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DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY

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RQF LEVEL: 7

Web And USSD-Based Mediation System

CASE STUDY: GICUMBI District

Submitted in partial fulfillment of the requirements for the award of Advanced Diploma of Information Technology

by:

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DECLARATION

I, **ISHIMWE RENE**, declare that this FINAL YEAR PROJECT is my own work. To the best of my knowledge, I acknowledged all authors or sources from where information was obtained. I further declare that this work has not been submitted to any university or institution for the award of a degree or any of its equivalents.

ISHIMWE Rene

Signed ----------Date …….

APPROVAL

This is to approve that the project report work entitled" **Web and USSD-Based Mediation System**" submitted by **ISHIMWE Rene** to the department of Information and Communication Technology-RP-Musanze College towards partial fulfillment of the requirements for the award of Advanced Diploma of Information Technology is valid record of the work carried out by them under my supervision.

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Name of Head of Department *Date & Signature*

HODARI Audace ……

DEDICATION

I dedicate this work to the Almighty God, the Head of the Department, all lecturers, and the ICT Department support staff at RP-Musanze College for their tireless and selfless efforts in shaping me into who am I today. Special thanks to my supervisor; this work is also dedicated to them. Additionally, I extend my heartfelt dedication to my beloved parents, relatives, brothers, and sisters.

ACKNOWLEDGEMENTS

First and foremost, I wholeheartedly express my gratitude to the Almighty God for the gift of life and the unwavering spirit of hard work that has sustained me, particularly during this intense period of project work.

My heartfelt thanks extend to the dedicated academic staff at RP-Musanze College who have generously shared their profound knowledge with me. Special appreciation goes to **Mr. NIYITEGEKA Jean Joas**, who provided invaluable assistance during my project. It is their unwavering support that has been instrumental in my success.

I owe the successful compilation of this book to the unwavering support of all those who stood by my side, offering encouragement and support throughout my project work.

I express my love and sincere appreciation to my families and relatives, who have instilled in me the values and discipline that have shaped me into the responsible individual am I today. Additionally, am grateful for their financial support, which has enabled me to meet the requirements of this project.

I humbly extend my thanks to the Ministry of Education, the Republic of Rwanda, and the RP-Musanze College. Their abundant financial and academic assistance throughout years in the College has been indispensable.

I also extend my gratitude to my friends and classmates, whose daily advice and contributions have significantly impacted to academic success.

May God bless every one of you!

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ABBREVIATIONS AND ACRONYMS

- **AJAX**: Asynchronous JavaScript and XML
- **API**: Application Programming Interface
- **APPs**: Applications
- **CSS**: Cascading Style Sheet
- **FTP**: File Transfer Protocol
- **HTML**: Hypertext Mark-up Language
- **HTTP**: Hypertext Transfer Protocol
- **HTTP**: Hyper Text Transfer Protocol
- **I.P**: Internet Protocol
- **ICT**: Information Communication Technology
- **IS**: Information System
- **IT**: Information Technology
- **JS**: Java Script
- **MMS**: Mediation Management System
- **OS**: Operating System
- **PHP**: Hypertext Pre-processor
- **PHP**: Hypertext pre-processor
- **SQL**: Structured Query Language
- **UI**: User Interface
- **USSD**: Unstructured Supplementary Service Data
- **WI**-FI: Wireless Fidelity
- **XHML**: Extensible Hypertext Markup Language
- **XML**: Extensible Markup Language

ABSTRACT

The primary objective of my project, Web and USSD-Based Mediation System, is to design and implement an integrated platform that enhances the mediation process in Rwanda, particularly in remote areas with limited internet access. This system aims to streamline the resolution of disputes by facilitating communication between disputing parties and mediators through both web and USSD interfaces. By leveraging mobile technology, the system ensures accessibility for users regardless of their technological resources.

The application focuses on improving the efficiency of mediation work, enabling users to schedule, manage, and track their mediation sessions seamlessly. It provides real-time notifications for users' complaints status or appeal decisions, ensuring no sessions are missed and reducing delays in dispute resolution. Furthermore, the system allows users to submit complaints, appeal, and receive notifications for its solving day, enhancing transparency and accountability in the mediation process.

Named the Mediation Management System (MMS), this platform is designed to be user-friendly, catering to individuals who may not be technologically savvy. A combination of methods was employed to gather relevant data for the development of this project, including documentation review, observation, and interviews. This approach ensured that the system was tailored to meet the specific needs of its users.

The project adopts an agile software development methodology, allowing for iterative testing and feedback throughout the development process. By continuously refining the system based on user input, we aim to create a robust platform that significantly contributes to improving mediation practices in Rwanda

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.0. Introduction

The importance of mediation in resolving disputes cannot be overstated. In Rwanda, where legal systems can be overburdened, and access to justice may be limited, mediation is an efficient and effective alternative.

This project introduces a dual-platform mediation system utilizing web and USSD technologies to enhance accessibility and streamline the mediation process for all citizens, including those in remote areas with limited internet access. This system aims to facilitate timely dispute resolution, reduce court case backlogs, and promote a culture of peaceful dispute resolution.

1.1. Background of the study

Mediation in Rwanda offers many benefits, including conflict resolution without going through the lengthy court system. However, the current mediation processes face several challenges related to accessibility, awareness, and efficient case management.

One significant issue is that traditional ways of filing complaints require direct meetings with mediators, which is not always feasible. Mediators are often unavailable throughout the week some are only accessible on specific days, such as Thursdays, in certain regions. This limited availability creates barriers for individuals seeking justice, especially for those in remote areas who cannot easily travel to mediation offices.

The mediation process operates on two levels: it starts at the cell level, and if the issue is unresolved, the case can be escalated to the sector level. Citizens who are dissatisfied with the decision at the cell level can appeal at the sector level. However, these traditional processes often depend on in-person interactions, which can be inconvenient and inefficient, particularly for users with limited mobility or who live in remote areas.

To address these challenges, there is a pressing need for an inclusive solution that enables citizens to submit complaints or appeals and receive timely updates, including notifications about the scheduled date for resolving their cases. (Minijust)

This system should be accessible through basic mobile phones, allowing users to submit complaints and receive messages about the resolution date even without internet access.
Additionally, the solution should integrate web-based platforms for users with internet access,
offering them an efficient way to file complaints or appeals online and receive notifications, ensuring that mediation services are accessible without the need for in-person meetings with mediators.

1.2. Statement of the Problem

Rwanda's current mediation process faces several significant challenges, including limited accessibility, inefficient case management, and a general lack of public awareness regarding the benefits of mediation. These issues contribute to prolonged dispute resolution times, increased legal costs, and an overwhelming backlog of cases in the formal court system.
Mediation, as an alternative dispute resolution mechanism, holds immense potential in alleviating the burden on the judicial system and promoting peaceful conflict resolution. However, the reality is that many citizens, particularly those in rural areas, struggle to access mediation services due to geographical, financial, and technological barriers. Traditional methods of filing complaints with mediators often require in-person meetings, which are not always feasible, especially for those living far from mediation centers or for mediators who may only be available on certain days, such as once a week in some areas. This system leaves many individuals without timely access to justice, exacerbating existing inequalities.
Moreover, the manual handling of mediation cases often leads to inefficiencies in case management, resulting in delayed decisions, poor communication between mediators and disputants, and limited tracking of case progress. As a result, the benefits of mediation, such as quicker and less costly resolutions, are not fully realized, and citizens are left with no option but to resort to the already overburdened formal court system.
To compound these challenges, there is insufficient public awareness about mediation as a viable option for dispute resolution, with many individuals opting for litigation, not realizing that mediation could provide a faster, cheaper, and less adversarial alternative.

This project aims to address these gaps by developing a dual-platform mediation system that leverages both web-based and USSD (Unstructured Supplementary Service Data) technologies. The web-based platform will cater to individuals with internet access, while the USSD system will ensure that those with basic mobile phones, even without internet access, can file complaints or appeals and receive notifications about their resolution dates. This system will offer an inclusive, efficient, and easily accessible mediation process for all citizens, ultimately promoting quicker dispute resolution and reducing the backlog in the formal court system.

By improving accessibility, enhancing case management efficiency, and raising public awareness, this project seeks to ensure that mediation becomes a more widely utilized and effective tool for resolving disputes in Rwanda.

1.3. Objectives of the study

1.3.1. General Objective

To enhance the accessibility and efficiency of mediation services in Rwanda by developing a dual-platform system that integrates both USSD and web-based interfaces, aimed at bridging the gap in access to mediation services, reducing court case backlogs, and promoting peaceful dispute resolution.

1.3.2. Specific Objectives

- Develop a USSD interface that allows users without internet access to send their cases into the system.
- Create a web-based platform for users with internet access to facilitate comprehensive case management.
- Implement a centralized database for mediation cases, allowing the mediator President to assign cases and appeals to concerned mediators.
- Develop automated scheduling and notification tools to ensure that users, whether submitting complaints or appeals, receive timely messages informing them of the scheduled day for resolving their cases.

1.4. Research questions

This study's research questions focus on enhancing mediation services in Rwanda by developing a dual-platform system. The questions explore how a USSD interface can serve users without internet access, and examine features of a web-based case management platform.

1. How can a USSD interface be developed to allow users without internet access to initiate mediation cases?
2. What features should a web-based platform include to facilitate comprehensive case management for users with internet access?
3. How can a centralized database be implemented to enable mediators to manage case progress efficiently?
4. What automated tools can be developed for scheduling and notification to ensure timely resolution and improve efficiency in the mediation process?

1.5. Scope and limitation of the study

This project centers on developing a dual-platform mediation system that integrates both USSD and web-based interfaces, enabling users to file complaints, assign cases or appeals to mediators, and receive notifications about resolution dates. The system is designed to enhance accessibility to mediation services, particularly in areas with limited internet connectivity.

The research and development process for this project spans three months, from July to October 2024. The system implemented in Gacurabwenge Cell, Byumba Sector, located in Gicumbi District, Rwanda.

However, the project faces several limitations. Time constraints may hinder thorough testing and optimization, particularly for the USSD interface, which is critical for users in remote areas. Additionally, certain security measures, such as data encryption, are still in early development, which may impact the system's overall functionality and scalability as it expands to other regions. Further research and development will be required to address these limitations before full-scale implementation.

1.6. Significance of study

This study is anticipated to offer significant benefits to the local community, researchers, and RP-Musanze College. For the community, particularly in rural areas with limited internet access, the dual-platform mediation system (USSD and web-based) will improve access to mediation services, fostering inclusivity and social justice.

Researchers will gain insights into the use of technology in the legal and mediation fields, contributing to academic knowledge and paving the way for future studies aimed at enhancing public services through digital solutions. Additionally, RP-Musanze College will benefit by showcasing practical applications of ICT in public services, helping prepare students to contribute to Rwanda's socio-economic development through innovative approaches.

1.7. Organization of the project

This study is subdivided into the following chapters:

- Chapter one presents the introduction, the background of the study, the problem statement, the study's objectives, and the study's significance.
- Chapter two presents the literature review, covering theoretical aspects published in the research-related topics.
- Chapter three presents the methodology, including methods and materials used to conduct the study.
- Chapter four presents the results, including tables representing the obtained results and a discussion interpreting the findings given the hypotheses made.
- Chapter five presents the conclusion and recommendations of the study.

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

This chapter presents a review of literature relevant to the development of a dual-platform mediation system utilizing both USSD and web technologies. The review is structured to explore key concepts, theoretical frameworks, tools and technologies, and related studies, providing a comprehensive understanding of the context within which this project is situated.

2.1. Definition of Key Concepts

2.1.1. Mediation

Mediation is an alternative dispute resolution process where a neutral third party helps disputing parties reach a mutually agreeable solution, offering a less formal and less costly alternative to litigation (Green, M., & Ponsford, R. , 2012)

In Rwanda, mediation has played a key role in promoting peace and reconciliation, especially after the genocide, with the Gacaca courts and community-based systems highlighting the effectiveness of informal dispute-resolution processes.

2.1.2. Unstructured Supplementary Service Data (USSD)

USSD is a mobile communication protocol that works on any phone, making it ideal for reaching populations without smartphones or internet access (Muto, M., & Yamano, T., 2009)

In this project, USSD is used to provide mediation services to citizens, particularly in remote areas or those with no internet access.

2.1.3. Web-Based Systems

Web-based systems are applications accessible through web browsers that offer advanced functionalities, including multimedia content, real-time updates, and integration with other platforms. (O'Reilly, 2007)

In the proposed mediation system, the web platform enhances the USSD service by providing a more comprehensive interface for users to submit cases. It includes features such as document uploads, detailed case histories, and notifications, specifically designed for users with internet access.

2.1.4. Access to Justice

Access to justice is the ability of individuals to obtain fair and effective legal remedies, but in many areas, there are barriers such as geographical distance, lack of legal awareness, and financial constraints that hinder this access, especially for rural or marginalized communities. Mediation serves as an alternative dispute resolution method, alleviating the burden on formal courts and improving access to justice for underserved populations. (Reynolds, 2015)

2.1.5. Digital Inclusion

Digital inclusion ensures that all individuals and communities, especially the disadvantaged, have access to digital technologies, helping to bridge gaps in services like access to justice (UNESCO, 2019)

This project promotes digital inclusion by integrating both USSD and web-based systems, allowing all citizens, regardless of their technological access, to benefit from mediation services.

2.2. Review of Related Studies

2.2.1. Mediation Practices in Rwanda

Mediation continues to play a significant role in Rwanda, especially in rural communities. Recent studies have explored the evolution of mediation services in the country. For instance, (Uwitonze, A., & Mugabo, J., 2022)examined the effectiveness of community-based mediation in promoting access to justice in rural Rwanda. Their findings highlighted the importance of technology in enhancing mediation services, particularly in overcoming logistical challenges in remote areas. They also stressed the need for digital tools to improve the efficiency of the mediation process, aligning with the goals of this project.

Furthermore, (Habimana, T., Uwase, M., & Ndayishimiye, P., 2021)explored the potential of integrating digital case management systems within Rwanda's mediation practices.

The study recommended automating processes to enhance tracking and resolving disputes more swiftly, especially in areas with limited access to formal legal institutions. This supports the proposed system's objective of utilizing technology to increase mediation accessibility.

2.2.2. Access to Justice in Rwanda

Recent research on access to justice in Rwanda, such as the (Bank., 2021)report underscores the persistent barriers to legal services, particularly for rural and low-income populations. The report emphasized alternative dispute resolution mechanisms like mediation as a viable solution to these challenges. It recommended using digital platforms to expand access to mediation services, a recommendation that aligns with the dual-platform approach of the proposed system.

In addition, (Kayumba, E., Ntamuhanga, F., & Mukarurinda, C., 2022)identified technological solutions as key to overcoming geographic and financial barriers in accessing justice in Rwanda. Their findings further justify the use of both USSD and web platforms to provide equitable access to mediation services.

2.2.3. Diffusion of Digital Innovations in Rwanda

In recent years, Rwanda has seen an increased adoption of digital innovations, especially in urban areas. (Niyitegeka, P., & Umutoni, D., 2022)studied the spread of internet-based services in Rwanda and found that mobile technology, particularly USSD, remains a critical tool in rural areas.

They advocated for dual-platform solutions that cater to both rural and urban populations, which is the core strategy of the proposed mediation system.

The study emphasized the need for inclusive digital strategies to bridge the digital gap between rural and urban areas, echoing the design principles behind the current project's dual-platform approach.

2.3. Conceptual framework or prototype/ models

This project bridges the gap in mediation services by integrating a USSD interface for users with limited internet access and a web-based platform for those with connectivity. The system supports email notifications to inform users about resolution dates and case decisions. The following variables shape the framework:

- **Independent Variable**: The USSD and Web-Based Platforms represent the system's ability to provide mediation services to different user groups based on their access to internet connectivity.

- **Moderating Variable**: **Internet Connectivity** determines which platform the users can access, impacting the system's functionality for rural and urban users.
- **Dependent Variable**: Access to Justice (Improved Mediation Process), which is the outcome of offering an inclusive, technology-driven solution to streamline the mediation process and reduce court burdens.
- **Mediating Variables**: Features like User Authentication, Case Management, and Notifications ensure smooth functioning of the system, improving the interaction between users and the mediation process.
- **Confounding Variables**: Location and User Access, as these factors influence the way users engage with the system based on their geographic location and technological resources.
- **Control Variables**: SMS Alerts and Testing help maintain the functionality and accessibility of the system across different platforms, ensuring that users remain updated about case progress regardless of their access to internet connectivity.

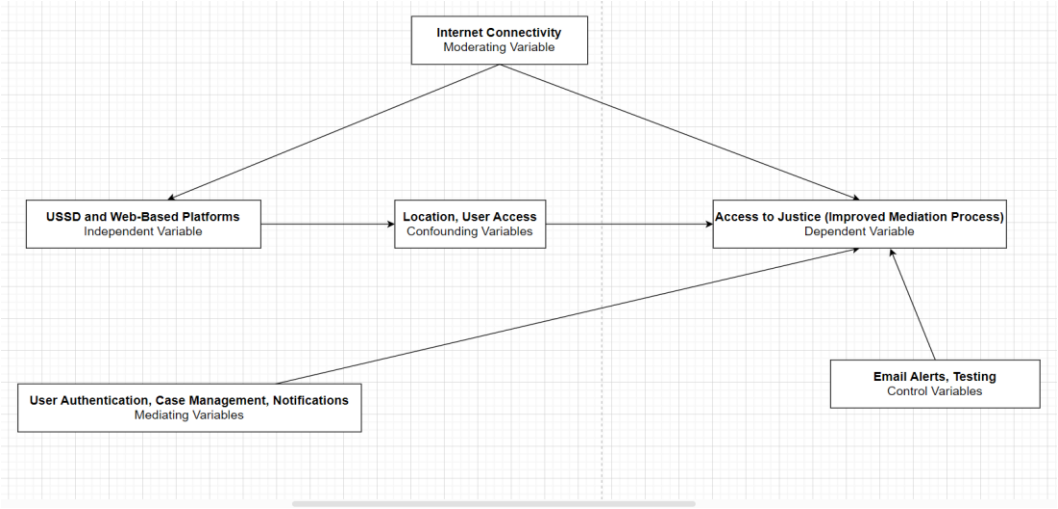

Figure 1: Conceptual Framework

The above diagram visually represents how the USSD and Web-Based Platforms connect to the Backend System for managing mediating functions, with Internet Connectivity determining platform access.

Source: Own drawing

CHAPTER THREE: METHODOLOGY

3.0. Introduction

This chapter outlines the research methodology used to achieve the objectives of this study. It includes the research design, data collection methods like Interviews, Observation, Document Review, data analysis techniques, and tools utilized for system development.

3.1. Research design

This study uses a mixed-method approach to develop and assess a dual-platform mediation system utilizing web and USSD technologies. It addresses challenges in Rwanda's mediation process, particularly limited accessibility in remote areas, by offering a USSD platform for basic phone users and a web platform for those with internet access. The system is developed using agile methodology, with iterative testing and data collection to evaluate its effectiveness in improving access to mediation services and reducing case backlogs.

3.2. Sampling Strategies

The sampling strategy for this study was carefully designed to ensure a representative selection of participants and reliable data. The process of sampling involved identifying relevant stakeholders who could provide valuable insights into both the current mediation system and the proposed dual-platform system.

3.2.1. Description of the Population

The population from which the sample was drawn included key stakeholders in Rwanda's mediation system. This population consisted of mediators and citizens, especially those living in remote areas with limited internet access. These groups were chosen due to their direct interaction with the existing mediation processes and potential to benefit from the proposed system.

The population was divided into two main categories:

- **Mediators:** This group provided expert insights into the functionality and challenges of the existing mediation systems and offered recommendations for improving access to justice.

- **Citizens and users in remote areas:** This group primarily represented end-users who would utilize the USSD platform and Web system for filing complaints and receiving updates on their cases.

3.2.2. Sampling Technique

The sample size was determined by data saturation, where interviews and observations were conducted until no new information emerged, ensuring the study's findings were both robust and comprehensive.

The sample size was determined using Yamane's formula, which ensures an accurate representation of the population while maintaining a reasonable margin of error. The formula used is as follows:

$N=N/1+N(e^2)$

Where:

- **n** = the sample size
- **N** = the total population size (50 people in this case)
- **e** = the margin of error (proposed at 0.05 or 5%)

For this study, the total population **N** is 50 people, and the margin of error **e** is set at 5% (0.05).

Applying Yamane's formula:

$N=50/1+50(0.5^2) = 50/1+50(0.0025) = 50/1+0.125 = 50/1.125 = 44.44$

Based on this calculation, the sample size would be approximately 44 participants. However, for the purpose of this study, we will select 30 participants to align with our earlier objectives. The total sample size is divided into two groups: mediators and citizens, with 10 mediators (33.3%) and 20 citizens (66.7%).

3.3. Data Collection Methods

This section details the methods and instruments used to gather data for the research, ensuring a comprehensive understanding of the study area. A combination of qualitative and quantitative approaches was employed during data collection. Below are the key methods and instruments used in the study:

3.3.1. Interviews

Semi-structured interviews were conducted with mediators and citizens to gain in-depth insights into the current mediation process and gather opinions on the dual-platform mediation system.

These interviews provided valuable qualitative data, revealing practical challenges, strengths, and areas for improvement in existing methods.

3.3.2. Document Review

Secondary data was collected through document review, which involved analyzing legal documents, government reports, and previous research related to mediation and technology in Rwanda.

3.3.3. Observation

Observational techniques were used to gather real-time data by witnessing the mediation processes in action.

Observations were conducted in natural settings, allowing researchers to record behaviors, interactions, and system usage patterns without interference.

3.4. System Analysis Methods

This section describes the tools and techniques used for analyzing the system during development. To ensure a structured and clear understanding of the system's functionality, requirements, and architecture, the following analysis methods were employed:

3.4.1. Data Flow Diagrams (DFD)

Data Flow Diagrams (DFD) were used to model the flow of information within the mediation system. The DFD helps visualize how data moves between different entities, including the USSD interface, web-based platform, and backend database.

3.4.2. Use Case Diagrams (UML)

Use case diagrams, based on Unified Modeling Language (UML), were employed to represent the different user interactions with the system.

These diagrams illustrated the various user roles (e.g., mediator, citizen, Mediator President) and their specific interactions with the system, such as logging in, submitting cases, scheduling mediation sessions, and receiving notifications.

3.4.3. Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) was used to model the database structure of the system, defining the relationships between different data entities such as users, mediation cases, and notifications.

3.5. System design and development methods

The system design involves using tools like UML for modeling interactions, ERD for database structure, and DFD to represent data flow between users, mediators, and mediator presidents. Agile methodology will guide the development, ensuring iterative improvements through user feedback.

3.5.1. Hardware requirements

- Personal computers with:
- RAM: 512 MB and above
- Processor: 1GHZ and above
- HDD: 100 GB and above
- Mobile Device (Android or IOS platform)
- Internet Connection (WI-FI, wired or Mobile Data)

3.5.2. Software requirements

- Browser (Safari, Baidu, Microsoft Edge, Mozilla Firefox, Chrome, Opera, etc...)
- Android OS or IOS mobile Operating Systems (Platforms)
- Win XP, 7, 8, 10,11, Linux Distributions such as (Fedula, Manjaro, Linux Mint, Debian, Ubuntu…) or MacOS for computer operating systems.

CHAPTER FOUR: SYSTEM ANALYSIS, DESIGN AND IMPLEMENTATION

4.0. Introduction

This chapter presents the design and implementation of the Web and USSD-Based Mediation System, which aims to facilitate effective dispute resolution remotely and USSD options for those with limited internet access. The system focuses on providing a seamless user experience for both mediators and users seeking mediation services, enabling them to register complaints and their appeals.

4.1. Illustration of existing system

The existing mediation system relies on traditional face-to-face interactions, manual paperwork, and slow communication methods like physical letters and phone calls. This approach is time-consuming, geographically restrictive, and inefficient, especially for citizens in rural areas with limited access to mediation centers. Additionally, the manual system introduces risks of errors and document loss, making it difficult to scale and meet growing demands.

These limitations emphasize the need for a dual-platform solution with web and USSD components to improve accessibility, speed, and efficiency in the mediation process.

4.2. Illustration of new system.

The new mediation system addresses the limitations of the existing system by introducing both a web-based platform and a USSD interface, ensuring accessibility for users with or without internet access. It automates case recording, session scheduling, notifications, and reporting, eliminating inefficiencies from the manual process. Secure digital records improve data integrity and retrieval. Visualized through a UML use-case diagram, the system's workflow highlights interactions between users and mediators, focusing on functions like case registration and notifications. This new system enhances remote access, efficiency, scalability, and transparency, making it a more effective solution compared to the existing mediation process.

4.3. New system design

4.3.1. System Architecture Design

In the proposed system's architecture, various components will be outlined, such as the user interfaces (USSD and web platforms), backend processes (case management, notifications), and databases that store user and case data. This section explains how these components will interact and be deployed in the production environment.

4.3.2. Data flow diagram

A Data Flow Diagram (DFD) is used to represent the flow of information within the system, showing how inputs are processed and outputs are generated. The DFD of the proposed system illustrates how the User, Mediator, and President interact with the USSD and Web-based Mediation System to complete tasks like registering complaints, managing appeals, and posting announcements.

Below is the DFD of the system:

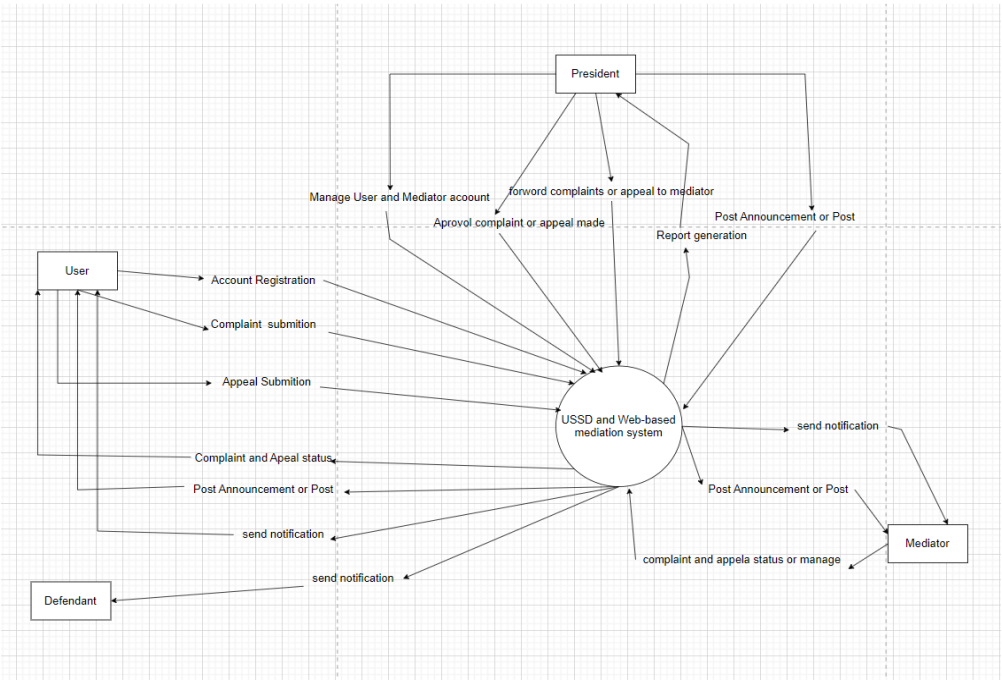

Figure 2: Data Flow Diagram

Source: Own drawing

4.3.3. Use Case Diagram

This use case diagram shows the interaction between users (such as Mediators, Presidents, and End Users) and the USSD and Web-based Mediation System.

It outlines key functions such as account registration, complaint submission, and appeal submission. Mediators make records, while the President manages the approval process. The system sends notifications about the resolution date and decision of the complaint or appeal.

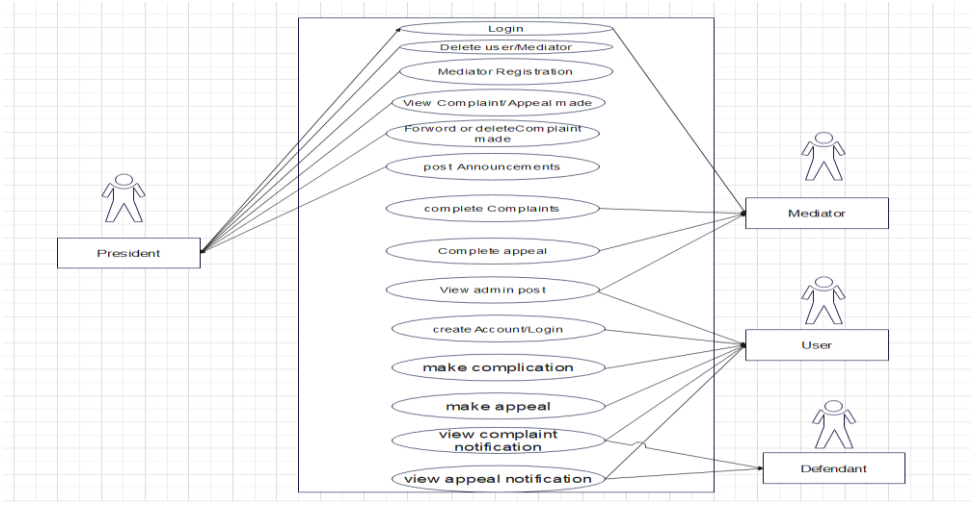

Figure 3: MMS Web User case

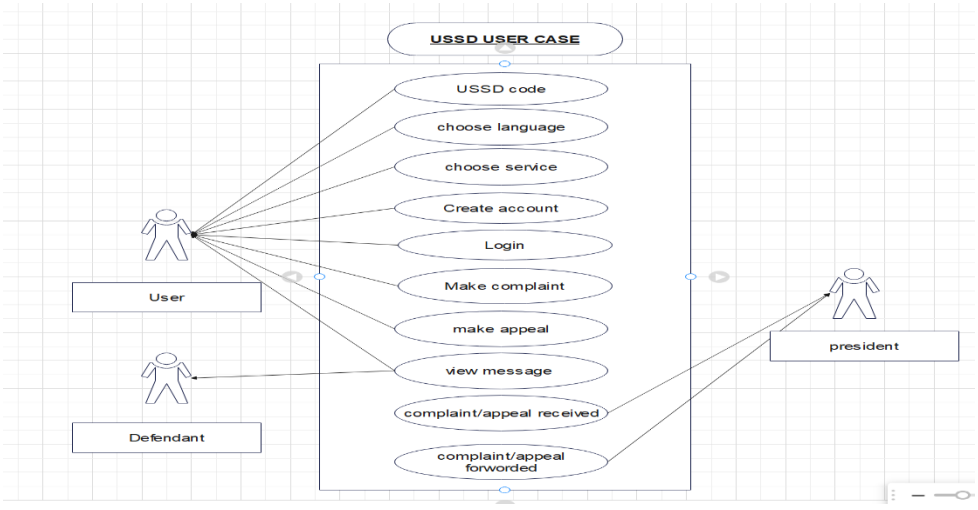

Figure 4: MMS USSD User case

Source: Own drawing

4.3.4. Entity Relationship Diagram

The ERD illustrates the relationships between key entities in the USSD and the Web-based Mediation System.

Entities such as Users, Complaints, Appeals, Mediators, and Presidents are represented, with relationships showing how data is connected across the system. Each user can register, and submit complaints and appeals, while Mediators and Presidents handle the management and resolution of these complaints or appeals. The diagram also shows the system's tracking of complaint status and notifications sent to users.

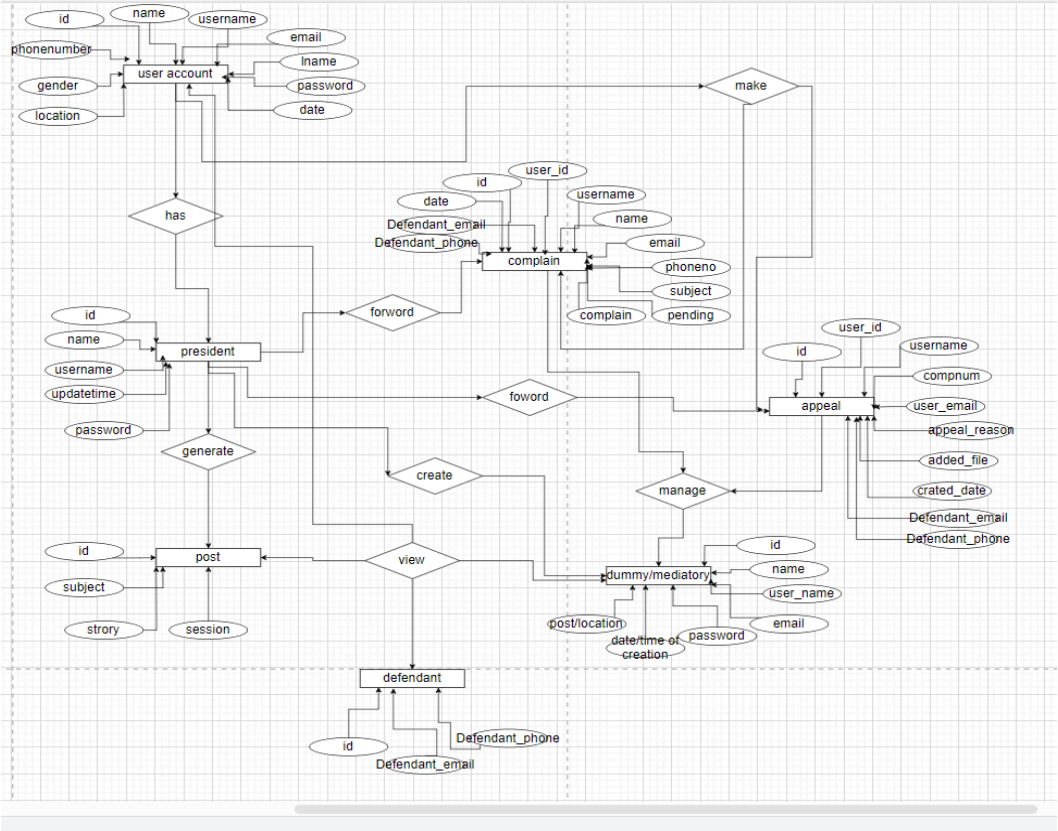

Figure 5: Entity-Relationship diagram

Source: Own drawing

4.3.5. Data dictionary

A data dictionary is a collection of metadata that describes the structure, organization, and content of a database. It includes information such as field names, data types, field lengths, and other details about the data stored in the database. It also provides descriptions of the purpose and use of each field.

President table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None		Primary key	It's unique number for President
name	Varchar(20)	No	None			Name of person
username	Varchar(20)	No	None			Username to be used
password	Varchar(20)	No	None			Password for login
Up_time	text	No	None			Date of update account

Table 1: President Table

Post table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None	AUTO_INCREMET	Primary key	It's unique number for post
subject	Varchar (50)	No	None			Course of post or announcement
story	text	No	None			Post or Announcement
Session_name	Varchar (20)	No	None			Name of who send it or post it

Table 2: Post/Announcement Table

Users table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None	AUTO_ INCREMENT	Primary key	It's unique number for user
name	Varchar(20)	No	None			Firstname
lname	Varchar(20)	No	None			lastname
username	Varchar(20)	No	None			Name to be used
email	Varchar(30)	No	None			User email
Phone_number	Varchar(30)	No	None			User phone number
gender	Varchar(30)	No	None			Gender or Sex of user
location	Varchar(50)	No	None			Location/District
password	Varchar(20)	No	None			Password to login
date	date	No	None			Date of user account creation

Table 3: Users Table

Completed complaint table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None	AUTO_INCREMENT	Primary key	Comlaint number
User	Int(30)	No	None			User number
User_email	Varchar(30)	No	None			User email
Username	Varchar(30)	No	None			User name
defendant_email	Varchar(30)	No	None			Defendant email
defendant_phone	Varchar(30)	No	None			Defendant phone
comment	text	No	None			Comment on complaint
Comp_decision	text	No	None			Complaint Decision
compnum	Varchar(30)	No	None			Complaint reference
Completed_date	datetime	No	None			Date

Table 4: Complaint Completed Table

Complaint table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None	AUTO_ INCREMENT	Primary key	number of complaint
User_id	Int(11)	No	None			number of user
name	Varchar(20)	No	None			Name of user
username	Varchar(20)	No	None			Name user use
email	Varchar(20)	No	None			Email of user
phoneno	Varchar(20)	No	None			User phone number
subject	Text	No	None			complaint course
complain	Text	No	None			Complaint
defendant_email	Varchar(20)	No	None			Defendant email
Defendant_phone	Varchar(20)	No	None			Defendant phone
Ref_no	Int(100)	No	None			complaint n^0
file	text	No	None			complaint file
date	text	No	None			Date

Table 5: Complaint Table

Appeal table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None	AUTO_INCREMENT	Primary key	number of appeal
User_id	Int(11)	No	None		Foreign key	number of user
compnum	Varchar(30)	No	None			Number of complaint
User_email	Varchar(30)	No	None			User email
username	Varchar(30)	No	None			User name
Phone_numbr	Varchar(30)	No	None			User phone number
defendant_email	Varchar(30)	No	None			Defendant email
Defendant_phone	Varchar(30)	No	None			Defendant phone
Appeal_reason	text	No	None			Appeal reason
Added_file	text	No	None			Appeal file
Created_at	timespamp	No	Current_timestamp()	ON UPDATE CURRENT_TIMESTAMP()		Date

Table 6: Appeal Table

Completed Appeal Table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(30)	No	None	AUTO_ INCREMET	Primary key	Appeal number
User_id	Int(30)	No	None			number of user
compnum	Varchar(30)	No	None			Complaint number
User_ email	Varchar(30)	No	None			User email
username	Varchar(30)	No	None			User name
Phone_ number	Varchar(30)	No	None			User phone number
defendant_ email	Varchar(30)	No	None			Defendant email
defendant_ phone	Varchar(30)	No	None			Defendant phone
Previous_file	text	No	None			file of complaint
Added_file	text	No	None			file for appeal
Appeal_reason	text	No	None			Appeal reason
Engineer_id	int	No	None		Foreign key	Mediator id
Engineer_name	Varchar()		None			Mediator name
Appeal_decision	text	No	None			Appeal decision
comment	text	No	None			idea on appeal
Created_at	datetime	No	None			Date

Table 7: Appeal Completed Table

Mediator Table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(30)	No	None	AUTO_ INCREMET	Primary key	It's unique number for mediator
name	Varchar(20)	No	None			Name of mediator
User_name	Varchar(20)	No	None			Name to be used
email	Varchar(30)	No	None			Mediator email
post	Varchar(50)	No	None			Location of mediator
password	Varchar(20)	No	None			password
time	timestamp	No	Current_ timestamp()	ONUPDATE CURRENT_ TIMESTAMP()		Time of created account

Table 8: Mediator Table

Appeal View table

Column	Type	Null	Default	Extra	constraints	Distribution
id	Int(11)	No	None	AUTO_ INCREME T	Primary key	appeal id
Appeal_ id	int (11)	No	None			appeal number
Enginee r_id	Int(30)	No	None		Foreign key	Mediator number
Enginee r_name	Varcha r(50)	No	None			Mediator name
compnu m	Varcha r(50)	No	None			complaint number
User_id	Int(30)	No	None			User number
User_e mail	Varcha r(30)	No	None			User email
usernam e	Varcha r(30)	No	None			User name
Phone_n umber	Varcha r(20)	No	None			User phone number
Appeal_ reason	text	No	None			Appeal reason
defenda nt_email	Varcha r(20)	No	None			Defendant email
defenda nt_phon e	Varcha r(20)	No	None			Defendant phone
Submitt ed_date	dateti me	No	None			Date

Table 9: Appeal View Table

Complaint View table

Column	Type	Null	Default	Extra	constraints	Distribution
compnum	Int(11)	No	None		Primary key	It's unique number for complaint
Ref_no	Varchar(30)	No	None			Number of complaint
User_id	Int(30)	No	None			It's unique number for user
name	Varchar(50)	No	None			User name
email	Varchar(50)	No	None			User email
Phone_no	Varchar(20)	No	None			User phone number
subject	text	No	None			Course of complaint
complain	text	No	None			Complaint or case
file	text	No	None			File of case
engineer_id	Int(11)	No	None			number of mediator
Enginner_ name	Varchar(50)	No	None			Name of mediator
pending	Int(50)	No	None			Panding it's equal to 1
Submitted_ date	datetime	No	None			Date of submition

Table 10: Complaint View Table

4.4. System implementation

This section details the implementation of the Web and USSD-Based Mediation System, breaking down key components and how they work together. It is divided into subsections that cover the system workflow, interface design, and database interaction.

4.4.1. Web Interface Overview

In this subsection, the key pages of the web interface are presented. Screenshots of the login page, user dashboard, complaint submission form, and complaint status page are provided to give an overview of the web interface's design and user experience.

-The landing page (Home Page):The MMS homepage features an illustration the welcome page to those visit MMS website. A central "WELCOME TO MMS" message is displayed, along with buttons for "About System" and "About Help." The top navigation offers links to "Home," "Mediator Login," "User Login," and "More About Us," providing easy access to essential sections.

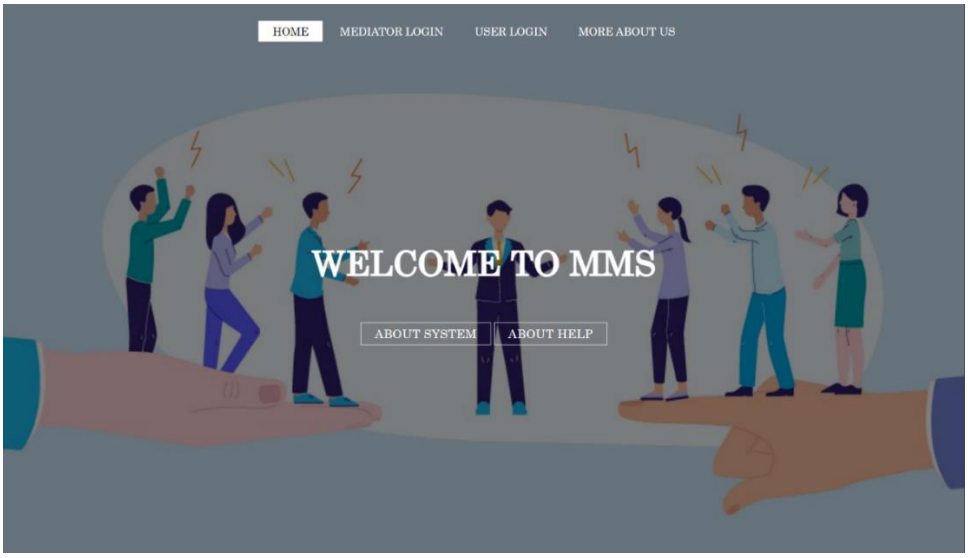

Figure 6: Home Page (Landing Page) for Mediator and user

Source: This image taken from home page of MMS website.

-Signup Page: It's a fundamental part of many online systems, and it typically includes a registration form where New Users provide their personal information to create an account in the Mediation management system.

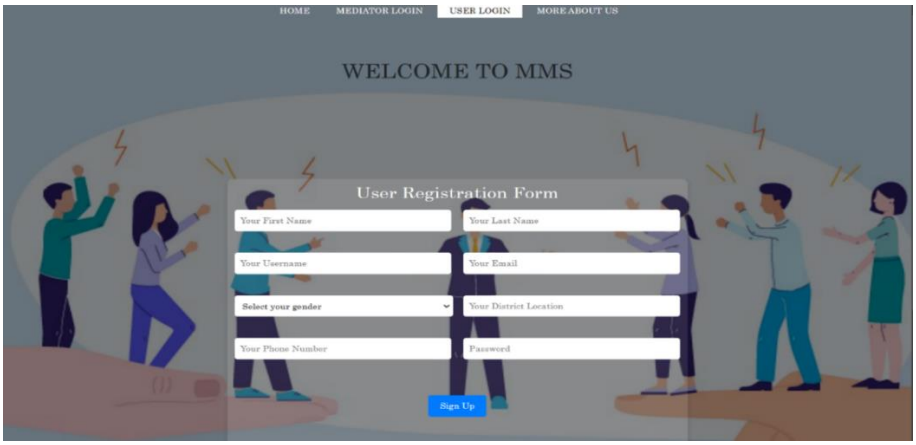

Figure 7: Page for Signup

Source: This image taken from home page of the MMS website.

-President Login: This page is designed for the President's login within the Mediation Management System (MMS), and go to website link to go back to normal website page.

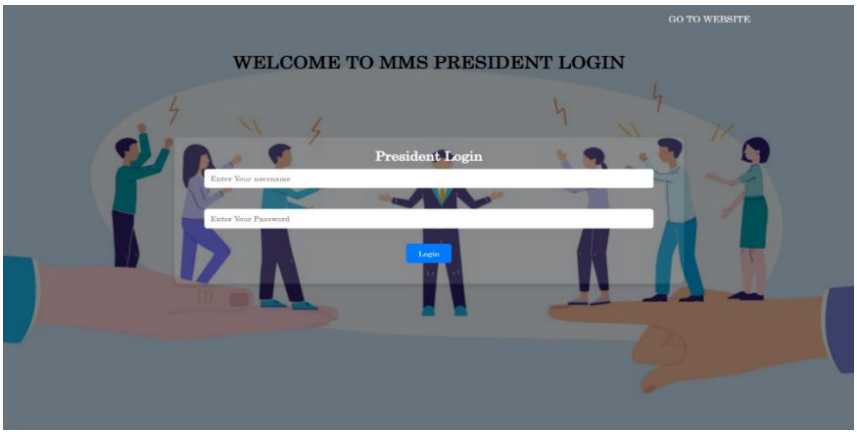

Figure 8: President Login page

Source: This image was taken from the MMS president login page.

-President Dashboard: This dashboard is for mediator's president where the president can create a mediator, manage users accounts, view report, view complaints and appeals made, and decide if he or she can send or forward them to mediator.

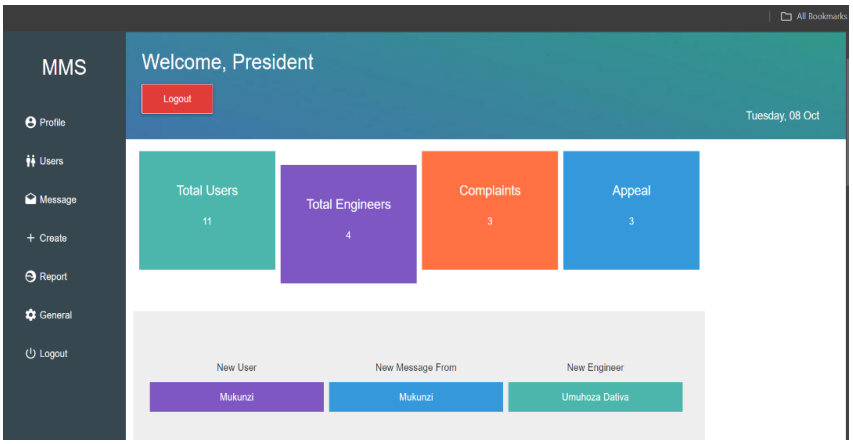

Figure 9: President dashboard

Source: This Image was taken form MMS and it shows the dashboard for president

-Complaints and Appeal dashboard for President: This president page where the president view complaints and appeals made,

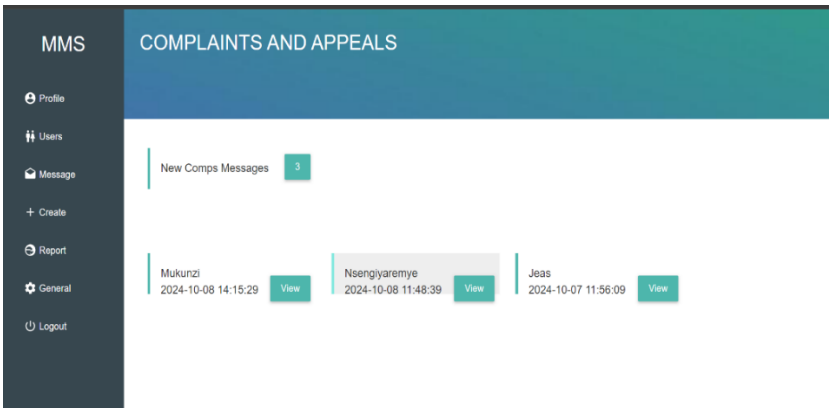

Figure 10: Complaints and Appeal dashboard for President

Source: This Image was taken form MMS

-President-compliant Forward: This image show page where president can forward complaint to mediator and with success message showing complaint sended or forward well

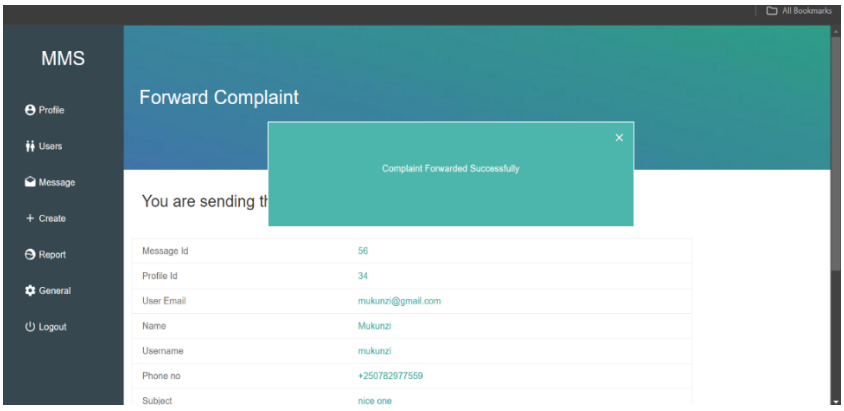

Figure 11: Complaint sending

Source: This Image taken form MMS

-President appeal Forward: This image show page where president can forward Appeal to mediator and with success message showing Appeal sended or forward well

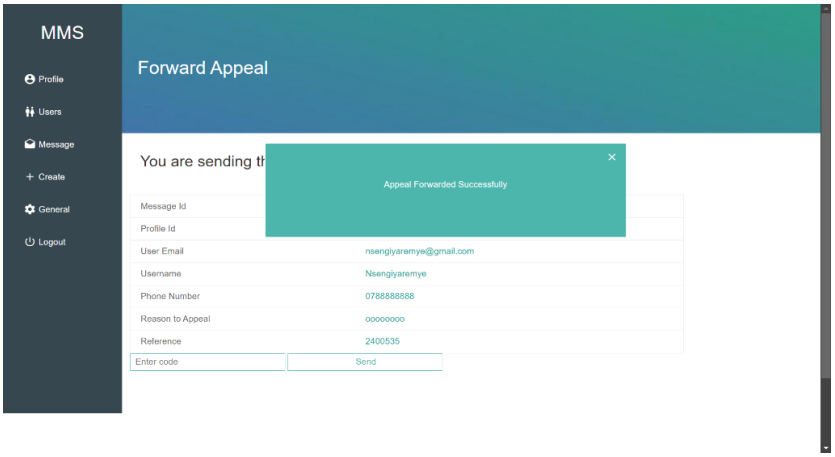

Figure 12: Appeal sending

Source: This Image was taken from MMS

-Mediator Dashboard: The Dashboard was designed to help Mediators quickly understand and monitor various aspects of a System such as Complaint and Appeal management.

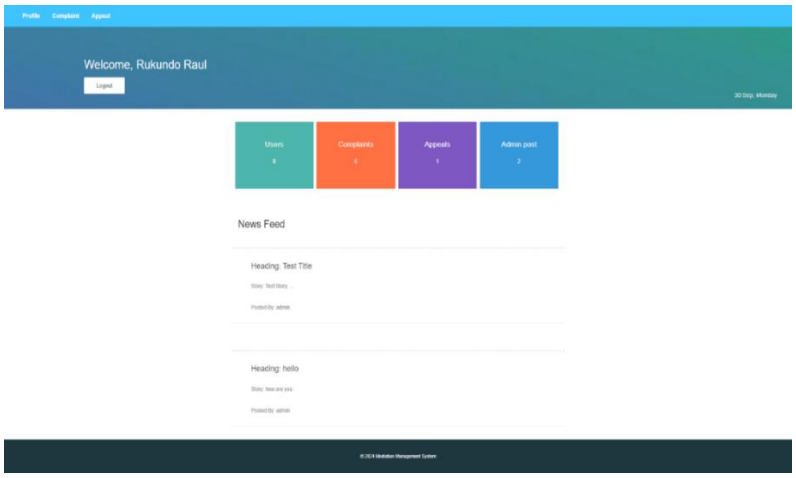

Figure 13: Mediator dashboard

Source: This Image was taken form MMS

-Complication view and its management: This image show page for complaint view on side of mediators and manage it option.

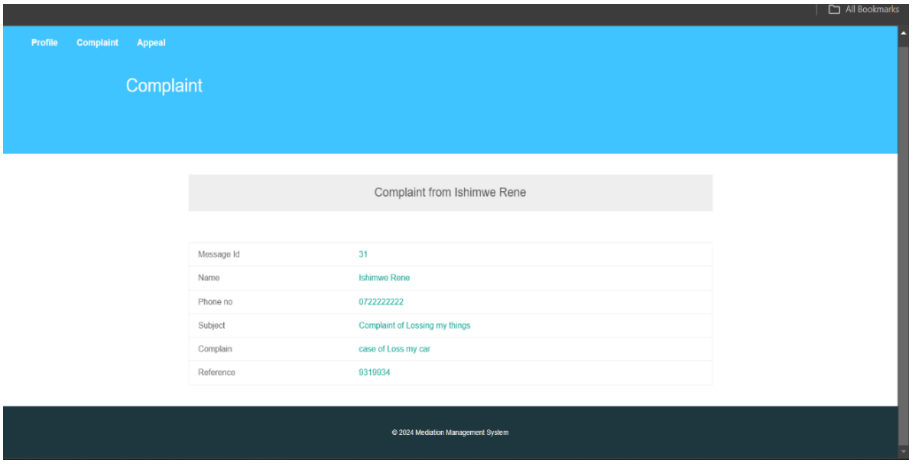

Figure 14: Complaint view page for Mediator

Source: This Image was taken form the MMS website

-Appeal view: This image show page for Appeal view on side of mediators and manage it option.

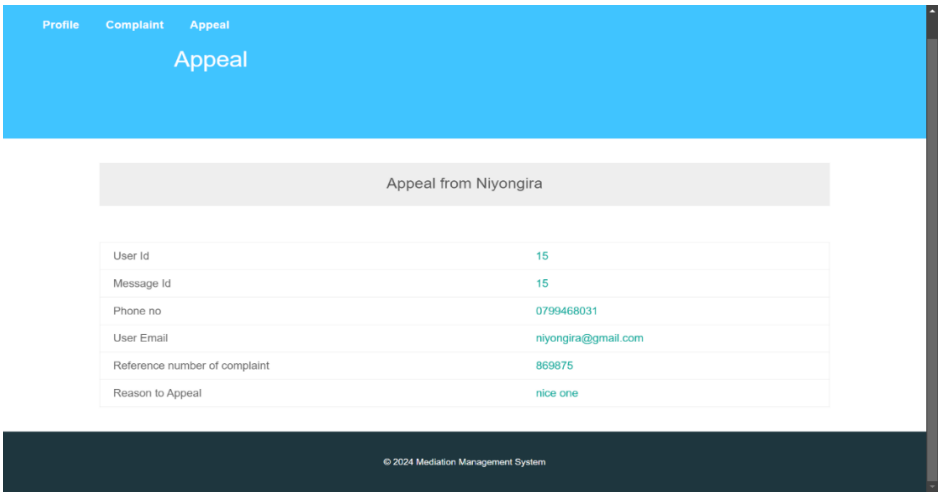

Figure 15: Appeal view page for Mediator

Source: This Image was taken from the MMS website

-User dashboard: The Dashboard for User to make new complaint and appeal.

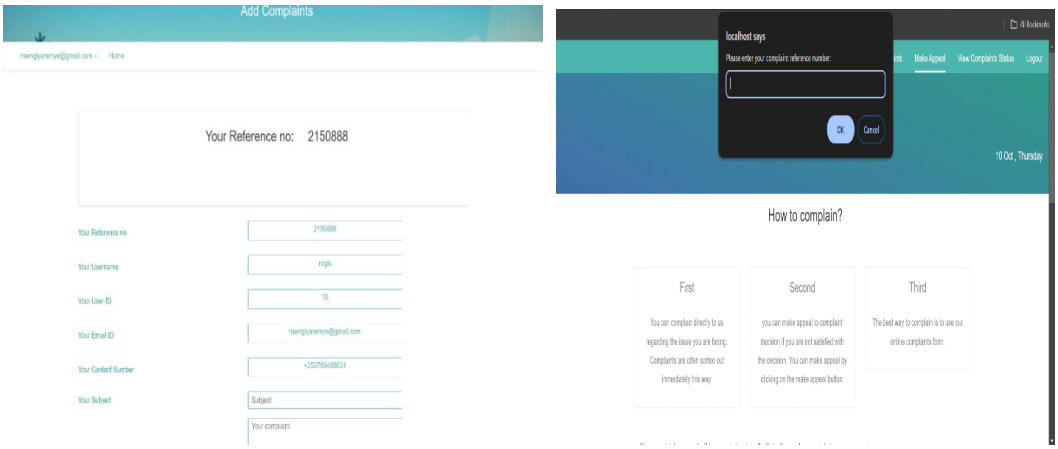

Figure 16: User Page Where user make complaints or appeal

Source: This Image was taken form the MMS website

-Email Notification: email is sent on both sides, on the side of the complainants and side of the defendant to notify them.

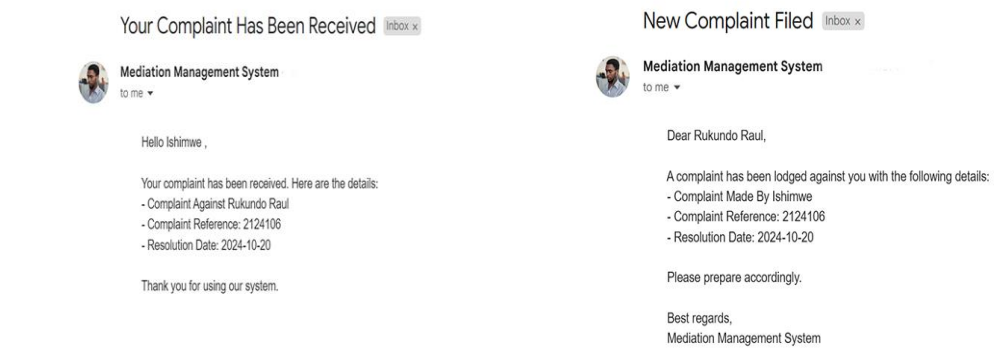

Figure 17: Email notify Complainant and Defendant

Source: This Image was taken from an email of two people, complainant and the defendant.

-USSD Flow and Interface: This image show USSD workflow.

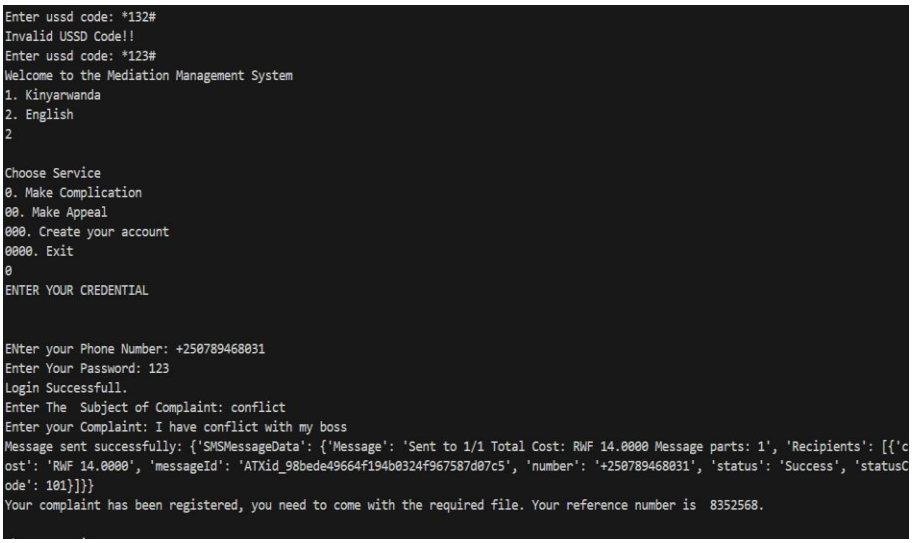

Figure 18: USSD Flow

Source: This Image taken form visual studio.

4.5. System testing

The Agile methodology was employed for system testing, ensuring continuous testing throughout the development lifecycle. This approach integrated various testing methods, including unit testing, integration testing, system testing, and user acceptance testing (UAT) at each phase of development.

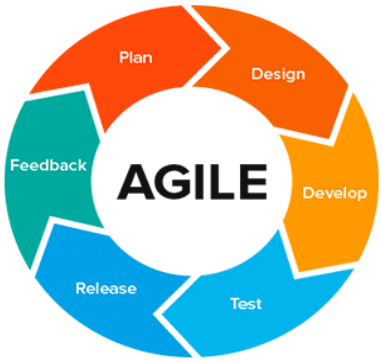

Figure 19: Agile Methodology

Source: Internet

Application of the Agile Model

1. Design: In the design phase, requirements are gathered and analyzed to create a blueprint for the system. This involves collaboration among stakeholders to ensure the design aligns with user needs and expectations.

2. Develop: During the development phase, the actual coding and implementation of features occur based on the design specifications. Agile practices encourage iterative progress, allowing for regular updates and enhancements.

3. Test: The testing phase involves various testing methods such as unit testing, integration testing, and user acceptance testing (UAT). Continuous testing ensures that issues are identified and resolved promptly, improving the overall quality of the product.

4. Release: In the release phase, the system is deployed to users, making it available for real-world use. This step may involve a staged rollout to gather feedback and monitor system performance.

5. Feedback: After release, user feedback is collected to assess the system's effectiveness and usability. This feedback is crucial for identifying areas for improvement and informing future development cycles.

6. Plan: The planning phase involves reviewing the feedback and performance data to prioritize features and enhancements for the next iteration. This step ensures that the development process remains aligned with user needs and market demands.

CHAPTER V: CONCLUSION AND RECOMMENDATIONS

5.0. Introduction

This chapter provides a summary of the project's findings, discusses the conclusions drawn from these findings, and presents recommendations based on the study area. It also includes suggestions for further study, which could enhance future research and development in the subject area. This chapter evaluates whether the initial objectives were met and proposes future directions.

5.1. Conclusions

In conclusion, the development and implementation of the Web and USSD-Based Mediation System successfully address the research questions outlined at the beginning of the study. The system significantly improves access to mediation services, especially in rural areas with limited internet access, fulfilling its primary objective. By leveraging both web and USSD platforms, the system provides a streamlined, efficient process for users to file complaints, appeals, and mediation can manage disputes. This outcome represents a meaningful step toward reducing barriers to legal services and enhancing the overall mediation process in Rwanda.

The implications of these results are crucial. The system's success demonstrates that a technology-driven approach can enhance accessibility and efficiency in dispute resolution, particularly in underserved regions. While this project may not revolutionize the legal system as a whole, it offers a significant improvement over existing methods, serving as a model for future developments.

5.2. Recommendations

Based on the findings of this study, several recommendations have been proposed to enhance further the effectiveness and reach of the Web and USSD-Based Mediation System.

First, the system should be integrated with existing government platforms, such as court registries, to facilitate seamless data sharing and reduce administrative delays. This integration would streamline the dispute resolution process, enhancing the system's overall efficiency and reducing the burden on users and authorities.

Secondly, awareness campaigns should be conducted to educate citizens, especially those in remote areas, on how to use the USSD system. Since internet access is limited in these regions, promoting the use of USSD, a technology that doesn't require an internet connection, is crucial to ensure inclusivity and participation in the mediation process.

Another recommendation is to expand the scope of the system to cover other sectors, such as labor disputes or consumer rights cases. This would broaden the utility of the system and increase its adoption among a more diverse user base.

Furthermore, the system’s security protocols must be regularly updated and enhanced to protect sensitive data. Given the nature of the information being handled, ensuring robust security measures is essential to maintain the trust of users and stakeholders.

Additionally, a mobile application could be developed to complement the USSD interface, providing a more user-friendly and efficient way for smartphone users to access the system. This would improve the user experience, offering a more modern interface for those with better access to technology.

Finally, it is essential to establish a feedback mechanism to gather continuous input from users. This will allow for ongoing improvements to the system, ensuring that it remains aligned with user needs and technological advancements. Based on this feedback, future research can explore how to enhance the system's features and address any finding challenges.

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APPENDIX : Code

```
<?php
session_start();
require 'core/config.php'; // Ensure this is the correct path to your config file
require 'core/redirect.php';
if (isset($_SESSION['username'])) {
   header("Location: profile.php");
   exit();
}
$message = "";
?>
<!DOCTYPE html>
<html lang="en">
   <head>
      <title>MMS</title>
      <link rel="shortcut icon" href="ico.ico">
      <link rel="stylesheet" href="style.css">
      </head>
      <body>
         <header>
            <div class="main">
               <ul>
                  <li class="active"><a href="#"><i class="fa fa-home"></i>
HOME</a></li>
                  <li><a href="dummy-login.php">MEDIATOR LOGIN</a></li>
                  <li><a href="user_login.php">USER LOGIN</a></li>
                  <li><a href="#"><i class="fa fa-caret-down"></i>MORE ABOUT
US</a>
                  <div class="sub-menu">
                     <ul>
                        <li><a href="histrory.php">HISTORY</a></li>
```

```
                    </ul>
                  </div>
                </li>
                </ul>
              </div>
              <div class="title">
                <h1>WELCOME TO MMS</h1>
              </div>
              <div class="button">
                <a href="blog/documentation.php" class="btn">ABOUT SYSTEM</a>
                <a href="#" class="btn">ABOUT HELP</a>
              </div>
            </header>
            <footer>
              <br><br>&copy; <?php echo date("Y"); ?> <?php echo
htmlspecialchars($web_name); ?>
            </footer>
            </body>
</html>
```

APPENDIX : Letter

INTARA: Amajyaruguru kuwa 23/09/2024

AKARERE: Gicumbi

IMPAMVU: Gusaba Amakuru mu bunzi

Nyakubahwa ,

Amazina ISHIMWE Rene,umunyeshuri muri RP MUSANZE COLLEGE Nishimiye kubandikira iyi baruwa ngira ngo nsabe amakuru ku birebana n'imikorere n'uburyo bw'imicungire y'ibirego mu mu bunzi.

Nk'uko mubizi, ubu buryo bufite akamaro kanini mu guha abaturage uburenganzira bwo kubona ubutabera no kubafasha mu gukemura amakimbirane mu buryo bwihuse kandi bworoshye. Ndashaka kumenya byinshi ku byerekeye:

1. Imiterere y'ubufasha mutanga ku baturage bafite ibibazo.
2. Uburyo mubona impinduka mu mikorere y'ubucamanza mu Rwanda.
3. Ibyo mubona bikenewe cyangwa byahinduka.

Nizeye ko muzatanga amakuru y'ingenzi azafasha mu kumenya neza uko imikorere y'abunzi ikorwa mu gihugu. Ntegereje igisubizo cyanyu mu gihe cya vuba.

Murakoze cyane ku bw'ubufasha bwanyu.