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COLLEGE OF COMPUTING AND INFORMATION SCIENCES

DEPARTMENT OF NETWORKS

BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING (YEAR 2)

RECESS TERM 2 (BSE 2301)

SOFTWARE DESIGN DOCUMENT FOR
CHAT ANALYSIS APPLICATION FOR NEW VISION

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Contents

1. INTRODUCTION

This document describes the design of chat analysis application developed for New Vision Uganda. It is assumed that this document's reader has read the SRS, since this document also defines the implementation details of the desired behavior given the requirements within it. This document will build heavily on the concept paper and so knowledge of the general architecture is recommended prior to commencing this document.

1.1 Purpose

This SDD describes the architecture and design of chat analysis application. The design description defined in this document is significant in the following ways;

- It will be used to assess the impact of New Vision data analysis application on the company itself.
- It will aid in producing test cases for example it will be used to verify compliance with the requirements specified in the SRS.
- It describes the modular structure, data and diagrams involved with in the application.
- It identifies the required system resources.
- It will be used in case of carrying out maintenance activities on the application.

1.1.1 Intended Audience

In contrast to the SRS, this SDD is written for knowledgeable software professionals and designers which implies that the operational staff of New Vision Uganda will not be among the suggested audience of this document.

1.2 Scope

This SDD describes the detailed structure of the components of the chat analysis application and the implementation details required to satisfy the requirements as specified in the SRS.

1.2.1 Description and Scope of the application

This chat analysis application analyzes information exchanged between clients and operatives of New Vision via an online chat inform of visual diagrams (i.e. graphs,plots,word cloud etc) that will be used to provide a clear review and analysis of data. For example it will output:

- A bar graph indicating emotional reaction of the customers towards the department's customer service.Bar graphs of the different field names against other field names for example a bar graph of countries versus operatives or customers and many others.
- Pie charts of the different field names for example a pie chart indicating New Vision operatives and the number of customers they have operated on.
- A word cloud indicating the most common words within the chat content

1.2.2 Goal

The goal of chat analysis application is to specifically derive or output understandable models that can be used to effectively analyze sentiments exchanged between New Vision operatives and its clients, draw out results that can be interpreted to make desired decisions in the company.

1.2.3 Main Objective

To develop a data analysis application for reviewing, analyzing and visualizing data for New Vision.

1.2.3.1 Specific Objectives

- To analyze and visualize chat content from the customers with an aim of displaying the common words within the chats that may guide the New Vision customer support department in determining the most common complaints from their customers.
- To analyze and visualize the emotional reaction of the customers towards the department's customer service.
- To visualize the most hard working or active operator among company operators, this will guide the department in performing employee morale boosting.
- To provide better decision making tools that will be used by the New Vision corporate staff in making better and smart decisions towards their customer service delivery for example the application will produce bar graphs and pie charts of different fields against their counter parts from the uploaded file which can be downloaded and saved for future reference.

1.3 Overview

Up to SDD, the concept paper document and SRS have been released. In this document, detailed design of the system with user interfaces will be described. In section 3; decomposition of the system with module.Decomposition, concurrent process decomposition

and data decomposition is given, in section 4; Data design with data descriptions is given, in section 5; there is description of the component design. In section 6, there are user interfaces; screen objects, images and actions. In section 8; Requirements matrix is provided and finally in section 8; there is the appendix which has the abbreviations and their in full and the reference materials.

1.4 Definitions and Acronyms

For a complete list of the definitions and acronyms used in the remainder of this document, refer to the Glossary.

2. SYSTEM OVERVIEW

The chat data analysis application follows client-server architecture design. The application consists of two major components: the functional component,and the graphical component. The functional component consists of several methods or modules of New Vision chat analysis app. It receives user input (uploaded files) and displays the content. It performs all the analysis required to guide decision making process at New Vision Uganda through offering faster decision making techniques and better data analysis tools. The graphical component, as the name implies, is simply the graphical user interface. It provides all of the buttons, table panels, and other onscreen elements which user can interact with to use the application.

3. SYSTEM ARCHITECTURE

3.1 Architectural Design

The design of this New Vision data analysis application will follow the client/server architecture where by the client is represented by user Interface which is used to send requests to the server,which then services the requests of the client.

ADIAGRAM SHOWING CLIENT/SERVER ARCHITECTURE OF CHAT ANALYSIS APP

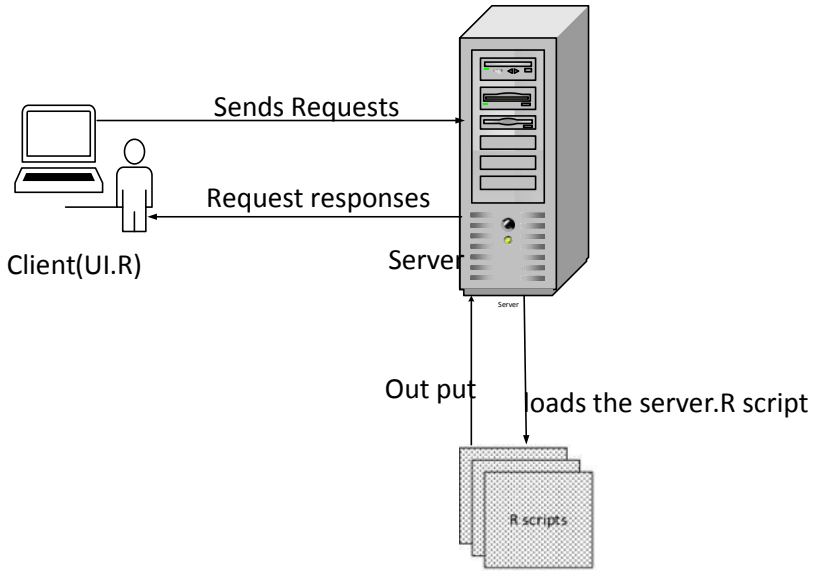


Fig 1.0 shows the client/server architecture of the New Vision chat analysis application

In this chat analysis application, the U1.R gets data from the user and sends it to the server. The server manipulates the data and sends the results in form of visual diagrams such as bar graphs, pie charts, sentiment analysis and word cloud which are displayed to the user on the user interface.

3.1.1 Module design

The SDD module design of the New Vision Chat Analysis application contains a detailed description of the classes within the whole application. The module design defines methods, properties and indicates algorithms or ways of how process occurs.

Uploading file class

The Uploading file class allows the user of New Vision chat analysis application to select a data file he/she wants to analyze. The data should be in csv or xls format.

PROCESSING NARRATIVE

When the app user selects a file, the file is then uploaded.

This file object is used to output visual diagrams which include:

- Bar graphs
- World cloud
- Sentiments
- Pie charts.

Therefore for the app user to visualize and analyze data of New Vision, a file must be uploaded first.

RESTRICTIONS/LIMITATIONS

The data set to be uploaded should be a csv file or an xls file and should contain column names as they are in within the sample data set (New Vision file) that is to say fields like ID, city, department, country, chat content, operatives' names, waiting time in minutes and URLs being used by clients because the application will be developed basing on the imported file.

Data Analysis and visualization class

This class analyzes and visualizes data within the uploaded file.

PROCESSING NARRATIVE

When a user selects an analysis tool from the navigation bar, the data within the uploaded file is analyzed according to the selected analysis tool.

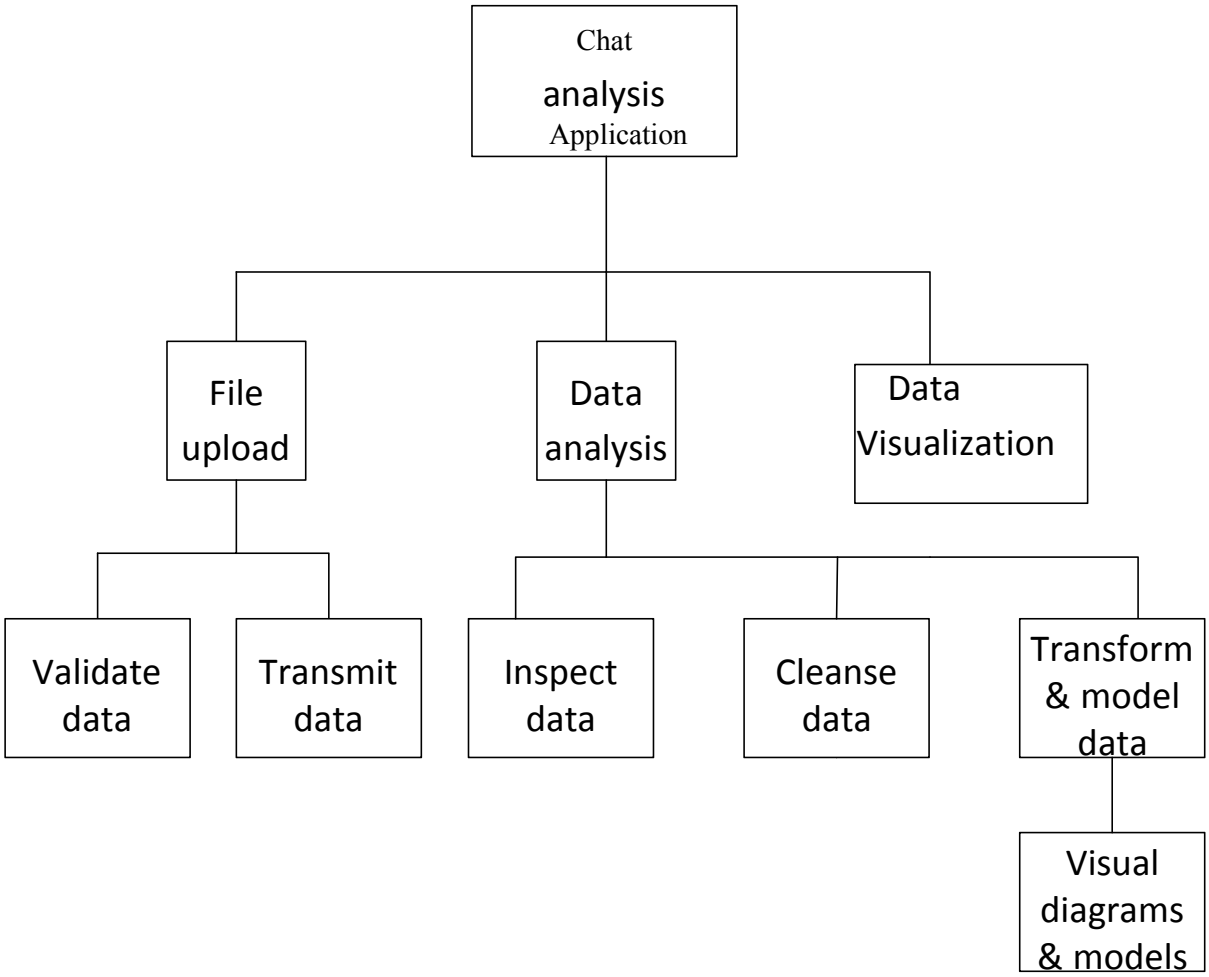
This analyzed data object will be used to output visual diagrams such as:

- Bar graphs of operators against countries, wait.time against countries an so much more
- World cloud of most common words within chat content
- Pie charts.

3.2 Decomposition Description

This section decomposes each use-case feature into its data flow processes by examining its data flow diagram and process. These assist in determining the preliminary members and methods of the modules that need to be implemented, or the modifications to existing modules to implement the feature. This document uses the names of the use cases in the SRS document as the names of the features. This section includes the description of the intended design to meet the requirements. When appropriate, the use cases will be expanded to include system requirements. This section also incorporates a decomposition diagram providing the segments involved in each process.

3.2.1 Decomposition diagram



3.2.2 Data flow diagrams

These diagrams provide a description of how data flows within the New Vision chat analysis app. There is a level 1 data flow diagram obtained from the context diagram, it consists of all the processes within the New Vision chat analysis app. This diagram is further divided into child diagrams which provide steps involved in each process thus every process has its own child diagram.

LEVEL 1 DFD OF NEW VISION CHAT ANALYSIS APP

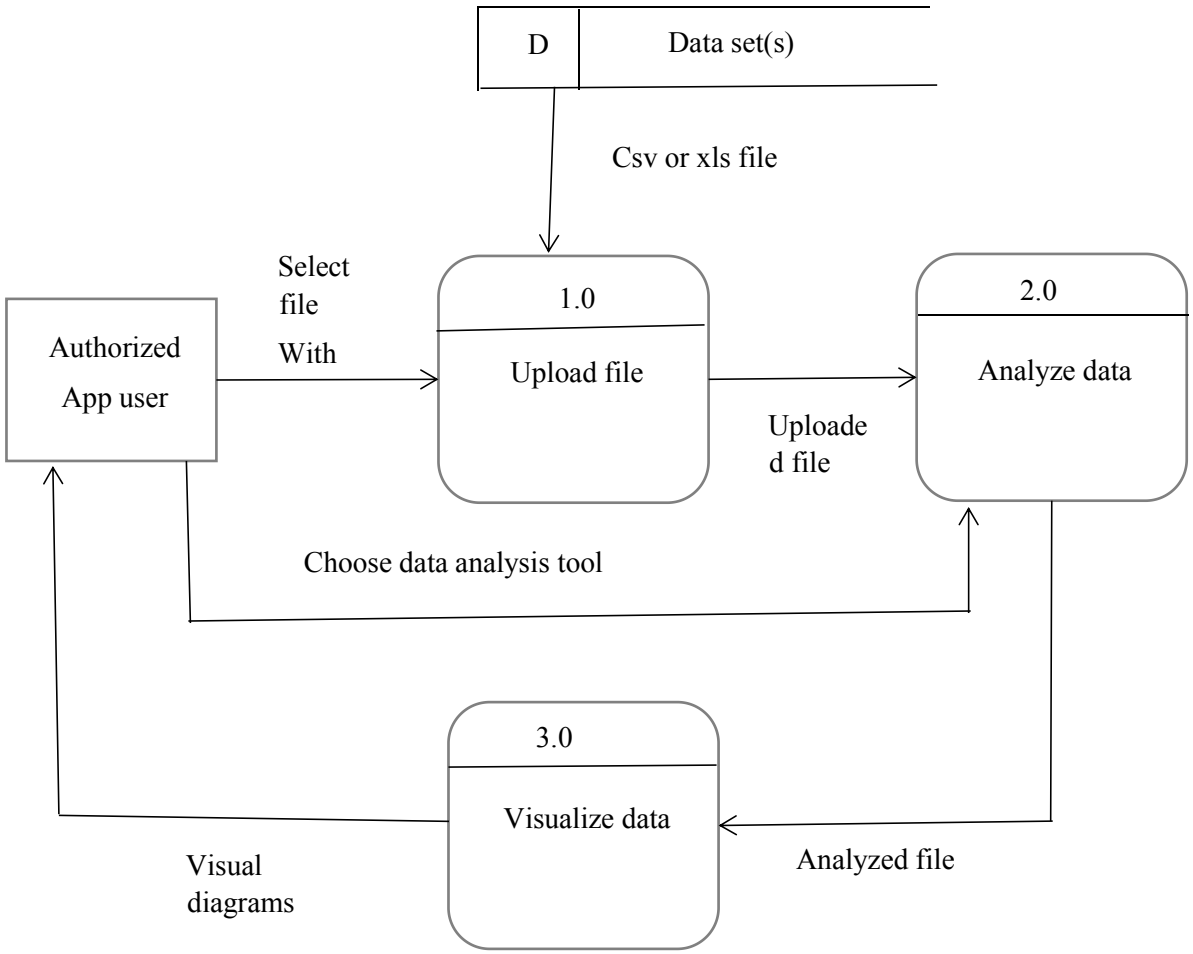


Fig 2.0 level 1 data flow diagram of New Vision chat analysis app

3.2.3 Child DFD diagrams

Process specifications and functional primitives

1.**File Upload**

1.1 Choose a file

1.2 Upload a file

1.3 Display uploaded file

2. Analyze data

2.1 Select an analysis tool

2.2 Analyze data

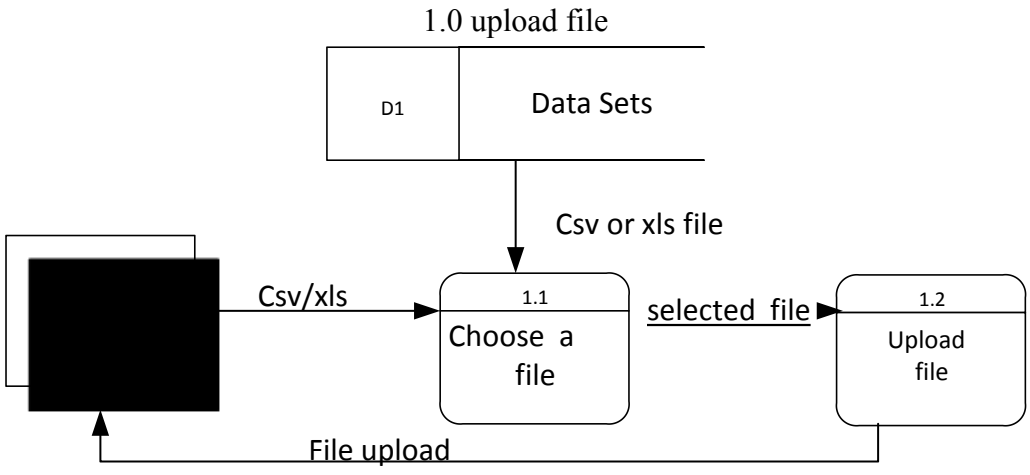
3. Visualize data

3.1 Select an analysis tool

3.2 Analyze data

3.3 Visualize analyzed data

3.2.2.1 CHILD DIAGRAM FOR UPLOAD FILE PROCESS



3.2.2.2 CHILD DIAGRAM FOR ANALYZE DATA PROCESS

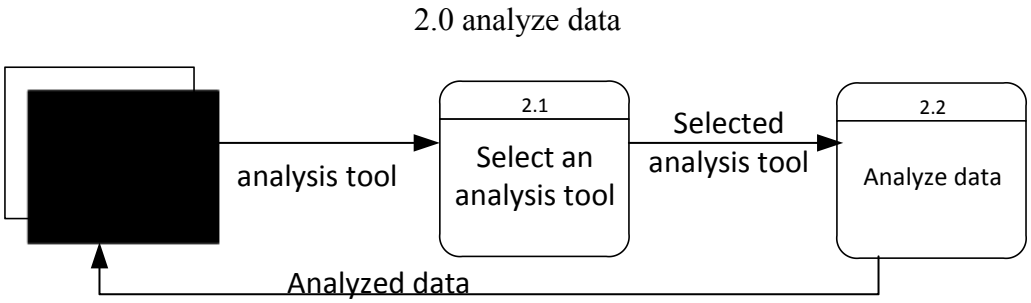


***Fig 1.4* level 1 diagram for analyze data process**

3.2.2.3 CHILD DIAGRAM FOR VISUALIZE DATA PROCESS

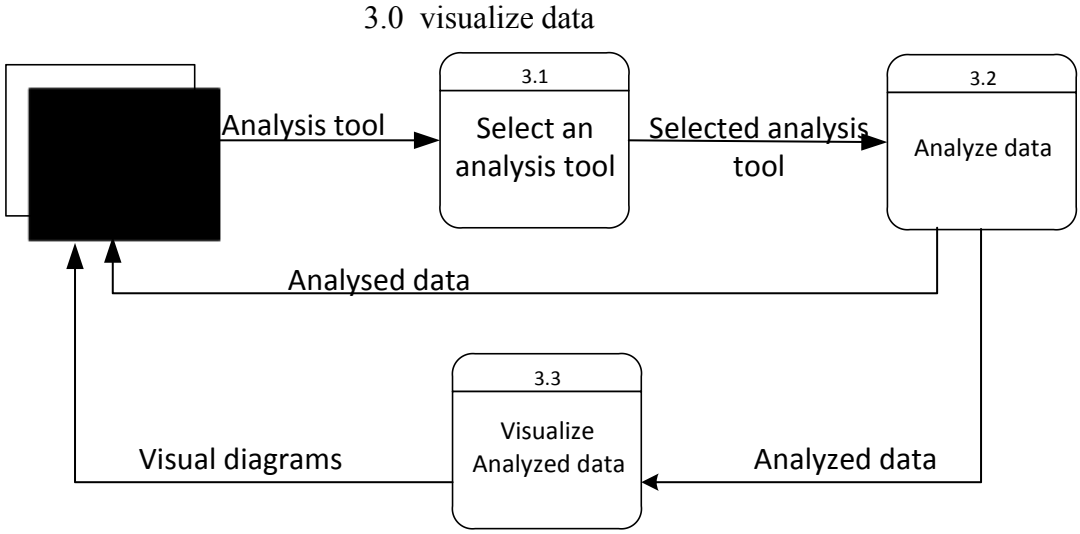


Fig 2.5 level 1 diagram for visualize data process

1.2 Design Rationale

Client/server architecture is preferred in designing chat analysis application because of the need to provide the user with an interactive interface. Most of the manipulations will be done in the server and this makes the user/operator's interaction with the application easier since he /she will only have to send requests to which the server will respond to.

4. DATA DESIGN

4.1 Data Description

This New Vision chat analysis application uses chat data about customers and operatives of New Vision.This data is obtained from the interaction between New Vision operative and the customer via online chat .It will be collected within Microsoft excel spread sheet(s) which can be also saved as csv file(s). These xls or csv files will be the data sets to be uploaded into the application.

4.2 Data Dictionary

TABLE FOR CHAT ENTITY OF THE NEW VISION CHAT ANALYSIS APP

Attributes	Types	Descriptions
Chat content	Character	Contents of the chat between the New Vision operative and the customer
ID	Numeric	Chat Identity
Date	Date	Date of the chat
Came.from	Character	Link of the response
Wait.time	Integer	Waiting time during the chat(in seconds)
Minutes	Alphanumeric	Waiting time in minutes

Fig 3.0 table for chat entity of the New Vision chat Analysis app

TABLE FOR CUSTOMER ENTITY OF THE NEW VISION CHAT ANALYSIS APP

Attributes	Types	Descriptions
ID	Numeric	Identity of the client
Visitor.name	Character	Customer name
Vote.status	Character	Voting status of the customer
Country	Character	Country of the customer

Fig 3.1 table for customer entity of the New Vision chat Analysis app

TABLE FOR OPERATOR ENTITY OF THE NEW VISION CHAT ANALYSIS APP

Attributes	Types	Descriptions
Name	Character	Operator name
Department	character	Department to which operator belongs to

Fig 3.1 table for operator entity of the New Vision chat Analysis app

TABLE SHOWING METHODS AND THEIR PARAMETERS OF THE DFD

Methods	Method parameters
UploadFile() chooseFile()	Csvfile
AnalyseData() selectAnalysisTool()	uploadedFile
visualizeData()	AnalysedData

Fig 2.4 table showing methods and their parameters of the DFD in section 3.2.1

5. COMPONENT DESIGN

- **File Upload**

Algorithm

1. Run the app
2. Select a file
3. Upload the file

❖ **Analyze and visualize data**

Algorithm

1. Choose the x and y variable in case of the need to create a bar graph and pie chart.

2. Select an analysis tool from the tab set panel.

6. HUMAN INTERFACE DESIGN

This section provides a complete description of the actual user interfaces of the New Vision chat analysis application. It includes screen images of the interfaces with brief explanation on their importance and how user interacts with them.

6.1 Overview of User Interface

The user interface consists of a tab set panel with a set of tab panels, and a left side bar with a set of buttons through which the user can interact with the system. The buttons on the left side bar include the browse button and the tab panels on the tab set panel include, uploaded contents, a bar graph, a word cloud, a pie chart, sentiment analysis.

These components will be arranged in such a way that the user will be able to quickly understand the purpose of each component and perform whatever task it is designed for,efficiently. A detailed description of this side bar and tab set panel and their interactions with each other will be described in section 6.3.

INTERFACE THAT AUTHENTICATES THE USER

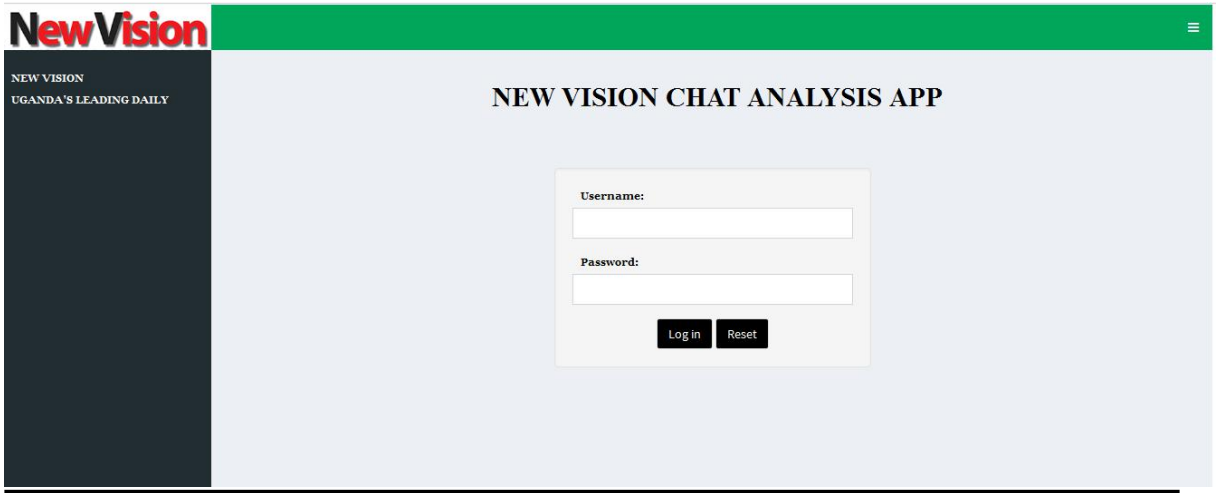


Fig 3.0 shows a log in interface for chat analysis app.Registered user must enter correct details ie username and password to access full functionality of the app.

6.2 Screen Images

USER INTERFACE THAT ACTS AS INDEX PAGE AFTER LOGGING IN

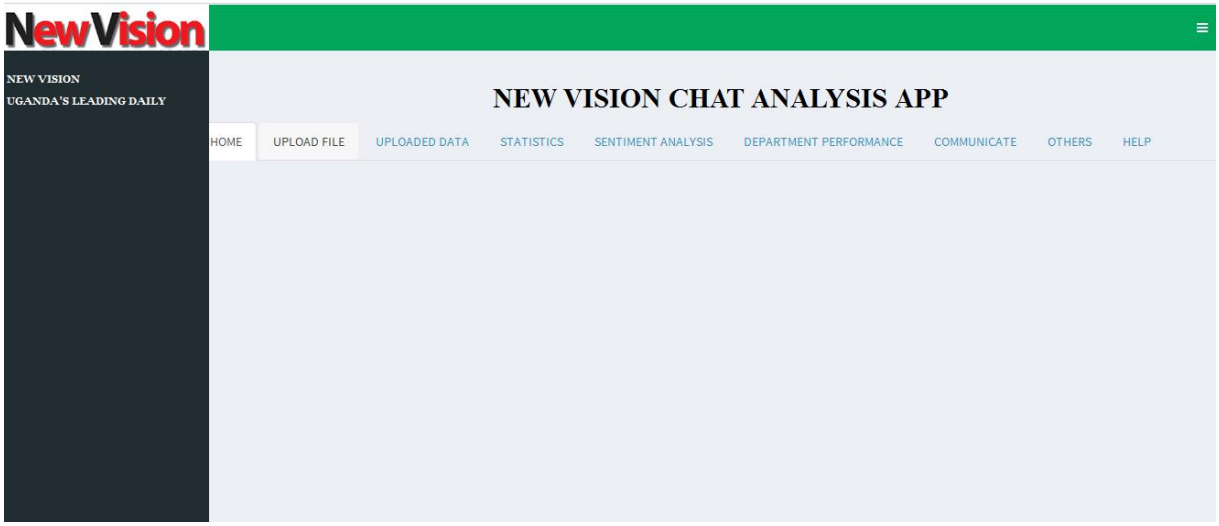


Fig 6.0 On loading the application this page will be displayed indicating all the various buttons, tab panels (as mentioned in section 6.1) available for the user interact with the application.

INTERFACE THAT IS DISPLAYED FOR THE USER TO SELECT A DATA FILE

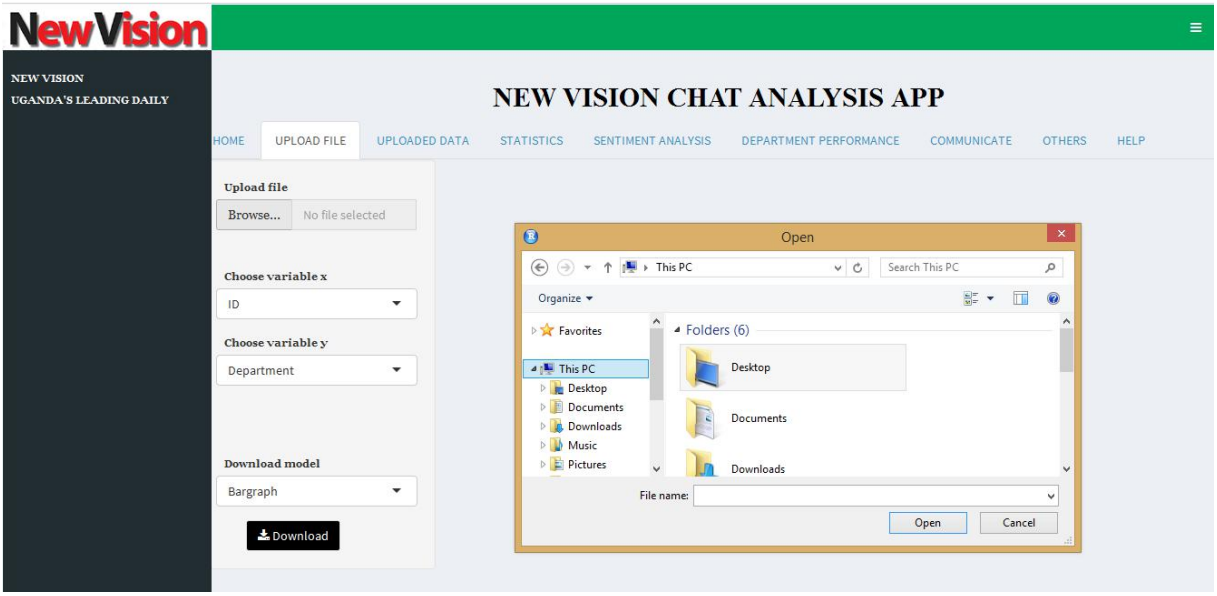


fig 6.1 In order for the application to analyze data, the user will be expected to select and upload a file. This figure shows a tab that will be displayed when a user clicks the browse button, it helps the user to choose a file that he/she wants to be analyzed.

INTERFACE SHOWING UPLOADED CONTENTS ONCE DATA FILE IS UPLOADED

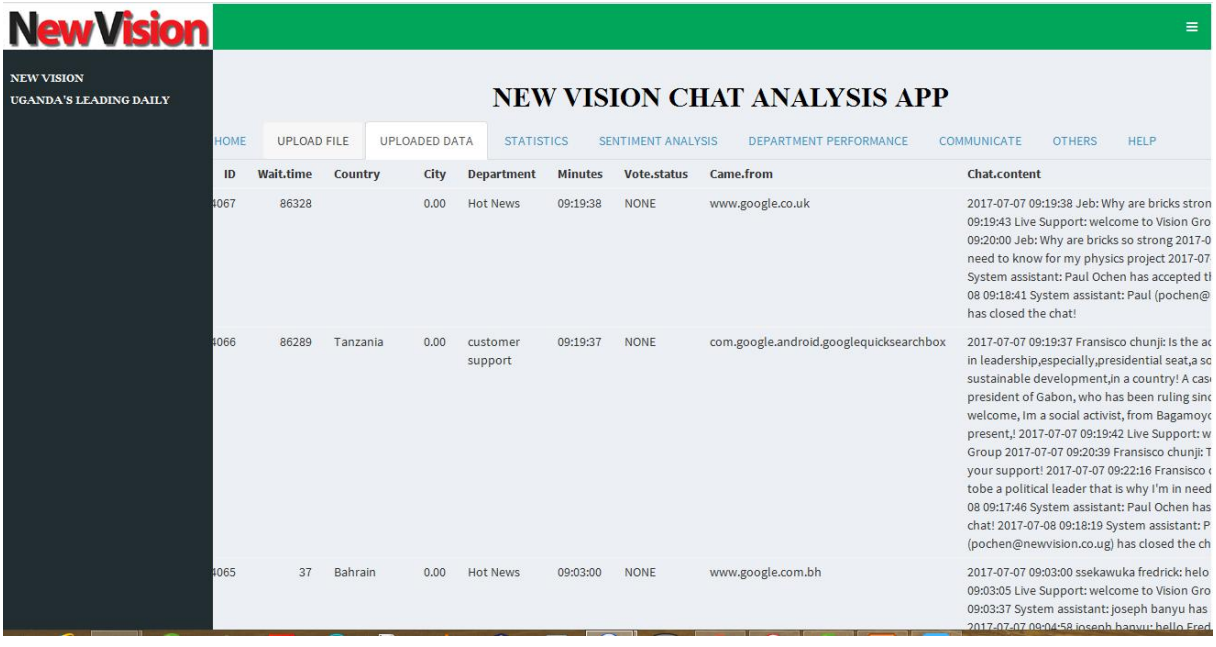


Fig 6.2 shows a page containing the contents of the uploaded file. In case the user wants to see the contents of the uploaded file, he/she will have to click the uploaded contents tab panel.

INTERFACE SHOWING ONE OF THE BAR GRAPHS THAT CAN BE OUTPUT

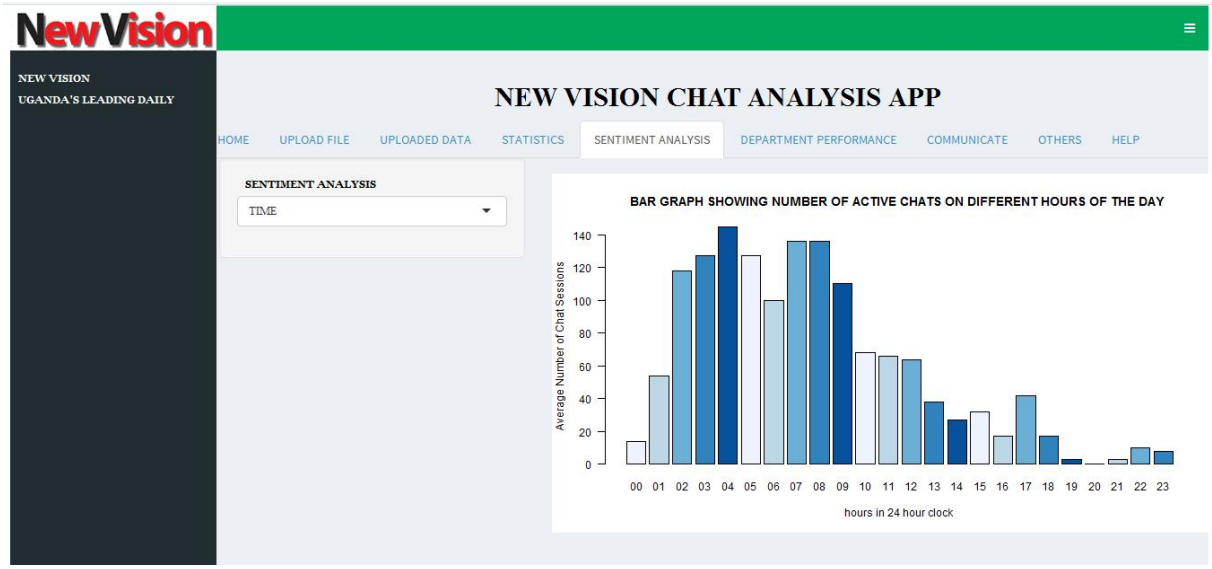


Fig 6.3 shows one of the bar graphs that can be produced by application. For bar graph to be created,the user will have to first select two variables x and y of his or her own choice, and then he/she will have to click the bar graph from the table set panel for it to be displayed.

INTERFACE SHOWING ONE OF THE PIE CHARTS THAT CAN BE OUTPUT

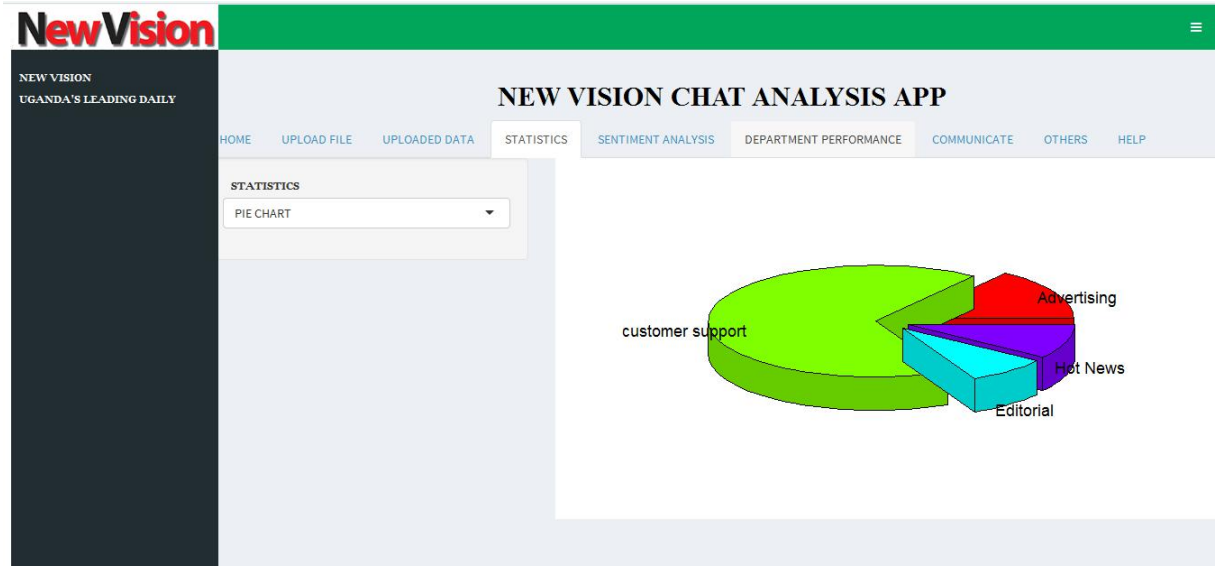


Fig 6.4 shows one of the pie charts that application can output. For pie chart to be created,the user will have to first select two variables x and y of his or her own choice, then he/she will have to click the pie chart from Visualization dashboard for it to be displayed.

INTERFACE SHOWING A WORDCLOUD AS ONE OF ANALYSIS TECHNIQUES

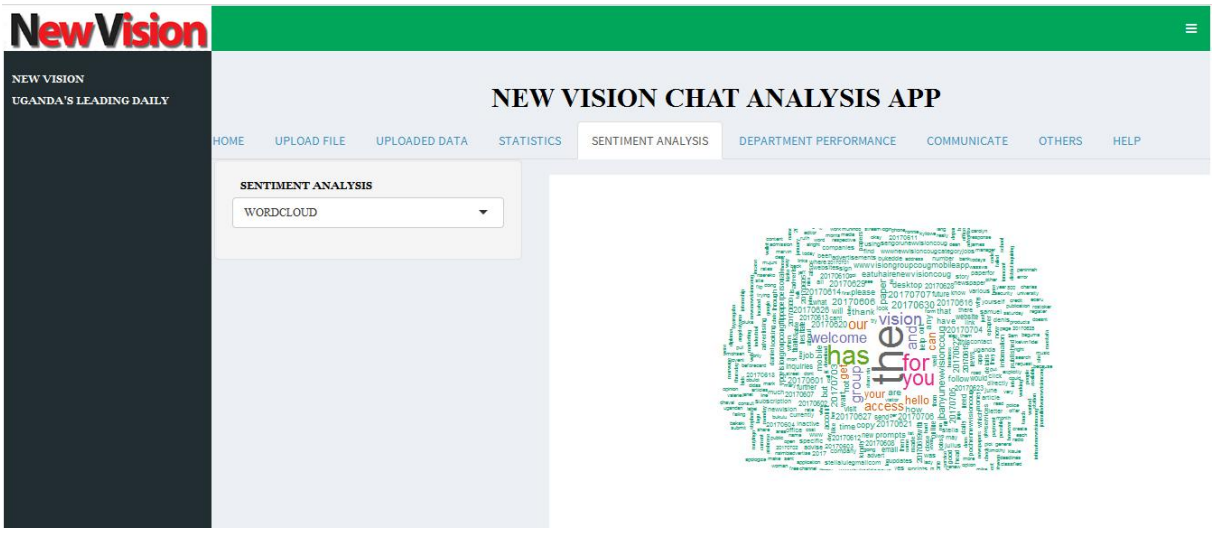


Fig 6.5 shows a word cloud that can be output by chat analysis app. For a word cloud to be displayed,the user must have uploaded data, then he/she will have to select word cloud under Sentiment Analysis from tab panel for it to be displayed.

INTERFACE THAT CAN BE USED BY APP USER TO SEND AN EMAIL TO APPROPRIATE RECIEVER.

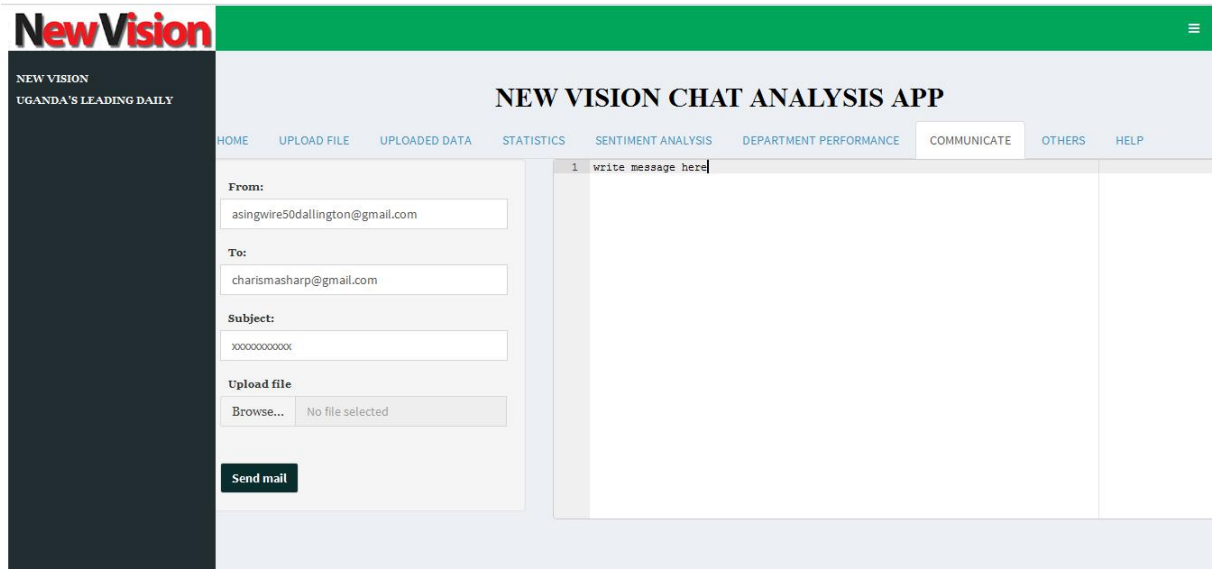


Fig 6.6 shows an interface used to send an email by app user. For this interface to be displayed,the user must select Communication from tab panel for it to be displayed.

INTERFACE THAT IS USED TO ASSESS OPERATORS' PERFORMANCE

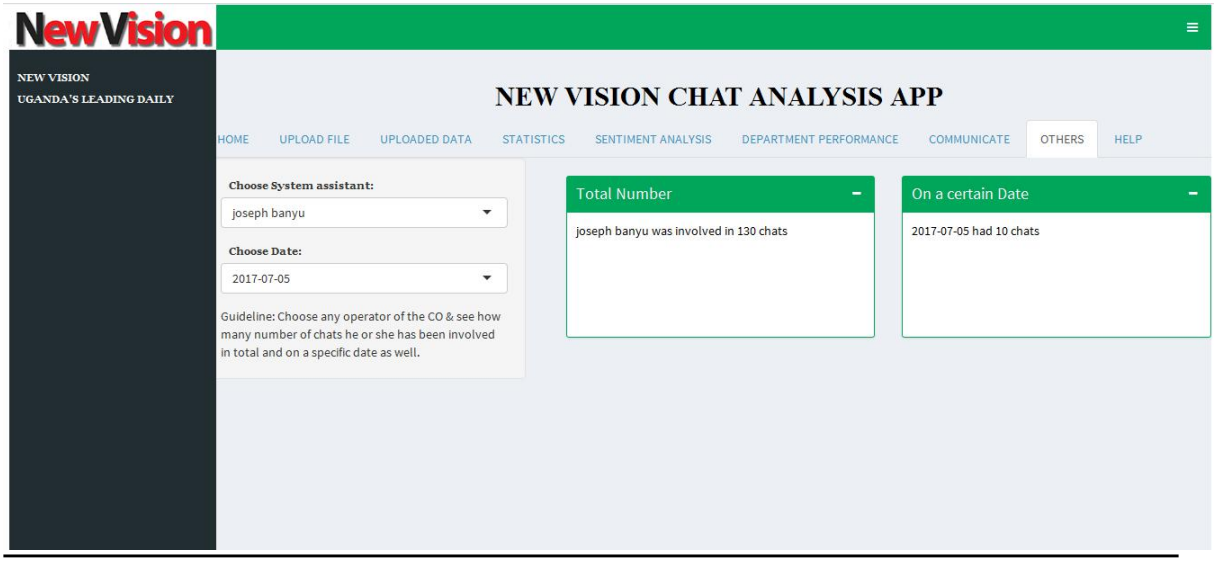


Fig 6.7 shows one of the interfaces used to assess performance of operators .For an authorized app user to determine most hardworking operator,file data must be uploaded first and then he or she selects 'OTHERS' tab. Under this tab,the app user selects system assistant to see how many chats he or she has participated in and can also enter a specific date to determine number of chats on that real day.

INTERFACE THAT PROVIDES APP USER GUIDELINES ON HOW TO USE THE APP

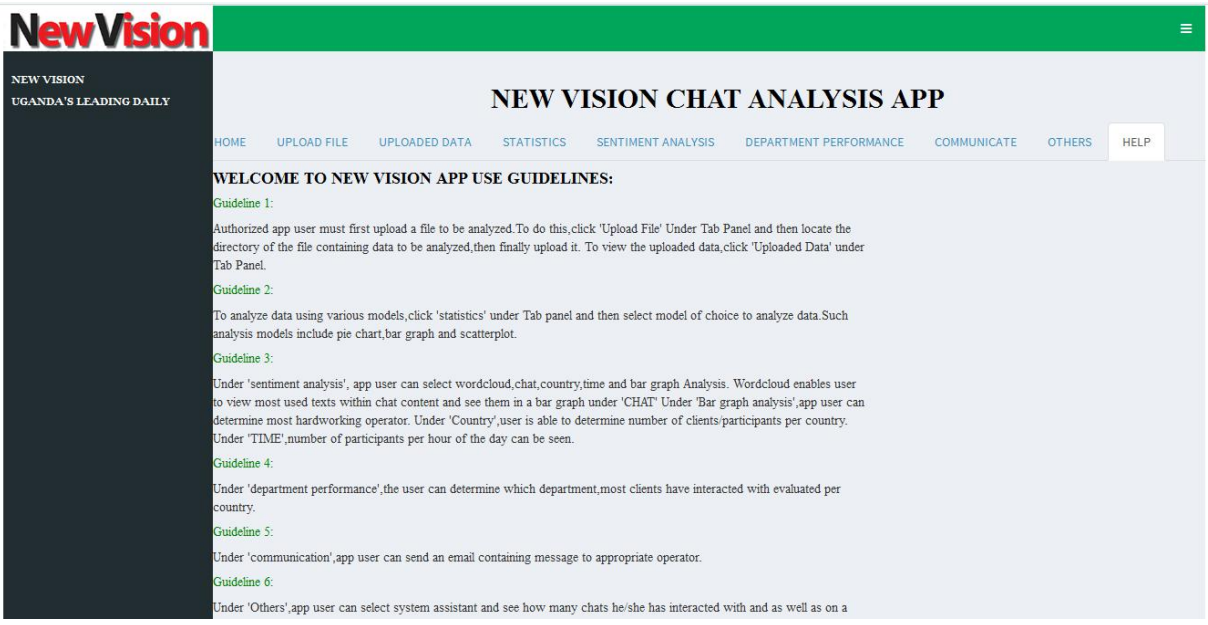


Fig 6.8 shows an interface with guidelines to enable app user in case of any help .App user clicks on HELP under Tab panel and he or she will be able to view app guidelines.

6.3 Screen Objects and Actions

The screen objects and actions with in the New Vision chat analysis app include the following:

1. Tab set panel

This displays most of the application's useful tab panels which include uploaded contents, bar graph, word cloud, pie chart, sentiment analysis.

- Uploaded contents tab panel - used to display contents of the uploaded file
- Bar graph tab panel - used to create bar graphs
- Pie chart tab panel - used to create pie charts.
- Word cloud tab panel - used to create the word cloud
- Sentiment analysis tab panel- used to create a bar graph showing the customer's emotions.

2. Left side bar

- This includes a browse button which is used to select a file to be uploaded and also to upload the selected file.
- It also includes a section for selecting the x and y variables to be used in plotting the bar graphs
- It also includes a download button which will be used to download the displayed visual diagrams.

7. REQUIREMENTS MATRIX

UC stands for use case

Use Cases from SRS	Upload file Component	Analyze data component	Visualize data component
UC1	X		
UC2	X	X	
UC3	X	X	X

8. APPENDICES

Terms	**Definitions**

Concept paper document	A document that is used to convince a project sponsor that a project needs to kicked-off to solve a particular business problem or opportunity.
Sentiment analysis	The process of determining whether a piece of writing is positive, negative or neutral.
Word cloud	An image composed of words in a particular text, email or subject in which the size of each word indicates frequency or importance.

Acronym/Abbreviation	**Full Form**
i.e.	that is
CSV	Comma Separated Values
SRS	Software Requirements Specifications
SDD	Software Design Document
DFD	Data Flow Diagram
ID	Identification

8.1 Reference Material

[1]SRS Group 3, 2018

[2]433-340 Software Engineering Project Manual, 2002