, inventory tracking, and sales analysis with ease and efficiency. Designed to cater to the diverse needs of both small-scale bakeries and large production facilities, BakeSys offers a user-friendly interface and adaptable functionality that streamlines bakery operations and enhances productivity.

Despite the commendable features and functionalities embedded within BakeSys, a notable research gap has emerged in the realm of user experience design for frontend interfaces. While the system excels in backend operations, there remains a need for further exploration of user-oriented design principles and usability testing methodologies to optimize the accessibility and usability of bakery management systems, particularly for non-technical users. This gap presents an opportunity for future research endeavors to delve deeper into the intricacies of frontend interface design, with a focus on enhancing user engagement, intuitiveness, and overall satisfaction with the system.

By addressing this research gap, researchers can contribute valuable insights towards the refinement and enhancement of BakeSys and similar bakery management systems. Through the exploration of user-centric design principles and rigorous usability testing methodologies, the accessibility and usability of these systems can be significantly improved, ultimately leading to greater user satisfaction and operational efficiency in bakery businesses. Moreover, by prioritizing user experience design in the development and implementation of bakery management systems, businesses can foster greater adoption and acceptance of these technologies among users of varying technical proficiencies.

### 2.4.5: Bakery Store in Nairobi, Kenya

In Nairobi, Kenya, a notable bakery store has emerged as a prominent player in the local market, showcasing the transformative power of adopting a web-based online bakery management system. When this bakery first opened its doors in 1997, it was just a small physical storefront. Over the years, it has grown significantly, becoming a successful online platform and increasing its physical presence. This strategic transition to an online bakery management system has not only enabled the bakery to reach a wider audience but has also facilitated the establishment of additional outlets, cementing its status as a fast-rising star in Kenya's bakery industry.

However, amidst the bakery's impressive journey of growth and expansion, a notable research gap has emerged. Despite the evident success of implementing an online bakery management system, there has been limited attention given to the impact of these systems on the overall customer experience. While the system has undoubtedly enhanced operational efficiency and facilitated business growth, there remains a need to explore how it has influenced customer satisfaction, engagement, and loyalty. This research gap offers a chance to look more closely at the complex relationships that exist between the dynamics of the customer experience and online bakery management systems.

By bridging the gap in research regarding the impact of online bakery management systems on the customer experience, stakeholders can make informed decisions to further optimize these systems and enhance customer satisfaction and loyalty. Moreover, a deeper understanding of customer dynamics in the context of online bakery operations can inform strategic initiatives to strengthen customer relationships, drive repeat business, and sustain long-term growth in the competitive bakery market.

Overall, research indicates that online bakery management systems can provide bakery businesses in Kenya with various benefits, including increased productivity, revenue, and operational efficiency. The examples and systems discussed demonstrate the potential for these systems to help bakeries overcome challenges in an increasingly competitive and technologically advanced market.

## 2.5: Emerging trends and patterns in the research area

In recent years, there has been a growing interest in the use of technology for e-bakery management systems. As the bakery industry becomes increasingly competitive and customer expectations rise, bakery businesses are looking for ways to improve their efficiency and enhance their customer experience. One of the major fast rising trends when it comes to the bakery industry is that of customers increasingly ordering bakery products online as a result of the rise of mobile apps and e-commerce platforms. According to (Ma et al., 2020), e-bakery management systems that provide online ordering and delivery capabilities can assist bakeries in acquiring new customers, increasing sales, and increasing customer loyalty.

Another emerging trend is the integration of artificial intelligence (AI) in online bakery management systems. AI can be used to optimize bakery operations such as inventory management, production planning, and quality control. For example, AI algorithms can analyze sales data to predict demand and optimize inventory levels, or they can monitor production processes to identify quality issues in real-time (Savchuk et al., 2021). This trend is likely to continue as AI technology becomes more accessible and affordable.

The growing application of data analytics in e-bakery management tools is another pattern that is emerging. Bakery companies now have access to a wealth of data on consumer behavior, production procedures, and supply chain operations thanks to the growth of digital platforms and Internet of Things(IoT) devices. This data can be used for data analytics to gain useful insights, such as finding patterns in consumer tastes, streamlining production, and enhancing supply chain effectiveness. (Gong et al., 2020).

Overall, these emerging trends and patterns are shaping the future of online bakery management systems, providing bakery businesses with new and innovative ways to improve their operations and provide value to their customers.

## 2.6: Research gap to be filled by your research

Despite the significant progress made in the development of e-bakery management systems, there are still several research gaps that need to be addressed. Some potential gaps to be filled may include:

Lack of studies that investigate the impact of e-bakery management systems on small and medium-sized bakeries. Most of the existing studies have focused on larger bakery chains, and there is limited research on how these systems can be adapted to the needs of smaller businesses. This is a critical gap since smaller bakeries may face different challenges and constraints in adopting e-bakery management systems, such as limited resources and technical expertise.

Another research gap is the limited attention given to the impact of e-bakery management systems on the customer experience. Although these systems can help bakeries improve their efficiency and reduce costs, their impact on the customer experience has not been fully explored. For example, how do these systems affect the speed and accuracy of order processing, the quality of products, and the overall satisfaction of customers? Answering these questions can help bakeries better understand the value of e-bakery management systems and improve their customer service.

A third research gap is the limited integration of e-bakery management systems with other technologies such as artificial intelligence (AI) and block chain. Although some studies have explored the potential of these technologies in the bakery industry, their integration with e-bakery management systems is still in its early stages. For example, how can AI be used to optimize production schedules and improve product quality? How can block chain be used to improve the traceability and transparency of the supply chain? Answering these questions can help bakeries unlock new opportunities for innovation and competitiveness.

In summary, there are several research gaps that need to be filled in the e-bakery management system area. Addressing these gaps can help bakeries better understand the potential of these systems, adapt them to their specific needs, and unlock new opportunities for innovation and competitiveness.

## 2:7: Chapter Summary

From this chapter, we have been able to get a clear understanding of related works from getting a perspective from its history, review of related works, review of related prototypes and systems, emerging trends and patterns in the area and lastly the research gaps that need to be filled in that area.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1: Introduction

This chapter provides a comprehensive methodology review on Requirement specification, data collection and the system analysis, design, implementation, testing and deployment of the system.

## 3.2: Methodology for Requirement Specification, Data Collection and Analysis Technique

### 3.2.1: Requirements Specifications

The envisioned system will entail requirements that are to be imposed on its design and verification. These requirements include identification of the stakeholders who are the owner(s), employees, customers and suppliers for the ingredients.

In addition, the functional requirements for this system are highlighted as follows:

The system should have an ability to allow customers to place an online order (choose the size and customize cake flavors they would like their cake to have and add decorations), checkout and make a down payment securely.

The system should allow the bakery owner(s) to update the menu with ease, which includes adding, removing and modifying the products in the store depending on their availability and their prices.

The system should grant the bakery admin access to efficiently process and fulfill orders in terms of managing order queues, tracking order status and coordination of the delivery to the customer/pickup of the order.

The envisioned system also has non-functional requirements which are laid out as shown:

The system’s response time to order placement and payment procedure should be quick and can handle a large number of orders and transactions from customers without causing a slow down or in worst scenario crashing of the system.

The system should be user friendly and easy to use for all the stakeholders to navigate through and access the system.

The system must be available at all times with minimal maintenance delays.

The system ought to work with many different web browsers, operating systems and gadgets.

The system should be scalable in that it can handle increased traffic and additional features as the business grows.

### 3:3:2: Data Collection Methods

Several methods were used in the data collection process which include surveys and document analysis.

### 3:3:3: Issuance of Surveys

The researcher can create a one-minute online survey for the customers at the store to fill after purchasing a product on their feedback in regards to the speed of service, customer service satisfaction and overall satisfaction of the purchase process. The last section of the survey could have the customer express what they would like to be improved to make the store run better.

### 3:3:4: Document Analysis

The researcher can take a look at existing documentations of the store such as the sales, order history and customer feedback reports of the store within a certain timeframe. The use of these existing documents to the researcher is so that they may get a more detailed insight about the store in terms of the customer’s preferences, ordering trends and other important data points that may assist them in their analysis.

## 3:4: Methodology for System Analysis

System analysis is a structured process that involves examining and evaluating the components of a system and their interrelationships to identify opportunities for improvement or optimization (Bassil, 2015; Siau and Rossi, 2011). The purpose of this analysis is so that the researcher has a complete understanding of the requirements and can guarantee that the proposed system will be developed in accordance with those requirements. The components of the system need to be first identified and generate a conceptual model thereafter from the components for the purpose of determining how effectively each component works together to fulfill its function. For our case, we will be adopting the Object Oriented Analysis for the system.

## 3.5: Methodology for System Design

According to Hoffer, George and Valacich (2014), System Design is the process of specifying a detailed computer based solution for a business problem or opportunity. (Gheorge et al,.2017) indicates that system design ensures that the system is designed to operate efficiently, making it more reliable and stable. In this section, various processes for defining the architecture, product design, modules, interfaces, and data of the proposed system are discussed.

Object-oriented models will be utilized to design the proposed system, encapsulating data into reusable objects containing functions. To describe the relationships in the online bakery management system knowledge domain, entity-relationship diagrams (ERDs) will be employed. ERDs will provide valuable information to design a relational database that classifies, identifies interrelationships, and enforces referential integrities based on the proposed system.

## 3:6: Methodology for System Implementation

For the proposed system, it will be operational as a web based application whereby it can be accessed by any operational browser. In this section, in-depth details of the front end, back end and database technologies will be discussed for quality assurance purposes.

### 3:6:1: Back End Technologies

According to IBM, the backend is where the magic happens in a web application. It is the server-side of the application, where data is stored, processed, and served to the client-side. ("What is Backend? Definition and Examples," IBM, 2022). Our proposed system will be utilizing PHP as our backend technology. Its flexible ability to update and maintain the system over time, integrate with other applications and systems, reliability and security features make it the suitable backend technology to utilize during the project. It will be responsible for storage and management of data used by the system as well as facilitate the processing of requests from the front end and communicating with other systems that are integrated to the bakery system such as payment gateways. In addition, the business logic of the system will be implemented here in instances such as tracking of payments and orders, addition and deletion of products in the system

### 3:6:2: Front End Technologies

The envisioned system will make use of front end technologies such as HTML, CSS and JavaScript. The users who are the customers in our case will be presented upon firstly the eye-catching Home page made by mostly HTML and CSS for the designing. It will contain an overview about the company, Login/Register, Contact Us and the Order pages respectively. Before a user makes an order, they will be prompted to create a new account if they are new or login if they are regular customers through a pop up window. All new users’ details will be captured by filling a form created by HTML which will contain personal details such as the customer’s names, age, phone number and area of residence. Validation of the user’s details will then be implemented by the use of JavaScript. The order section will then allow the user to customize what they would like to have to their preference through a drop down menu. Uniform Resource Locators (URLs) will also be used in our application for navigation purposes through the different web pages and for social media sharing purposes.

### 3:6:3: Database Technologies

Our system will utilize a relational database which stores data in tables with each table representing a different type of data such as inventories, sales, customers or employees. The management system to be used will be MySQL and the language to be used to query in the database will be Structured Query Language(SQL).

## 3:7: Methodology for System Testing

System testing is a major stage when developing an e bakery management system as it certifies that the application under test(AUT) meets the client’s expectation. Various testing methodologies shall be used to validate the application under test which majorly include functional and non-functional testing. However, a test strategy is in need beforehand so as to cater for the estimations and resources and create a schedule for when each testing will take place. For this, a test plan is created to act as a blueprint of how the testing will take place.

### 3:7:1: Testing Plan

The test plan is a dynamic document that acts as a blueprint of how the testing activity is going to take place in the project. It will have specific objectives of ensuring the bakery management system meets the functional and non-functional requirements, validate the system’s performance, reliability and security, verify the usability and accessibility of the system and lastly identify and document any defects found during the testing process. The various requirements to perform the testing for instance the hardware and software requirements, test data and resources, tools and technologies and the test environment setup need to be noted down in the test plan so that the testing activity may be successful.

### 3:7:2: Testing Techniques

Various techniques will be used to test the application under test against the functional or non-functional requirements gathered from business. For functional requirements, Unit testing, which is the first level of testing will be performed by the developer to ensure everything is running smoothly. Integration testing can then be used to determine whether the system's components are interacting in such a way that there is no contradiction between the system's functionality and the requirements listed in the requirements document. The researcher can also conduct system testing to confirm that the complete system is operating as intended and satisfies the set criteria. The system's suitability for the user's requirements must also be confirmed through acceptance system testing.

For non-functional requirements, performance testing can be undertaken to test how much time it takes to process an order after ordering under different scenarios. Usability test can also be performed to check if the system is user friendly for all stakeholders, including those with no technical background. Each of these techniques are performed so as to find a specific kind of defect.

## 3.8 Methodology for System Deployment

System deployment involves the processes used to plan for and manage the transition of new or evolved systems and capabilities into operational use and the transition of support responsibilities to the eventual maintenance or support organization. All of the procedures, actions, and processes necessary to make a software system or upgrade accessible to its intended users are included in software deployment. One software release will contain all of the resources and code that have been collected. The system will be deployed to a server following testing. Either a local computer or the cloud can host the system. The system will be deployed on the cloud since it is a web-based application. The tools to be utilized for local server development will be Apache server .The code will also be stored in a GitHub repository.

3:9: Chapter Summary

This chapter has descriptively been able to bring out the requirements specifications of the system, the various data collection methods to be used for analysis and the methodologies utilized right from the analysis all the way through till the deployment stage.

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# CHAPTER 4

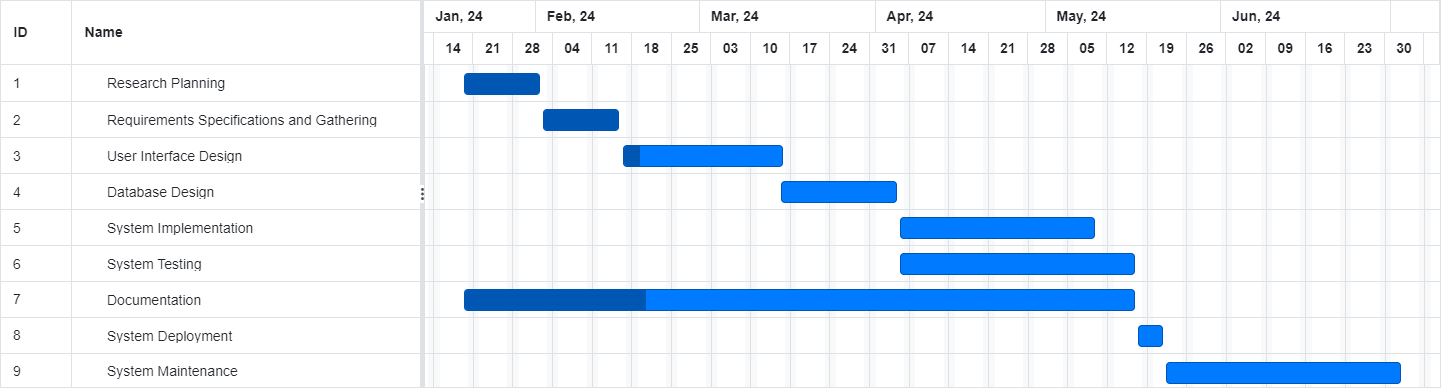
# SCHEDULE, BUDGET AND RESOURCES

## 4.1: Introduction

This chapter provides a comprehensive approach on the project’s schedule, the budget allocated and resources to be utilized for it to be a success.

## 4.2: Project Schedule

This outlines the different stages, activities, and schedules necessary to ensure the effective development and deployment of the online bakery management system.Top of Form



## 4.3: Project Budget

|  |  |
| --- | --- |
| **EXPENSES** | **COST (Kshs)** |
| Laptop | 50,000 |
| Printing | 5,000 |
| Transport | 3,500 |
| Airtime | 2,500 |
| Internet (Wi-Fi) | 3,000 |
| Miscellaneous(5% of the budget) | 5,000 |
| **Total Cost:** | **67,200** |

## 4.4: Project Resources

To gather insights on online bakery management systems and ensure stable pricing, the project will leverage various resources, including consultations with bakery owners and industry experts. Our development process will involve using a single laptop and mobile phone to ensure compatibility across different devices and conducting thorough research. The project will include a comprehensive risk assessment to identify potential challenges, such as technical issues, shifting customer preferences, or external market factors. Based on this assessment, effective contingency plans will be developed to mitigate risks and ensure project success. Additionally, flexibility will be maintained in project timelines and resource allocation to accommodate unforeseen circumstances. This approach will enable the project team to effectively manage risks and uncertainties while achieving the project's objectives and desired outcomes.

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# APPENDICES

## APPENDIX A: SAMPLE QUESTIONNAIRE

Online Bakery Management System Questionnaire: To provide an understanding of the use of bakery management systems and evaluate its impact on customers

**BIODATA**

Please fill in the spaces below marked with asterisks (\*) before beginning the questionnaire.

\*Kindly specify your gender: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\*What age are you currently: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\*How long have you been a customer here? (Indicate First Time for new customers): \_\_\_\_\_\_\_\_\_\_\_\_\_

**INSTRUCTIONS**Please answer the following questions in the spaces provided by ticking where it may apply for you. Thank you

1. How frequently do you visit our shop for purchases?

Daily

Weekly

Monthly

Rarely

Never

1. Have you ever experienced any inconvenience while purchasing from our shop

Yes

No

1. How likely are you to use a website for purchasing baked goods?

Very likely

Somewhat likely

Neutral

Somewhat unlikely

Very unlikely

1. What features would you expect from our website?
   * + Online ordering
     + Delivery tracking
     + Customized orders
     + Loyalty programs
     + Discounts and coupon
     + Others (please specify)
2. How important is it for you to be able to track your order status and delivery?

* Very important
* Somewhat important
* Neutral
* Not very important
* Not important at all

6. How satisfied are you with the quality of the baked goods you receive from the bakery?

* Very satisfied
* Somewhat satisfied
* Neutral
* Somewhat dissatisfied
* Very dissatisfied

1. Is there anything else you would like to share about your experience with our website or suggestions for improvement? Please feel free to write down your answer. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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