

# MAKERERE

COLLEGE OF COMPUTING AND



# UNIVERSITY

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

### PROJECT MEMBERS [GROUP 3]

NAME	REG NO	STUDENT NO
ASINGWIRE DALLINGTON	16/U/127	216000708
KALEMA ARNOLD	16/U/5256/PS	216003529
NANJUKI SAIDAT	16/U/9715/PS	216017634
MUTUNGI DENIS SHARP	16/X/2340/PS	216002239

**PROJECT LEADER:** ASINGWIRE DALLINGTON

**SUPERVISOR:** NOAH KANGE

SUBMITTED IN PARTIAL FULFILLMENT OF  
SOFTWARE ENGINEERING RECESS PROJECT BSE 2301  
4TH, JULY 2018

## Contents

1. INTRODUCTION.....	3
1.1 Purpose.....	3
1.1.1 Intended Audience.....	3
1.2 Scope.....	3
1.2.1 Description and Scope of the system.....	3
1.2.2 The goal.....	4
1.2.3 Main Objective.....	4
1.3 Overview.....	4
1.4 Definitions and Acronyms.....	5
2. SYSTEM OVERVIEW.....	5
3. SYSTEM ARCHITECTURE.....	5
3.1 Architectural Design.....	5
3.1.1 Module design.....	6
3.2 Decomposition Description.....	7
3.2.1 Decomposition diagram.....	8
3.2.2 Data flow diagrams.....	8
Level 1 DFD.....	9
3.2.3 Child DFD diagrams.....	10
4. DATA DESIGN.....	12
4.1 Data Description.....	12
4.2 Data Dictionary.....	12
5. COMPONENT DESIGN.....	13
6. HUMAN INTERFACE DESIGN.....	14
6.1 Overview of User Interface.....	14
6.2 Screen Images.....	15
6.3 Screen Objects and Actions.....	18
7. REQUIREMENTS MATRIX.....	20
8. APPENDICES.....	20
8.1 Reference Material.....	21

## **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**

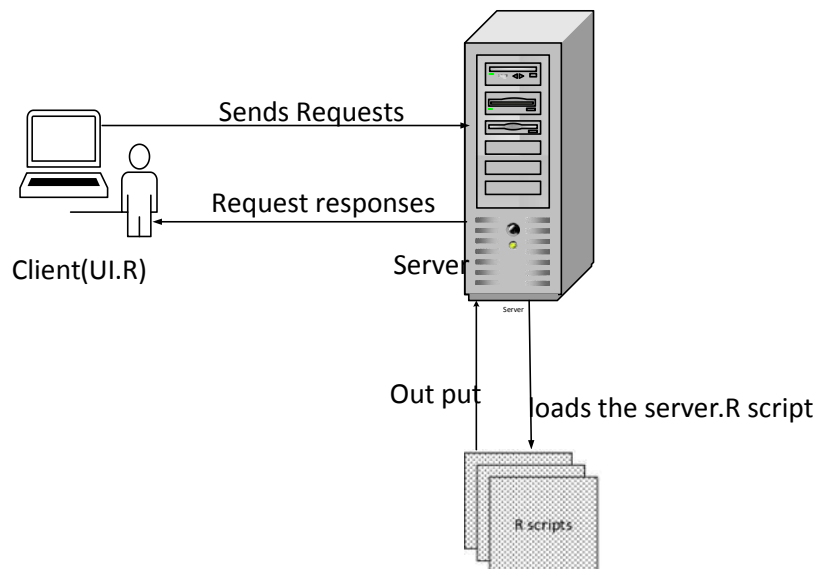
The chat data analysis application follows client-server architecture design. The application consists of two major components: the functional component, and the graphical component. The functional component consists of several methods or modules of New Vision chat analysis app. It receives user input (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 UI.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.

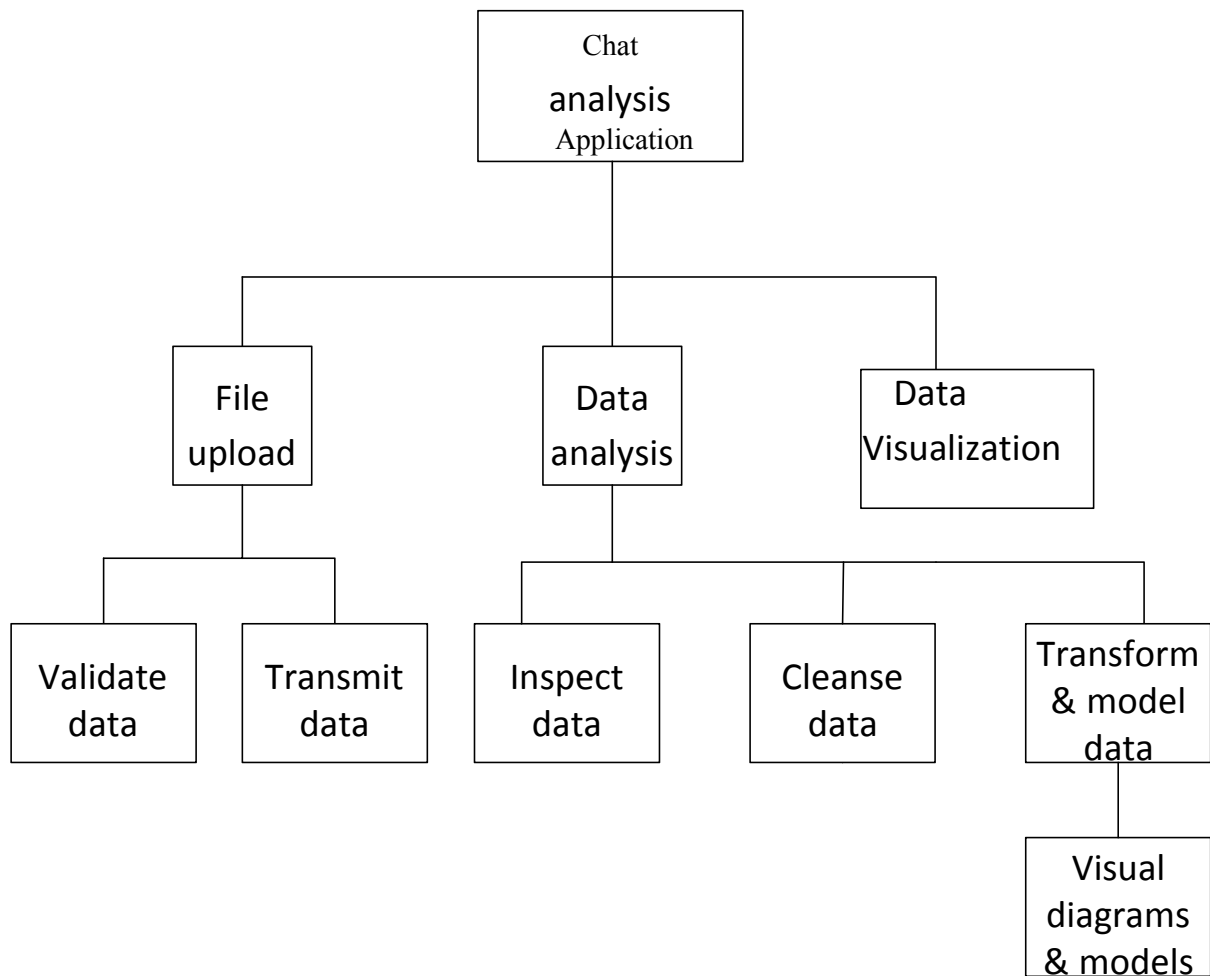
This analyzed data object will be used to output visual diagrams such as:

- ❖ 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

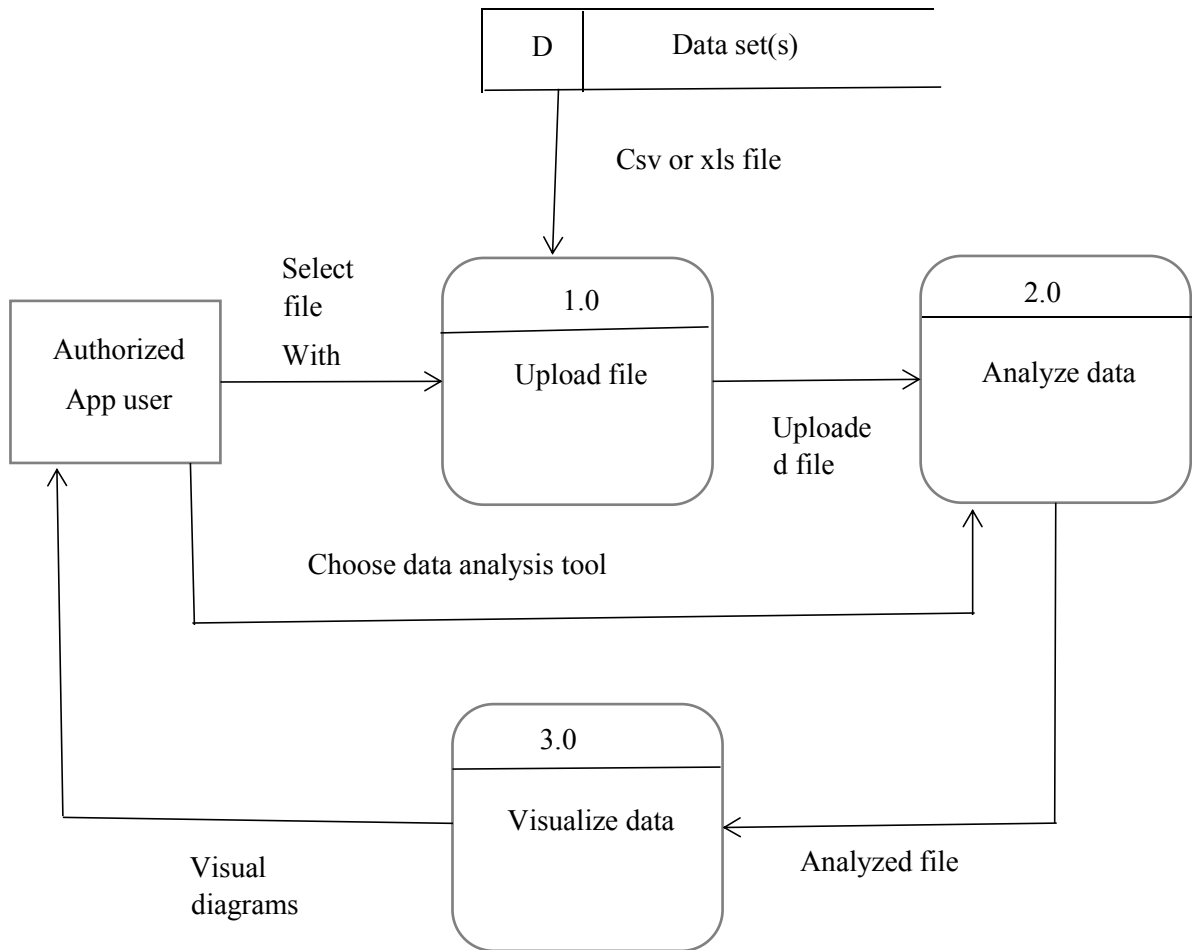


### 3.2.2 Data flow diagrams

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

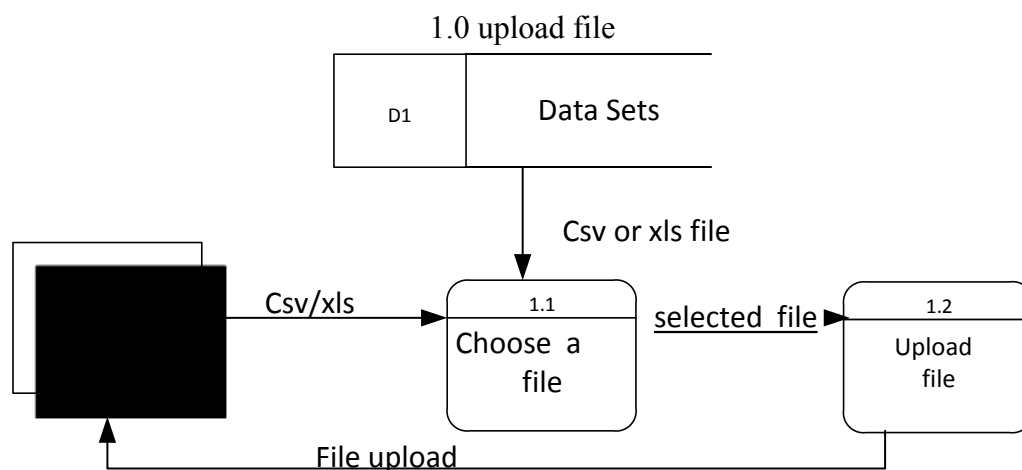
#### 3. Visualize data

3.1 Select an analysis tool

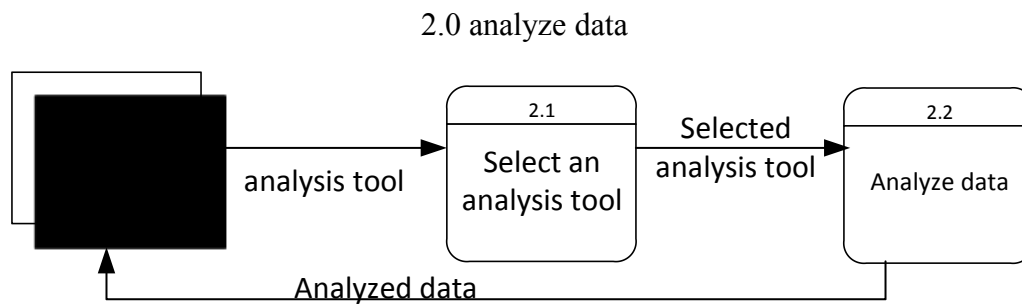
3.2 Analyze data

3.3 Visualize analyzed data

#### 3.2.2.1 CHILD DIAGRAM FOR UPLOAD FILE PROCESS

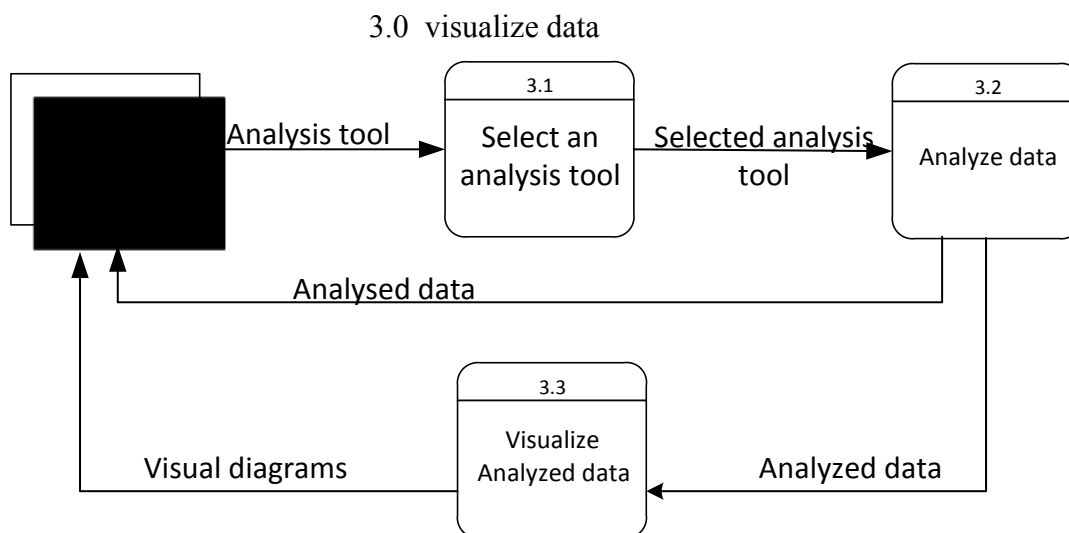


### **3.2.2.2 CHILD DIAGRAM FOR ANALYZE DATA PROCESS**



***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

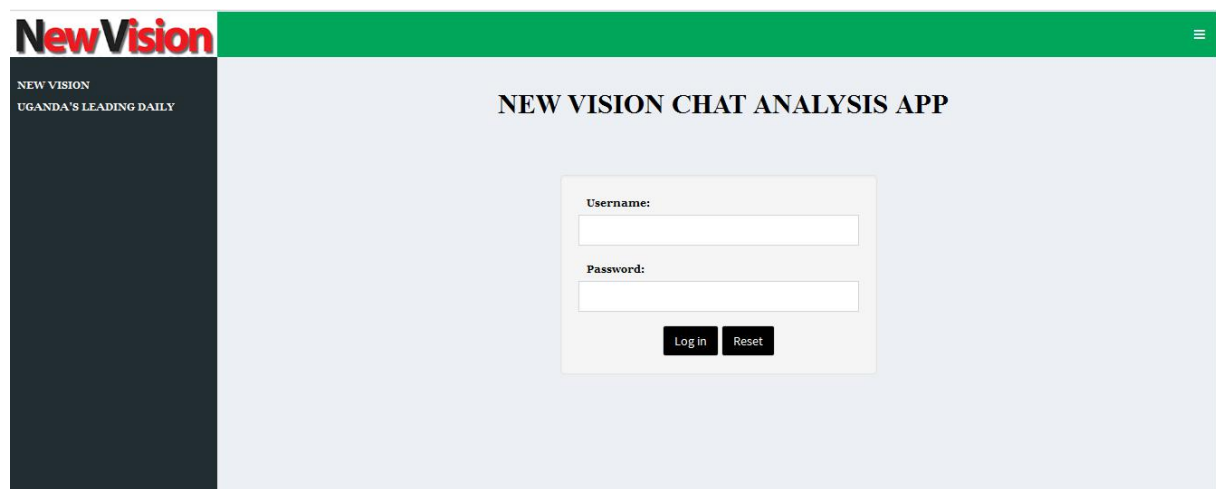
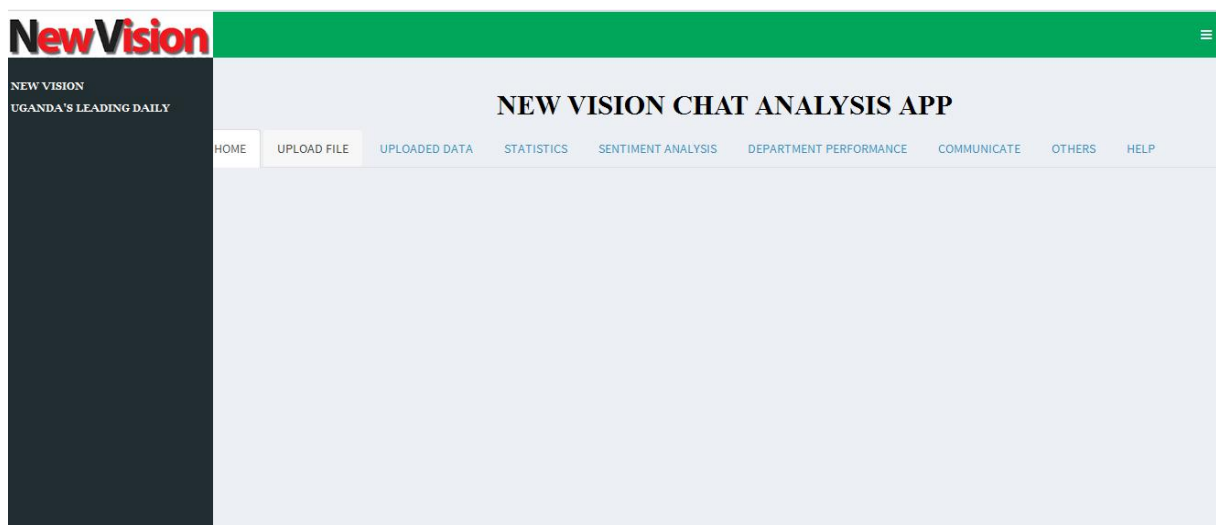
The screenshot shows the login interface of the 'New Vision Chat Analysis App'. At the top, there is a green header bar with the 'NewVision' logo on the left and a hamburger menu icon on the right. Below the header, the main content area has a light blue background. On the left side of this area, there is a dark blue vertical sidebar containing the text 'NEW VISION' and 'UGANDA'S LEADING DAILY'. In the center of the main area, the title 'NEW VISION CHAT ANALYSIS APP' is displayed. Below the title is a white login form with two input fields: 'Username:' and 'Password:'. At the bottom of the form are two buttons: 'Log in' and 'Reset'.

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.

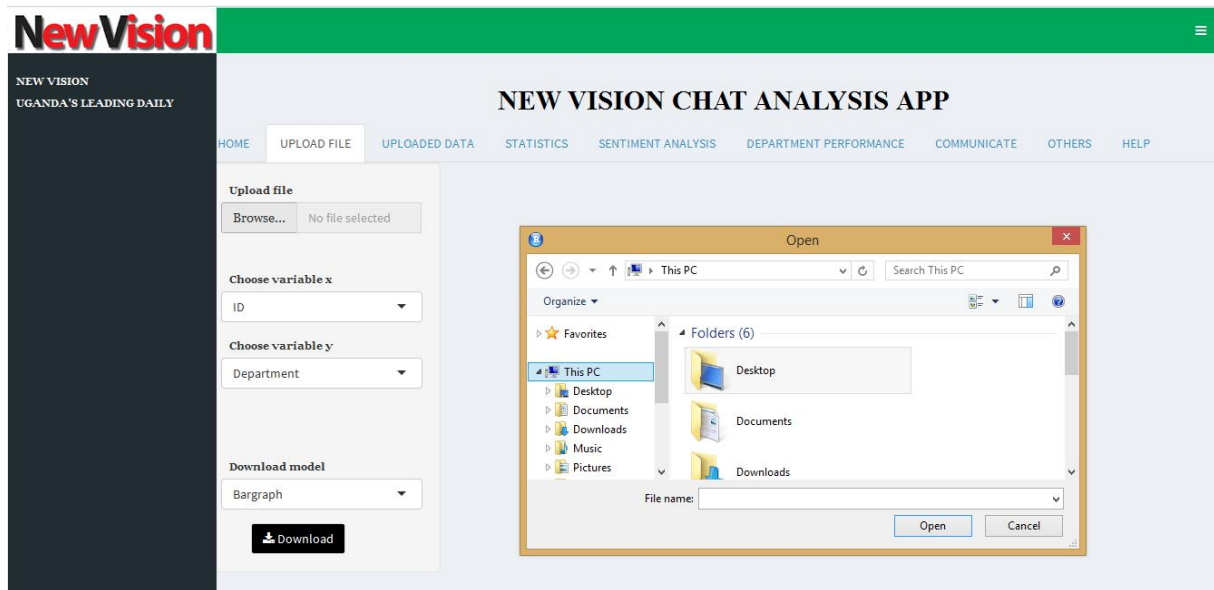
## 6.2 Screen Images

### 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.

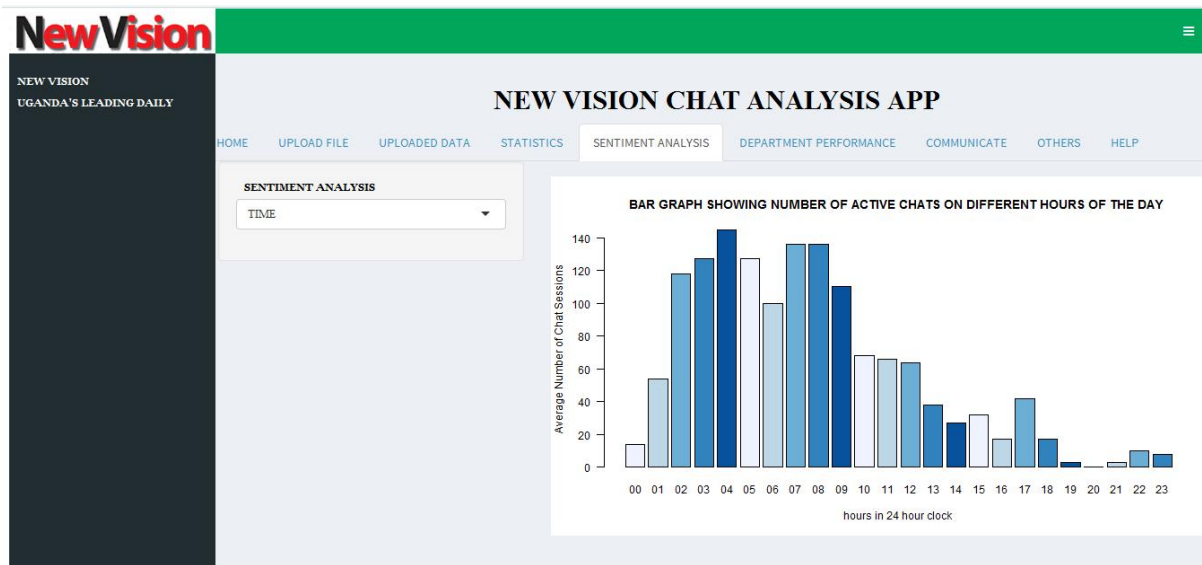
## INTERFACE SHOWING UPLOADED CONTENTS ONCE DATA FILE IS UPLOADED

ID	Wait.time	Country	City	Department	Minutes	Vote.status	Came.from	Chat.content
067	86328			Hot News	09:19:38	NONE	www.google.co.uk	2017-07-07 09:19:38 Jeb: Why are bricks stron 09:19:43 Live Support: welcome to Vision Gro 09:20:00 Jeb: Why are bricks so strong 2017-0 need to know for my physics project 2017-07 System assistant: Paul Ochen has accepted tl 08 09:18:41 System assistant: Paul (pochen@ has closed the chat!
066	86289	Tanzania		customer support	09:19:37	NONE	com.google.android.googlequicksearchbox	2017-07-07 09:19:37 Fransisco chunji: Is the ac in leadership,especially,presidential seat,a so sustainable development,in a country! A cas president of Gabon, who has been ruling sinc welcome, Im a social activist, from Bagamoyo present,! 2017-07-07 09:19:42 Live Support: w Group 2017-07-07 09:20:39 Fransisco chunji: T your support! 2017-07-07 09:22:16 Fransisco tobe a political leader that is why i'm in need 08 09:17:46 System assistant: Paul Ochen has chat! 2017-07-08 09:18:19 System assistant: P (pochen@newvision.co.ug) has closed the ch
065	37	Bahrain		Hot News	09:03:00	NONE	www.google.com.bh	2017-07-07 09:03:00 ssekawuka fredrick: helo 09:03:05 Live Support: welcome to Vision Gro 09:03:37 System assistant: joseph banyu has 2017-07-07 09:04:58 joseph banyu:hello Fred

**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.

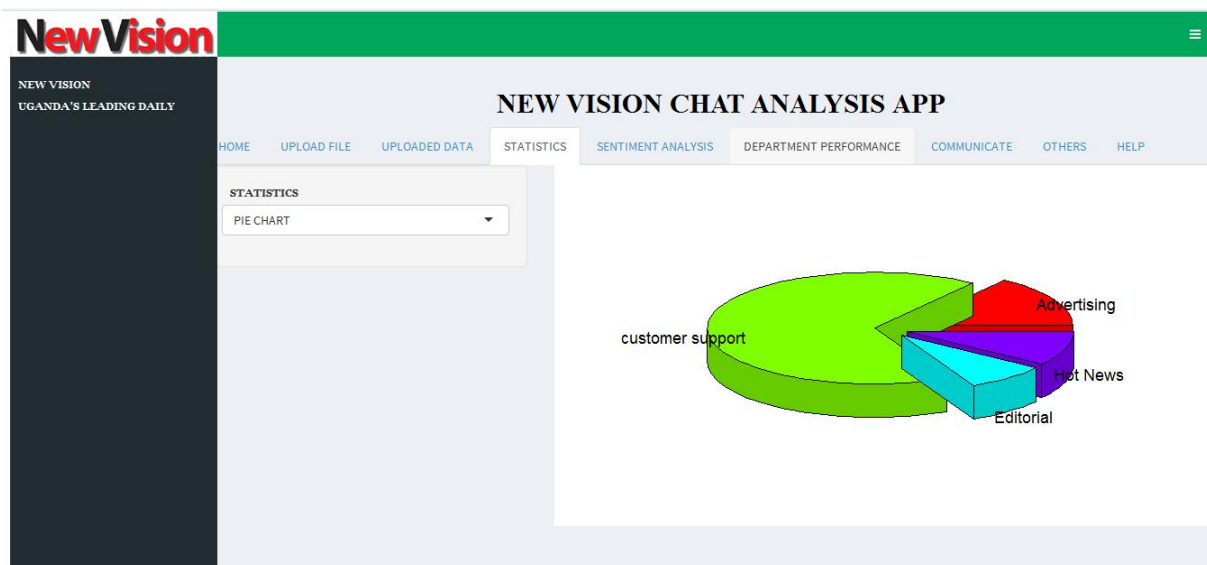


## INTERFACE SHOWING ONE OF THE BAR GRAPHS THAT CAN BE OUTPUT



**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

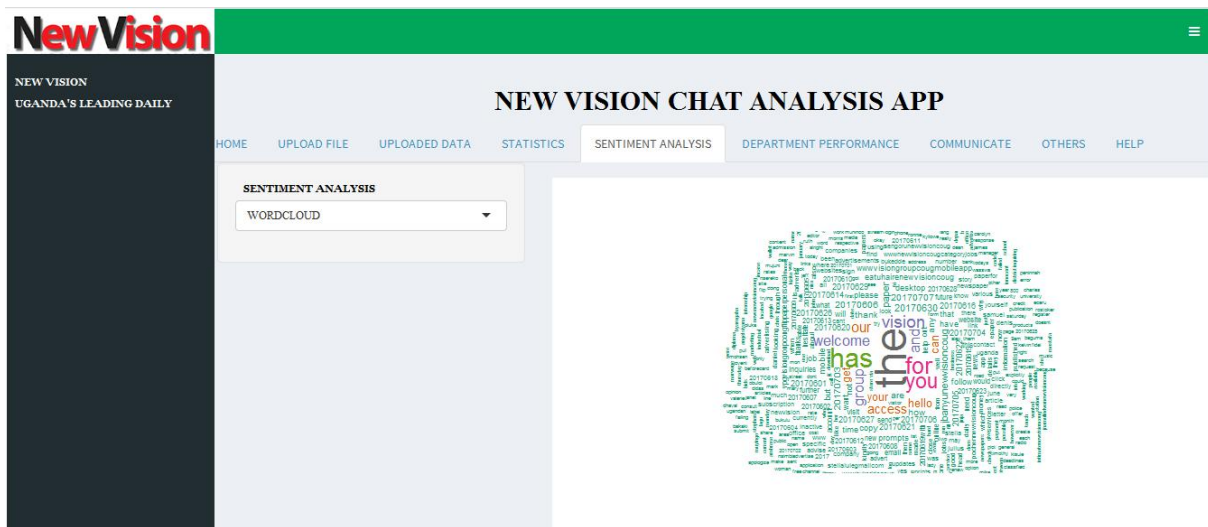


Fig 6.5 shows a word cloud that can be output by chat analysis app. For a word cloud to be displayed, the user must have uploaded data, then he/she will have to select word cloud under Sentiment Analysis from tab panel for it to be displayed.

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

The screenshot displays the 'NEW VISION CHAT ANALYSIS APP' interface with the 'COMMUNICATE' tab selected. The left sidebar remains the same. The navigation bar highlights 'COMMUNICATE'. The main content area is divided into two sections. On the left, there is an email composition form with fields for 'From:' (asimgwire50dallington@gmail.com), 'To:' (charismasharp@gmail.com), 'Subject:' (xxxxxxxxxxxx), and an 'Upload file' section with a 'Browse...' button and 'No file selected' text. A 'Send mail' button is at the bottom of this form. On the right, there is a large text area for writing the message, with a placeholder text '1 write message here'.

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

The screenshot shows the 'NEW VISION CHAT ANALYSIS APP' interface. On the left is a dark sidebar with the 'NewVision' logo and 'NEW VISION UGANDA'S LEADING DAILY'. The main header is green with a menu icon. Below the header is a navigation bar with tabs: HOME, UPLOAD FILE, UPLOADED DATA, STATISTICS, SENTIMENT ANALYSIS, DEPARTMENT PERFORMANCE, COMMUNICATE, OTHERS, and HELP. The 'OTHERS' tab is selected. The main content area has a left panel with two dropdown menus: 'Choose System assistant:' (set to 'joseph banyu') and 'Choose Date:' (set to '2017-07-05'). Below these is a guideline text. To the right are two green-bordered boxes: 'Total Number' showing 'joseph banyu was involved in 130 chats' and 'On a certain Date' showing '2017-07-05 had 10 chats'.

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

The screenshot shows the 'NEW VISION CHAT ANALYSIS APP' interface with the 'HELP' tab selected. The main content area displays 'WELCOME TO NEW VISION APP USE GUIDELINES:' followed by six guidelines. The sidebar and navigation bar are identical to the previous screenshot.

**WELCOME TO NEW VISION APP USE GUIDELINES:**

- Guideline 1:**  
Authorized app user must first upload a file to be analyzed.To do this,click 'Upload File' Under Tab Panel and then locate the directory of the file containing data to be analyzed,then finally upload it. To view the uploaded data,click 'Uploaded Data' under Tab Panel.
- Guideline 2:**  
To analyze data using various models,click 'statistics' under Tab panel and then select model of choice to analyze data.Such analysis models include pie chart,bar graph and scatterplot.
- Guideline 3:**  
Under 'sentiment analysis', app user can select wordcloud,chat,country,time and bar graph Analysis. Wordcloud enables user to view most used texts within chat content and see them in a bar graph under 'CHAT' Under 'Bar graph analysis',app user can determine most hardworking operator. Under 'Country',user is able to determine number of clients/participants per country. Under 'TIME',number of participants per hour of the day can be seen.
- Guideline 4:**  
Under 'department performance',the user can determine which department,most clients have interacted with evaluated per country.
- Guideline 5:**  
Under 'communication',app user can send an email containing message to appropriate operator.
- Guideline 6:**  
Under 'Others',app user can select system assistant and see how many chats he/she has interacted with and as well as on a

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 within 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 be 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