

ONLINE BULK SMS SYSTEM

CASESTUDY: AZAM TV MEDIA, KAMPALA

BY

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2024

DECLARATION

I, **OCHEN ISAAC**, with registration number BU/UP/2021/0918 hereby declare that this Project Report is original and has not been published or submitted for any other University before.


Sign: *uf

Date: 03/09/24

OCHEN ISAAC

APPROVAL

This is to acknowledge that this project report is for OCHEN ISAAC, Registration number BU/UP/2021/0918. It was done under my supervision and was completed successfully.

Sign; 

Date; 24/9/2024

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DEDICATION

First and foremost, I thank the Almighty God who has successfully enabled me to complete with a sound mind and good health.

I then dedicate this report to my inspiration of all times my father OCHERO JULIUS MONTREAL. Sincerest appreciation to my lovely Mother AKULLU LILLIAN as well as a big shout out to my dearest brothers. Thank you so much for the support and may the Almighty God reward you abundantly.

I also dedicate this report to my dear supervisor MR. OBOTH ANDREW who guided me on the dos and don'ts of making this report a success.

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LIST OF ACRONYMS

SSADM Structured System Analysis and Design

RAD Rapid Application Development

SAD System Analysis and Design

DFD Data Flow Diagram

ERD Entity Relationship Diagram

HTML Hypertext Markup Language

CSS Cascading Style Sheet

PHP Hypertext Pre-Processor

RAM Random Access Memory

UPS Uninterruptible Power Supply

GUI Graphical User Interface

SMS Short Message Service

API Application Programming Interface

ABSTRACT

In today's digital age, SMS messaging has gained a significant growth due to the rapid presence of mobile technology. The bulk SMS messaging solutions interface with a service provider's SMS gateway to facilitate delivery of messages to mobile phone numbers anywhere in the world.

The main objective of this project was to design an Online Bulk SMS System with a feedback mechanism to track the status of delivered messages.

The main development approach employed for this project was Structured System Analysis and Design Methodology (SSADM). SSADM followed the waterfall life cycle model starting from the feasibility study to the physical design stage of development

The researcher used Interviews and Document Reviews as data collection methods which described the methods, procedures and factfinding techniques that were used to identify requirements of the system

In conclusion, from the various tests carried out, the designed Online bulk system was found to be reliable and practical thus meeting the intended objectives of the researcher. The system also unifies the internet and mobile networks making it possible to deliver messages through SMS gateway API.

CHAPTER ONE

1.0 Introduction

Bulk SMS is a service that enables sending a large number of SMS messages to a broad audience at once. This type of SMS service is ideal for advertising and marketing agencies, retailers, B2B businesses, financial institutions, banks, travel companies and agencies or any type of business/organization that wants to create a customer list to reach and inform them on a regular basis. In the same time, SMS Bulk messaging service provides its users' capability to communicate rapidly with large numbers of people. (GoMoNews.com, 2023).

SMS messages are bought and sent in bulk, so the term Bulk SMS was the best to use since it describes this service. (Horisen, 2011). Since messages are bought in bulk, they are much cheaper than regular text messages used on individual mobile phones. In the same time, Bulk SMS is cheaper and significantly more effective than e-mail and e-mail marketing. Communication done this way is far more affordable and cheaper, providing a higher return on investment and it is far more convenient too. (Sid Bhutani, 2023).

Bulk SMS in Uganda is a fast growing trend, almost all the small businesses in Uganda need to send text messages (bulk SMS) for various reasons. Whether it is about launching a new product or to update clients or to make a major announcement. (Famitech, 2022).

TextOut SMS is a user friendly web interface with an intuitive and easy to use solution, ideal for mobile marketing and business SMS communications. There is no application software to download and install. TextOut SMS Web is totally web based platform so all you need to get started is a web browser and internet access. Its ease of use allows you to send text messages (bulk SMS) to hundreds of recipients in a matter of minutes. Features include; Schedule message delivery, Phonebook, Personalize SMS messages, Message Logs, Phone and Email Support, and Alphanumeric Sender ID. (TextOut SMS.com, 2023).

EgoSMS Bulk SMS service is an effective communication tool that meets the expense of businesses and provides an opportunity to communicate to their target market at low cost compared to other forms of communication. The use of EgoSMS' responsive bulk SMS messaging platform provides customers with a secure, simple, affordable, dependable and high capacity messaging platform. This is an easy to use web-based product, which offers bulk SMS delivery, functionality, history reporting and bulk imports of contacts. This SMS communication

services is offered straight from your internet enabled computer or device across all networks in Uganda. Features include; Manage Bulk SMS Account, SMS Bonus, Sending and Receiving SMS messages. (EgoSMS.com, 2022).

SMS.Easyuganda is an easy to use SMS service tool for sending messages from both your mobile phone and your PC to any mobile number in Uganda whether you're sending messages about sports events, looking for volunteers for a school event, or taking a poll on customer preferences. SMS.Easyuganda does it seamlessly. The main features include; Send SMS and Receive replies, manage contacts and Schedule text-outs. (SMS.Easyuganda.com, 2021).

In conclusion, it is from the above enriched details that I sought to develop an Online Bulk SMS system which aims at providing a user friendly web interface and communication tool for single and bulk SMS services in Uganda. The online web based bulk SMS system will offer a feedback mechanism to track the delivery status of sent SMS messages as well as the validity of the status of SMS messages are sent.

1.1 Background

Azam TV Media Uganda is Media Company located Plot 19, Golf course road, Lower Kololo. Kampala. The company offers home entertainment packages suitable for individuals and family across Uganda. It was formed to promote high quality Digital Satellite TV services to its clients.

Azam TV on recent times have maintained customer intimacy inform of communication with its stakeholders (Client) through social media platforms such as Whatsapp, Facebook, Twitter and telegram as well as Emails and Direct calls, these communication tools are controlled by Azam media team. The company also uses Azam Bulk SMS system which supplements media platforms and direct Calls to pioneer presentation of information to clients in the form of text messages sent.

The Bulk SMS system used by AZAM TV Media is a communication tool that's web based which meets the SMS services for sending messages to any mobile number in Uganda. It has been used for mobile marketing and Business SMS communication such as launching new product packages or announcements. The system is also capable of sending to one or hundreds of mobile numbers from a single send. In addition, the system used by AZAM TV Media is

characterized by main features such as; Manage Accounts, Sending and Receiving SMS messages, View SMS logs, Phone and Email support.

However, the Bulk SMS system being used by AZAM TV Media is faced by numerous challenges ranging from lack of a message delivery status functionality which hinders the Media team to assess if the sent messages have been sent to intended clients, the system also lacks the functionality to schedule messages that should be periodically sent to clients thereby making the work of retyping messages to be sent tiresome to the media team as well as the current system is faced by a challenge of determining the validity of registered SIM card numbers of Clients.

Therefore, the online Web based Bulk SMS system ensured that clients regardless of their background could receive communication regarding Azam TV. What Azam TV needed was to comply client's contacts and group them in a bid to send bulk SMS messages via the Online web base Bulk SMS system to reach a wider coverage of clients.

1.2 Problem Statement

Over the years, the evolution of messaging and SMS has garnered significant research interest. With mobile phones being easily accessible, communication has been made easy. Mobile phone is the effective way of communication; you can use this path to reach easily every people. Mobile phones provide some facility like voice call, SMS etc. SMS is the term that change the world and make own innovative history (Steinbock 2005). Today you get in touch with large number.

The current SMS Bulk System faces a number of challenges/ gaps associated with lack of a message delivery status functionality as well as message scheduling functionality. As result of these challenges, communication to certain clients have been limited which makes clients miss out on communications.

Therefore the Online Web based Bulk SMS system aims at providing a web-based user friendly interface and communication tool for single and bulk SMS services at affordable costs. The online web based Bulk SMS system will offer a feedback mechanism to verify the status of delivered messages as well as offer functionality to schedule messages to be sent periodically.

1.3 Objectives of the Study

1.3.1 Main Objective

The main objective of this project was to design and develop an Online Bulk SMS system with a feedback mechanism to track the status of delivered messages.

1.3.2 Specific Objectives

- i). To review literature and determine requirements for the Online Bulk SMS system.
- ii). To analyze the requirements and design the Online Bulk SMS system.
- iii). To implement the Online Bulk SMS system.
- iv). To test and Validate Online Bulk SMS system.

1.4 Scope

The scope provides for the boundary of the research in terms of depth of content, theoretical coverage, investigation, geographical and methodology.

1.4.1 Geographical Scope

The system was designed and developed to facilitate the process of sending large number of SMS to different groups of people at different locations all over Uganda.

1.4.2 Content Scope

The online web based bulk SMS system was designed with only two (2) main users that is the Administrator and the Client (User). The system will require the users to log onto the system panel over the web in a browser by passing through authentication process by providing vital details to login.

The Authorized Administrator can log onto the system where he/she can perform responsibilities such as;

- a) Create, delete, and add user accounts.
- b) Send single, bulk SMS messages.
- c) Schedule and delete scheduled messages.
- d) View SMS logs.
- e) View delivery reports.

The Authorized User (Client) can also log onto the system where he/she can perform responsibilities such as;

- a) Send single, bulk and group SMS messages.
- b) View SMS logs.
- c) Create groups and save contacts on the account (phonebook).
- d) View delivery reports.
- e) Schedule and delete scheduled messages.

1.4.3 Technological Scope

The Online web based bulk SMS system was designed in such a way that makes it possible to be accessed through a web browser such as Google chrome, Firefox and Microsoft edge which provides an interface. The system is embedded with HTML (Hyper Text Markup Language) and CSS (Cascading Style Sheets) were used as the languages of preference for the design of user interfaces. In the interfaces, JavaScript was used as data validation tool. PHP (Hypertext Preprocessor) was used as a scripting language for linking the interfaces to the SQL database. PHP is a server-side scripting language that enables one to have the ability to insert into the web interface, instructions that web server software can execute before sending a response to the web browser. SQL was used as the programming language for developing the database. SQL is used to manipulate and retrieve data from the relational databases.

XAMPP as a local server environment and an integrate database creation software tool was used as the software for creating the MYSQL database. Whereas it provided a local server environment, it was also used for testing the system locally.

1.4.4 Time Scope

The content of time scope defines the estimated time frame in which the project can be accomplished. This time frame can sometimes be long enough that the project is completed before the assigned period of period or the project can go beyond the time frame that it had been allocated. This can be due to changes in the System requirements. This system took quite a longer period than earlier estimated period. The entire development process took four (4) months to come up with the fully working system.

1.5 Justification

The online web based bulk SMS system is aimed at providing a reliable communication tool with improved functionalities such as feedback mechanism on delivery status of sent SMS messages and SIM card registration status thereby supporting single and bulk SMS services with a wide coverage all over Uganda.

1.6 Significance

Upon the successful development and further implementation of the online web base Bulk SMS system, the study has led to the following significances.

- a) The online web base Bulk SMS system is being used to convey important information or used for promotional and transactional purposes among stakeholders.
- b) The developed solution is being used in controlling a website to send SMS through a control SMS sent from website to the phone number.
- c) The online web based Bulk SMS system is enhancing custom Sender IDs, send SMS from your own 6-digit alpha-numeric sender IDs or sender names therefore enhance brand identity.
- d) The developed system is enabling the transmission of Bulk SMS messages at far more affordable price than voice calls.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Today mobile phone is an integral part of our modern life that connects one people to another instantly (Turow 2010). Mobile phone is the effective way of communication; you can use this path to reach easily every people. Mobile phones provide some facility like voice call, SMS etc. SMS is the term that change the world and make own innovative history (Steinbock 2005). Today you get in touch with large number of people on their mobile within seconds using Bulk SMS. (Enck, Traynor et al. 2005)

Furthermore, Bulk SMS is a powerful marketing tool that allows business owners to engage with their target customers via mobile technology. In other words, you can blast out a huge quantity of messages to your customers, with just a few clicks. The benefits of Bulk SMS services include; speedy and effective, cost effective, strengthen customer relationships, high readability, personalized and customized message contents (Chong, 2020).

The System is integrated with an API that is an SMS gateway which is a device or service offering SMS transit; transforming messages to mobile network traffic from other media, or vice versa, allowing transmission or receipt of SMS messages with or without the use of a mobile phone. Typical use of a gateway would be to forward simple e-mail to a mobile phone recipient. SMS gateway is most fast and reliable way for mass / bulk SMS sending. It deals with mobile service provider and sends SMS with sender identity as textual sender ID and authentication. This system is developed for improving gateway user security.(MAKUDZA, MASIYANISE et al. 2020)

An example of one the current Bulk SMS System is; EgoSMS Bulk SMS service which offers an effective communication tool that meets the expense of businesses and provides an opportunity to communicate to their target market at a low cost compared to other forms of communication. The use of Egoisms' responsive bulk SMS messaging platform will provide customers with a secure, simple, affordable, dependable and high capacity-messaging platform. This is an easy to

use web-based product, which offers bulk SMS delivery, functionality, history reporting, bulk imports of contacts and many advanced sending features (Li and Bond 2022).

2.2 BULK SMS

The term bulk SMS is generally used in reference to SMS marketing texts, rather than alerts or notifications(Sanger, Taylor et al. 2005) . Bulk SMS or bulk messaging is the dissemination of SMS messages from a business to consumers. Usually working in high volumes, bulk SMS sends out text messages to a long list of mobile numbers (that may include international numbers), which receive the same message content. (GoMoNews.com, 2009).Bulk SMS is usually used for mobile marketing campaigns, customer alerts and reminders in a wide range of industries, such as travel, finance, retail and e-commerce as well as on-demand and enterprise. (Tyntec, 2019).

2.3 SYSTEM

A system is a group of components (people, objects and processes) that work together to achieve a common goal, or multiple goals, by accepting input, processing it and producing output in an organized manner.(Geck, Hiss et al. 1996) . There are people, objects and processes in computer systems, the processes are for example computer programs and the objects are the computer hardware. Every system be it computer based or not has to accomplish the activities required for it. Therefore, what all systems have in common is a goal out of some desire to overcome a certain set of tasks.(McCarthy 1984) .

A system consists of three major components including the input which implies something that goes into the system, the processes which is defined as type of work that must be accomplished in the system and lastly the output which is a desired product that must be produced.(Szyperski 2003).

2.4 ONLINE

The word online means anything connected to, served by or available through a system and especially a computer or telecommunications system (such as the internet) (Webster, 2002). This implies that the system is to operate under the direct control of a computer thus the ordering and transaction phases are to be done online.

2.5 ONLINE SYSTEMS

Online systems are computer programs or applications that are accessible through the internet (Stryker, 2013). They allow users to interact with data and services remotely, from any device with a web browser and an internet connection. These systems enable users to interact with data, perform tasks, and access services through a web interface. (Houlem, 2017).

2.6 ONLINE BULK SMS SYSTEM

An online bulk SMS service is a platform or provider that enables users to send large volumes of text messages (SMS) to multiple recipients simultaneously via the internet. (Quora, 2015). These services typically offer web-based interfaces or APIs that allow users to create, manage, and send SMS campaigns from any internet-connected device (Blog, 2014).

Online bulk SMS services are widely used by businesses, organizations, institutions, and individuals across various industries for marketing, customer engagement, communication, and notification purposes. They offer a convenient, cost-effective, and scalable solution for reaching target audiences, delivering timely messages, and driving engagement through SMS messaging .(Zenodo, 2020).

2.6.1 DESIGN AND DEVELOPMENT OF ONLINE BULK SMS SYSTEMS.

SMS messaging services have evolved to include bulk SMS messaging alongside the sending of single messages (such as one-time passwords and delivery notifications), interactive messaging (such as group messaging services). Bulk SMS messaging is that businesses and organizations can make use of one or more solutions to send SMS messages. These bulk SMS messaging solutions interface with a service providers' SMS gateway to ensure the delivery of messages to mobile phone numbers anywhere in the world. (Ghodake & Patil, 2020). The design and development of these systems entail a multifaceted process that integrates technology, user experience, and real-time data management, as explained below (Pinnacle, 2008).

Requirements Analysis: The genesis of an online Bulk SMS system lies in a thorough requirements analysis. Stakeholders collaborate to outline the specific needs and challenges faced by SMS messaging services. This phase involves understanding intricacies such as sending and receiving SMS messages, create and schedule marketing campaigns, monitor campaign

performance, receive promotional messages and updates from the organization thus ensuring that the system aligns with the unique demands of the business (Rorschach, 2018).

System Architecture: Choosing an appropriate system architecture is crucial to accommodate the complexity and scale of Bulk SMS services operations. Architects decide on the structure, opting for modular designs or micro services to enhance scalability. A well-defined architecture sets the foundation for a responsive and adaptable Bulk SMS system. (Troyster, 2012).

Database Design: At the core of an effective Online Bulk SMS system is a robust database design. Bulk SMS system involves handling vast amounts of data related to send SMS messages, Contact details, received SMS messages, scheduled SMS messages, and authentication credentials. Designing a database schema that supports efficient data storage and retrieval is essential for the smooth functioning of the system. (Choocke, 2016).

User Interface (UI) Design: The user interface is the portal through which Bulk SMS system users interact with the system. UI designers create intuitive dashboards that facilitate the monitoring of contact management, send SMS messages, contact details, received sms messages, scheduled sms messages, and authentication credentials and generation of insightful reports. A responsive design ensures accessibility across different devices, contributing to a positive user experience. (Aidmale, 2019).

Backend Development: The backend of the Bulk system serves as the operational engine. Backend developers implement logic for critical functions such as sending SMS messages, receiving SMS messages, scheduling of messages and contact management. APIs are developed to enable seamless communication between the frontend and backend components. (Skeener, 2020).

Frontend Development: Frontend development focuses on bringing the UI designs to life. Using technologies such as HTML, CSS, and JavaScript, developers ensure a dynamic and responsive user interface. Frameworks and libraries may be employed to enhance the user experience and streamline the development process. (Rexel, 2013).

Integration with External Systems The integration with external systems aims to streamline processes, improve efficiency, and enhance the functionality of the bulk SMS system by leveraging data and services from other applications. Online Bulk SMS systems often interface

with customer relationship management, E-commerce platforms, marketing automation tool, enterprise resource planning system and Payment gateways. (Hauptstrasse, 2019).

Security Measures: Given the sensitive nature of bulk SMS system, robust security measures are implemented. Encryption, secure authentication methods, and regular security audits safeguard against unauthorized access and data breaches. Compliance with data protection regulations is a priority. (Kimlee, 2022).

Testing: Thorough testing is conducted to identify and rectify any bugs or issues before deployment. Unit testing, integration testing, and performance testing ensure the system's reliability under different conditions, contributing to a seamless user experience.

Deployment: Once successfully tested, the Bulk SMS system is ready for deployment. Organizations choose a suitable hosting environment and coordinate the deployment to minimize disruptions to ongoing Bulk SMS System operations.

Training and Support: To ensure the effective use of the system, training is provided to system Users. A support system is established to address any issues or questions that may arise during regular operations, fostering a smooth transition to the new system. (Hyden, 2012).

Continuous Improvement: The design and development process do not conclude with deployment. Continuous improvement is a key tenet, with regular updates based on user feedback, changing business requirements, and emerging technologies. Monitoring system performance and gathering analytics contribute to ongoing enhancements (Patel, 2021).

The design and development of online Bulk SMS systems represent a strategic convergence of technology and operational efficiency. By addressing the specific needs of Bulk SMS operations through meticulous planning, integration, and user-centric design, these systems empower organizations to navigate the complexities of modern effective communication with agility and precision. (Makudza, et al. 2020)

2.6.2 LOOPHOLES OF THE CURRENT SYSTEM

In this section, the weaknesses of the current system that is intended to be improved are addressed and these include;

Authentication and Access Control; Weak or inadequate authentication mechanisms may allow unauthorized access to the system.

API Security; Insecure API endpoints or insufficient API security controls may expose the system to unauthorized access, data breaches, or API abuse.

Message Delivery and Reliability; Lack of redundancy and failover mechanisms may lead to message delivery failures or service interruptions during peak usage periods or system outages.

Third-Party Integrations; Vulnerabilities in third-party integrations or dependencies may expose the system to security risks or data breaches.

Message Scheduling; Inaccurate or inconsistent time zone handling may result in messages being sent at the wrong time, causing inconvenience to recipients or missing important deadlines.

Character Limit: Messages are limited to a specific number of characters, restricting the amount

of information you can convey.

2.6.3 RELEVANCE OF THE ONLINE BULK SMS SYSTEM

- i. **Targeted Promotion;** Bulk SMS, which allows businesses to connect with their customers and prospects in real time, irrespective of their location. Bulk messaging generates a massive opportunity for businesses to reach across different demographics and geographic locations, at the same time.
- ii. **Wider Appeal;** whether it's promotional, transactional or bulk SMS, all your messages can reach out to an increasingly large number of people with the element of rapidity.
- iii. **Cost-effective;** Bulk SMS in finance is an effective marketing strategy for business vendors in the financial sector. Bulk SMS services give an effective solution for communications either with large or small contact groups. This service influences the customers when they get the message about the organization's new service.
- iv. **High open rates:** SMS messages have a much higher open rate than email messages, making them an effective way to deliver important information to customers and prospects.
- v. **Personalization:** Bulk SMS services allow you to personalize your messages, making them more relevant and engaging for your audience. You can use the recipient's name or

other personal details to make the message more appealing and increase the chances of a response.

- vi. **Quick delivery:** Bulk SMS services deliver messages instantly, making it possible to communicate time-sensitive information to your audience. This can be useful for promotions, event reminders, or other urgent communications.
- vii. **Increased engagement:** Bulk SMS services can increase engagement with your brand and improve customer loyalty. By sending targeted messages to customers, you can encourage them to take action, such as making a purchase or attending an event.

2.7 REQUIREMENTS FOR DEVELOPING AN ONLINE BULK SMS SYSTEMS

Requirements form the basis for initiating any task. When there is a need, then we devise an action plan and proceed towards its accomplishment.

Hence requirements for a software could be classified in two broad categories- functional, non-functional. The official definition of ‘a functional requirement’ is that it essentially specifies something the system should do (Theodore, 1997). The definition for a non-functional requirement is that it essentially specifies how the system should behave and that it is a constraint upon the systems behavior. One could also think of non-functional requirements as quality attributes for of a system. (ReQtest, 2012).

2.7.1 FUNCTIONAL REQUIREMENTS FOR DEVELOPING ONLINE BULK SMS SYSTEMS

Users of the Online Bulk SMS System namely agricultural produce store customers had to be provided with the following functionality. (Jackowitz, 2017);

- i. User Authentication and Authorization.
- ii. Contact Management.
- iii. Message Creation and Personalization.
- iv. Scheduling and Sending Messages.

The Online Bulk SMS System enabled the admin to manage the menu. The functions afforded by the system provided user with the ability of using a graphical interface. The functions accorded to the admin included;

- i. Login into the system.
- ii. View dashboard.
- iii. Add a new/update/delete contacts.
- iv. Manage roles and permissions.
- v. Schedule messages/ delete scheduled messages.
- vi. View message status.
- vii. Send Messages.
- viii. Configure system settings and preferences.
- ix. Create/edit/delete groups.

The Web based Bulk SMS system which is integrated with SMS gateway API to facilitate sending of SMS both single and bulk SMS messages to target audience as well as offer a mechanism to track status of send messages.(Katankar and Thakare 2010) : As client web interface send data using web POST method and encrypted then web application will first read web data from POST method using server request object then it will decrypt SMS in to text because SMS gateway can't understand encrypted message it need ASCII code SMS(Mahmoud and Mahfouz 2012).

The Online Bulk SMS System enabled the Social Media Team to manage the menu. The functions afforded by the system provided social media team with the ability of using a graphical interface. The functions accorded to the social media team included;

- i. Login into the system.
- ii. View Dashboard.
- iii. Add/ update/ delete contacts.
- iv. Send SMS messages.
- v. Schedule messages/ deleted scheduled messages.
- vi. View status of send messages.
- vii. Create/edit/delete groups.

2.7.2NON - FUNCTIONAL REQUIREMENTS FOR DEVELOPING ONLINE BULK SMS SYSTEMS

Non-functional requirements of a system are the quality attributes of a system, which enable it to effectively satisfy the needs of the users (Chung, Nixon et al. 2012), the non-functional requirements include;

Usability: The system should provide an interactive user-friendly interface that is easily understandable for all users.(Pitale and Bhungara 2019) .

Availability: The System should be available at least at all operating hours and must be recovered within an hour or less if it fails. The system should respond to the requests within two seconds or less(Delany, Buckley et al. 2012).

Security: Only authorized users must be able to access the system and view and modify the data (Saxena and Payal 2011).

Dependability: The system should provide consistent performance with easy sending of SMS messages, tracking of messages status and updating of message content.(Laamanen 1995) .

Maintainability: The software should be easily maintainable and adding new features and making changes to the software must be as simple as possible.(Ogbunugafor 2012) .

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter laid out and presented the system the system design, data collection methods, sampling strategies, data analysis and ethical considerations that were used in the study.

3.1 Area of Study

The study was conducted at Azam Tv Media which offers home entertainment packages suitable for individuals and family across Uganda. Henceforth the focus was towards understanding the current mode of communication at Azam Tv Media, Kampala.

3.2 System Development

The main development approach employed for this project was Structured System Analysis and Design Methodology (SSADM).

SSADM follows the waterfall life cycle model starting from the feasibility study to the physical design stage of development. One of the main features of SSADM is the intensive user involvement in the requirements analysis stage. The users are made to sign off each stage as they are completed assuring that requirements are met. The users are provided with clear, easily understandable documentation consisting of various diagrammatic representations of the system (Turner, 2000). SSADM breaks up a development project into stages, modules, steps and tasks. The first and foremost model developed in SSADM is the data model. The techniques used in SSADM are logical data modelling, data flow modelling and entity behaviour modelling (Shaw, 2001).

3.3 Data Collection Methods

This section discusses the methods, procedures and factfinding techniques that were used to identify requirements of the system. The researcher used the following methods to collect relevant data about the research.

3.3.1 Interviews

This technique involved asking open-ended questions to converse with respondents and collect elicited data about a subject. This involved the interviewer who in most cases is the subject matter expert to understand respondent opinions in a well planned and executed series of questions and answers. These were used as they help one explain, better understand and explore research subjects' opinions, behaviour, experiences and phenomenon.

3.3.2 Document Review

This technique involves the reading of literature from various books and articles concerned with Web Bulk SMS system as well as acquiring related information from the internet to boost the knowledge of the research. Articles in the newspapers giving a brief overview about the recent trends in the business sector in regard to Bulk SMS systems. The research used such information to guide the researcher more on the development of the system.

3.4 System Analysis and Design

Research design refers to the overall strategy utilized to carry out research that defines a succinct and logical plan to tackle established research question(s) through the collection, interpretation, analysis and data modelling (Maynard, 2012).

There are a number of tools that were used to represent facts from the collected data. The tools included; the System Architecture, a Context Diagram, Data Flow Diagram, Use-case Diagrams and Entity Relationship Diagram. These clearly represent the raw facts gathered during the data collection process, while defining the behavior and interactions among the various components of the system as well;

3.4.1 System Architecture

This is a conceptual model that defines the structure, behavior, and the other views of a system (Cooper, 2011). This was used to clearly show the interactions and behaviour among the various components of the system.

3.4.2 Context Diagram

This highlights relationships established between data items to show how the different entities relate with the system. The context diagram shows the basic interaction of the system with its environment.

3.4.3 Data Flow Diagram

Data Flow Diagram (DFD) is a graphical representation of the flow of data through an information system. Its used for visualization of data processing. The Data Flow Diagram shows how the data moves/flows within the system.

3.4.4 Use-Case Diagram

Use-Case Diagram is a representation of a user's interaction with the system that shows the relationship between users and different cases in which the user is involved. A use case diagram was used to identify the type of users of the system and the different use cases.

3.4.5 Entity Relationship Diagram

An entity relationship diagram (ERD) is a visual representation of data entities, their attributes, cardinalities and relationships. The ERD is used in database design and development to; Identify entities (tables) and their characteristics (attributes), define relationships between entities (tables), Illustrate data flow and dependencies as well as Visualize database structure and organization.

3.5 System Implementation.

The tools employed in the implementation of Online Bulk SMS system include the following;

- a) Visual Studio Code which enabled the researcher to write the dynamically generated pages easily and very quickly because it was used as the main text editor.
- b) Hypertext markup language (HTML) used to develop user interfaces with Cascading style sheets (CSS).
- c) The system was implemented on Windows 10 Operating System environment and the back end implemented using MySQL database server.
- d) MySQL was very useful in constructing the database of the Online Logistics Management System. A database is a collection of interrelated data stored with minimum redundancy to

serve many users quickly and efficiently. Database was used in order to make data access easy, quick, inexpensive and flexible for the user.

- e) The front end was implemented using Hypertext Pre-processor (PHP). PHP is a server-side scripting language embedded in the HTML used to manage dynamic content, databases and session tracking. It enabled the researcher to write simple scripts directly into the HTML files. PHP made it quite easier to manage the large website by placing all the components of a web page in a single HTML file. The users were not in position to see the source code, thereby maintaining security of the source code.

I used tools like PHP and HTML programming languages to implement the system interfaces in a Visual Studio Code programming environment. I also used XAMPP server as a server-side database tool for implementing databases.

3.6 Testing and Validation

Both unit testing and integration testing were performed on the Online Bulk SMS System to clarify the specifications of the system to reveal possible faults and establish confidence in the system.

Unit testing focused on the one function at a time in that whenever the researcher designed a function, it would be tested instantly before proceeding to design another function.

Integration testing was done after all different modules had been put together to make a complete system. Integration aimed at ensuring that all modules of the system work hand in hand and they could be integrated to form a complete working system.

In the end, User testing was performed. This involved the potential users of the system to test the system if it met their requirements.

3.7 Ethical Considerations during Data Collection and Analysis.

The ethical issues that were considered during data collection and analysis include the following;

- i). **Honesty:** The data results, methods, procedures and publication status were reported honestly by the researcher. The researcher did not falsify or fabricate data and neither did she deceive the public nor colleagues on the data collected and the reasons for collecting data.

- ii). **Integrity:** The researcher endeavored to be sincere and consistent in all her actions during the research process and kept her promises and agreements with all the stakeholders of the Online Bulk SMSSystem.
- iii). **Respect for intellectual property:** During the course of this research project, the researcher endeavored never to copy, or plagiarize other people's work but instead considered text citation and referencing in a bid to acknowledge the source of the information, that is, statistics, tables, expressions and phrases.
- iv). **Objectivity:** The researcher endeavored to avoid any form of systematic bias in all aspects such as natural bias in reporting data, avoided defective measuring devices, ensured proper sampling and carefully observed the respondents considering the indeterminacy principle.
- v). **Confidentiality:** The researcher protected any piece of sensitive information that was provided by respondents and as well followed the guidelines that govern protection of confidential communications.

CHAPTER FOUR

FIELD STUDY AND SYSTEM DESIGN

4.0 Introduction

This chapter presents the results from the field study. It highlights the strengths and weakness of the current system. This chapter describes system requirements (user requirements, functional requirements, and non-functional requirements) and the design of the system (system architecture, context diagram, data flow diagram, entity relationship diagram and the flow chart diagram).

4.1 System Study and Analysis

The study was carried out at Azam TV Media, Kampala. The main purpose of the study was to find out the challenges faced by the communication department at Azam TV media. It involved the researcher studying the existing system to identify its strengths and weaknesses and come up with possible solutions. The information acquired from the study was done by employing a number of data collection methods including Document reviews and interview guide where the questionnaires were analyzed to give the basis to design a new system.

4.1.1 Findings from the Data Collection

During interview interaction with the Media Team Manager, The interviewee suggested that the Online Bulk SMS System should have a Feedback mechanism to track the delivery status of sent messages in order to verify if the intended recipient has received the message or not.

Furthermore, after collecting the required information from the various literature reviews from different Documents, articles, internet and blogs, the researcher analyzed the data and found out that the system should be integrated with an API that is an SMS gateway which is a service offering SMS transit, transforming messages to mobile network traffic from the web, allowing transmission or receipt of SMS messages with or without the use of a mobile phone.

4.2 Current System

The Bulk SMS system used by AZAM TV Media is a communication tool that's web based which meets the SMS services for sending messages to any mobile number in Uganda. It has been used for mobile marketing and Business SMS communication such as launching new product packages or announcements. The system is also capable of sending text messages to one or hundreds of mobile numbers from a single send. In addition, the system used by AZAM TV Media is characterized by main features such as; Manage Accounts, Sending and Receiving SMS messages, View SMS logs, Phone and Email support. It is on this basis that the study of developing an online Bulk SMS System came in handy to address some of the challenges experienced by the Communication Team at Azam TV Media, Kampala.

4.3 Features of the Online Bulk SMS System

Basing on the data collected, some of the features to be included in the system are given below.

Requirement	Features
The Administrator should be able to login and manage contacts, send single and Bulk SMS messages, View delivery status of messages, as well as Schedule messages.	<ul style="list-style-type: none">-Provision of a login form to enable the Admin enter a username as well as password before accessing dashboard.-Provision of a dashboard to display Message logs.-Interfaces for displaying Manage contacts, Send SMS, Delivery Status and Schedule Messages.-Provision of buttons for adding, updating and deleting contacts.-Provision of forms and buttons for sending SMS messages-Provision of interface to show delivery status of sent messages.-Provision of form and buttons to schedule messages.
The Social Media Team should be able to login and Manage contacts, schedule SMS messages, view delivery status of messages, as well as send messages.	<ul style="list-style-type: none">-Provision of a login form to enable the Social media team enter a username as well as password before accessing dashboard.-Provision of a dashboard to display Message logs.

	<ul style="list-style-type: none"> -Interfaces for displaying Manage contacts, Send SMS, Delivery Status and Schedule Messages. -Provision of buttons for adding, updating and deleting contacts. -Provision of forms and buttons for sending SMS messages -Provision of interface to show delivery status of sent messages. -Provision of form and buttons to schedule messages.
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4.4 User Requirements

The major users of the system include the Social media team and the administrators. The user requirements include the following.

- i. The social media team should be able to visit the Bulk SMS system website and view the contact list, view SMS logs, schedule SMS messages as well as send SMS messages.
- ii. The administrators should be able to login, change password, update login details, and manage contacts.
- iii. The administrators should also be able to access the dashboard to view contact lists, SMS logs, delivery status as well as scheduled Messages.

4.5 Functional Requirements

Social media team requirement:The social media team should be able to visit the bulk SMS system website and view contact list, schedule SMS messages, view SMS logs as well as Send SMS messages.

Administrator requirement:The administrator should be able to change password, update login details and manage contacts. Furthermore he/she should be able to upload new contacts to be added on the bulk SMS system database.

4.6 Non-functional Requirements

Non-functional requirements support the functional requirements and determine how the system must perform. Generally non-functional requirements should be;

- i. **Performance:** System performance defines how fast a system can respond to a particular user's action under certain workload.
- ii. **Reliability:** Is the probability and percentage of the system performing without failure for a specific number of uses or amount of time.
- iii. **Flexibility requirement:** Each part of the system should be independent, so that changing of one part does not affect the other part and new parts can be added to increase functionality.
- iv. **Accuracy requirement:** The System should be more accurate in terms of sending messages.
- v. **Usability:** This feature concerns the users i.e. it indicates how effectively they can learn and use the system.

4.7 Hardware/ Software Requirements

4.7.1 Hardware Requirements

The hardware requirements include;

- i. Storage disk drive: 256 GB SSD hard drive or higher.
- ii. Processor: Intel core i5 or i7.
- iii. Random Access Memory (RAM): 8GB or higher.
- iv. An Uninterruptible power supply (UPS): backup time of at least 4-6 hours.
- v. Laptop/ Desktop: size at least 13 inches (laptops) or 24 inches (desktops).
- vi. Battery: battery life at least 8 hours (for laptops).

4.7.2 Software Requirements

The software specifications required on the computer system include;

- i. Web server: XAMPP (Version 3.2.4)
- ii. Operating System: Windows 10 or higher version.
- iii. Internet browser such as Google Chrome and Microsoft Edge.
- iv. The system should have 32/64 bits Operating System.
- v. Development Tools: Visual studio code or notepad.

4.8 System Development Approach

The requirements determined were used to design the Online Bulk SMS System. The major development approach to be employed for this project is the Structured System Analysis and Design Methodology.

SSADM followed the waterfall life cycle model starting from the feasibility study to the physical design stage of development. One of the main features of SSADM is the intensive user involvement in the requirements analysis stage.

4.9 System Design

The design follows system development methods. In this study, Rapid Application Development derived from Structural System Analysis and Design Methods was invoked. The design stages included; System architecture, Context Flow Diagram, Data Flow Diagram and System modelling using Use Case Diagrams.

4.9.1 System Architecture

System architecture refers to the high-level structure and organization of a complex system. It encompasses the design of a system's components, their relationships, and how they work together to achieve the overall goals and objectives of the system.

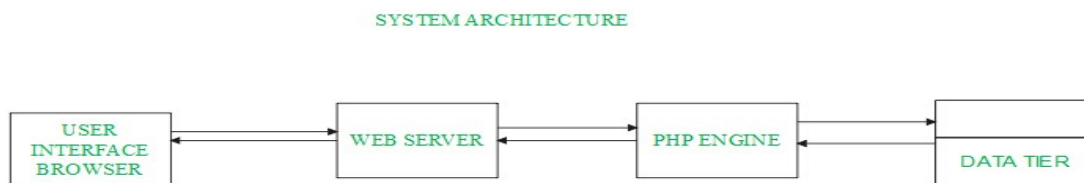


Figure 1: System Architecture

The online Bulk SMS System proposed in the study was designed using four layered architectural pattern which include;

Presentation layer: This represented the various ranges of devices that were used to access the Online Bulk SMS System via the internet.

Online Bulk SMS System modules: This layer represented the key features which consisted of: Administrator module and social media team module.

Server; This showed the server used during implementation.

Storage service: This layer covered the rapid and storage of data or information using a relational data base management system like MySQL which was used in this case.

4.9.2 Context Diagram

A context diagram is a high-level overview of the system that shows its interactions with external entities. It is like a map that outlines the system's boundaries and its key relationships with the outside world.

This diagram showed the general overview of the system and its interactions with external entities. The main external entities were the administrator and the social media team.

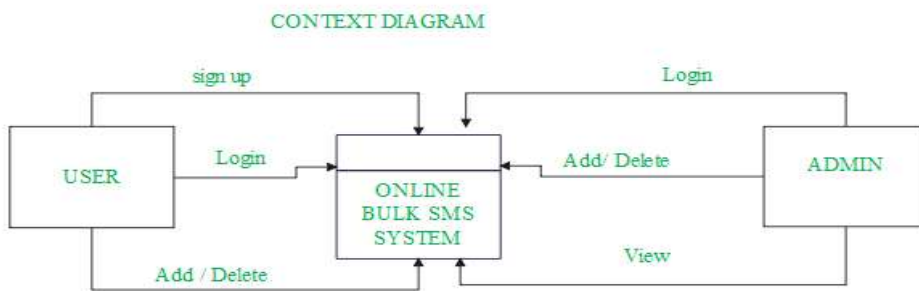


Figure 2: Context Diagram

4.9.3 Data Flow Diagram

This is a visual representation of how data flows within a system or process. The data flow diagram summarized how data/information flowed in the system.

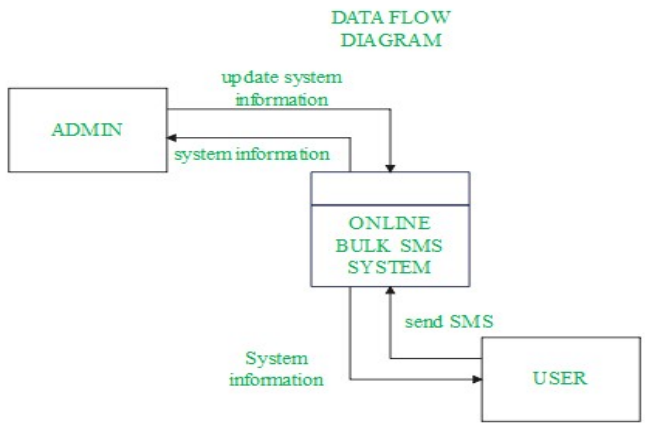
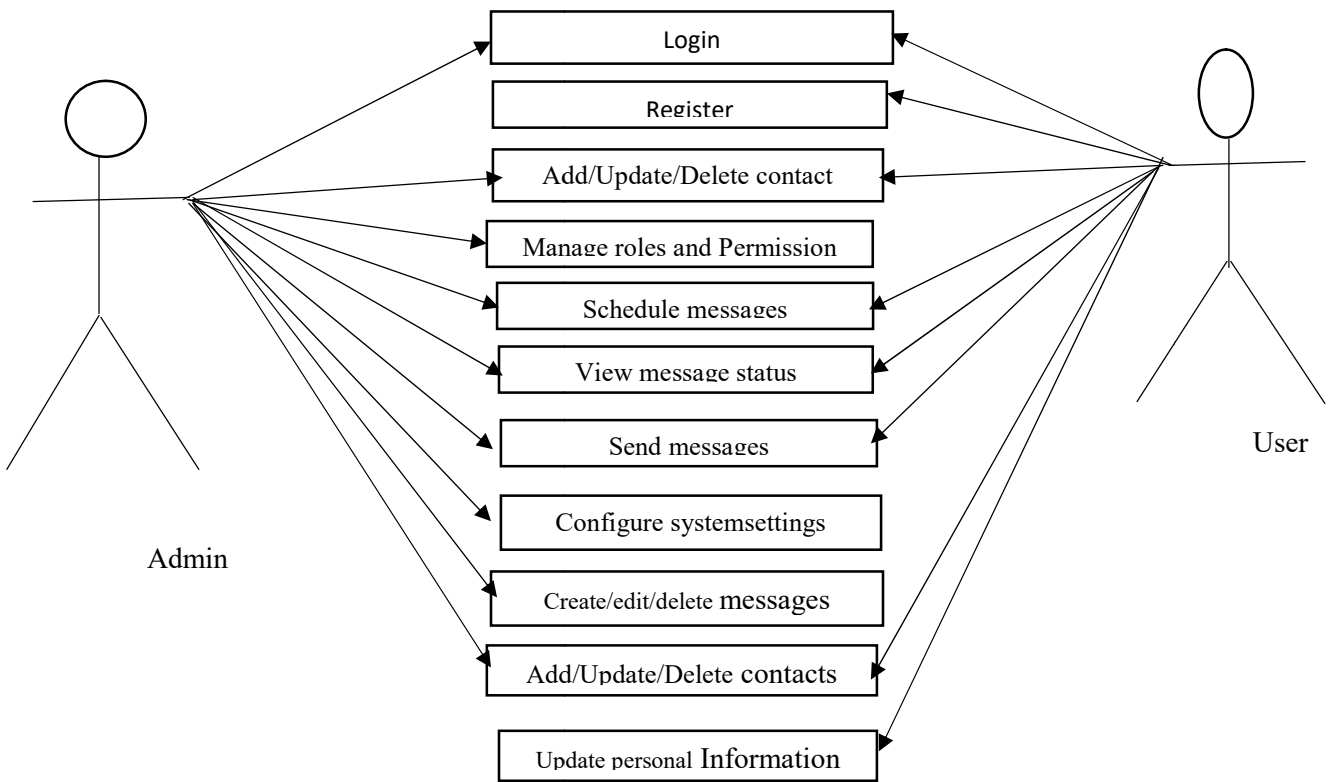


Figure 3: Data Flow Diagram

4.9.4 Use-Case Diagram

A use case diagram is a visual representation of a system’s functionality and requirements, showing how users (actors) interact with the system to achieve specific goals. This diagram highlights the main interactions between the admin, user, and system, showing the key functionality and relationships within the online bulk SMS system.



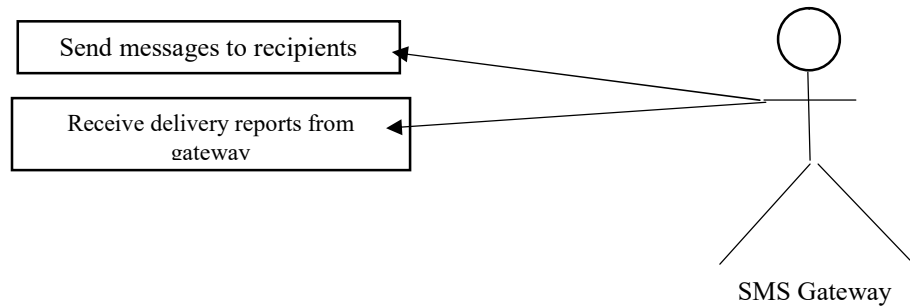


Figure 4. Use Case Diagram

4.9.5 Entity Relationship Diagram

An entity relationship model describes things of interest. This is composed of entity types and specific relationships that exist between entities. The entity relationship diagram showed all relationships existing among the entities within the online Bulk SMS System.

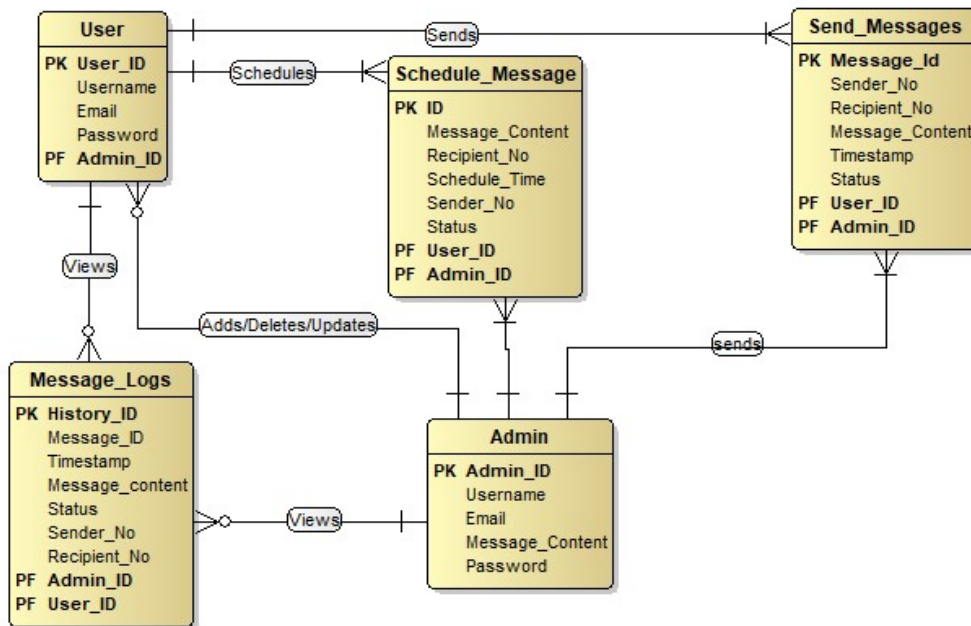


Figure 5: Entity Relationship Diagram

4.9.6 Programming Tools

Programming tools are software applications or programs used by developers to create test, debug, and maintain software applications. In the context of the bulk SMS, these programming tools help developers design, develop, test and deploy the system, ensuring efficient and reliable

sending and receiving of SMS messages. Below are some of the programming tools that the researcher used;

- a) Visual Studio Code.
- b) MySQL.
- c) XAMPP v3.2.4.
- d) PHP (Hypertext Preprocessor).
- e) SMS gateway API.
- f) Testing frameworks thus PHPUnit.

4.9.6 Implementation and Testing

This is where the actual development of the Online Bulk SMS System happened which included developing the Graphical User Interface (GUI), implementing the model HTML and PHP, and creating the system database using MySQL. Visual Studio Code was used as a text editor.

4.9.7 Coding and Testing

Coding involved transforming the identified structural design specifications into actual working computer codes after which each function was designed, a test was performed to ensure that it worked properly as per the set user expectations. Coding was done using a text editor known as Visual Studio Code, and testing was carried out on a localhost XAMPP server software.

4.9.8 System Documentation and Training

The system was documented after all the tests had been performed to serve as reference point to the system administrator to maintain the system throughout its productive life. Training of the system users was done after the testing of the system.

CHAPTER FIVE

PRESENTATION OF RESULTS

5.0 Introduction

This area was focused on fulfilling the use of the requirements ie functional and non-functional requirements into working / running system. It furthermore presented implementation of the design presented in Chapter Four.

5.1 Interface Design

The goal of user interface design is to make the user's interaction with the system as simple and efficient as possible, in terms of accomplishing user goals. It is also the way through which a user interacts with a website or an application. It mainly focused on the looks and style of how a system appeared to the user referring to the users and administrator in this case.

Interface for user homepage



Figure 6: Homepage Interface

The footer contained all the contact information plus other information, and links to the admin.

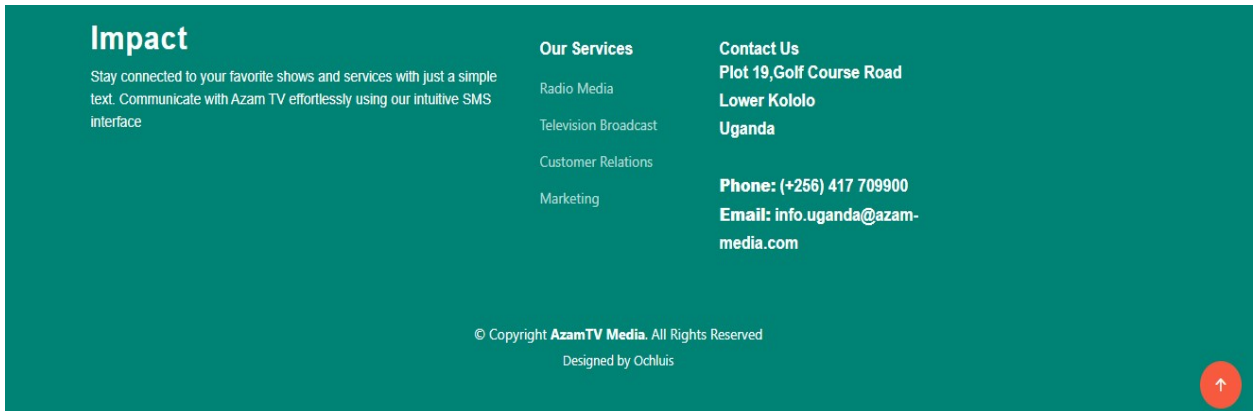
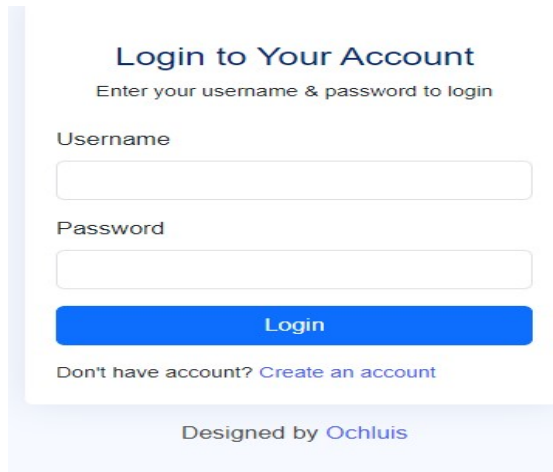


Figure 7: Footer interface

The user could register using the registration form on the register page as shown.

Figure 8: Form to register

The users could as well as login after creating an account in order to proceed and send messages.



Login to Your Account
Enter your username & password to login

Username

Password

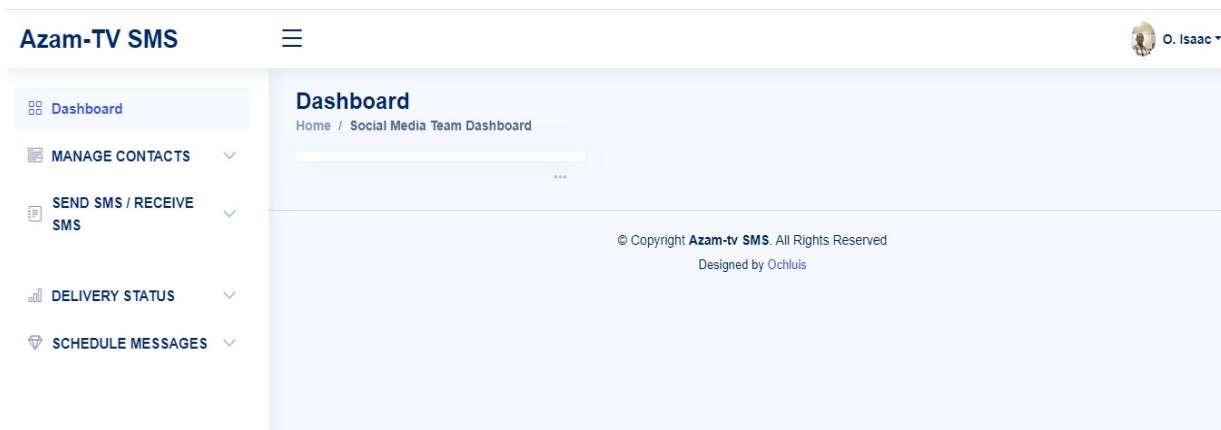
Login

Don't have account? [Create an account](#)

Designed by **Ochluis**

Figure 9: Login form

The user was redirected to their dashboard after logging in successfully.



Azam-TV SMS ☰ O. Isaac ▾

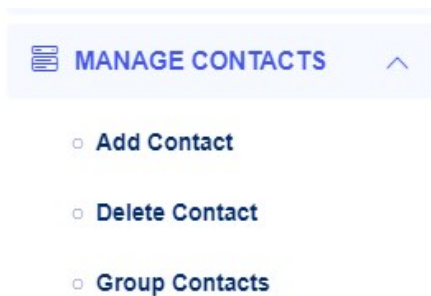
Dashboard
Home / Social Media Team Dashboard

- Dashboard
- MANAGE CONTACTS ▾
- SEND SMS / RECEIVE SMS ▾
- DELIVERY STATUS ▾
- SCHEDULE MESSAGES ▾

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Designed by Ochluis

Figure 10: User dashboard

Features after user clicks on the manage contact functionality



MANAGE CONTACTS ^

- Add Contact**
- Delete Contact**
- Group Contacts**

Figure 11: Dropout interface items of manage contacts functionality

User could add contact to the system database

The screenshot shows the 'Azam-TV SMS' dashboard with a sidebar menu containing 'Dashboard', 'MANAGE CONTACTS', 'SEND SMS', 'DELIVERY STATUS', and 'SCHEDULE MESSAGES'. The main content area is titled 'Add Contact' and includes a breadcrumb 'Dashboard / Add Contact'. The form contains input fields for 'Name:', 'Email:', 'Address:', 'Contact:', and 'Phone:', followed by a 'Submit' button.

Figure 12: Form to captures details to add new contact

The user click on the box in order to select contact he/she intends to delete from account

The screenshot shows the 'Azam-TV SMS' dashboard with a sidebar menu. The main content area is titled 'Delete contact' and includes a breadcrumb 'Delete contact'. A 'Contacts List' box contains a list of contacts with checkboxes: 'Ochen_luis - 074555555', 'solo - 0745555555', 'Sanyu - 0755673510', and 'Sanyu louisie - 0760576091'. The checkbox for 'Sanyu louisie - 0760576091' is checked. Below the list is a 'Delete Selected Contacts' button. The footer contains the text '© Copyright Azamtv-sms. All Rights Reserved' and 'Designed by Ochluis'.

Figure 13: Interface to delete contacts

The user could also be able to group contact basing on desird description

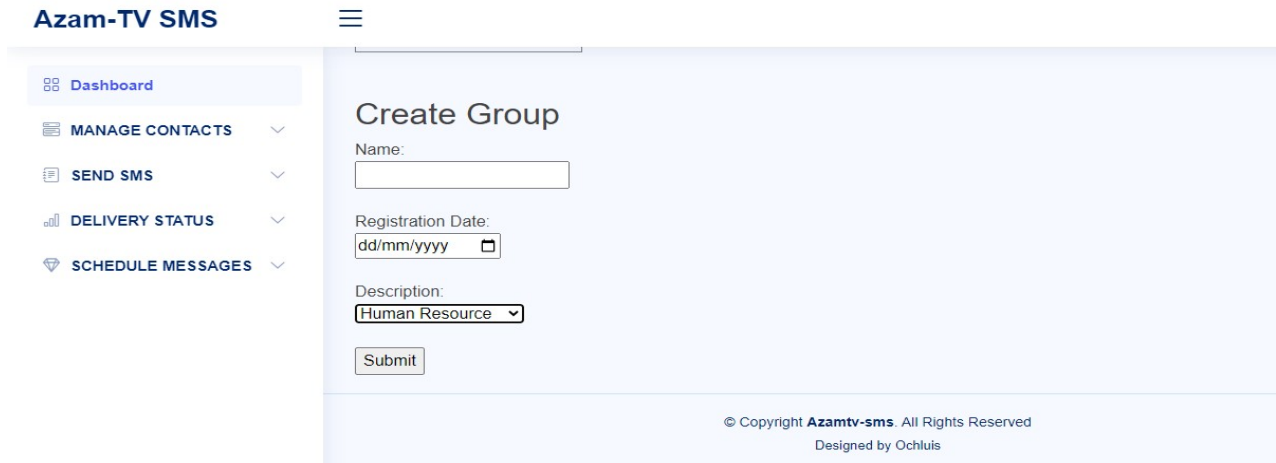


Figure 14: Interface to group contacts

The user is redirected to the features send shown after clicking on the Send SMS functionality



Figure 15: Dropdown items of Send Sms Functionality

The users could send single SMS messages on the send single sms page which also contained contact list

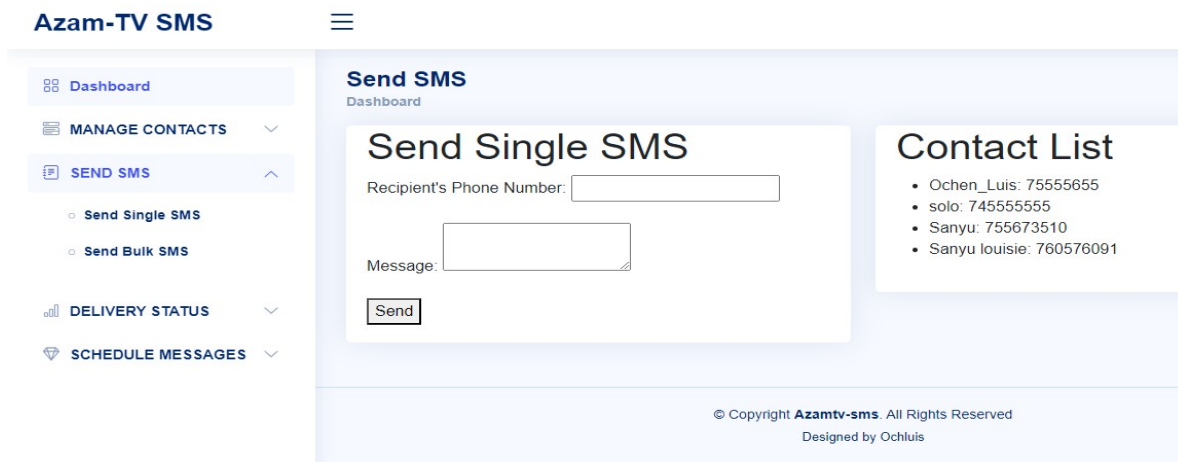


Figure 16: Interface to send Single sms

The user could send bulk SMS on the send bulk sms page

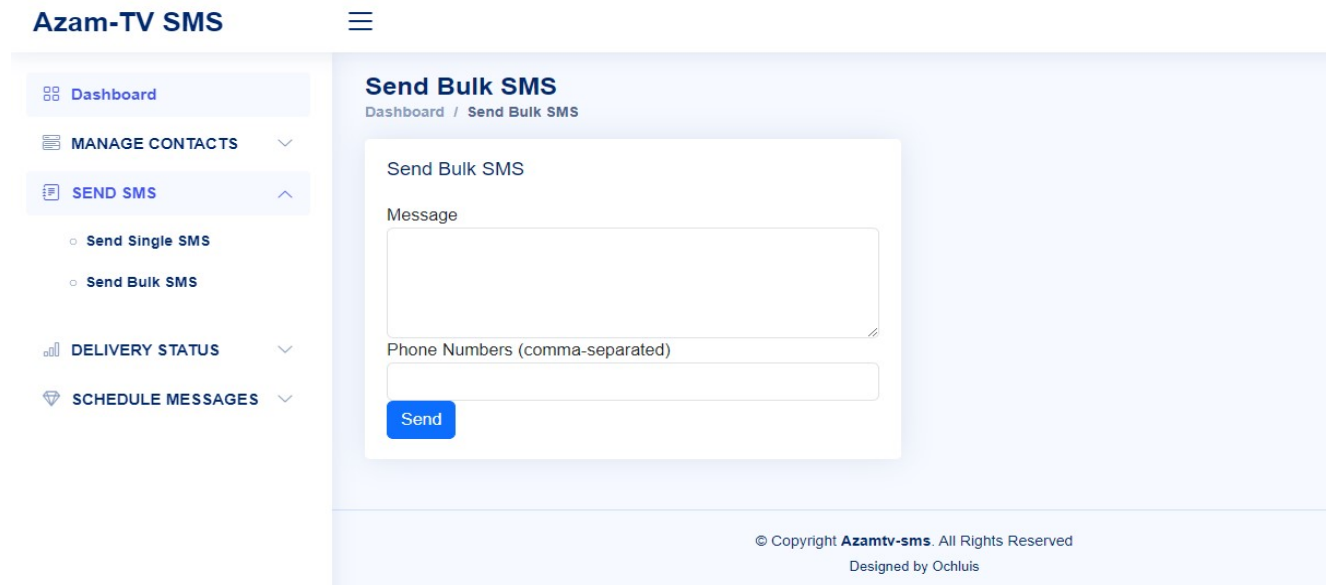


Figure 17: Interface to send Bulk sms

The user is redirected to the sent delivery sms status on clicking the Delivery status

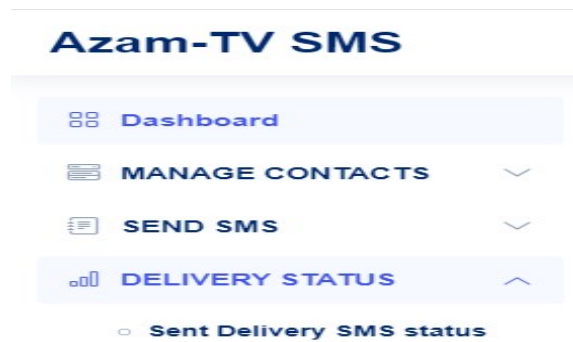


Figure 18: Dropdown item after clicking delivery status functionality

The delivery status of sms sent



Delivered SMS Dashboard
Dashboard / Delivered SMS

Delivered SMS Messages

Message Content	Recipient	Time Sent	Status
hello	0755673510	2024-04-11 12:46:06	success
hello	0783455555	2024-04-11 12:46:06	failed
hello		2024-04-11 12:46:06	failed
helo	0755673510	2024-04-11 12:47:32	success
helo	0783455555	2024-04-11 12:47:32	failed

Figure 19: Interface showing list of status of delivered messages

The user is redirected to the features of SMS scheduling and view scheduled messages on clicking on the schedule Messages functionality

Azam-TV SMS

- Dashboard
- MANAGE CONTACTS
- SEND SMS
- DELIVERY STATUS
- SCHEDULE MESSAGES**
 - SMS Scheduling
 - View Scheduled Messages

Figure 20: Dropdown lists after clicking schedule message functionality

The user could schedule messages to be sent to recipient, this could be done on the schedule message page

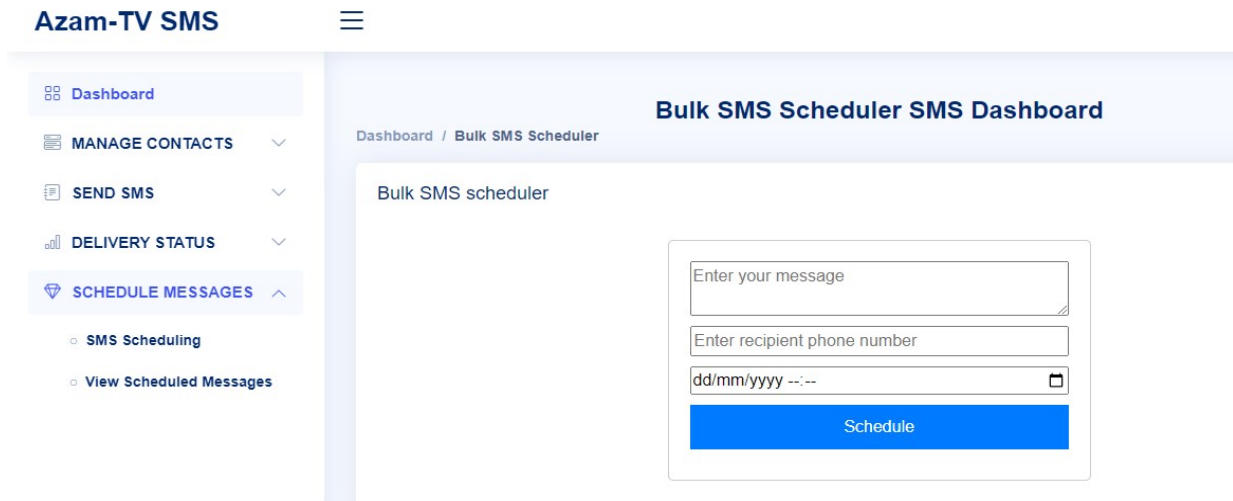


Figure 21: interface to schedule messages

The user could also manipulate his/her profile status after clicking on profile photo found in the header of the administrator pages.

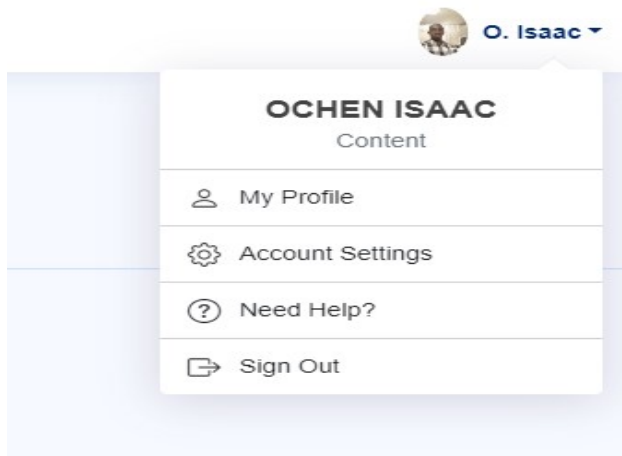
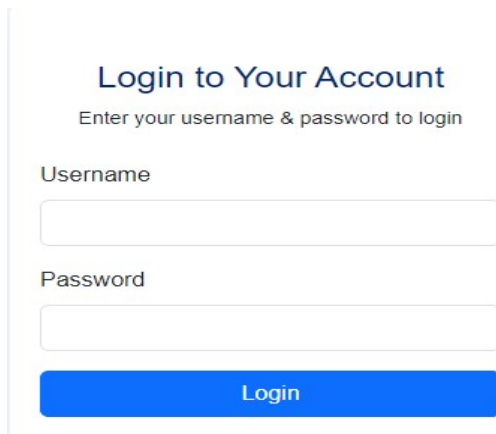


Figure 22: settings to perform profile settings by user

For the administrator, he/she was presented with a login form to enter his/her username and password in order to be able to access the administrator dashboard as well as the different pages for managing contacts, send sms, manage profiles.



Login to Your Account
Enter your username & password to login

Username

Password

Login

Figure 23: Login form for Admin

The interface for administrator dashboard

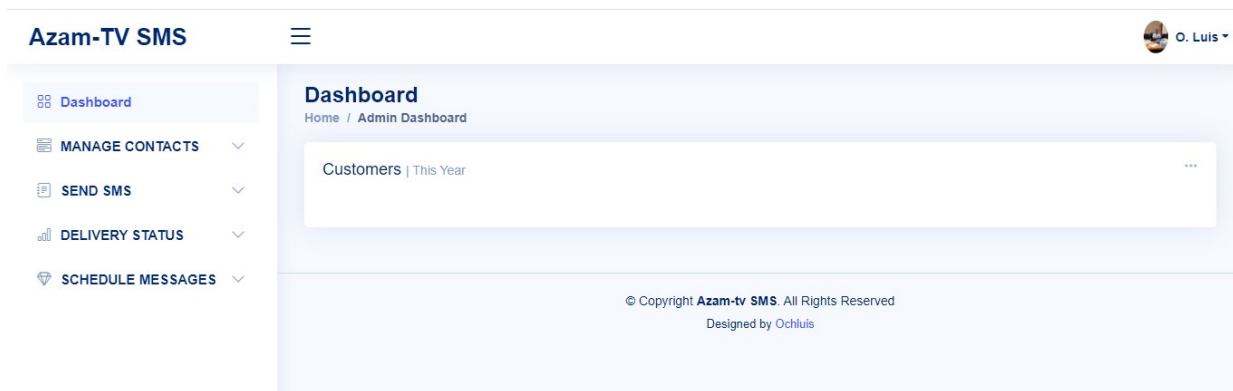


Figure 24: Admin Dashboard

Features after administrator clicks on the manage contact functionality

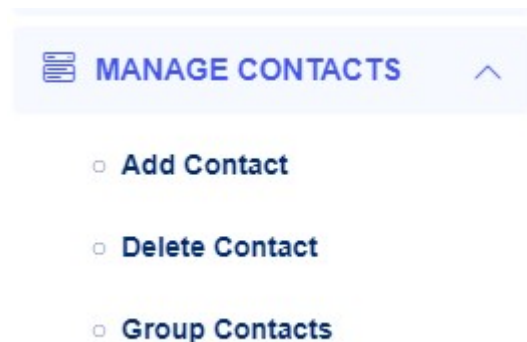


Figure 25: dropdown list after clicking Manage contacts

The administrator could add contact to the system database

The screenshot shows the 'Add Contact' form in the Azam-TV SMS system. The form is located on the right side of the dashboard, with a breadcrumb trail 'Dashboard / Add Contact'. The form contains the following fields: Name, Email, Address, Contact, and Phone. Each field is represented by a text input box. Below the Phone field is a 'Submit' button. On the left side of the dashboard, there is a sidebar menu with the following items: Dashboard, MANAGE CONTACTS, SEND SMS, DELIVERY STATUS, and SCHEDULE MESSAGES. The Azam-TV SMS logo is visible at the top left of the dashboard.

Figure 26: form to enable adding of new contact

The administrator click on the box in order to select contact he/she intends to delete from account

The screenshot shows the 'Delete contact' interface in the Azam-TV SMS system. The interface is located on the right side of the dashboard, with a breadcrumb trail 'Delete contact'. The interface contains a 'Contacts List' box with the following contacts: Ochen_luis - 074555555, solo - 074555555, Sanyu - 0755673510, and Sanyu louisie - 0760576091. Each contact has a checkbox next to it. The checkbox for 'Sanyu louisie - 0760576091' is checked. Below the list is a 'Delete Selected Contacts' button. On the left side of the dashboard, there is a sidebar menu with the following items: Dashboard, MANAGE CONTACTS, SEND SMS, DELIVERY STATUS, and SCHEDULE MESSAGES. The Azam-TV SMS logo is visible at the top left of the dashboard. The user's name 'O. Luis' is visible at the top right of the dashboard.

Figure 27: interface to enable Admin Delete a contact/contacts

The administrator could also be able to group contact basing on desird description

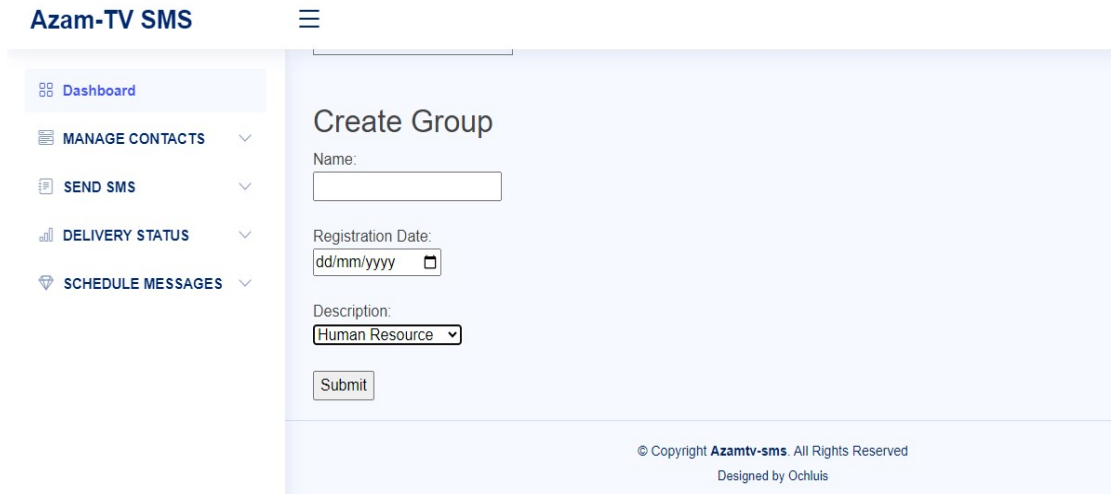


Figure 28: interface for Admin to group contacts

The administrator could send single SMS messages on the send single sms page which also contained contact list

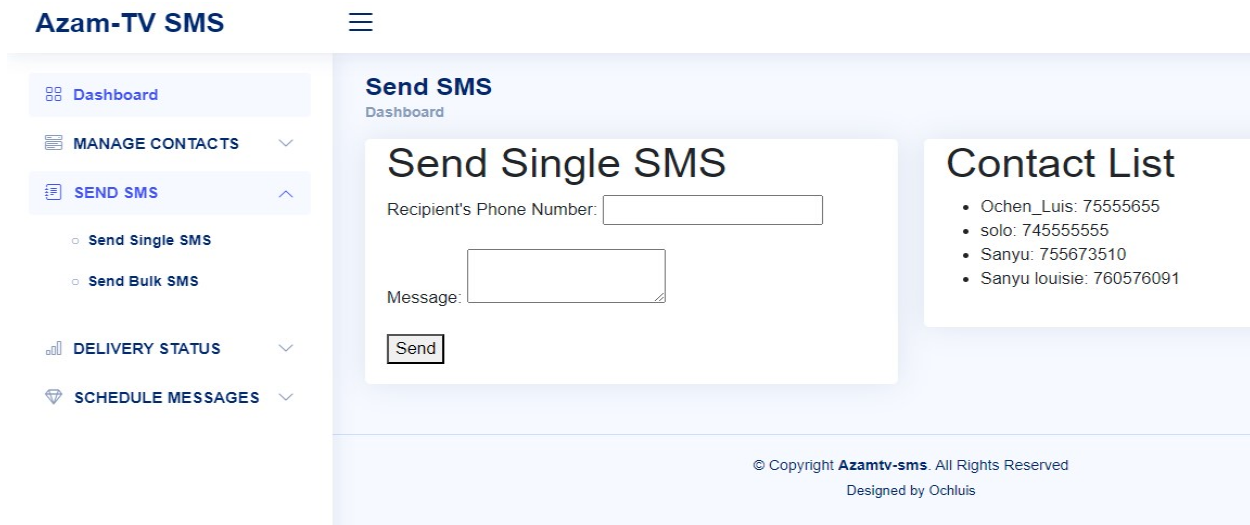


Figure 29: Inteface for Admin to send single sms

The administrator could send bulk SMS on the send bulk sms page

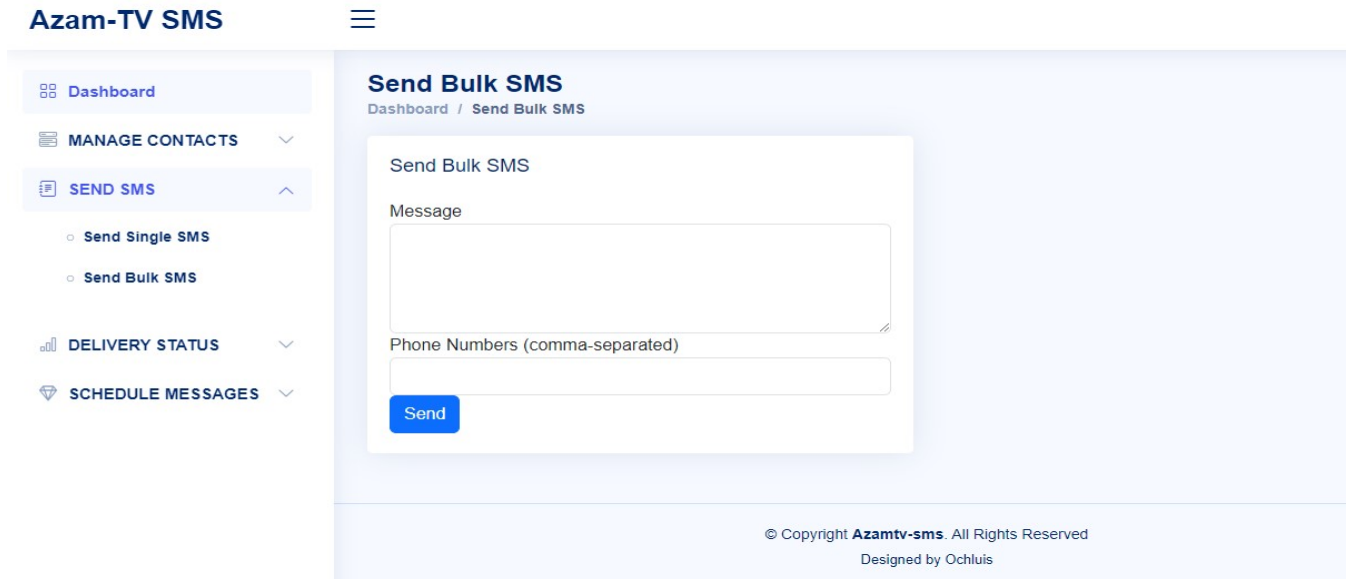


Figure 30: Interface to bulk sms

The delivery status of sms sent

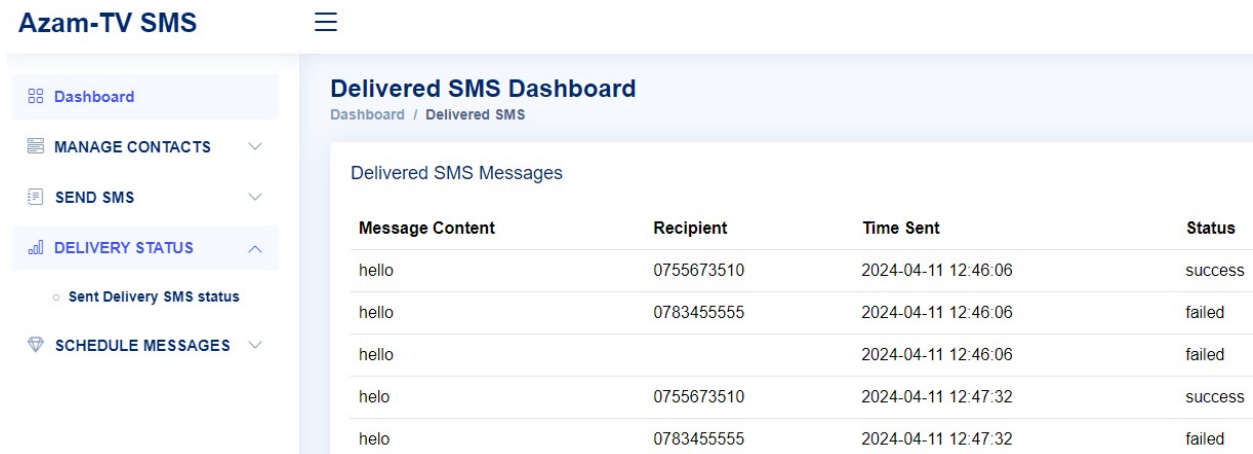


Figure 31: Interface for Admin to view list of delivery status of sent sms

The administrator could schedule messages to be sent to recipient, this could be done on the schedule message page

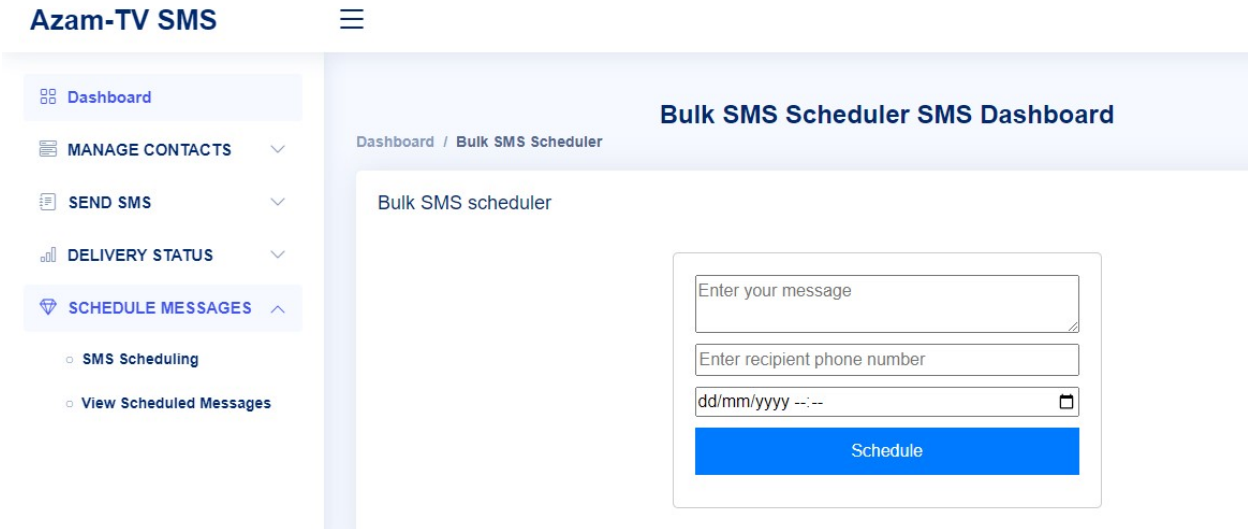


Figure 32: Interface to enable Admin schedule sms

5.2 Data Storage

The system automatically stored the administrator, social media team users details as well as the information of contacts, message content, scheduled messages and message logs into the system relational database “azam_sms” in tabular form. some of the tables include:

Admin Table (admin)

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 AdminID	int(11)			No	None			Change Drop More
<input type="checkbox"/>	2 Username	varchar(15)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	3 Email	varchar(25)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	4 Contact	int(15)			No	None			Change Drop More
<input type="checkbox"/>	5 Password	varchar(25)	utf8mb4_general_ci		No	None			Change Drop More

Figure 33: Admin table

Delivered SMS

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
<input type="checkbox"/>	2 message_content	varchar(255)	utf8mb4_general_ci		Yes	NULL			Change Drop More
<input type="checkbox"/>	3 recipient	varchar(255)	utf8mb4_general_ci		Yes	NULL			Change Drop More
<input type="checkbox"/>	4 time_sent	timestamp			No	current_timestamp()			Change Drop More
<input type="checkbox"/>	5 status	enum('success', 'failed')	utf8mb4_general_ci		Yes	NULL			Change Drop More

Figure 34: Delivered SMS table

Groups

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 groupid	int(11)			No	None		AUTO_INCREMENT	Change Drop More
<input type="checkbox"/>	2 Name	varchar(15)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	3 RegDate	datetime			No	None			Change Drop More
<input type="checkbox"/>	4 Description	text	utf8mb4_general_ci		No	None			Change Drop More

Figure 35: Groups table

Received Messages

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 DeliveryID	int(11)			No	None			Change Drop More
<input type="checkbox"/>	2 MessageID	int(11)			No	None			Change Drop More
<input type="checkbox"/>	3 sender	varchar(25)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	4 recipient	varchar(25)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	5 message_content	text	utf8mb4_general_ci		No	None			Change Drop More

Figure 36: Received_messages table

Scheduled SMS

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
<input type="checkbox"/>	2 message	text	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	3 recipient	varchar(20)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	4 scheduled_time	datetime			No	None			Change Drop More
<input type="checkbox"/>	5 status	enum('pending', 'sent')	utf8mb4_general_ci		Yes	pending			Change Drop More
<input type="checkbox"/>	6 created_at	timestamp			No	current_timestamp()			Change Drop More

Figure 37: Scheduled_sms table

Social team Media

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 SocialID	int(11)			No	None			Change Drop More
<input type="checkbox"/>	2 Username	varchar(25)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	3 Email	varchar(25)	utf8mb4_general_ci		No	None			Change Drop More
<input type="checkbox"/>	4 Password	varchar(20)	utf8mb4_general_ci		No	None			Change Drop More

Figure 38: User table

Entire Relational Database (azam_sms)

The entire relational database showing all tables, primary keys and foreign keys is shown below;

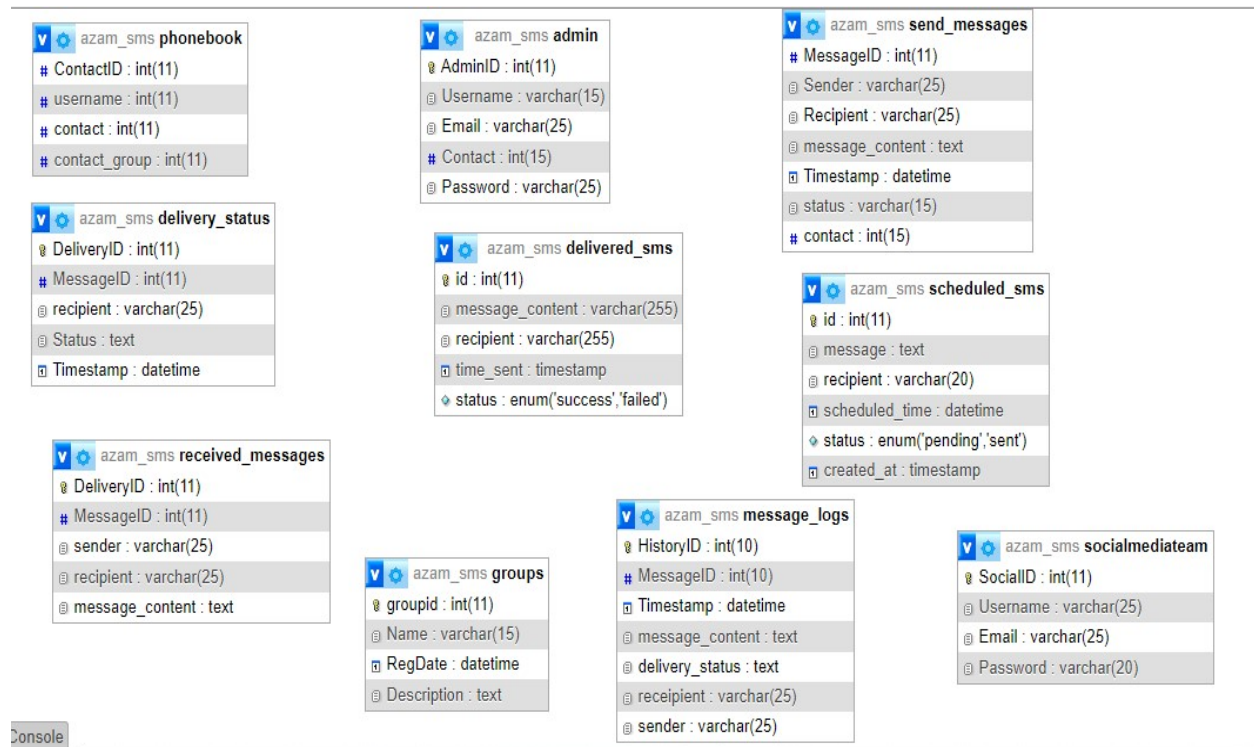


Figure 39: Relational database

5.3 System Testing

Testing is the process of executing the program in order to identify errors or bugs. Testing shows the software errors. Therefore, testing was done after completion of the system. This was done in two formats including Unit testing and Integration testing.

The entire system was tested using codes, class modules and modules. This stage of implementation ensured accuracy and efficiency operation of the system before it was given to the users. It required a series of different tests which varied at different system levels. The system tester assumed that if all parts of the system were correct then the goal would have finally been achieved.

5.3.1 Unit Testing

Unit testing was done on individual codes of the system to ensure that they fully yield the functional units. This was done by examining each unit, for example the code for scheduling messages. This was done to ensure that scheduling messages without errors.

5.3.2 Validation of the system

Validation of the system was done in order to confirm whether the system met its intended requirements and functionalities. It involved a series of evaluations to ensure that the system is correct, consistent, complete, traceable and secure.

Functional validation was done in order to test the system's core functionalities and ensure they meet the specified requirements.

Non-functional validation was also done to test the system's performance, usability, security, compatibility and other quality attributes or non-functional aspects.

Integration validation was also done to test how well the system interacts with other systems it depends on.

CHAPTER SIX

DISCUSSION, CONCLUSION, RECOMMENDATION AND FUTURE WORK

6.0 Introduction

This chapter is concerned with discussing the findings for developing an Online Bulk SMS System in relation to the set of objectives and methodology. The study found that the current Bulk SMS System lacked a feedback mechanism for tracking sent messages. The Online Bulk SMS System that was developed focuses on establishing a mechanism of showing status of messages sent.

6.1 Discussion

The discussion of this chapter is based on the theme of objectives stated in chapter one.

Objective (1): To review the literature and establish the requirements for developing Online Bulk SMS System

The requirements of the study were got from two sources. They include; Library research and field research.

Under Library research, the study was conducted on the previous done projects about the same topic such as fantasy Sms System. This guided me on the alignment of my project work. The library research generated requirements that were used in the design of the DFD database design and a few others which led to the fulfilment of functional and non-functional requirements.

The field research helped me get to know how the current bulk SMS system used by Azam Tv media works, the respondents' view and perception towards the Online Bulk SMS system which also generated the requirements.

Objective(2): To design an Online Bulk SMS System

The system was designed depending on the requirements followed by the RAD from the SSADM. The stage of design included Architecture, Context Diagram and Data Flow Diagram, Use-case diagram and database design, which enabled the smooth flow of data. Design and evaluation of the effectiveness of online Message transmission, encouraged the use of the different stages of design.

Objective (3): To implement an Online Bulk SMS System

The implementation of the system design was carried out using the implementation tools which included; Visual Studio code editor, Google Chrome, MySQL, HTML, XAMPP server and windows to fulfil the implementation where I came up with the interfaces in chapter 5, which interfaces include; Login, dashboard, contact management, send messages, schedule messages and delivery status.

Objective (4) To test the Online Bulk SMS System

The system was tested during and after implementation. Each component was tested (Unit testing) and the whole system was also tested (system testing).

Unit testing was used to test individual parts/modules of the code whereby every part of the interface was as well tested to check whether it works properly. This was essential during the identification of errors in specific units of the code thereby making debugging quite an easy task.

Integration testing was done after all the different modules had been put together to make a complete system. Integration aimed at ensuring that the modules of the system worked hand in hand and they could be integrated to form a complete working system.

Validation Results

After development and testing of the system, it was taken to Azam TV media and given out for testing to the Communications Manager and the Social Media Team in order to look at its performance, appearance, security, integrity, efficiency, effectiveness and other quality attributes, after which the overall percentage acceptance of the system was 82% and the percentage rejection of the system was 12%.

6.2 Conclusion

The Online Bulk SMS System should be deployed for use since most of the users agreed that the system performs its functions that suit their needs especially when it came to addressing majority of the challenges that the existing Bulk SMS system presented as already discussed in this write up in the previous chapters, specifically in problem statement well-stated in chapter 1. This implies that the Online Bulk SMS System is deemed fit for adoption to Azam Tv Media.

6.3 Recommendation

I recommend that my Online Bulk SMS System should be adopted by the different Communication departments to support online messaging and to furthermore reduce on the overall cost of communication.

I recommend my Online Bulk SMS System to be adopted by different academic institutions as a point of reference for development of similar systems, and for study purpose too.

6.4 Limitations and Future Work

- a) The researcher should try to integrate other Application Programming Interfaces (API's) such as Google Language Translators to enable message translation to different recipients.
- b) System maintenance should be done continuously in order to improve on the system performance.
- c) The researcher should try using other programming languages so as to improve on the system.
- d) The system should be hosted on a commercial web-hosting platform in order to enhance its security and improve on its accessibility to the users.
- e) Other features should be added to the system such as more responsiveness and support for dark mode, since it is a present trend for websites.

APPENDENCIES

[Appendix I: Requirements collection interview guide](#)

During the interview process, the interviewer will seek for permission to interview the intended interviewees, briefly introduce the project and its objectives, as well as explain the purpose of the interview and the importance of gathering accurate requirements.

Topic: Online Bulk SMS System

a) Interview Permission Letter

Dear Madam/Sir,

I am Ochen Isaac, a final year student of Busitema University pursuing a Bachelor's Degree in Information Technology.

I am reaching out to request your participation in an interview for the purpose of gathering requirements for an Online Bulk SMS system project. The interview will take approximately 20 minutes session and will be conducted at Azam Media Offices on 17th, March 2024.

The information gathered will be solely used for the purpose of this project and kept confidential.

I hope my request is put into your consideration.

Thank you.

b) Interview Guide Questions

- i. Can you describe your current process for communicating with the stakeholders?
- ii. Briefly describe the current bulk SMS system being used at Azam Tv Media(If there is any)?
- iii. What features do you expect to be improved on the current Bulk SMS System?
- iv. Are there any existing systems that the Online Bulk SMS system needs to intergrate with?
- v. Are there any regulatory or compliance requirements that need to be considered?

Appendix II: Analysis of the Interview Data

Respondents	Data Items
Mr. Okull Emmanuel Tel: 0773084217	<ul style="list-style-type: none"> a) Through use of the social media platforms, emails, direct calls as well as azam tv bulk sms system. b) It is web-based and its mainly used in mobile marketing, and business SMS communication like launching of new packages/products. c) Feedback functionality to track status of sent SMS messages. -Mechanism to schedule messages to be periodically send. d) -A payment system, Content management system. e) Respect the intellectual property of Azam Tv media..
Ms. Komugisha Lynn Tel: 0783299263	<ul style="list-style-type: none"> a) Through official letters, emails, company internet ,regular meetings and azam tv Bulk SMS system. b) The system is able to send large volumes of SMS messages to stakeholders. c) Intuitive and responsive user interface for easy navigation and usage. -Schedule messages in advance with flexible scheduling options. d) Payment system, Subscriber management system and Marketing Automation tool. e) Comply with data protection regulations. Ensure compliance with privacy regulations.

RESULTS.

From the above data obtained, the respondents agreed that the Online Bulk SMS System should operate in a way that enables scheduling of messages, system integration with other existing systems thus to enable effective communication with stakeholders.

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