**Online Ticketing Web Application System for Triple S Sacco**

**Mwangi Edwin Gichara**

**136945**

**Wambui Lexie**

**136672**

**ICS 3 Group: B**

**Supervisor: James Gikera**

An Informatics Project Document Submitted to the School of Computing and Engineering Sciences (SCES) in fulfilment of the requirements for the award of a Degree in Informatics and Computer Sciences

22nd July 2022

# **Declaration**

We declare that this project has not been submitted to any other University for the award of a Degree in Informatics and Computer Sciences.

Students’ Signatures:

Sign: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Supervisor’s Approval Signature:

A picture containing hydrozoan, night sky

Description automatically generatedSign: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (esign-Lexie & Edwin only) Date: 25/07/2022 .

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# **Abbreviations**

**CBD** – Central Business District

**SDLC** – Software Development Life Cycle

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# **Abstract**

The Matatu industry is an industry that contains a group of organizations and saccos that offer public transport services within towns and offer inter-county travel within Kenya. The saccos own a fleet of 14-seater vehicles and buses used by the public to travel to specific destinations all over the country. Most inter-county travel saccos have ticketing stations at their headquarters and boarding stations mainly residing in downtown CBD. The sort of system that is used by the Matatu industry at the counter is an internal system that is used to manually sell tickets. Customers must go to the counter to purchase tickets or inquire about schedules; customers must also line for a long period to get a bus ticket, and customers pay cash when purchasing a bus ticket. The proposed system will online ticketing web application system for the Matatu industry that offers forms of cashless payment, that is M-PESA and debit/credit cards. This system will be accessible through your mobile phone or computer. It will be a user-friendly system. The customer will be able to see the schedules, destination of the vehicles, and hours of operation. They will also be able to pay for the tickets and receive a system-generated receipt.

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# **Chapter 1: Introduction**

## **1.1 Background**

Public transportation has been the most common form of transport in Kenya. Public transport vehicles in Kenya range from taxis to minibuses to buses. 90% of households have matatus or buses available within their vicinity in urban Kenya (Salon & Gulyani, 2019). “Matatu”, as Kenyans call it, was derived from the English number “three” as people used to pay three coins to use it. It is the preferred form of transport for Kenyans as they commute in the cities and between cities to meet their daily needs because they are affordable (TripAdvisor, 2021).

Matatus were made more reliable when SACCOs expanded their route of travel from intracity to intertown and/or intercity. They were made to still operate at very affordable prices. We have existing matatu Saccos that strictly function between towns such as Nairobi-Nakuru, Nairobi-Nyahururu, Nairobi-Nyeri, and many more. Some of these saccos are 4.N. T.E Sacco, Molo Line Shuttle, 2NK Sacco, etc. These matatus are also used for parcel services between towns which makes them even more efficient for they offer more than one service.

The main issue existing in these saccos is that they do not have an online presence such that they only operate by physically buying and booking a ticket at their head offices which are in downtown CBD and customers at times must wait in line for hours after purchasing a ticket since they are waiting for the next available vehicle to take them to their travel destination.

The Online Ticketing Web Application System is a web-based application that allows customers to check ticket availability, buy a ticket, and pay for the ticket online (Asaad, Ayad and Hayder, 2012). In public transport, e-ticketing systems are not only means of payment but process a huge amount of information which offers a large range of possibilities to make public transport easier to use, manage, and control. They offer opportunities as well to introduce an integrated pricing structure that is not easy to implement with traditional payment tools. Electronic ticketing technologies are classified according to the way they are used for payment. The closer the card is to the payment system, the more reliable the transaction is, but the more constraining it is for the user (Mezghani, 2008). Therefore, the long-term objective is for the customer to be able to book and pay for public transport without having to validate any card, relying on fully automatic fare payment.

The system that was proposed here was to create an Online Ticketing Web Application System for one of the saccos that will allow customers to purchase and book a ticket online before their days of travel and are at liberty to cancel the trip at any time. They can also book the ticket online at any time since the system will be operational all day long. A system such as this will increase bookings, save time, and increase the efficiency of operations (Gungon, 2020).

## **1.2 Problem Statement**

The system used by the Saccos at the counter is an internal system that is used to manually sell tickets. Customers must go to the counter to purchase tickets or inquire about schedules; customers must also line for a long period to get a matatu ticket, and customers must pay cash when purchasing the ticket. This system intends to solve this problem by making everything online.

The booking of a ticket by a customer shall be done on the customer’s mobile device. In case of a customer cancels the trip, they shall get a refund after being charged a cancellation fee by the ticketing system, or they could push their booking and reservation to a later date and not be charged or asked to pay again. The payments shall be made online via M-PESA, or debit and/or credit cards. The system will all in all ensure that all ticket details can be viewed before departure and shall give the customer a receipt of their trip. The system will make ticket booking easy and efficient and fast.

## **1.3 Objectives**

This subsection contains two categories of objectives: general objective/aim and specific objectives.

### **1.3.1 General Objective**

The main objective is to develop a secure online ticket booking system to improve and make the booking of tickets easier to avoid long queues.

### **1.3.2 Specific Objectives**

* To analyze the operations of the Matatu industry in Kenya
* To analyze the current ticketing systems used by matatu organizations in Kenya
* To identify the problems and limitations of the current ticketing system
* To design the system according to the requirements and functionalities that are required.
* To test and deploy the system.

### **1.3.3 Research Questions**

* What are some of the current ticketing systems used by public transportation services in Kenya?
* What are the problems faced and limitations experienced in the current ticketing systems?
* How will an online ticketing web application system for the Saccos be designed?
* How will an online ticketing web application system for the Saccos be developed?
* How will an online ticketing web application system for the Saccos be tested and deployed?

## **1.4 Justification**

According to Ruwena Gungon (2020), it is now crucial that every business has a recognizable online presence, no matter its sector. Not only does modern technology help businesses get found online, but it also helps them easily convert visits into revenue through an online reservation system. This proposed system will introduce the use of mobile phones to make payments through mobile money services which eliminate the risks of carrying paper money. It will also be easier to check for the availability of vehicles and their travel times and schedules, buy, and book tickets online, and pay for the tickets online. This system will be reliable because one can cancel a ticket and it can be charged to their next trip, if not they shall get a refund. This proposed system will be new for the current matatu industry in Kenya since there is no current existing online platform to book tickets online for matatu saccos. The system will be available for intertown saccos, not only within Nairobi.

The online ticketing system will remove the hassle of going downtown before your trip to queue and wait in line to buy your physical ticket, and not knowing whether there is a risk of cancellation. It will save on time, energy, and money.

## **1.5 Project Scope**

The Online Ticketing System for Saccos will provide options for viewing different travel days and schedules available with different timings for a particular date and enable a customer to register as a member, book a ticket, modify or cancel a particular reservation and booking, details of the cost of the ticket, make payments through mobile money and he/she can also modify and update his/her details.

The system will be online and will therefore require internet connectivity.

# **Chapter 2: Literature Review**

## **2.1 Introduction**

This chapter summarizes ideas that were given by past researchers. A detailed synthesis of those ideas was completed, with comparisons provided where possible. The study's objectives were followed when reviewing this literature

## **2.2 Operations of the Matatu industry in Kenya**

According to Jennifer Graeff (2018), the evolution of the matatu began in the late 1950s. After Kenya’s independence in 1963, Africans migrated to Nairobi seeking employment opportunities. The city began to expand, and they were areas that were limited to any transport. People residing in these areas were too poor to afford private vehicles. This led to the emergence of mini-bus taxis known as matatus. Due to high demand, the number of matatus increased. They continued to operate illegally in the city until 1973 when then President Jomo Kenyatta issued a decree officially recognizing matatus as a legal mode of public transport. The idea was to make the mobility of people more efficient and to create more jobs. Nairobi became dependent upon matatus to transport people to and from various destinations located all over the city. Within the time it became the most common mode of transport used all over the country.

According to Carol Macharia (2015), individuals, businesses, and institutions are interested in the matatu mode of transportation. Insurance companies, motor vehicles, bodybuilders, car assemblers, vehicle importers and garages, petrol stations, driving schools, and other businesses are all connected to the matatu sector. Money lenders and commercial banks Individuals, groups, and institutions with an interest. As a result, the matatu sector generates a slew of economic, social, and political tensions. Interests. Furthermore, there are economic rewards in addition to the fight for regulatory dominance. The matatu isn't merely a low-cost mode of transportation. It is currently a big-time business venture involving wealthy and self-employed workers. There have been reports of one person owning multiple matatus. This mode of transportation also employs drivers, conductors, and stage workers, who oversee the matatu's day-to-day operations.

## **2.3 Current ticketing system for Matatu industry in Kenya**

According to Academia (2018), the current reservation system of the Matatu industry is still carried out manually and separately at each branch; each branch's front-office must contact the head office for each customer's inquiry to obtain the most up-to-date schedule, seat availability, and other reservation-related information; and to avoid delays. Over-capacity or duplicate bookings. Reservation availability is also limited due to the physical location of each branch. Only certain hours are open, and reservations must be made on the spot. These are not the only limits. The company's current problems are the only ones. Human errors (e.g., typing typos are another source of difficulties. Miscalculations in ticket prices, errors in recording passenger statistics, and so on), and passenger fluctuation throughout travel. Some periods when there is a check-in bottleneck because of the front officer’s incapacity to multitask and the lack of an overview or report of ongoing activity, it's impossible for the corporation toanalyzee past/current performance or plan future improvements throughout the check-in procedure. Bus operators were also having trouble keeping track of their bus seat filling data.

## **2.4 Challenges and limitations facing the Matatu industry in Kenya**

According to Jennifer Greaff (2018), security issues were one of the challenges faced by the matatu industry in Kenya. Because the matatu industry is considered an "open" sector, many unemployed adolescents loiter, providing safe havens for antisocial acts such as drug use, petty theft, prostitution, and violence. The presence of cartels, particularly the Mungiki, causes security difficulties throughout the country. Many people feel that, based on discussions with everyone from matatu owners to academic specialists, Politicians and the Mungiki are collaborating for illegal financial gain at the expense of the people of the matatu business. Conflicts over routes by matatu Saccos endanger innocent bystanders.

Lack of political will to support the matatu industry is also another challenge that was faced by the industry. Most stakeholders believe this is the cause of the matatu industry's disorganization, as the lack of a political advocate is a key roadblock to building a progressive matatu plan. Thousands of people operate matatus on their own and compete against one another The relevant ministries and organizations are thought to be corrupt or ineffective. Without a governmental umbrella agency to guide transportation, the entire system would be in chaos. Because the system has become broken, cartels can exist because they provide a form of protection. The absence of political resolve to organize the matatu is related. Industry has a negative impact on Nairobi's image. Nairobi is the capital of Kenya.

Police bribes are also a major concern in the Matatu industry in Kenya. Matatu owners and drivers frequently allege that police harass them and pull them over even though they have done nothing wrong. Rather than towing the truck off the road, the crew settles with the officer. They’re also thought to be cooperating with the Mungiki. The cops are paid bribes every week allowing the Mungiki to perform their business with ease

## **2.5 Related Applications**

This section shows all the related applications based on the ticketing system in the transport sector.

### **2.5.1 Madaraka Express Online Booking**

Madaraka express is a new high-speed train that connects Mombasa and Nairobi (Antony Ray,2018).

Graphical user interface, website

Description automatically generated

Figure 2. 1: Madaraka express online booking (Madaraka express, 2022)

### **2.5.2 Kenya airways online booking**

Kenya Airways is an airline company that is currently a public-private partnership (Monica,2013).

Graphical user interface, website

Description automatically generated

Figure 2. 2: Kenya airways online booking (Kenya airways, 2022)

**2.5.3 SWVL online booking**

Swvl is a smart ride-sharing transportation service that connects travelers with bus drivers at certain times and locations, ensuring cost, reliability, and convenience for all parties involved (Hoda,2021).

Graphical user interface, application

Description automatically generated

Figure 2. 3 : SWVL online booking (Swvl,2022)

## **2.6 Gaps in Current Approaches and Related Applications**

According to Jennifer Greaff (2018), transportation services are in high demand in both the developed and developing worlds. Rapid urbanization, expensive operating costs, and deteriorating infrastructure have drained public resources and transportation services, resulting in a gap in urban transportation systems.

## **2.7 Conceptual Diagram**

Figure 2.4 represents how the online matatu ticketing system is supposed to work. The customer can key the destination and select a vehicle that is a 14-seater or a bus. The customer can then book a seat or seats depending on how many occupants are travelling. Then he/she is directed to the payment section. Upon payment, the administrator confirms the payment, and the customer can now print the receipt. The administrator can add a vehicle and generate the report. The staff can provide customer support through emails and phone calls.

Diagram

Description automatically generated

Figure 2. 4: Conceptual Framework

# **Chapter 3: Methodology**

## **3.1 Introduction**

This section includes the different research methods that were used to achieve the objectives of the project. It will also discuss the applied development approach to be used and the system analysis, design, and its deliverables.

## **3.2 Waterfall Methodology**

Shettima et al. (2018) suggest that waterfall model is the ideal methodology to use for objectives and solutions to the problems are clearly stated and well understood such as this project. The Waterfall methodology—also known as the Waterfall model—is a sequential development process that flows like a waterfall through all phases of a project (analysis, design, development, and testing, for example), with each phase completely wrapping up before the next phase begins.

A waterfall-type model shall be adhered to, whilst creating each different section of the project which as mentioned above will be shown to the client. Each stage will require requirements to be defined followed by the design, implementation, and testing. Each step will be completed fully before continuing to the next step, as described in the waterfall model. As mentioned earlier, using the waterfall model prevents the addition of extra features which may have been thought of during a step after the requirements. This is good for this project as it prevents adding any time-consuming additions to the system. Finally, the waterfall model places a considerable emphasis on a careful analysis before the systually built (Vliet 2008, P.50).

Diagram

Description automatically generated

Figure 3. 1: Steps in Waterfall Model ([What Is SDLC Waterfall Model?], 2022)

**3.2.1 Requirement Analysis**

This step involves identifying system requirements. For the proposed system, functional requirements for both the public service vehicle operators and persons with disabilities are identified. This step also identifies the unique modules that need to be developed in their order of priority.

### **3.2.2 System Design**

The requirement specifications from the first phase are studied in this phase and the system design is prepared. System Design helps in specifying hardware and system requirements and helps in defining overall system architecture. The software code to be written in the next stage is created now*.*

### **3.2.3 Implementation**

With inputs from system design, the system is first developed in small programs called units, which are integrated into the next phase. Each unit is developed and tested for its functionality which is referred to as Unit Testing.

### **3.2.4 Integration and Testing**

All the units developed in the implementation phase are integrated into a system after testing each unit. The software designed, needs to go through constant [**software testing**](https://www.toolsqa.com/software-testing/software-testing/) to find out if there are any [**flaws or errors**](https://www.toolsqa.com/software-testing/istqb/error-defect-failure/). Testing is done so that the client does not face any problem during the installation of the software*.*

### **3.2.5 Deployment**

Once the [**functional and non-functional testing**](https://www.toolsqa.com/software-testing/functional-and-non-functional-testing/) is done, the product is deployed in the customer environment or released into the market.

### **3.2.6 Maintenance**

This step occurs after installation and involves making modifications to the system or an individual component to alter attributes or improve performance. These modifications arise either due to change requests initiated by the customer, or defects uncovered during live use of the system. The client is provided with regular maintenance and support for the developed software*.*

## **3.3 System Analysis**

System analysis is the process of modelling the functional requirements and assessing implementation needs. The following will be used in the system analysis phase.

### **3.3.1 Use Case Diagram**

A use case diagram is a diagram that is used to identify, clarify, and organize system requirements. It shows how a system interacts with its entities. There are 2 major symbols in the Use Case Diagrams. The first symbol is an Actor: this is a person or an organization that plays a role in or more interactions with the system. Use cases: used to describe a sequence of actions (Academia,2022). This was implemented in the proposed system to illustrate how the actors and public service operators will interact with the system.

**3.3.2 Sequence diagram**

This diagram depicts how the items within a use case communicate with one another over time.

## **3.4 System Design**

The process of system design is defined as establishing how the system will be built and how it will appear. Considerations like the software to be utilized and performance requirements are considered at this stage.

### **3.4.1 Entity relationship diagram**

An entity-relationship diagram is a diagram that employs the notions of entity type and relationship set, as well as certain key semantic data about the real world. The entity-relationship approach suggests that it can be represented using a diagrammatic approach known as an entity-relationship (ER) diagram. Two of the most important reasons for employing the ER method for the original database design is because it enables us to collect and preserve some of the world's most valuable assets in form of significant real-world semantics; second, it can attain a high level of data independence. As a result, it becomes an appealing option for logical database structure (Tok-wang,2009). An ERD was used to show the link between the entities in the proposed system. The relationship between public service vehicles and journeys, for example, was one to many. This means that a single public transportation vehicle can make multiple journeys every day

**3.4.2 Context Diagram**

A context is a diagram that shows the static structure of the system being modeled (Donald,2015).

**3.4.3 Data Flow Diagram**

A data flow diagram shows the way information flows through a process or system. It includes data inputs and outputs, data stores, and the various subprocesses the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships

**3.5 System Development Tools and Techniques**

This section will list the tools that will be used for the development of the system.

**3.5.1 PHP**

This is a server-side scripting language that enables a website to become more dynamic and interactive by adding functionality. It has features like connecting to a database and displaying error messages to the user. This will be utilized to aid with the application's connection to MYSQL.

**3.5.2 HTML**

This is a common markup language for documents that are shown in a web browser. It is one of the internet's primary building components and will be utilized to create this web application system.

**3.5.3 CSS**

This is a style sheet language that is used in conjunction with a markup language, such as HTML, to describe the appearance of a document, such as text color and animations, giving it personality. It will be used to style this web application system

**3.5.4 MYSQL**

This is a relational database management system that is free source. This will be used to hold the information about the passengers and vehicles that will be linked to their reference number.

**3.5.5 JavaScript**

This is a server-side scripting language that enables a website to become more dynamic and interactive by adding functionality.

**3.6 Deliverables**

This section will describe the system modules.

**3.6.1 System Modules**

The different modules in the system are as follows:

**Passenger**

They are the system’s primary focus. They use the front end to communicate with the ticketing system. They can select the destination and reserve a sit. They can pay for their reservation and in turn the system generates a receipt.

**Administrator/staff.**

They help acknowledge the payment. They also assist in customer care services in case the passenger has any inquiries.

**Front End User Interface**.

This is the interface that the passenger interacts with when booking a ticket. It also contains privilege control to ensure the passengers are not accessing the wrong information.

**Server**

This is the backend of the system that handles the user data. It stores the passenger and staff data. It also controls the access to the database.

**Database**

It is responsible for storing all the data for future referencing

# **Chapter 4: System Analysis and Design**

## **4.1 Introduction**

This section talks about the requirements, the system analysis and design diagrams and wireframes. The requirements are divided into 2, functional and functional requirements. System analysis diagrams are the use case and sequence diagram. System design diagrams are the Entity Relationship Diagram, Context Diagram and Data Flow Diagram.

## **4.2 System Requirements/Requirement Analysis**

This is the process of determining user expectations for a new or modified product. These features, called requirements, must be quantifiable, relevant, and detailed. There are 2 key categories of system requirements: functional requirements and non-functional requirements

### **4.2.1 Functional Requirements**

Functional requirements are a function or feature that must be included in an information system to satisfy the business needs and user acceptance. Users (staff) and Customers will use this proposed Online Matatu Ticketing System web portal. A clear and detailed functional system requirement for this system are the Administrator section and Customer section are described as following.

**Customer**

A customer should perform the following activities:

Check the ticket availability by selecting destination and travel date which a system will use to validate to see the route selected and the date is available. Seats available are to be incrementing from previous booking with the same date and route after checking availability.

After successful registration with validations from the system, a customer proceeds to payment page and pay online

Then lastly, a message will be sent via the mobile number a customer provided. Or a customer prints a ticket.

**Administrator**

Seat inventory: The staff can delete and search the tickets booked.

Route: The staff can edit, delete, or add route to each matatu allocated to the company.

Vehicle inventory: The staff can add, edit and delete a vehicle.

Hired staff: The administrator can add, edit, and delete staff.

System information: The administrator can edit system information.

### **4.2.2 Non-Functional Requirements**

A non-functional requirement is a specification that describes the system’s operation capabilities and constraints that enhance its functionality. These include system performance, costs, and general system features like reliability, security, and availability. The non-functional criteria also cover aspects of the system development process and the implementation of the system.

**Reliability**

The system should be able to accurately generate a ticket once the customer has paid for the reservation. It should also be able to generate reports of all the customers that have used the system.

**Availability**

The display should update in fractions of a second whenever a consumer clicks any button on the system. The time it takes to validate a card in the system should not exceed 5 seconds.

**Security**

The customer’s data should be secure from any outside attack. The system should be able to provide a secure platform for authentication and payment of the ticket

**Performance**

During any given week/month, the ticketing system should not be offline for more than 10 minutes between 6:00 a.m. and 23:00 p.m. For any given day in a week/month, the recovery time should not be shorter than 3 minutes between 6:00 a.m. and 23:00 p.m. Between 23:00 and 6:00 a.m., the total system downtime should not exceed 20 minutes.

## **4.3 System Analysis**

This subsection talks about the use case and sequence diagrams.

### **4.3.1 Use Case Diagram**

Diagram

Description automatically generated

Figure 4. 1: Use Case Diagram

This diagram represents the users and how they will interact with the system. The customer can be able to search for a destination, select a schedule for the specific date he would like to travel, reserve a seat, make payment, and print the ticket. The administrator can be able to view and delete reservations and inquiries, add edit, and delete a vehicle, schedules, and system information. The staff can be able to view and delete reservations and inquiries.

### **4.3.2 Sequence Diagram**

Chart, box and whisker chart

Description automatically generated

Figure 4. 2: Sequence Diagram

This diagram details how a passenger will interact with the system. The passenger can search for a schedule and select the available schedule and seat type. He/she can fill up the passenger information, make a reservation and the pay for the reservation. After payment, the passenger can then print the ticket

## **4.4 System Design**

This subsection talks about Entity Relationship, Context and Data Flow Diagrams.

### **4.4.1 Entity Relationship Diagram**

Diagram

Description automatically generated

Figure 4. 3:Entity Relationship Diagram

This diagram represents the tables in the database and their relationships.

### **4.4.2 Context Diagram**

Diagram

Description automatically generated

Figure 4. 4: Context Diagram

This diagram represents the context diagram for the system. The customer can select a schedule, seat, make payment and print the ticket. The administrator can generate report and perform system maintenance. The bank is used to deposit the payment made by the customers. The staff can view and delete inquiries and reservations.

### **4.4.3 Data Flow Diagram**

Diagram, engineering drawing

Description automatically generated

Figure 4. 5: Data Flow Diagram

This Diagram represents the Data Flow Diagram of the system. It consists of the customer, administrator, staff, and bank. The customer can select a schedule, seat, make payment and print the ticket. The administrator can generate report and perform system maintenance. The bank is used to deposit the payment made by the customers. The staff can view and delete inquiries and reservations.

## **4.5 System Wireframes**

This subsection contains different wireframes that is used in the design of different pages.

### **4.*5.1* Admin panel**

A picture containing diagram

Description automatically generated

Figure 4. 6:Admin side wireframe

This diagram represents the admin-panel wireframe. It contains the reservation, inquiries, vehicles, schedules, and staff table.

### **4.*5.2* Schedules page**

Graphical user interface

Description automatically generated

Figure 4. 7: Schedules Wireframe

This Diagram represents the Schedules page. It contains 2 input fields where the customer can search for desired date and time of travel. It also displays the schedules table

### **4.*5.3* Reservation Page**

Graphical user interface

Description automatically generated

Figure 4. 8: Reservations Wireframe

This diagram represents the reservation page. It contains the schedule picked by the customer. The seater represents the normal capacity seat of the vehicle while shuttle represents less capacity seat of the vehicle. The customer can select the seat type. It contains a form whereby the customer can fill in their names and can add other passengers. It contains a book reservation button.

### **4.5.4 Tickets Page**

#### Graphical user interface, application Description automatically generated

Figure 4. 9: Tickets Wireframe

#### This diagram represents the Tickets page. It displays the Ticket generated after the customer makes a reservation. It can display one or more tickets depending on the number of passengers. It contains a proceed to payment button.

# **Chapter 5: System Implementation and Testing**

## **5.1 Introduction**

This chapter deals with the implementation and testing environments that were used while developing the Triple S Ticketing System. It will give details about the hardware and software specifications that were used and the various modules that are present in the system. It will also explain the testing environment that was used to run this system.

## **5.2 Description of the Implementation Environment**

This subsection will explain the implementation environments that were used to design the 4NTE ticketing system.

### **5.2.1 Hardware Specifications**

Graphical user interface, text, application, email

Description automatically generated

Figure 5. 1: Hardware Specifications

We used a hardware of CPU 1.00GHz 1. 19GHz.It contains a RAM of 8.00 GB with a 64-bit operating system and a 64 based processor.

### **5.2.2 Software Specifications**

Graphical user interface, text, application, email

Description automatically generated

Figure 5. 2: Software Specifications

Windows 10 has been used as the operating system as it is stable and supports more features and is more user friendly.

## **5.4 System Implementation**

This section will explain the various modules that are available in this system. The modules include database module, schedule module, login module for the administrator or staff, Administrator module, staff module, reserve ticket module and ticket module

### **5.4.1 Database**

Graphical user interface, application

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Figure 5. 3:Database Module

The database module contains tables that are used to store data of the 4NTE Ticketing system. This tables include:

Vehicle list: It contains the list of vehicles owned by the 4NTE organization.

Schedule list: It contains the list of schedules that are available.

Reservation list: Contains the list of reservations that have been made.

Users: contains the list of staff and administrators.

System info: Contains information about the system.

Message list: Contains inquiries or comments made by the customers.

### 

### **5.4.2 Schedule Module**

Graphical user interface, table

Description automatically generated

Figure 5. 4: Schedules Module

This module contains the list of schedules that are available. A customer can search for the day and time he/she would like to travel and select the schedules that available that day.

### **5.4.3 Reservation Module**

Graphical user interface, application

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Graphical user interface, text, application

Description automatically generated

Figure 5. 5:Reservation Module

This module comes after a customer has selected the reservation; he/she would like to make. The customer will then select the date and the seat he/she would like to take. Then the customer can fill in the names of the passengers he will be booking for and then submit reservation.

### **5.4.4 Ticket Module**

Graphical user interface, text, application, email

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Figure 5. 6:Tickets Module

This module shows the ticket that is generated after submitting a reservation. The ticket contains the name of the passenger, the seat number, the group, the travel date and time and the vehicle identification number

### **5.4.5 Login Module**

A picture containing text, car, outdoor, parked

Description automatically generated

Figure 5. 7:Login Module

This is where the administrator or staff can login to access the system.

### **5.4.6 Administrator Module**

Graphical user interface, application

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Figure 5. 8:Administrator Module

The administrator can login, view inquiries and reservations. He can also delete past reservations and inquires. Apart from that, the administrator can add, edit and delete vehicle details, Schedule details, staff and administrators and system information.

### **5.4.7 Staff Module**

Graphical user interface, application

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Figure 5. 9: Staff Module

The staff and the administrator have different access levels. The staff can only view or delete an inquiry and reservations.

### **5.4.8 Payment Module**

Graphical user interface, application

Description automatically generated

Figure 5. 10: Payment Module

There are 2 ways the customer can pay for the ticket. The customer can either use mobile money or pay with card.

## 

## **5.5 System Testing**

This section deals with the various test that were carried to ensure system works as required. In our system we used black box testing to check the functionalities work as required.

### **5.5.1 Black Box Testing**

Black box testing is a technique for testing software applications' functionalities without having access to their underlying code structure, implementation specifics, or internal routes. Black Box Testing is totally based on software requirements and standards and primarily concentrates on the input and output of software programs. We tested the various functionalities of the system, and the results are listed below.

### **5.5.2 Test Results**

**Compatibility Testing**

The application underwent compatibility testing to make sure it functions on the most common device versions. This would guarantee that users of various versions of the program may use it without difficulty or experiencing any issues. The test results are shown in Table below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Case Name: Compatibility Testing  Date Tested: 19 July 2022  Tested By: Edwin Mwangi  Test Description: | | | | | |
| Pre-Condition: | | | | | |
| Post-Condition: | | | | | |
| Test Steps | | | | | |
| **Steps** | **Actions** | **Expected Response** | **Pass/Fail** | **Comments** |  |
| i | Launch the web application | The web application runs without any problem | Pass | None |
| ii | Check if the web application is running well | It runs well | Pass | None |
| iii | Repeat step I and ii on different web browsers | It runs well | Pass | None |

Figure 5. 11: Compatibility Testing

**Check Schedule and book ticket Functionality**

This was tested to make sure the customer can check the available schedules and also reserve a ticket for the desired date of travel.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Case Name: Check Schedule and book ticket testing  Date Tested: 19 July 2022  Tested By: Edwin Mwangi  Test Description: | | | | | |
| Pre-Condition: | | | | | |
| Post-Condition: | | | | | |
| Test Steps | | | | | |
| **Steps** | **Actions** | **Expected Response** | **Pass/Fail** | **Comments** |  |
| i | Launch the web application | The web application runs without any problem | Pass | None |
| ii | Go to the schedules and search for the desired date of travel | It displays the schedules available that date | Pass | None |
| iii | Select a schedule and reserve a ticket | It generates a ticket with the passengers’ details | Pass | None |

Figure 5. 12:Reservation testing

**Payment Functionality**

This was tested to make sure the customer can pay for the reserved ticket.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Case Name: Payment testing  Date Tested: 19 July 2022  Tested By: Edwin Mwangi  Test Description: | | | | | |
| Pre-Condition: | | | | | |
| Post-Condition: | | | | | |
| Test Steps | | | | | |
| **Steps** | **Actions** | **Expected Response** | **Pass/Fail** | **Comments** |  |
| i | Launch the web application | The web application runs without any problem | Pass | None |
| ii | Go to the schedules and search for the desired date of travel | It displays the schedules available that date | Pass | None |
| iii | Select a schedule and reserve a ticket | It generates a ticket with the passengers’ details | Pass | None |
| iv | Proceed to payment. Select the means of payment you want to use and click pay now | After the funds are received it generates a receipt that is sent to the mobile number | Pass | None |  |

Figure 5. 13:Payment Testing

**Add, edit, and delete vehicles, schedules, users, and system information functionality**

This was tested to make sure the staff can add, edit, and delete vehicles, schedules, users and system information.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Case Name: Add, edit and delete vehicles, schedules, users and system information Testing  Date Tested: 19 July 2022  Tested By: Edwin Mwangi  Test Description: | | | | | |
| Pre-Condition: | | | | | |
| Post-Condition: | | | | | |
| Test Steps | | | | | |
| **Steps** | **Actions** | **Expected Response** | **Pass/Fail** | **Comments** |  |
| i | Launch the web application | The web application runs without any problem | Pass | None |
| ii | Go to the staff side and login using the credentials | The system redirects to the staff side after successful validation | Pass | None |
| iii | Add, edit and delete the schedules, vehicles, users and system information | All the functionalities work as expected | Pass | None |
| Iv | Logout and go back to the homepage | It redirects to the homepage after logging out | Pass | None |  |

Figure 5. 14:System Testing

# **Chapter 6: Conclusions, Recommendations and Future Works**

## **6.1 Conclusions**

The system was developed successfully. The web-based application can allow customers to book matatu tickets for inter-county travel from any device that connect to the internet. It will allow customers to book tickets online, make reservations, check travel schedules, and make online payments via M-PESA and Credit or Debit cards. It will be a new system for matatu saccos in Kenya, for there is no current existing matatu Sacco that has such a system. It can be presented and hopefully implemented by the saccos. We have designed the system to provide the user with ease of booking, details of schedules and travel, and the administrator with ease of managing schedules, vehicles and monitoring reservations and cashless payments made.

## **6.2 Recommendations**

The system will have more improvements made in the future making it reviewable and easy for redeveloping. A few suggestions that can be added to this application are that a user can book a ticket for an adult at the standard price, and for a child at a discounted price. It can also have a star-rating section where one can rate the experience of the trip and rate the driver or Sacco. Another recommendation is that the web-based system to be implemented to a mobile application for ease of use. On the area of payment, the system will hope to send a push notification and send an SMS from MPESA to the mobile number regarding confirmation of the payment, and not receive the confirmation only on email.

## **6.3 Future Works**

For future developers intending to expand this system, a great idea to implement would be to make this system available offline to people who do not internet connection or mobile smart phones.

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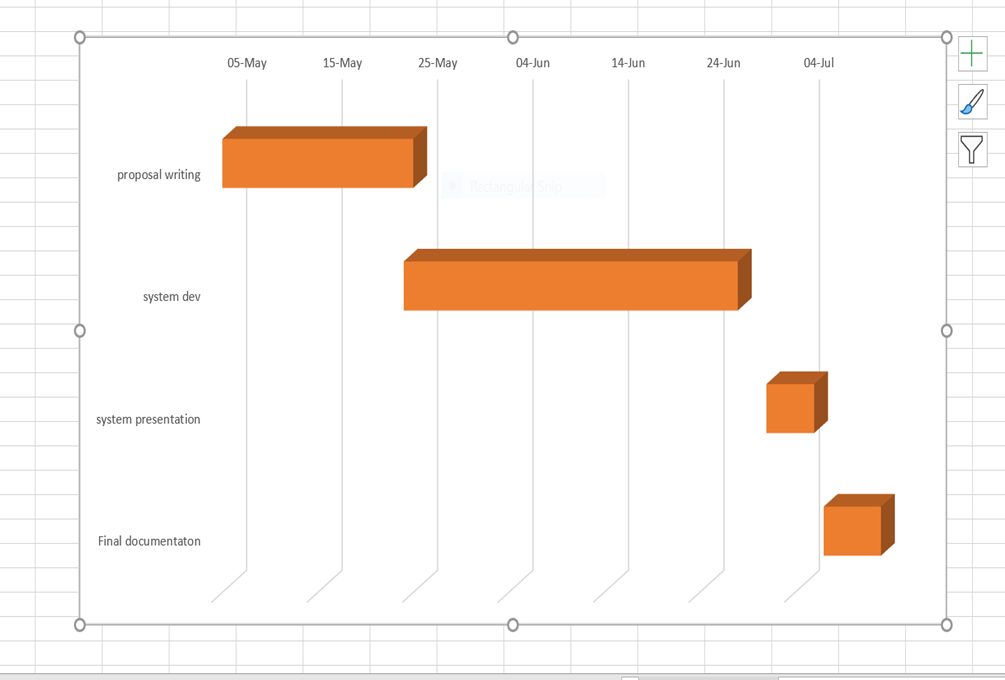
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# **Appendix**

# **Appendix A : Gantt Chart**



## **Appendix B: Lecturer Signing Sheet**

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**Bachelor of Science in Informatics and Computer Science ICS Project I**

**Final Documentation Assessment Sheet**

**Name:** ........................................................... **Adm. no.** ….................................

**Name:** ............................................................**Adm. no.** …................................

**Project Title:**.............................................................................................................................

|  |  |  |
| --- | --- | --- |
| **Assessment Area** | **Marks** | **Score** |
| **Preamble** | **4** |  |
| • Title: Informative, objective and appropriate | 1 |  |
| • Table of Contents: Correct structure. This includes the various lists | 1 |  |
| • Abstract: Summary inclusive of all relevant aspects of the document | 2 |  |
| **Chapter 1: Introduction** | **8** |  |
| • Background: Well detailed, inclusive of relevant research background, and well cited. | 2 |  |
| • Problem Statement: Concise and clear gap/problem identified and explained | 2 |  |
| • Objectives: S.M.A.R.T | 2 |  |
| • Justification and Scope: Convincing justification and precise project scope based on various aspects | 2 |  |
| **Chapter 2: Literature Review** | **10** |  |
| • Adequate literature is consulted | 2 |  |
| • Literature consulted is relevant | 2 |  |
| • Gaps show clear critique of the existing and related systems | 2 |  |
| • Literature well cited using APA | 2 |  |
| • Conceptual Framework: Descriptive and detailed | 2 |  |
| **Chapter 3: Methodology** | **6** |  |
| • Methodology is well described (all steps) | 2 |  |
| • Methodology is justified | 2 |  |
| • Tools and techniques clearly highlighted described | 1 |  |
| • Deliverables: All identified and well explained | 1 |  |
| **Chapter 4: System Analysis and Design** | **12** |  |
| • Functional Requirements: Detailed and complete | 2 |  |
| • Non-functional Requirements: Detailed and complete | 2 |  |
| • System Analysis: Diagrams (at least 3) well drawn using the required standard structures, well detailed, and legible | 3 |  |
| • System Design: Diagrams (at least 3) well drawn using the required standard structures, well detailed, and legible | 3 |  |
| • Consistency of entities and processes in both system analysis and system design | 2 |  |
| **Chapter 5: System Implementation and Testing** | **8** |  |
| • System Implementation: Well covered with screenshots of the various modules | 4 |  |
| • System Testing: Well explained testing regimes and detailed tabled testing results | 4 |  |
| **Chapter 6: Conclusions, Recommendations and Future Works** | **6** |  |
| • Conclusions: Shows achievements against objectives, challenges, and any other conclusive statements from the entire project scope | 2 |  |
| • Recommendations: Clear recommendations based on the research experience achieved | 2 |  |
| • Future Works: Explains clear gaps that could be filled in future works | 2 |  |
| **References** | **2** |  |
| • Adequate references styled using APA | 2 |  |
| **General** | **4** |  |
| • Report structure according to the minimum requirements guided by the template | 2 |  |
| • Clear and proper use of language/grammar | 2 |  |
| **Total** | **60** |  |

**Comments:**

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**Name**: ................................................................... **Signature**: ....................................................