JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

SCHOOL OF ELECTRICAL, ELECTRONIC AND INFORMATION ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FINAL YEAR PROJECT PROPOSAL

NAME	**REG. NO.**
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BARBERSHOP/SALON RESERVATION SYSTEM WITH A REAL-TIME UPDATE OF THE NUMBER OF CUSTOMERS IN THE SALON

A Final Year Project Proposal submitted to the Department of Electrical and Electronic Engineering in partial fulfillment of the requirements for the award of a Bachelor of Science Degree in Electronic and Computer Engineering.

JULY 2021

DECLARATION

This project proposal is my original work and to the best of my knowledge, has never been presented to Jomo Kenyatta University of Agriculture and Technology or any other institution for the award of a degree or diploma.

NAME: GACWE DANIEL NYERE **REG. NO.:** ENE212-0152/2021

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TITLE: BARBERSHOP/SALON RESERVATION SYSTEM WITH A REAL-TIME UPDATE OF THE NUMBER OF CUSTOMERS IN THE SALON

SUPERVISOR CONFIRMATION:

This project proposal has been submitted to the Department of Electrical and Electronic Engineering, Jomo Kenyatta University of Agriculture and Technology, with my approval as the supervisor:

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ABSTRACT

Everyone needs to go to a salon to get a haircut of their desire this includes shaving hair, grooming, and style as per the latest trends. It is impossible to predict how many individuals will be waiting to receive a service. There are a number of techniques that can be used to improve the efficiency of a salon, and one of them is to implement an online-based system. Barbershop and salon businesses are rapidly growing industries across the country. Appointment scheduling is one of the most significant actions to consider in this profession. The goal of this project is to create an internet-based barbershop/salon appointment system.

One of the most important activities to consider in this rapidly growing industry is appointment scheduling. The focus of this project is based on developing a barbershop appointment system that could be accessed via the internet. The purpose of this system is to maximize client preferences while increasing the number of customers served during usual business hours. This is a multi-objective problem aimed at introducing order in a barbershop, by saving time for both client and the barber. It will also ensure all activities within the barbershop run in an efficient manner.

Designing circuitry that counts the number of clients in the barbershop at any given time is part of the solution. The data is updated in real-time via a web application and an Android mobile app. Users will be able to register as clients or barbers on the system. When a client registers, they can select a certain barber, after which the barber's details will be displayed. After reserving the barber, one can accurately estimate the number of persons who will need to be served before their turn to avoid wasting time.

CHAPTER 1: INTRODUCTION

1.1. Background

Queue management has been a concern in numerous industries for years, including finance, health care, administration, and retail. In the current technological age, it is not only necessary to manage the existing queues, but it is also important to collect statistics about the queue in order to discover trends that can be predicted. These requirements are not met in a sophisticated manner by many barbershops. Therefore, this project suggests that using a Reservation System can boost customer and barber satisfaction in a shop.

Scheduling appointments is one of the most important activities in today's high-traffic businesses. Customer satisfaction and the number of clients served can both benefit from a well-designed appointment system. This process is most often treated as a queuing system when people study appointment scheduling. The implementation of a web-based reservation program allows users to register, search for, and meet with the top service providers online.

1.2. Problem Statement

Users should be able to sign up for an application and then have access to all barbershops in a specific area. At some point, everyone will need to visit a barbershop or salon to acquire their ideal hair style. A barbershop has evolved into a social gathering spot as well, but a lot of time is spent in line waiting to be served. The majority of clients are in constant evolution and are increasingly becoming cognizant of time management. Customers require a platform that allows them to log in and schedule an appointment at a nearby salon or barbershop. Barbershop and salon businesses also require a platform on which to market and demonstrate their abilities. This would be helpful to both salon customers and business owners. However, since most walk-in customers do not make an appointment, the customer should be able to know the number of people waiting in line before making an appointment. Even after making an appointment, the client requires this information.

In reality, most salon and barbershop customers do not have access to such a platform. We rely on disrupting ourselves by strolling into a shop or calling the barber, which is a sort of disruption. As a result, a lot of time is wasted waiting in lines that could be spent on more important activities. Implementing an online-based system is one of the strategies for increasing efficiency in a barbershop.

The proposed online barbershop/salon system not only saves the time for the customers but also saves the time of the employees. They won't have to spend as much time on the phone making appointment calls

when they could be doing something more productive. Normally when the barber shop is closed, very many clients try contacting the barber to register for a future appointment. Probably they end up not reaching him/her and they both lose in one way or another. The client does not get the service and the barber loses money. Collecting data on how one's business is doing, what hours get the most traffic, what customers get a haircut or a shave at the barbershop most often is also extremely important for planning purposes.

1.3. Problem Justification

First and foremost, the barbershop system is designed to get the barbershop person more bookings. There are several reasons for this, including the fact that it keeps the business open throughout. The majority of customers prefer to book their reservations online. Barbershop appointment software not only increases bookings but also gives a leg up on barbershops that only take appointments during regular business hours. By just allowing customers to book after hours, there will be a huge boost in bookings. Barbershop appointment software streamlines many aspects of the company and includes rebooking reminders. With rebooking reminders, one can persuade clients to come in a little earlier than they might otherwise. This will lead to significant increase in repeat bookings as a result. The system to be designed has to meet the customers wherever they are. Barbershop software increases bookings through the process of adding book buttons to the website.

Barbershop appointment software shall generate more revenue for the business in a variety of other ways in addition to the increase in bookings. It shall reduce no-shows by a significant percentage. It is well known that cancellations happen due to various reasons among them forgetting. An online booking software will automatically send customers email and text reminders 24 hours before their appointment. Good scheduling software should be designed to maximize profits. This will be achieved by allowing clients to book multiple services at once, making it very easy and convenient for barbershops to "upsell" and "cross-sell."

Barbershop appointment software helps the barber improve the customer experience in a variety of ways. For starters, online scheduling makes it easier for a company to deliver excellent customer service. Second, barbershop software can also be used as a customer relationship management system (Customer Relation Management). This allows for Viewing of Client History and provision of personalized service. Appointment software makes it possible for one to view each client's appointment history, payment history, etc. as well as add personalized notes at each appointment such as their birthday or products they like. This enables the barber to remember the details about the clients so as to provide a personalized and memorable experience each and every time. By us of Automated Email Messages relationships between the barber and customer can be easily maintained. You can also send tailored (but

still automated) messages to clients using built-in marketing tools, such as SMS messages.

Barbershop appointment software simplifies operations in a variety of ways, resulting in a more efficient barbershop. Barbershop software can be used as a point-of-sale system, allowing the barber to receive payments and issue invoices with ease. The barber can also accept pre-payments and deposits, which helps to reduce payment processing time while also lowering no-shows. The technology also syncs employee schedules with the cloud. Barbershop appointment software also manages staff schedules as well. For instance, staff can easily access their schedules from the cloud and alter their availability. The barber person gets notifications whenever customers book, reschedule, or cancel appointments. everything is stored securely in one place. Barbershop software allows the staff to store documentation securely in the cloud meaning, it can allow customers to have access to information wherever they are. Paper clutter is reduced in the process as well. Barbershop appointment software automates many aspects of the scheduling process. From the actual appointments to appointment and rebooking reminders, barbershop software frees up time and makes the business function more efficiently.

With its reporting tools, barbershop appointment software may provide a wealth of information about the barbershop. It can, for example, show the most popular services, the number of times each individual client rebooks or cancels appointments and the most loyal customers.

Appointment booking is the most straightforward technique to ensure that customers don't have to wait on the premises until it is their turn to be serviced. Customers can arrive close to their appointment time, which can significantly reduce their wait time and thus help to avoid crowding within the barbershop. As a result, one can maintain control over client flow and manage resources while reducing or even eliminating unexpected crowds. This is especially important due to the COVID pandemic prevention measures which discourage crowding.

1.4. Objectives

1.4.1. Main Objective

To design, implement and test an online barber/salon reservation system, with a real-time update of the number of customers in the shop.

1.4.2. Specific Objectives

i. To design and implement a web application
ii. To design and implement a mobile version of the application
iii. To design, implement and test a device that determines client occupancy numbers in a barbershop at any given time and relays this data to the applications for remote use by potential customers
iv. To establish a remote link between the application and the customer counter device

CHAPTER 2: LITERATURE REVIEW

2.1. Overview of Appointment Scheduling

A variety of tools may be included in an appointment management solution. Appointments can be made in a variety of ways, including walk-ins, phone calls, and online inquiries [1]. When a customer arrives at the business or calls to set an appointment, some firms utilize a scheduling book or a simple online appointment calendar to record the appointment. This is the most common method of scheduling an appointment [2]. While online appointment scheduling is more common these days, making an appointment via phone is still available [3]. The majority of individuals prefer to book appointments online, according to a Wall Street Journal poll. The online scheduling system offers more convenience compared to other methods. [4]

2.2. Types of Appointment Scheduling

Customer appointments have been scheduled for many years. For instance, doctor appointment systems have been around for quite some time now. The system was created primarily to reduce doctors' idle time since it was believed that doctors' time was more precious than patients' waiting time. However, it was later established that decreasing the patient's waiting time is just as crucial as the doctor's time. As a result, when creating an appointment system, both the business owner's idle time and the customer's waiting time are given equal weight. [5]

2.3. Current Systems

Privately ran barbershops and salons are becoming increasingly popular in Kenya. Barbershop owners maintain their own private businesses and see customers in the evenings or at any time during the day, depending on their schedule. Some are well-known and well-liked, while others are little-known. Even if they have a good customer service delivery, new business people face a difficult scenario because they are unknown to most people. Customers, on the other hand, have a tough time identifying and selecting the best and nearest barbershop. Unscheduled appointments and long waits in the tangible form are among issues that Kenyan citizens and most customers encounter.

For starters in the business, opening a private barbershop might be difficult. For example, if a new barbershop was to start, there is currently no platform via which or from which people can learn about it. Similarly, any newcomer to a city faces some challenge of determining which barbershop is the best or closest to visit for the services. Customers have to visit the barbershop more than once to get the shop services. Most customers show up to the barbershop without making an appointment, resulting in a lengthy wait. Even after a long wait, there is a chance they will not get proper services at their convenience.

There have been studies done to try to identify and compare systems or applications that are similar to the proposed E-Barber System. Two comparative studies were conducted in order to determine the similarities and differences between these applications or systems and the system to be developed. The following are some of the systems or applications that have been chosen; Ashleys Kenya and Barber Kings Kenya. The conclusion was that the two main barbershop appointment systems in Kenya are barbershop specific, unlike the E-barber system.

2.4. Proposed System

The goal is to create a platform that brings together all barbershops and customers. All barbershop owners whether they are new or have been in business for a long time can sign up for this application. People will be able to learn about and visit any barbershop of their choice in this manner. The user will be able to learn about and access the professional profiles of all registered shops from all specialties by utilizing this application. Professional experience, practicing license, educational background, barbershop timings, working days, barbershop accessibility, and other customers' feedback are all included in the barbershop profile. Users can then schedule appointments from the comfort of their own homes.

The user can select a barbershop closest to them, one with the best professional experience, or has received positive feedback from previous customers. Without the requirement for expensive marketing, new barbershop owners can immediately join the platform and begin taking appointments. When enrolling as a customer, the user can make a deposit payment just before placing an appointment since an online payment system will be integrated. Due to walk-in customers who don't place an appointment, a counter-circuit will be used to communicate the number of customers at the shop in real-time to the appointment system. A customer can therefore tell the number of customers currently in the barbershop and the number of people who have placed an appointment.

2.5. Software Development

Web development is the process of using several technologies to create a static or dynamic webpage or web application for the internet or intranet. The development of a website can be divided into two sections [6]. The first section, Front-End, consists of the web page's User Interface (UI). This is how the user will see the page. The back-end is the second section. It encompasses all databases and tables and, in essence, all server-side programming.

2.5.1. Front-End

The front-end of a website is where the look and feel of the site are created. Various front-end development tools are used to achieve this [7]. The tools used are described below.

HTML

HTML stands for HyperText Markup Language, which is a programming language used to create online pages and applications. Tags represent HTML components, which are the building blocks of a website [7]. Tags do not appear on a webpage directly, but they do assist in the rendering of other material.

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="UTF-8">
    <title>Title goes here</title>
  </head>
  <body>

  </body>
</html>
```

Figure 1: Sample HTML code

CSS

Cascading Style Sheets (CSS) is an acronym for Cascading Style Sheets. It is used to give HTML elements a style. It can be written as an HTML file or as a separate ".CSS" file. [8]

Figure 2: Basic CSS syntax

As demonstrated in the figure above, typical CSS syntax consists of a selector and a declaration block. The selector identifies the HTML element that needs to be styled. A colon separates the property and value (:). Curly braces surround each declaration block, and each declaration concludes with a semicolon (;)

JavaScript

JS is an interpreted high-level programming language. It is a scripting language that is mostly utilized in Web development. It does not need to be compiled because it is an interpreted language. It renders web pages in a dynamic and interactive manner. Along with HTML and CSS, it is one of the three essential technologies of the World Wide Web. [9]

```
(function() {
    /** Get a list of employees */

    Employee.list((success, employees) => {
        if(!success){
            console.error(response);
        }

        /** Do something with employees */

    })
})();
```

Figure 3: Java script sample code

Bootstrap

Bootstrap is a front-end toolkit for creating websites and online apps that is free and open-source. It comprises typography, forms, buttons, navigation, and other interface templates in HTML and CSS, as well as JavaScript extensions. Unlike many other web frameworks, it focuses solely on front-end development.

2.5.2. Back-End

The client is regarded as a front-end and the server is considered a backend in the client-server approach; even some presentation work is done on the server [10]. Various tools utilized in a project's backend are detailed below.

XAMPP

XAMPP is used to represent the classification of solutions for various technologies. It provides a platform for testing applications using various technologies via a personal server. Each of the key components of XAMPP is represented by an abbreviated form of each alphabet. A web server named Apache, a database

management system named MariaDB, and scripting/programming languages like PHP and Perl are all included in this collection of software. [11]

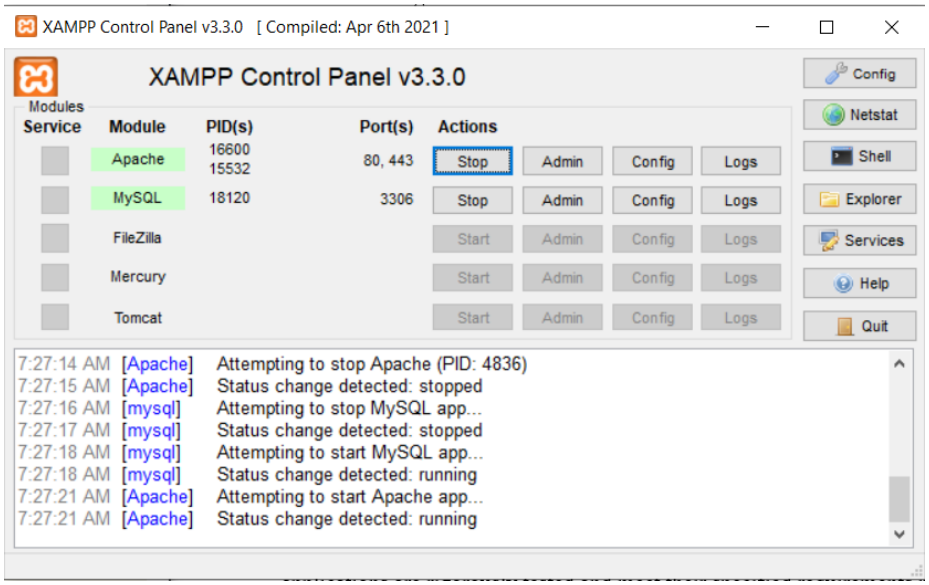


Figure 4: XAMPP startup page

PHP

PHP is the acronym for "Hypertext Preprocessor." It is a server-based, general-purpose open-source scripting language that is ideally suited for web development. “. PHP" is the extension for a PHP file [12]. Normal text, HTML tags, CSS styles, JavaScript scripts, and PHP codes can all be found in a PHP file. The PHP code is run on the server, and the output is sent to the browser as plain HTML.

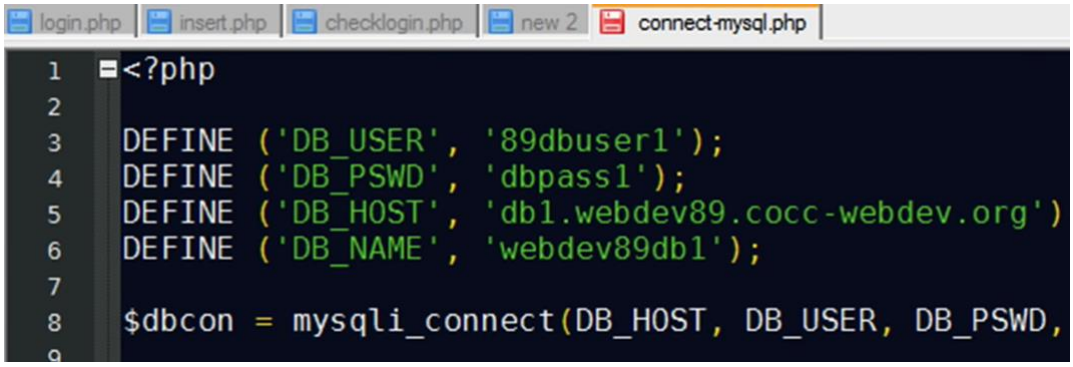


Figure 5: Sample PHP Database connection code

PHP can handle everything that happens in the backend of a website. It has the ability to generate dynamic content. It also has the ability to collect data from HTML forms and send it to databases. In a database, it

can also conduct a CRUD (Create, Read, Update, and Delete) activity. PHP may be used to set admin privileges, standard user privileges, and visitor privileges.

PHP Framework

Laravel is a free open-source PHP web framework that is Symfony-based. Taylor Otwell was the one who came up with the idea. For web application development, it uses the MVC (model-view-controller) design. Laravel's source code is maintained on GitHub and licensed under the MIT license. [12]

Database

A database is a collection of data that has been arranged. The XAMPP MySQL database management system can be used to create a database and all of its associated tables. As software applications become increasingly complicated and intertwined, as well as with the rising use of enormous and diverse data from many sources, cybercrime, and a variety of other platforms, it is more critical than ever to have a durable, strong, secure, and consistent database system. Similarly, methodologies for ensuring that database-driven applications are rigorously tested and meet their specified requirements must be robust and adaptable, allowing software applications to be screened to successfully operate in any anticipated environment while maintaining the required usability and security.

A company may be prone to various risks of a system crash, internal logical structure deterioration, deletions, broken insertions, or updates. This is especially true if the software is launched without first verifying the application's database performance, security, and stability. Software testing is the process of finding software faults, isolating them, and subjecting them to correctional measures. Software testing, according to [13], is a process of informing stakeholders about the quality of a system by investigating the system under test. Through testing any of the three primary software components, namely interface codes, and database, stand a better chance of not suffering from a single defect. Due to these reasons, techniques such as black box, white box, and gray box testing were developed to test software applications via the user interface, internal logical structure, or both. Additionally, methods for specifically testing SQL database-driven applications were presented, as studying codes alone is insufficient for detecting and mitigating vulnerabilities. These methods have shown to be effective in detecting issues with software design and implementation, SQL database operations, and security issues including SQL injection and cross-origin attacks. However, they should be tweaked to detect specific vulnerabilities in programs that are database-based.

2.6. Hardware Development

2.6.1. Microcontroller

In embedded systems, a microcontroller is a small integrated circuit that governs a certain operation. On a single chip, a microcontroller contains a CPU, memory, and input/output (I/O) peripherals. These microcontrollers, also known as embedded controllers or microcontroller units (MCUs), are found in a variety of devices, including automobiles, robotics, office equipment, medical devices, mobile wireless transceivers, vending machines, and home appliances. They are essentially simple miniaturized personal computers (PCs) with no complex front-end operating system, designed to operate small characteristics of a bigger component (OS).

Arduino

An Arduino board is a small computer that also serves as an open-source platform for creating electronic projects. Arduino IDE is a computer-based software that runs on the physical programmable circuit board (which is the microcontroller). Before uploading computer code to the physical board, the Arduino IDE is used to generate and write it. [14]

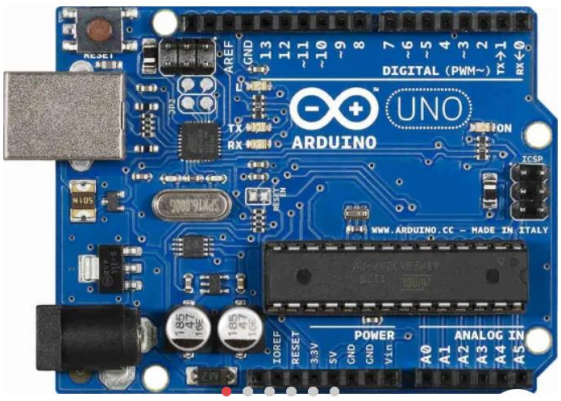


Figure 6: Arduino Uno Board

2.6.2. Pressure Sensor

A force detecting resistor, also known as a force sensor, is a specific form of resistor that exhibits a decrease in resistance as the force applied to the active sensing surface increases. In most cases, the force detecting resistor is delivered as a polymer sheet or ink for screen printing. This sensing film has both electrically conducting and non-conducting particles. When force is applied to the sensing film's surface, the particles collide with the conducting electrodes, changing the film's resistance. [15]

There are a variety of resistive-based sensors available, but force-sensing resistors perform well in challenging settings and have a simple interface compared to other resistive-based sensors.

Despite the fact that there are many different types of force sensors, force detecting resistors have several advantages, including a small size (less than 0.5mm), low cost, and strong shock resistance. The only drawback of FSR sensors is their low precision; there will be a 10% or more variance in measurement findings. As a result, it can't be utilized as a weighing machine. It acts as a force reaction rather than a precise pressure reading.

Figure 7: Force Sensitive Resistor and its pinout diagram

2.6.3. Arduino Ethernet Shield

Using its Ethernet library, the Ethernet Shield connects an Arduino board to the internet. This Ethernet library can be used to create sketches (Arduino programs written in the IDE) that assist in configuring the shield to connect to the internet. The shield is designed to work with practically all Arduino boards. It connects the board to the internet, allowing it to receive and send data from anywhere in the world. It also has an SD card option, which can be used to write to and read from the board. This allows the project to connect to the internet opening up an infinite number of options.

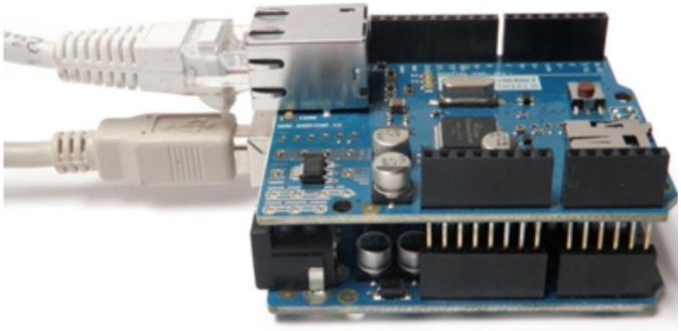


Figure 8: Arduino to Arduino Ethernet Shield Connection

Due to this connection, the Arduino board can be used for various roles; SERVER: It can function as a server, which means it can be accessed through the internet and commands can be sent from it. This server can be used in a variety of ways, such as control functionalities and to show data such as sensor readings, and much more. CLIENT: A client is a program that sends data to a server. If Arduino is operating as a client, it will be able to send data to a database on the server. This Arduino client model is used for data logging and managing massive amounts of data. [16]

CHAPTER 3: METHODOLOGY

3.1. Web Development

This is tied to the objective number one; to design and implement a web application. The type of methodology that will be employed in the creation of the Barbershop Appointment Application will be defined in this chapter. The prototype model is the methodology model that will be used in the application. It refers to a system development process in which a prototype, or an early approximation of a final system, is produced, tested, and tweaked as needed until an acceptable prototype is obtained, from which the whole system or product can now be developed [17]. When not all of the project needs are understood in detail ahead of time, this approach works best. It is an iterative, trial-and-error method.

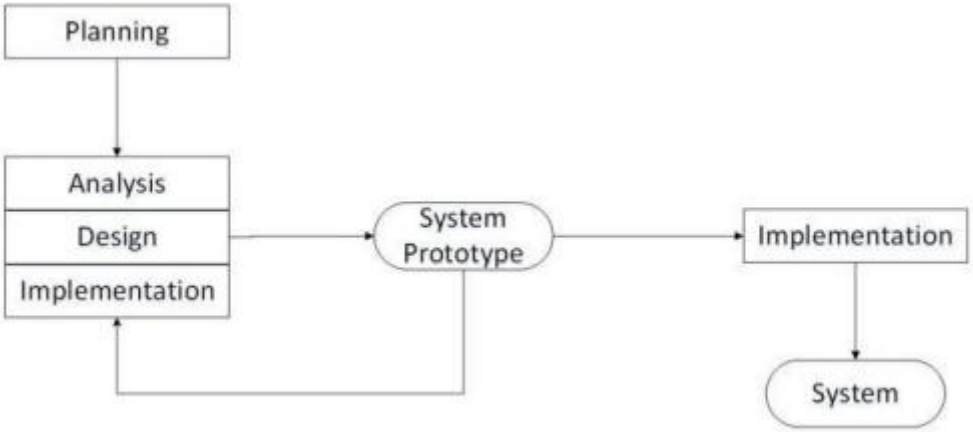


Figure 9:Steps in software design

3.1.1. Planning Phase

In the Prototype Model, the planning phase is the first stage. Every planning in the creation of a project is completed during this period. Choosing a project title is one of the tasks that this phase entails. Developing an E-barber system is the chosen project title. The application will be built in accordance with the project's main goal, which is to create a web-based mobile application that will bring all barbershop owners together in one place, allowing users to choose their preferred shop and schedule an appointment. Before developing the application, the project scope and work plan timeline must be completed. [17]

In addition, the planning phase investigates the requirements and issues of existing systems and applications in order to improve the application that will be produced. In addition, the project's importance is determined in order to visualize the values available in the program. This phase also includes a Gantt chart to ensure that the project's development goes smoothly.

3.1.2. Analysis Phase

The literature review was carried out during the analysis phase to distinguish the generated application from existing systems and apps. The Ashleys Kenya and Barber Kings Kenya systems are some of the existing systems that have been reviewed. The research's goals are to improve the established application and to layout the functionalities that can be added to it [17]. Aside from that, this phase consists of an analysis phase as well as approaches for gathering information and data, such as interviews and research. The information gathered throughout the analysis will be used to develop the E-Barber Application.

The flowchart below shall be used as a rough concept of the application's process.

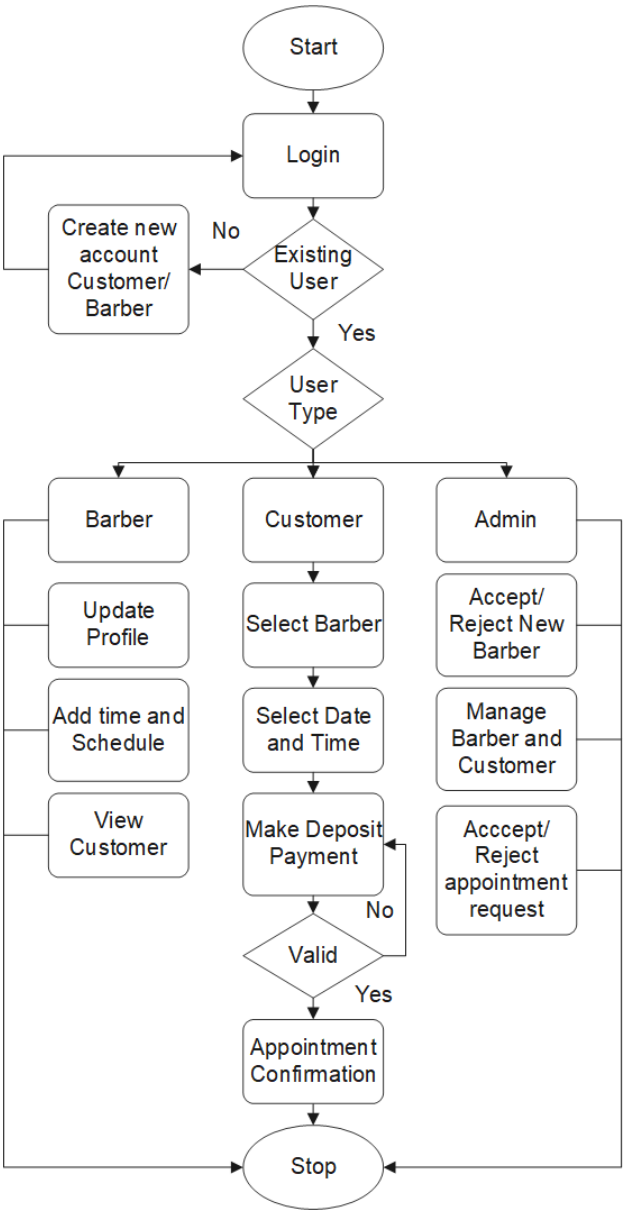


Figure 10: System Flowchart

Application Programming Interfaces (APIs)

An application programming interface (API) is a set of protocols for creating and integrating software applications. APIs allow a product or service to communicate with other products and services without requiring the programmer to understand how they work. This can speed up and lower the cost of application development. APIs enable flexibility, simplify design, administration, and use, and allow for innovation when creating new tools and products or managing current ones.

APIs facilitate collaboration between business and IT by making it easier for developers to integrate new application components into an existing architecture. Business requirements frequently evolve in reaction to rapidly changing digital markets, where new competitors might disrupt an entire industry with a single app. It is critical to support the quick development and deployment of innovative services in order to remain competitive. Cloud-native application development is a well-known method of increasing development speed, and it depends on APIs to connect a micro services application architecture.

Google Calendar API

Developers can use the Google Calendar API to integrate full calendar data and functionality into their apps via a REST interface or one of Google's client libraries. This can be achieved for languages like Java, Python, PHP, JavaScript, among others. The Calendar Data API allows users to conduct the majority of the functions available on the Google Calendar website for regular Google Calendar users. In the form of Google data API, G-Data, feeds, Google Calendar allows client applications to view and update calendar events. Users can utilize the Calendar Data API to integrate Calendar functionality into their own app or website. Users can create and delete events, change calendars, search for events that meet specific criteria, send invitations, and more. The Calendar data API can be used in a variety of ways. Users can, for example, make a web front end for a group calendar using Google Calendar as the back end. Users can also do a search for related calendars in order to see a list of forthcoming events on certain calendars. The google calendar API will therefore play a critical role in the development of the E-barber system.

Lipa na M-Pesa API

Safaricom recently released the ‘The Daraja API,' which allows developers to integrate Safaricom payment for Business to Customers (B2C), Customers to Business (C2B), and Business to Business (B2B) transactions. To accept Lipa na Mpesa online, one must have a checkout button on the website, app, or system that the user can use to pay for the goods or services being provided. When a user hits the button, Daraja receives a post request with the appropriate payload amount. Daraja processes the request and sends a STK push notification to the user's phone, instructing him or her to enter his or her M-Pesa password and click OK to complete the transaction. M-Pesa accepts the request by debiting the user's account and transmitting the transaction data to your servers via a web-hook. This API will be used in the implementation of deposit payments.

3.1.3. Design Phase

The database and user interface of the program will be designed during the design phase depending on the modules that have been identified. The E-Barber application's database will be created using MySQL with XAMPP local server. The application's user interface will be created using Bootstrap. In the implementation phase, the interface design will be utilized as a guide for developing the application.

3.1.4. Analysis and System Design

The E-Barber application analysis and system design are examined from many perspectives. The purpose of this stage is to guarantee that the application satisfies the set requirements. The problem has been detected during the analysis process and will act as a benchmark for designing a high-quality application. In the analysis phase, research on similar systems and applications was done. System design is required to define the progress of the system flow in order to construct an application that meets user and system criteria. The system is divided into two parts throughout the design phase: database design and system application design.

The database design employed in the proposed system shall be represented by a Data Flow Diagram (DFD) and an Entity Relationship Diagram (ERD). The implementation of this stage is critical to ensuring that the system development process meets the needs of users and the project's goals.

3.2. Mobile Application

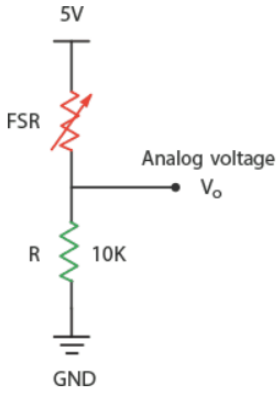
Mobile web app development faces many of the same issues as desktop web app development such as cross-browser compatibility and inconsistent HTML and CSS in mobile browsers. Frameworks have been created (based on HTML5 and CSS3) that are specifically designed to address these issues and work as smoothly as possible on a variety of smart phones and tablets. The majority of these mobile web app frameworks are lightweight, allowing for quick mobile web browsing without sacrificing the site's design and feel.

The jQuery JavaScript library provides an excellent basis for transforming web applications to mobile apps. It comes with a widget library that translates semantic HTML into a gesture-friendly format, making touch-screen actions simple. The most recent version has a very light code base that packs a punch with a lot of graphical components that can truly improve the user interface. This framework will be used in the development of the mobile app.

3.3. Hardware Design

3.3.1. Customer Counter Circuit

The FSR shall be placed on the salon chairs then connected to an Arduino board. The best technique to read the FSR is to build a voltage divider by connecting the FSR to a fixed value resistor (typically 10k). The FSR has one end connected to a power source and the other to a pull-down resistor. The Arduino's ADC input is then connected to the spot between the fixed value pull-down resistor and the variable FSR resistor. This creates a variable voltage output that can be read by the ADC input of a microcontroller. The output voltage measured is the voltage drop across the pull-down resistor, not across the FSR.



The voltage divider configuration output is described by:

$$V_O = V_{CC}\frac{R}{R+FSR}$$

When there is no pressure (that is no body sitting on the chair), the FSR resistance is quite high (about 10MΩ) with a 5V supply and a 10K pull-down resistor. Then output voltage is as follows:

$$V_O = 5V\frac{10k\Omega}{10k\Omega + 10M\Omega}$$

$$= 0.005V$$

$$\approx 0V$$

The resistance on the FSR will drop to around 250Ω if force is exerted on it (in this case, when a customer sits on the chair). As a result, the following output voltage is obtained:

$$V_O = 5V\frac{10k\Omega}{10k\Omega + 250\Omega}$$

$$= 4.9V$$

$$\approx 5V$$

The sensor's output voltage ranges from 0V (no pressure applied) to about 5V. (maximum pressure applied). When the Arduino translates this analog voltage to digital, it creates a 10-bit value with a range of 0 to 1023.

3.3.2. Remote Communication

IP / MAC addresses are assigned to each and every device that connects to the internet. Depending on how the network is set up, IP addresses might be fixed or modified. These addresses are used to identify network devices so that data can be received or transferred from them. The MAC address, in particular, is unique to each device and is normally assigned during production. The MAC address of the Arduino Ethernet shield will be written on the sticker attached to the board. The Arduino board will be connected to a router for IP address assignment. Unless or until the device is turned off, the router will automatically assign an IP address to it, which will remain fixed. When the device is switched off, the IP address assignment operation must be redone. The router's primary function is to handle all IP addresses in a given area and facilitate their communication.

An Arduino code will be developed to allow the sensors to send a signal to the Processing software, which will wirelessly transmit the data. The four pressure sensors to be used with Arduino will vary their resistance depending on the force applied to them. The goal is to update the Web application using the signal supplied by the sensors (when a customer takes a seat). A graphic design will be made to mimic reality as much as possible. Such that when someone sits on a seat, a link will be created with the Arduino microcontroller, and the color of the seat will change. The customer will be able to know in real-time whether there is a vacant seat or not. [16]

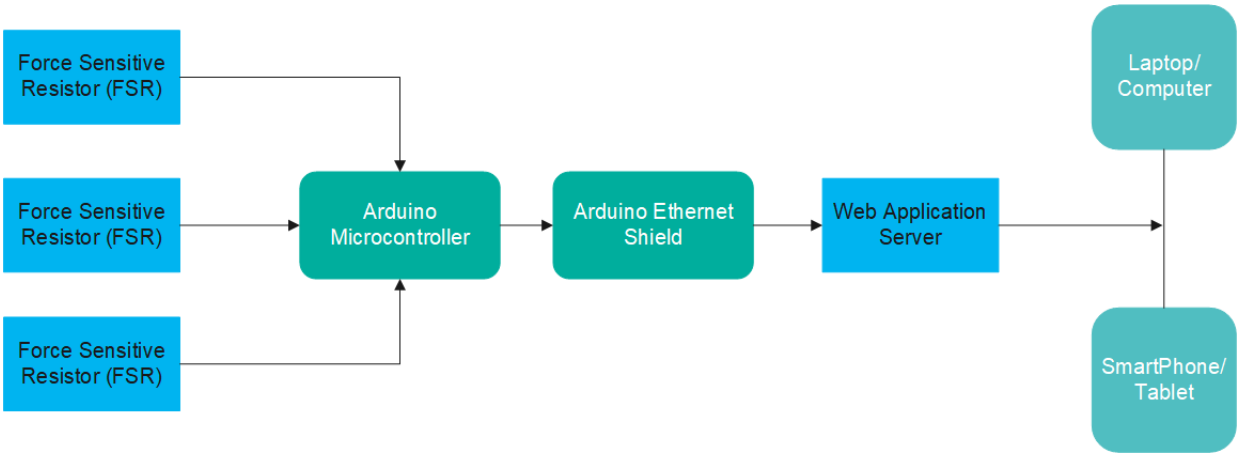


Figure 11: Block Diagram

CHAPTER 4: EXPECTED RESULTS

Of course, the application I am working on has a limited reach. It is however my hope that at the very least it will be useful to both clients who prefer making an appointment and those that just show up without an appointment. It would be an excellent solution to the country's current challenges of time wastage. As stated before, there are numerous tiny barbershops all over the country. This type of system will assist consumers in choosing the best barber to make an online appointment with, and it will also provide all barbers an equal chance to showcase and display their skills.

Since this will be Kenya’s first system of its kind, it's critical that the user interface be simple to learn and utilize. As a result, the web pages shall be designed in a simple user-friendly manner. For the time being, I have decided on working on an E-barber system. However, in the future, it can be expanded to include salons and gym sessions.

CHAPTER 5: PROJECT TIMEPLAN

ACTIVITY	SEM 1				SEM 2			
	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
DOCUMENTATION								
RESEARCH								
PROGRESS REPORT 1								
PROPOSAL WRITING								
PROPOSAL PRESENTATION								
DESIGN AND CODING								
PROGRESS REPORT 2								
HARDWARE CONFIGURATION AND TESTING								
PROJECT REPORT WRITING								
PROGRESS REPORT 3								
FINAL PRESENTATION AND DEMONSTRATION								

Table 0.1 : Project Time-plan

CHAPTER 6: BUDGET ESTIMATES

ITEM	QUANTITY	PRICE PER UNIT	TOTAL
Arduino Uno	1	1,500	1,500
Arduino Ethernet Shield	1	1,200	1,200
Pressure Resistor	1	1,600	1,600
PCB	1	500	500
Pressure Resistor	1	1,500	1,500
Pressure Resistor	1	1,500	1,500
Pressure Resistor	1	1,500	1,500
Resistor	4	25	100
Resistor	4	25	100
Miscellaneous			1,000
TOTAL			10,500

Table 6.1 : Project Time-plan

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