

**A COMPUTERIZED SYSTEM DEVELOPMENT AND THE SURVEILLANCE OF THE  
INFLUENZA VIRUS**

**(CASE STUDY IN MUKONO DISTRICT)**

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## DECLARATION

I, MASEMBE EMMANUEL hereby that this research report is my original work and has never been submitted to any institution or organization of learning for the award of any degree.

Student:

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Signature  .....

Date:

### APPROVAL

This project has been submitted for examination with my approval as the University candidate supervisor

Signature .....

Date.....

**MR. LUGGYA HERBERT**

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## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background of the study**

Influenza, commonly referred to as flu, is an infectious disease caused by RNA viruses of the family, Orthomyxoviridae (the influenza viruses), that affects humans, birds and other mammals. In other words, Influenza is an acute viral infection that primarily attacks the upper respiratory tract, including the nose, throat, bronchi and less frequently, the lungs. The disease occurs worldwide and spreads very quickly in large populations, especially in crowded circumstances. In the northern hemisphere, annual influenza epidemics occur during autumn and winter affecting approximately 5-15% of the population. (Summary of the 2012–2013 influenza seasons in the WHO European Region).

In Africa, influenza has received relatively little attention on the continent even though it is in its own right, a major cause of morbidity and mortality – to a much greater extent than in the developed world owing to the aggravating prevalence of underlying diseases. (Yazdanbakhsh M, Kremsner PG, Influenza in Africa, 2009)

The surveillance of the influenza virus in Uganda started in 2007 by Mukono district planning unit (MDPU); influenza surveillance was initiated in 2008 following the pandemic threat created by the H5N1 viruses which had exhibited very high mortality rates. This has carried on till to date, where five surveillance sites have been established so far at: Mulago National Referral Hospital in Kampala, Kayunga district Hospital, Jinja regional referral Hospital in Jinja district, Mukono district hospital in Mukono district and Gulu regional referral hospital in Gulu district.

The impact of the surveillance has been assessed over years. This has been made possible by carrying out monitoring and evaluation studies. Usually these studies take long time periods, which makes the process slow and inefficient. The studies always entail different activities like data collection, analysis, from which information upon which decision making bases is got.

It is instructive to note that computers have become attractive and key elements of state capacity building initiative to the developing world, as many countries engage in activities that are meant

to improve managerial, technical and productivity efficiency. (Teddy, 2000)  
This has encouraged computerization of every system in any organization.

Given the nature of work there is need for the current statistics expatriates of MDPU to take note of the different stages of success or failure and to what extent. This raises the need for a time series model for the different studies being carried out. Hence the future of the studies can easily be predicted thus adding more information for better decision making.

## **1.2 Problem statement**

According to the National Influenza Centre (NIC) or Ministry of Health (MOH) in Uganda, the objectives of the surveillance were to identify and monitor seasonal strains of circulating influenza viruses. The report made from the sentinel surveillance system recommended that there is need for increased surveillance so as to understand the pattern of influenza virus in Uganda. However the procedures used are usually hectic hence slowing down the entire process since the process of Monitoring is followed by Evaluation, which involves numeric estimation of certain parameters. After data has been collected, there is call for skillful and experienced personnel to analyze the data. These in turn spend more time in relating and getting acquainted with the data hence time wastage, then they too use complex statistical packages, hence the existing system eliminates non experienced personnel or people with lesser skills. The computer system that is to be developed must be user-friendly to the extent that anyone who is able to use a computer can use it. It will simplify the establishment of the rate of prevalence and also the process of forecasting given the existence of bias especially one thinking that there is need to have a very good 'mathematical background', many have been discouraged from learning to use such software even when someone is acquainted with the computer. This has caused the knowledge in such fields to be left for only experienced personnel in Statistics. Therefore the existing packages are built to handle many tasks, this increase on the complexity to learn and use them.

## **1.3 Objectives**

### **1.3.1 Main Objectives**

To develop and implement a computerized system that will prove whether the treatment done after the surveillance of the influenza virus has helped on the people of Mukono district.



### 1.3.2 Specific objectives:

The specific objectives of the study are to:

**Plan for the Project (feasibility study):** that is establishing a high-level view of the intended project and determines its goals, that to say, the system as to be able to perform the duty of surveillance of influenza virus like in Mukono district that is mostly on influenza patients and their level of response to the treatment and to Forecasts the rates of spread of the virus, among others.

**Analysis the Systems (requirements definition):** that by refines project goals into defined functions and operation of the intended application, like to analyze end-user information needs.

**Design a System:** that is describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudo code and other documentation.

**Implement the Systems:** The real code is written here.

**Integrate and test the Systems:** this brings all the pieces together into a special testing environment, then checks for errors, bugs and interoperability that is mostly by use of the data generated at NIC in Mukono District.

**Accept, install and deploy:** This is the final stage of initial development, where the system is put into production and runs actual business that is, the surveillance of influenza virus like in Mukono district that is mostly on influenza patients and their level of response to the treatment and to Forecasts the rates of spread of the virus, among others.

**Evaluation:** Some companies do not view this as an official stage of the SDLC, while others consider it to be an extension of the maintenance stage, and may be referred to in some circles as post-implementation review. This is where the system that was developed, as well as the entire process, is evaluated. Some of the questions that need to be answered include: does the newly implemented system meet the initial business requirements and objectives? Is the system reliable and fault-tolerant? Does the system function according to the approved functional

## 1.4 Hypothesis

I. The Null Hypothesis ( $H_0$ ): the series is not trended.

Reporting of surveillance data to facilitate treatment decisions is not related with time

II. The alternative Hypothesis ( $H_a$ ): the series is trended.

Reporting of surveillance data to facilitate treatment decisions is related with time hence surveillance is made much easier using the computerized system.

## 1.5 Significance of the study

- ✓ The study is aimed at improving the quality, efficiency and effectiveness of the monitoring and evaluation processes.
- ✓ Timely analysis and reporting of surveillance data will facilitate treatment decisions by clinicians and control measures by public health officials. It will also encourage continued reporting of cases by clinicians in the surveillance system.
- ✓ Shorter time spent in computing the rates of spread of the influenza virus thus accurate timely data.
- ✓ Prediction of the future rates of the spread of the influenza virus.
- ✓ Improving the budgeting and planning for disease control and treatment.

## 1.6 Scope

The data to be used in this study is by MDPU influenza virus survey in Mukono district for the period of January/ 2009 to December/ 2013. Mostly from “HOSPITALS” as sited in five surveillance sites which have been established so far that is at: Mulago National Referral Hospital in Kampala, Kayunga district Hospital, Jinja regional referral Hospital in Jinja district, Mukono district hospital in Mukono district and Gulu regional referral hospital in Gulu district.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

#### **2.1 Influenza Virus**

Influenza, commonly referred to as the flu, is an infectious disease caused by RNA viruses of the family Orthomyxoviridae (the influenza viruses), that affects humans, birds and other mammals. The virus spreads easily from person to person. Influenza circulates worldwide and can affect anybody in any age group. (Summary of the 2012–2013 influenza seasons in the WHO European Region).

According to Dr. Margaret Hunt (2010), influenza is a serious public health problem that causes severe illnesses and deaths for higher risk populations. The most common symptoms of the disease are chills, fever, sore throat, muscle pains, severe headache, coughing, weakness/fatigue and general discomfort. Sore throat, fever and coughs are the most frequent symptoms.

In more serious cases, influenza causes pneumonia, which can be fatal, particularly for the young and the elderly. An influenza epidemic can take an economic toll through lost workforce productivity, and strain health services. (Emerging Infectious Diseases [www.cdc.gov/eid](http://www.cdc.gov/eid), August 2010)

In Africa, the continent has experienced a serious drawback for patient management. Influenza, because of its nonspecific clinical presentation, is reliant on laboratory support which triggered the high rate of spread in the early stages. However, a solution to this was developed and continually implemented where out of the 46 countries constituting the WHO African region (AFRO), only 18 have national influenza centers, of which only ten are able to carry out diagnostic PCR for influenza. Of the 16,664 laboratory-confirmed cases in 2012 from 30 countries on the continent, 12,636 (76%) were reported from South Africa, which accounts for only 5% of the continent's population. (Yazdanbakhsh M. & Kremsner PG., 2010 Influenza in Africa)

## **2.2 Information system**

Various scholars have different views about information systems. This is because of their different levels of understanding of exactly what information systems are. Some are of the view that information systems are computer based, others include libraries, registries and other related institutions thus numerous.

According to Kenneth C. Laudon and Jane P. Laudon (2001), an information system is defined as interrelated components working together to collect, process, store, and disseminate information to support decision making, coordination, control, analysis, and visualization in the planning unit.

The dictionary defines a computer system as “a system of interconnected computers that share a central storage system and various peripheral devices such as a printers, scanners, or routers.” Each computer connected to the system can operate independently, but has the ability to communicate with other external devices and computers. (<http://www.businessdictionary.com>)

An information system is devised to aid management in the MDPU, operation and development. It improves flexibility and facilitates acquisition, updating and use of information as summarized by Curtis 1998.

Computerized systems also allow for greater efficiency in performing specific tasks both more accurately and more rapidly. (Christine Lebednik, eHow Contributor)

This will be an automatic surveillance system to detect changes in the prevalence rates of influenza virus and also predict the future rates. The program is to be incorporated into the laboratory computer system to give timely report on the different rates.

Basing on the above observations and stated relevancies, it is imperative to carry out this research in an effort to expand and incorporate such matters for a more effective and efficient Information system for the organization to meet more of its information needs and better decision making.

## **2.3 Surveillance**

The dictionary explains the word “surveillance” as it is used as a noun in different cases to refer to the following:

- i. Close observation of a person or group, especially one under suspicion.
- ii. The act of observing or the condition of being observed.
- iii. The collection, collation, analysis, and dissemination of data.
- iv. A type of observational study that involves continuous monitoring of disease occurrence within a population. ([www.businessdictionary.com](http://www.businessdictionary.com)).

All of the above meanings have a common thing of “observation” which is among the methods of data collection. Hence surveillance of influenza virus can be, in other words, described as a process that involves the observation of influenza infected areas with an aim of testing whether the surveillance has an impact on the society or area.

To assess the epidemiology and seasonality of influenza in Uganda, there was established sentinel surveillance system for influenza in 5 hospitals and 5 outpatient clinics in 4 geographically distinct regions. From the studies that have been carried out since 2009 to 2011, the conclusion is that “Continued and increased surveillance is needed for better understanding the morbidity and mortality of influenza in Uganda.” (Clinic and hospital-based sentinel influenza surveillance, Uganda 2009-2011).

In addition to the above findings, Influenza Uganda specified some objectives for the surveillance as:

1. To determine the epidemiology of influenza viruses and provide data to document the disease burden and the public health risk posed in Uganda.
2. To identify and monitor seasonal strains of circulating influenza viruses for vaccine composition for the Southern hemisphere.
3. To prepare and strengthen capacities to prevent a pandemic. ([www.influenzauganda.drupalgardens.com](http://www.influenzauganda.drupalgardens.com))

The achievement of these objectives can be made possible and easier using some improvements in the sentinel surveillance system, for which the seasonal rates (time series analysis) will be computed more quickly. The system will also make a possibility of predicting the future rates.

We conclude that continuous surveillance of laboratory data with time series analysis is a valuable tool for epidemiologic surveillance and quality control.

#### **2.4. Forecasting**

Forecasting is a gradual term which varies from one school of thought to another. There is basically no clear definition of forecasting though generally forecasting can be termed as the prediction of a future value of the variable in question.

This involves the use of models to estimate the required variables (sales, taxes, profits, population size, and so many others). Most of these models were developed in the field of econometrics where there is use of statistical methods and mathematical procedures to obtain the values that are required.

Obviously, it cannot be expected that the solution will provide the exact value of the unknown parameter but as a less ambitious goal we might be able to find two limits within which the exact value is certain to lie. These two limits known as confidence interval can be found such that the probability that they enclose the true parameter is say 0.95. In other words, limits can be found that are almost certain to enclose the true parameter, where the degree of certainty as measured by the probability can be chosen by the analyst. (Cochran, 1957)

Time series uses the models developed in econometrics like the "ARIMA" modeling to forecast against time. Today, more models are developed where some are just a modification of the already existing ones while others are quite new, depending on the factors or fields to forecast. Forecasting can be applied on both quantitative and qualitative data though better and effective use of models is attributed to using quantitative data, since these data are just fitted in the existing model to obtain results. Since the data we are to use about the number of people infected with the virus, this makes the data quantitative.

Therefore applying the definition of the time series analysis in this context, forecasting of the rates of spread of the influenza virus will imply analyzing the rates to determine whether the surveillance has had impact on the society thus estimate the required resources to improve the work and the time frame when the work is to be done.

#### **2.4.1 Features of forecasting**

1. Forecasting assumes that the same conditions that existed in the past will continue to prevail in the future.
2. Forecasts are not often perfect, actual results will always differ from the predicted values thus; allowances should be made for accuracy.
3. Forecasts for groups of items tend to be more accurate than those of individual items. This is true because forecast errors among the items have a cancelling effect.
4. Forecast accuracy decreases as time period covered by the forecast increases.

Hence, with such gaps highlighted, it has become a necessity to carry this study about the relevancy of a system that simplifies the computation of prevalence rate and makes forecasts of the future rates for the spread of influenza virus in Mukono district.

#### **2.5 Review of related studies**

Many developing countries do not have an influenza surveillance system or adequate laboratory capacity for virus detection. A primary source was used, that is, questionnaires were designed and sent to NICs and MoHs in Africa countries to gather information on influenza virus infection as a surveillance systems, sentinel sites, specimen Annual reports and presentations were made by the National Influenza Centers, Doctors like Dr Mark Beatty, Dr Nicola Groth, and Dr Ibrahim Abdel-Messih who served as scientific advisors in this research. Dr Ada Portia Abueg (Singapore), Dr Merlin Sanicas (Philippines), Dr Nguyen Trong Toan (Vietnam), and Dr Shampa Saha (Bangladesh) for the technical help and assistance and also Ministries of Health to International Conferences (e.g. Annual African Network for Influenza Surveillance and Epidemiology) were also included, data collection, Data Analysis, Summarizing and laboratory testing. By use of the secondary data like the Summary of the 2012–2013 influenza seasons in the WHO European Region, Countries in Africa like Uganda have just added establishment Rate & Forecasting of their influenza surveillance by use of computers.

## **CHAPTER THREE**

### **3.0 Methodology**

#### **3.1 Research design**

(Parahoo, 2006) describes a research design as simply a map that explains when, where and how information will be collected and analyzed.

According to the study, the data on infected people is to be collected from past records of the surveillances that have been carried out over the different years. This will involve looking at the past evaluation studies and methods used in carrying the Monitoring and Evaluation process.

Research is carried out using two main approaches, qualitative and quantitative. In this study, the quantitative approach will involve collecting the information from the existing records that is data base while the qualitative approach will involve interaction with the different personnel responsible for the influenza surveillance program. This will also provide me with more information about the history of the organization and their relation to the study of Influenza virus in Uganda.

The study is to cover only the influenza surveillance program that was carried out in mukono district from the start till 2013. Since the program was carried out at sentinel surveillance site, mukono Hospital, the data is already specific with respect to geographical location.

#### **3.2.1 Data collection**

Through the interaction and discussion with the District senior planner, the Mukono District Planning Unit members, and Head of the Monitoring and Evaluation (M & E) as well, the data from the surveillance of influenza virus is to be collected. It will be collected on annual or monthly basis depending on the availability. The data for Mukono district will be extracted from the period when the surveillance started till the year 2013.



In the Record sheet shown in the appendix A,  $X_t$  denotes the number of infected people in the given period of time (monthly) from the year 2009 to 2013,  $Y_t$  denotes the total number of patients in a given time,  $t$  denotes time period annually and monthly.

### 3.2.2 Identifying the model

Considering that, it is a time-sequence data set, time series techniques are to be applied. This will involve the use of the additive model:

$$\text{Additive: } X_t = T_t + S_t + C_t + I_t$$

Where:  $t$  denotes time period,  $X_t$  denotes the number of infected people,  $T_t$  denotes the Trend of spread of influenza,  $S_t$  denotes the seasonal component of spread of influenza,  $C_t$  denotes cyclic component of the spread of influenza virus, and  $I_t$  denotes the Irregularly term.

### 3.3 Testing for the Trend

A linear trend model is to be considered in this study, this is because the study has been carried out on an annual basis.

## ARIMA MODELING OF TIME SERIES DATA.

To introduce several ideas, some old and some new, let us work with the influenza patients ( $Y$ ) time series data for Mukono District given in the Appendix A Table, recall that  $Y$  is non-stationary

### An Autoregressive (AR) Process

Let  $Y_t$  represent influenza patients at time  $t$ . If we model  $Y_t$  as

$$(Y_t - \delta) = \alpha_1(Y_{t-1} - \delta) + u_t$$

Where  $\delta$  is the mean of  $Y_t$  and where  $u_t$  is an uncorrelated random error term with zero mean and constant variance  $\sigma^2$ , then we say that  $Y_t$  follows a first-order autoregressive, or AR(1), stochastic process. Here the value of  $Y$  at time  $t$  depends on its value in the previous time period and a random term; the  $Y$  values are expressed as deviations from their mean value. In other words, this model says that the forecast value of  $Y$  at time  $t$  is simply some proportion ( $= \alpha_1$ ) of

its value at time  $(t - 1)$  plus a random shock or disturbance at time  $t$ ; again the  $Y$  values are expressed around their mean values.

But if we consider this model,

$$(Y_t - \delta) = \alpha_1(Y_{t-1} - \delta) + \alpha_2(Y_{t-2} - \delta) + u_t$$

Then we say that  $Y_t$  follows a second-order autoregressive, or AR (2), process. That is, the value of  $Y$  at time  $t$  depends on its value in the previous two time periods, the  $Y$  values being expressed around their mean value  $\delta$ .

In general, we can have

$$(Y_t - \delta) = \alpha_1(Y_{t-1} - \delta) + \alpha_2(Y_{t-2} - \delta) + \dots + \alpha_p(Y_{t-p} - \delta) + u_t$$

In which case  $Y_t$  is a  $p^{\text{th}}$  order autoregressive, or AR ( $p$ ), process.

Notice that in all the preceding models only the current and previous  $Y$  values are involved; there are no other regressors. In this sense, we say that the “data speak for themselves.” They are a kind of reduced form model that we encountered in our discussion of the simultaneous-equation models.

ARIMA'S AR test will be applied to test whether there is a trend in the surveillance of the influenza virus. If the series is trended, the incidence rate of the virus will be computed, and then, to obtain the forecast of  $Y$ , we rewrite model using the estimated values, it is more efficient by use of the vector autoregressive forecasting, then the forecasts of the rate are to be made.

### 3.4 Hypothesis test for the trend

III. The Null Hypothesis ( $H_0$ ): the series is not trended.

Reporting of surveillance data to facilitate treatment decisions is not related with time

IV. The alternative Hypothesis ( $H_a$ ): the series is trended.

Reporting of surveillance data to facilitate treatment decisions is related with time hence surveillance is made much easier using the computerized system.

### Rejection criteria

If  $|t_r| > t_{\alpha/2, n-2}$ , then reject  $H_0$  and conclude that the series is trended.

### 3.5 Formulae

$$t_r = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

$$r = \frac{SS_{ty}}{\sqrt{SS_{tt} * SS_{yy}}}$$

$t_r$  - Pearson's test

$r$  - Pearson's correlation

### 3.6 Trend equation

$$Y = \alpha + \beta t \quad \dots\dots\dots (i)$$

Where:  $Y$  denotes the total number of patients in a given time,  $t$  denotes the time period,  $\alpha$  denotes the constant and  $\beta$  denotes the prevalence rate of the influenza virus.

$$\beta = \frac{SS_{ty}}{SS_{tt}} \quad \dots\dots\dots (ii)$$

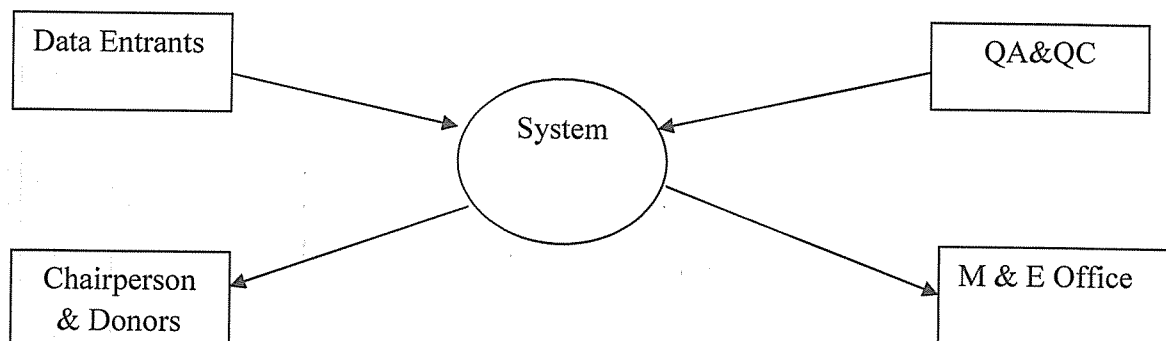
$$\alpha = \bar{y} - \beta \bar{t} \quad \dots\dots\dots (iii)$$

### 3.7 Choice of the computer programming language

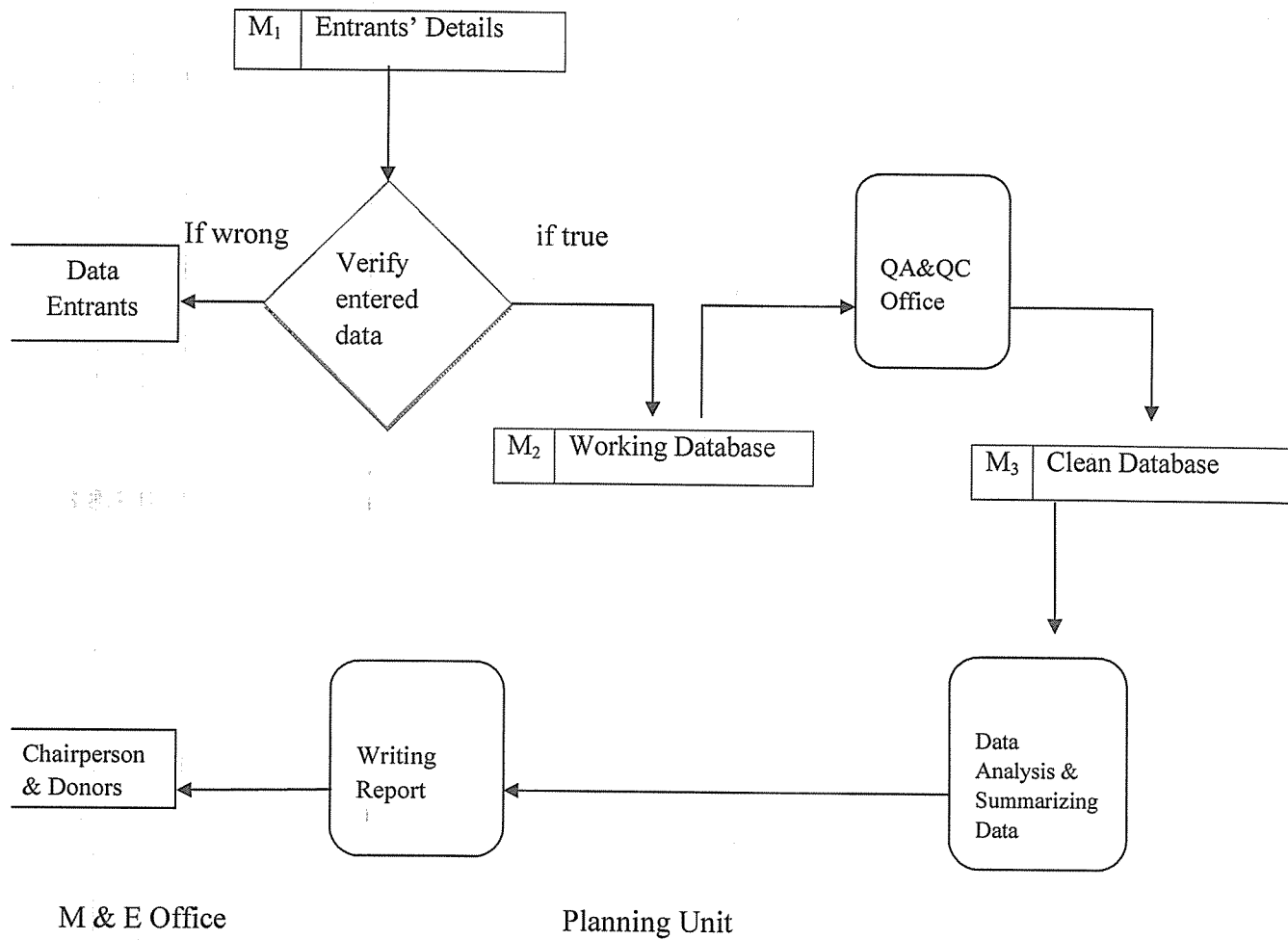
The system was constructed using JAVA- Netbeans computer programming language. This language catered for the mathematical calculations and graphical outlook (GUI) that was involved in the system.

The JAVA- Netbeans language made the system user-friendly and compatible with any computer environment available, that is, it was too possible to install to any operating system.

### 3.8 Context diagram

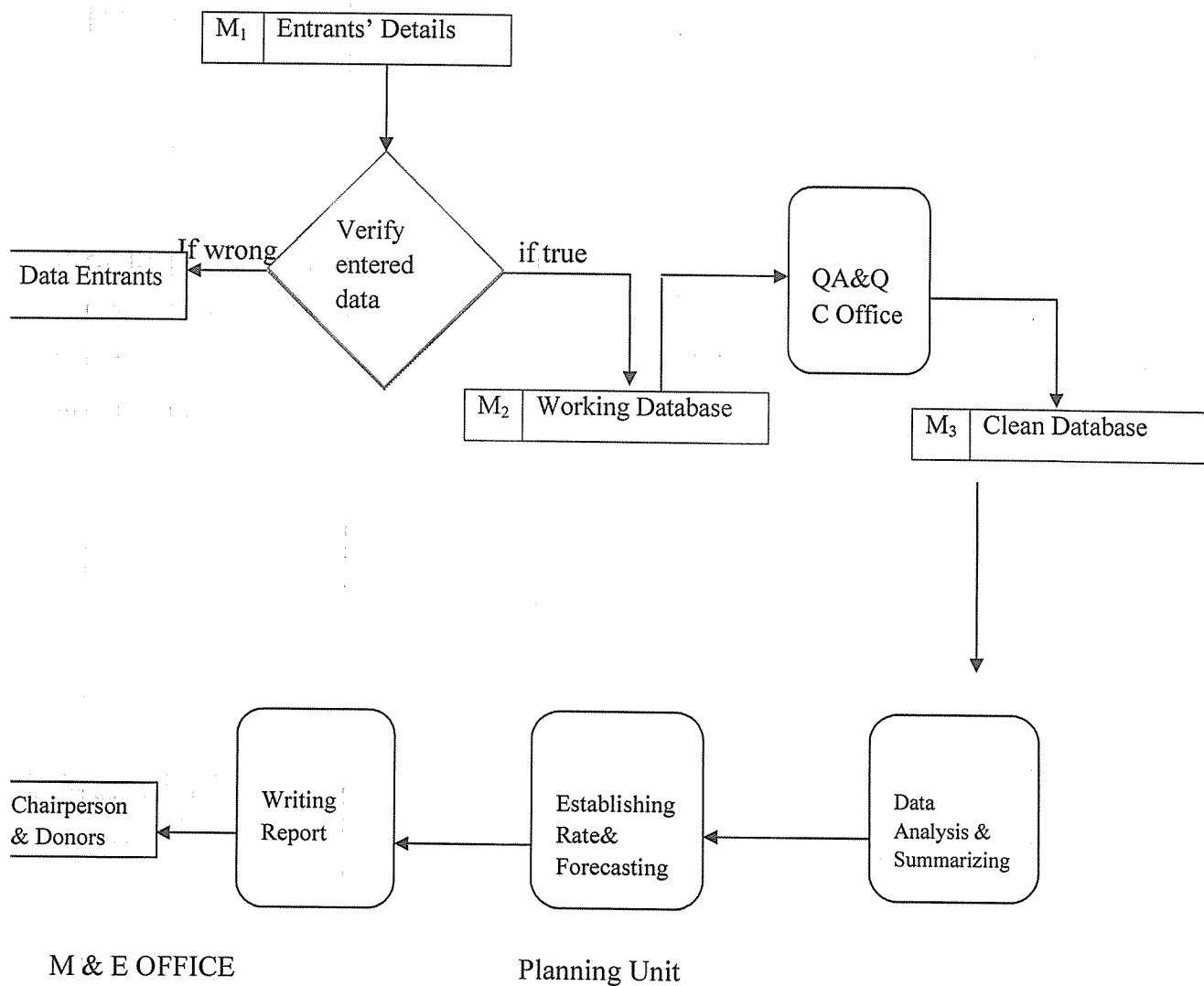


### 3.8.1 Data flow diagram of existing system



### 3.8.2 Data flow diagram of after changing the system

A new process is to be introduced in the system. After the data has been summarized in a table, the prevalence rate is to be computed directly with less difficult and then make predictions of the future rates.



### **3.8.3 Establishing Rate & Forecasting**

Establishing is setting up, initiating or bringing about something on permanent basis. That is the computer system that is to be developed which will be user-friendly to the extent that anyone who is able to use a computer can use. It will simplify the establishment of the rate of prevalence and also the process of forecasting. Which is the prediction of a future value of the variable in question, that is the number of influenza infected people in Mukono district as shown below in chapter four.

## CHAPTER FOUR

### 4.0 System Analysis and Design

#### 4.1.1 Input

- From the database, the data about the number of infected is extracted for each month and inserted in a single column (a new column is created in the Microsoft Access database). This column is copied into an Excel sheet.
- The excel data is saved as a “csv (Comma delimited) file”
- The computer system is open and run.
- From the task bar of the system, click the icon “open” then browse to the saved “csv file” where the data is saved.

#### 4.1.2 Process

- After the data has been read by the system.
- The system input the column for “t” as a counter for the number of months in which data was collected. So the values of “t” will keep accumulating from one to the last row containing the data of the infected people.

The button “mean of t”, this instructs the system to compute the summation of the period, t. then divide by their number. The mean of the infected people is also computed on pressing the button “mean of y.” Where the sum of infected people in column y is computed and then divided by the number of values in that column.

Using the formulae in section 3.6 equations (ii) & (iii), the rate of spread of the disease and the value of the constant are computed, thereby formulating the equation that is used in the forecast process. Using the values establish above, the rate of the spread and the constant, for the equation in section 3.6 equation (i), a forecast of the rate is made. The value of the period for which the forecast is to be made is entered into the respective place that “month” then the forecast value is computed when the button “forecast” is clicked.



#### **4.1.3 Output**

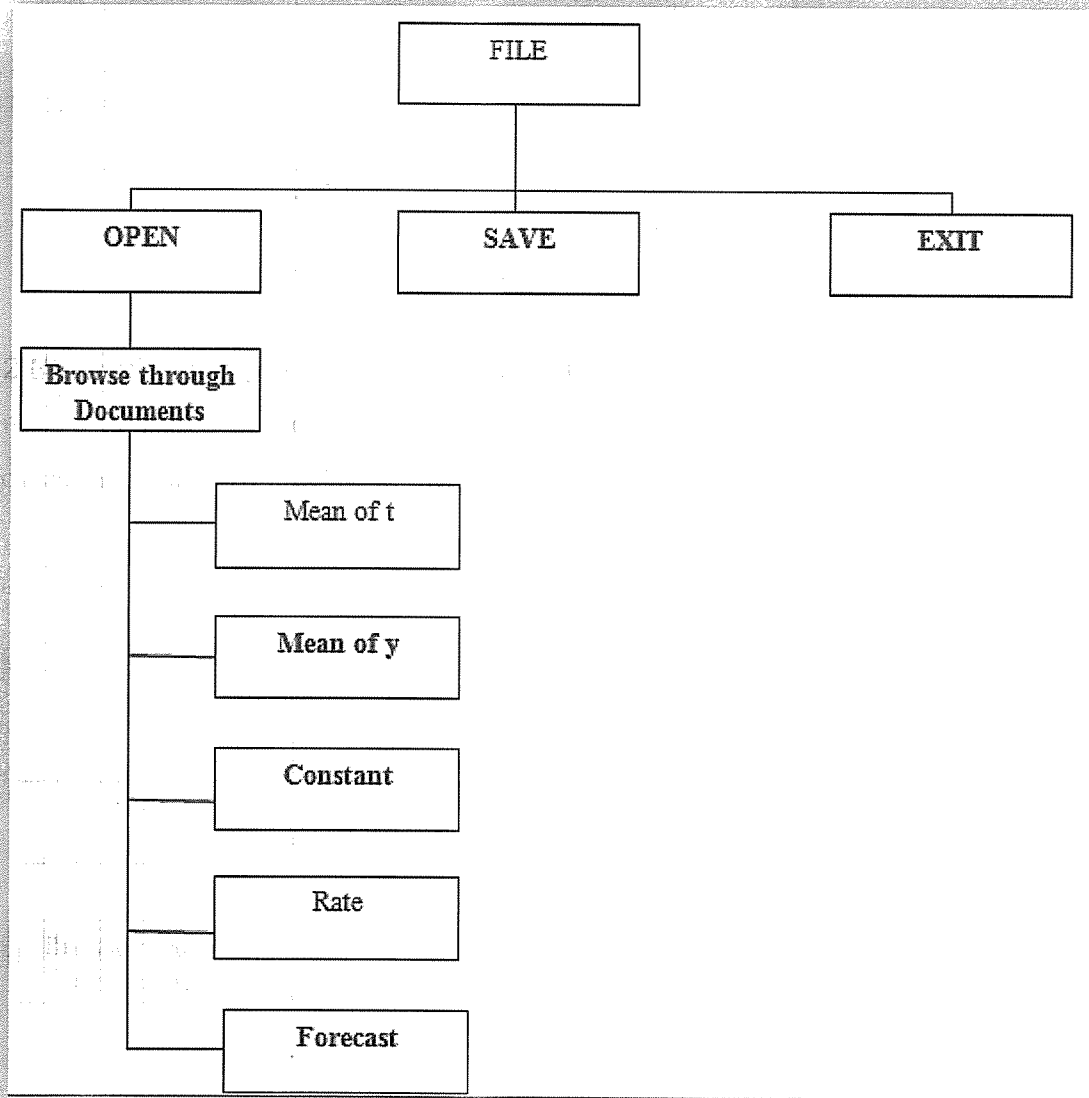
The values that are put out by the system are to 2-decimal places. The system outputs the average of the time period that is average number of months of surveillance, the average number of people infected during the stipulated period of study.

The rate of spread of the virus during this period is also given by the system. In addition, the value of the constant, the value that is used in the forecast equation is also among the outputs of the system.

The system also outputs the future rate of spread of a virus after a specified number of months.

#### 4.2 Hierarchical Input process Output (HIPO)

This is a tool used in the program architecture to show the top-down format of the system. It provides a pictorial view of the knowledge flow of the processes in different modules.



#### 4.3 Program pseudo code

The Pseudo code refers to the representation of the program logic using structured English statements. The technique allows easy and better understanding of the program by users. In addition, the logical flow of the program in the Pseudo code allows easy transfer of a program

into other programming languages such as java eclipse, C++. In general it's a mix of English, algebra and computer languages.

### **Creating the calculation functions**

Declare the function sum. Declare the variables in the function. Set the initial sum and counter to zero. While the counter is still less than the size of the array, add the value to the initial sum and accumulate the counter by 1. Then return the sum of the values to the function Main.

#### Procedure

1. Set the function sumOFvalues
2. Set  $\text{sum}=0$  and  $c=0$
3. While  $c<\text{size}()$
4.  $\text{Sum} = \text{sum} + \text{size}(i)$
5.  $c = c + 1$
6. Return sum

Declare the function Mean. Set initial Sum to be zero. Set a counter for the values. While the counter is still less than the number of values, add the sum of the former values to the new value, then accumulate the counter. Return the quotient of the sum and number of the values.

#### Procedure

1. Set the function mean
2. Set  $\text{sum1} = 0$ , and  $d=0$
3. While  $d<\text{size}()$
4.  $\text{Sum1} = \text{sum} + \text{size}(i)$
5.  $d=d+1$
6.  $\text{Quote} = \text{sum1} / \text{size}()$
7. Return quote

Declare the function for the sums of squares. Also declare the variables to be used in the function. Set initial Sum to be zero, and set a counter for the values to also be zero. While the counter is less than the array size, compute the square of a value, the add it to the sum of the

former values, and accumulate the counter by 1. Then return the sum of the squares of all the values to the function Main.

#### Procedure

1. Set a function sumOFSquare
2. Set sum2=0 and k=0
3. While k< size()
4. Sqr = (values.get(i)\*values.get(i))
5. Sum2 = sum2 + Sqr
6. k = k+1
7. return sum2

Declare the variables and the function for the sums of products to be reading the values in both columns of the data. Set the sum and counter of the values to be zero. While the counter is still less than the size of the array in the first column, compute the product of the two values, then add the product to the sum of the former values. After, accumulate the counter by 1. Then return the sum of the product of all the values to the main function.

#### Procedure

1. Set a function sumOFProducts
2. Set sum3=0
3. Set the counter, i =0
4. While i<value1.size()
5. Compute pdt =value1.get(i)\*value2.get(i)
6. Compute sum3 = sum3+ pdt
7. Set i= i +1
8. Return sum3

#### **Function Main**

Declare the variables in the function Main. Set the initial sums to zero. Call the values from the function sumOFproduct for both columns. Call the value from the function sumOFsquares(t). Call the values from the function SumOFValues for both columns. Compute the rate. Call the

values from the function mean for both columns. Compute the value of the constant. Print the value for the mean of the two columns. Print the values for the rate and constant.

### **Forecastingprocess**

Declare the variables for the forecast value. Enter the period number whose number of infected people is wanted. Compute the forecast value. Print the forecast value

### **Procedure**

1. Set the variables rate, r and constant w
2. Set  $n = \text{values.size}(i)$
3. Compute  $p1 = (\text{sumOFvalue}(y) * \text{sumOFvalue}(t)) / n$
4. Compute  $p2 = (\text{pow}(\text{sumOFvalue}(t), 2)) / n$
5. Compute  $d1 = \text{sumOFproduct}(t, y) - p1$
6. Compute  $d2 = \text{sumOFsquare}(t)$
7. Compute  $r = (d1 / d2)$
8. Set  $Ay = \text{mean}(y)$  and  $At = \text{mean}(t)$
9. Compute  $w = Ay - (At * r)$
10. Print r
11. Print w

### **Forecasting process**

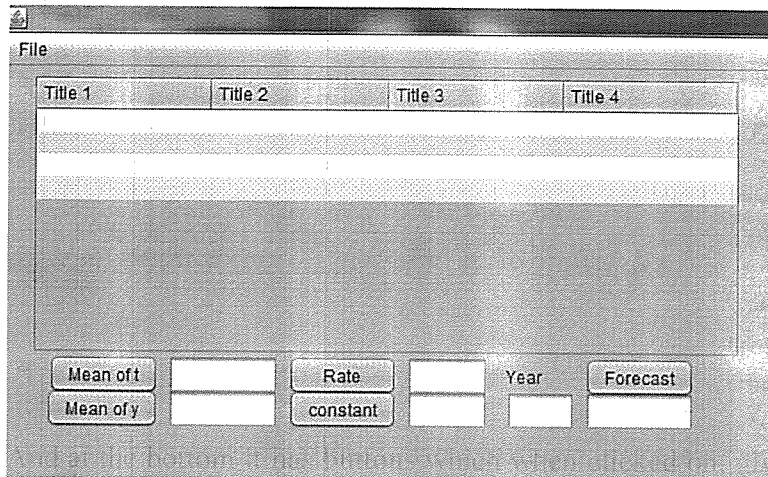
12. Set the variable forecast value, F
13. Set the variable for the period value, P
14. Enter the value of P
15. Compute  $F = w + (r * P)$
16. Print the value F

## **4.4 Presentation of the System and Findings**

### **4.4.1 Importing the data into the system.**

When the program is run, a window is generated. This window characterizes of a Menu bar which has an icon "File" on its top. It also comprises of four columns entitled – Title 1 to Title 4.

And at the bottom it has buttons which when clicked on; give a value responding to the name of the button.



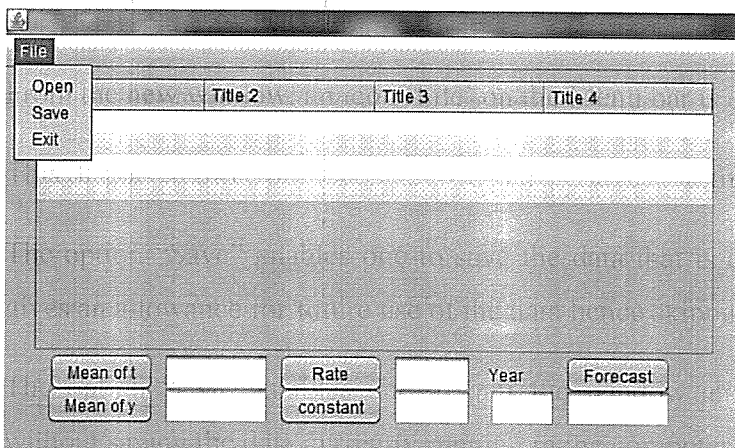
From the new window, an icon 'File' on the Menu bar is clicked.

This displayed three options that is "Open", "Save", "Exit."

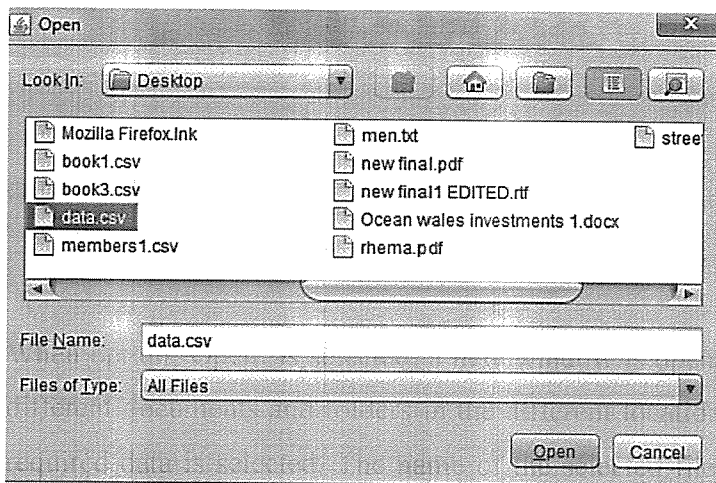
The option "Save" enables one to save the data that is currently being run in the system. This gives an allowance for future use of the data hence skipping the burden of re-importing.

The option "Exit" enables one to quit the window and also close the system, this happens without saving the data currently running in the computer system.

The option "Open" enables the system to import data from a file anywhere in the computer.



When option 'Open' is selected, a new window is opened. This enables one browse through the different documents and folders in the different locations of storage. The csv file containing the required data is selected. The name of the selected file appears in the field space "File name." Then the icon "Open" bottom corner of the window is clicked.



The data in the selected cvs file then appears in the system window as shown below. Hence the system has imported the data.

t	Period	Month	Total
1	1	JAN	63
2	2	FEB	61
3	3	MAR	73
4	4	APRIL	58
5	5	MAY	66
6	6	JUNE	70
7	7	JULY	61
8	8	AUG	73
9	9	SEPT	58
10	10	OCT	56
11	11	NOV	69

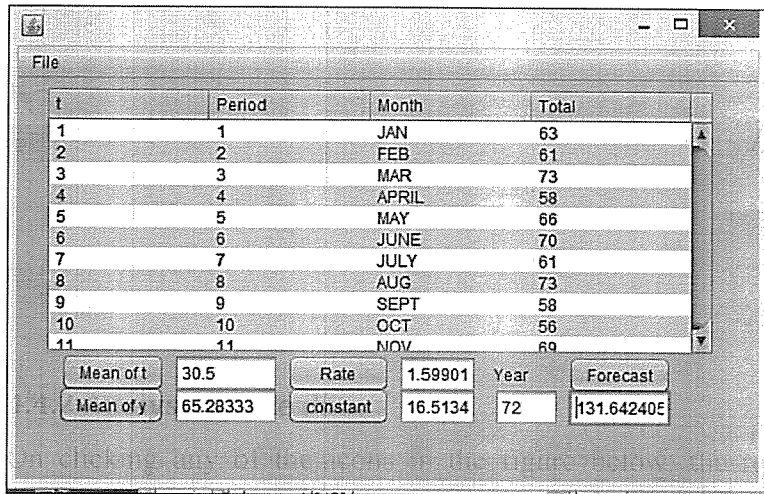
Mean of t:  Rate:  Year:  Forecast:

Mean of y:  constant:

The system creates a new column "t" in the imported data. This is automatically generated as the number of periods for data entry point and also acts a counting variable for the number of entry points.

#### 4.4.2 Analysis of the data

On clicking any of the icons in the figure below, the respective values are printed in their respective fields.



The screenshot shows a software window with a menu bar (File) and a table with four columns: t, Period, Month, and Total. The table contains 11 rows of data. Below the table are several buttons and input fields for calculations: 'Mean of t' (30.5), 'Mean of y' (65.28333), 'Rate' (1.59901), 'constant' (16.5134), 'Year' (72), and 'Forecast' (131.64240E).

t	Period	Month	Total
1	1	JAN	63
2	2	FEB	61
3	3	MAR	73
4	4	APRIL	58
5	5	MAY	66
6	6	JUNE	70
7	7	JULY	61
8	8	AUG	73
9	9	SEPT	58
10	10	OCT	56
11	11	NOV	69

Mean of t: 30.5      Rate: 1.59901      Year:      Forecast:        
Mean of y: 65.28333      constant: 16.5134      72      131.64240E

The icon “Mean of t” generates the average of the periods when the study was conducted.

The icon “Mean of y” generates the average number of people infected with the virus.

The icon “Rate” generates a value for the rate of spread of the virus.

The icon “constant” gives the value of the number of people that were initially infected by virus.

A value of the period for which the forecast is to be made is entered in the space field “Year.” Then the icon “Forecast” is clicked to generate the value for the number of people that will be infected by that time period.

Therefore according to the study done, the following were found with the help of the new computer system.

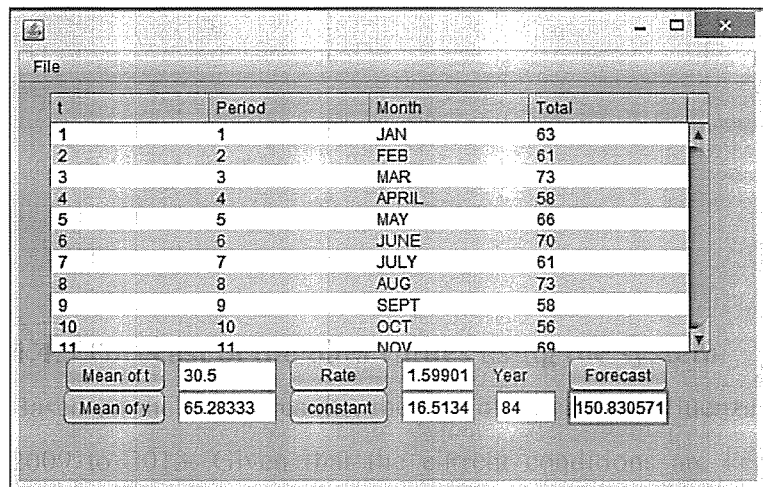
On average there were about 65 people infected with the influenza virus in Mukono district between the year 2009 and 2013.

The influenza virus was spreading at a low rate of about 1.6 between the 2009 and 2013.



#### 4.4.3 Forecast of the data values using the system

Based on the above results, the rate of spread of influenza virus was lower during the period of 2009 to 2013. Given that the current conditions are kept unchanged, the following will be forecasts of the number of infected people for the different periods;

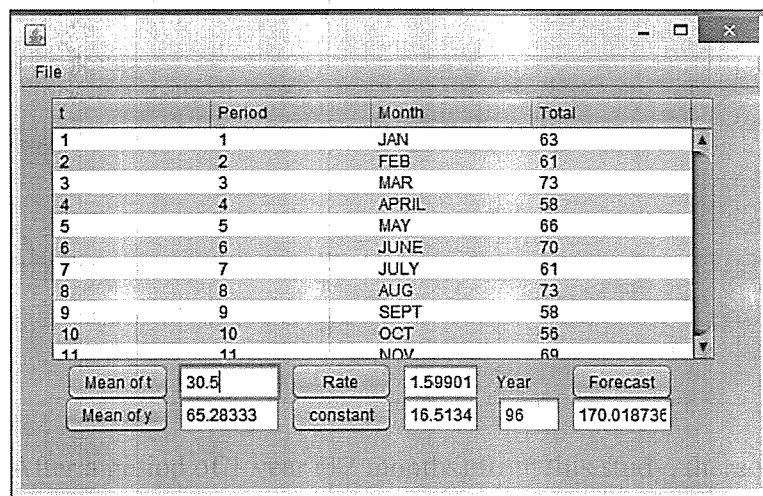


The screenshot shows a software window with a menu bar (File) and a table with 4 columns: t, Period, Month, and Total. The table contains 11 rows of data. Below the table, there are input fields for 'Mean of t', 'Mean of y', 'Rate', and 'constant', and a 'Forecast' button. The 'Forecast' button is highlighted.

t	Period	Month	Total
1	1	JAN	63
2	2	FEB	61
3	3	MAR	73
4	4	APRIL	58
5	5	MAY	66
6	6	JUNE	70
7	7	JULY	61
8	8	AUG	73
9	9	SEPT	58
10	10	OCT	56
11	11	NOV	69

Mean of t: 30.5    Rate: 1.59901    Year:    Forecast  
Mean of y: 65.28333    constant: 16.5134    84    150.830571

After a period of 1 year (12 months) from this study, there will be about 150 people infected with the virus.



The screenshot shows a software window with a menu bar (File) and a table with 4 columns: t, Period, Month, and Total. The table contains 11 rows of data. Below the table, there are input fields for 'Mean of t', 'Mean of y', 'Rate', and 'constant', and a 'Forecast' button. The 'Forecast' button is highlighted.

t	Period	Month	Total
1	1	JAN	63
2	2	FEB	61
3	3	MAR	73
4	4	APRIL	58
5	5	MAY	66
6	6	JUNE	70
7	7	JULY	61
8	8	AUG	73
9	9	SEPT	58
10	10	OCT	56
11	11	NOV	69

Mean of t: 30.5    Rate: 1.59901    Year:    Forecast  
Mean of y: 65.28333    constant: 16.5134    96    170.018736

In a period of 2 years, there will be about 170 people infected by the virus.

The screenshot shows a software window with a menu bar containing 'File'. Below the menu is a table with four columns: 't', 'Period', 'Month', and 'Total'. The table contains 11 rows of data. Below the table are several input fields and buttons for calculations.

t	Period	Month	Total
1	1	JAN	63
2	2	FEB	61
3	3	MAR	73
4	4	APRIL	58
5	5	MAY	66
6	6	JUNE	70
7	7	JULY	61
8	8	AUG	73
9	9	SEPT	58
10	10	OCT	56
11	11	NOV	69

Mean of t	30.5	Rate	1.59901	Year	Forecast
Mean of y	65.28333	constant	16.5134	108	189.206902

In three years' time from now, there number of people infected with the influenza virus will be about 189 in Mukono district.

Though the number of infected people is increasing, the rate of increase is very low. Such results are attributed to the surveillance program done by MDPU, hence the activities of the organization have been of positive impact to the people in Mukono district with regard to the spread of Influenza virus. Hence there will be a fewer number of post-surveillance studies to be done.

The use of the system in making forecasts of the virus helps to ease the work during the Monitoring and Evaluation process. The system with ease computes of the current rate of spread and forecasts are just a click away. This will help the M & E officers to do well preparations and know how to react to the given forecasts so as to improve decision making in order to curb the situation at hand.

## **CHAPTER FIVE**

### **5.0 DISCUSSION, CONCLUSIONS, RECOMMENDATIONS**

#### **5.1.0 Discussion of the new system**

The new system working alongside the existing system is expected to bring in a number of improvements to MDPU. The new system replaces the manual analysis of time series data to speed up data requirements for management purposes.

##### **5.1.1 Efficiency**

- The new system can enable easy management of the MDPU to determine the existence of trend movements in the number of infected people in Mukono district. This can all be accomplished with ease and at lesser costs compared to the previous one.
- The management of MDPU can also now with ease predict future rates of the virus spread.
- Given the fact that the new system is built in Java, it takes a shorter time to execute being more effective in terms of saving time compared to the old system.

#### **5.2 Limitations of the new system**

Although all efforts have been made to come with a simplified and user-friendly computer system, it has not been able to design a system that can meet all the demands for the statistical analysis of MDPU data like ANOVA. The system gives general forecast values thereby ignoring the specific period for example the rate in a given year for a given month. Only one type of data set can be stored by the system in only one column. And the data to be imported in the system must only be in a csv file thereby limiting other formats like notepad (txt).

### **5.3 Challenges**

The new system was built in a language that was new to the student, so the student was meant to learn this new language and yet this was to be done in a very short time period. Hence constraining the student.

The language that was used to construct the system that is Java was different from that used for the other software used in MDPU. This caused the organization to incur an expense in purchasing the new software that is ORACLE, so as to use the system.

### **5.4 Conclusion**

This software application has been developed with Java techniques, system analysis and design to improve a real life situation at MDPU. Irrespective of the challenges faced, the new system has been able to establish with ease the rate of spread of Influenza virus and also make forecasts of the rate.

### **5.5 Recommendations**

The new system can be applied in the process of Monitoring and Evaluation of different projects. The computer system can be used for different applications say by researchers in the field of health, agriculture and others which do involve decision making about the impact of a study and the future results of what the study was about.

I recommend that the system should be adopted by the Ministry of Health (MOH), Office of the Prime Minister (OPM) to ease and make faster the work done.

## References

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2. World Health Organization. Summary of the 2012–2013 influenza season in the WHO European Region. Available from [http:// www.euro.who.int/communicable diseases/ influenza /surveillance](http://www.euro.who.int/communicable_diseases/influenza/surveillance).
3. Yazdanbakhsh M & Kremsner PG (2007), Surveillance and management of Influenza in Africa Continent.; 4(2):167–169
4. Ministry of Health. Clinic and hospital-based sentinel influenza surveillance, Uganda 2007-2010. Available from [www.influenzauganda.drupalgardens.com](http://www.influenzauganda.drupalgardens.com)
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8. C. Chatfield, the Analysis of Time Series.

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1. World Health Organization, (2009). WHO consultation on priority public health interventions before and during the influenza pandemic;. Available from [http://www.who.int/csr/disease/avian\\_influenza/final.pdf](http://www.who.int/csr/disease/avian_influenza/final.pdf)
2. World Health Organization. Summary of the 2012–2013 influenza season in the WHO European Region. Available from [http:// www.euro.who.int/communicable diseases/ influenza /surveillance](http://www.euro.who.int/communicable_diseases/influenza/surveillance).
3. Yazdanbakhsh M & Kremsner PG (2007), Surveillance and management of Influenza in Africa Continent.; 4(2):167–169
4. Ministry of Health. Clinic and hospital-based sentinel influenza surveillance, Uganda 2007-2010. Available from [www.influenzauganda.drupalgardens.com](http://www.influenzauganda.drupalgardens.com)
5. Dr. Margaret Hunt (2010), University of South Carolina School of medicine. Microbiology and Immunology on-line, [Virology; 13]
6. Justin R, Viviana S, Osvaldo C. Uez, Otavio Oliva, Deborah Bettels, Margaret McCarron, Joseph S. Bresee, & Anthony W. Mounts.(2009) Strategy to enhance influenza surveillance worldwide. *Emerg Infect Dis*. [Vol 15; 1271-72]
7. Kenneth C. Laudon & Jane P. Laudon (2001). *Management Information Systems* (7<sup>th</sup>ed.)
8. C. Chatfield, *the Analysis of Time Series*.

## Internet references

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## Appendix 1; Budget Estimate

	ITEM	AMOUNT (Ug shillings)
1	Travel (Transport to MUWRP)	30,000
2	Equipment and Materials	10,000
6	Miscellaneous	10,000
TOTAL		50,000

## Appendix A: Data of the influenza infected people in Mukono District

No of months	Month (t)	Total No( $X_t$ )	Total No( $Y_t$ )
1	JAN	63	50
2	FEB	61	50
3	MAR	73	69
4	APRIL	58	56
5	MAY	66	66
6	JUNE	70	67
7	JULY	61	61
8	AUG	73	73
9	SEPT	58	58
10	OCT	56	56
11	NOV	69	69
12	DEC	58	58
13	JAN	74	74
14	FEB	72	72
15	MAR	71	71
16	APRIL	74	70
17	MAY	57	50
18	JUNE	74	70

No of months	Month (t)	Total No( $X_t$ )	Total No( $Y_t$ )
31	JULY	68	60
32	AUG	73	73
33	SEPT	57	57
34	OCT	59	50
35	NOV	59	59
36	DEC	68	68
37	JAN	60	60
38	FEB	59	50
39	MAR	74	40
40	APRIL	73	40
41	MAY	72	70
42	JUNE	61	60
43	JULY	56	50
44	AUG	75	70
45	SEPT	57	50
46	OCT	64	60
47	NOV	60	60
48	DEC	74	70

19	JULY	64	63
20	AUG	75	75
21	SEPT	63	60
22	OCT	72	70
23	NOV	61	60
24	DEC	64	64
25	JAN	72	70
26	FEB	67	60
27	MAR	59	50
28	APRIL	69	69
29	MAY	73	70
30	JUNE	64	63

49	JAN	57	57
50	FEB	66	66
51	MAR	66	66
52	APRIL	70	70
53	MAY	73	70
54	JUNE	57	50
55	JULY	63	60
56	AUG	66	66
57	SEPT	59	50
58	OCT	64	45
59	NOV	56	40
60	DEC	60	60

## APPENDIX B: Source Code

packagecsvfile;

importjava.io.BufferedReader;

importjava.io.File;

importjava.io.FileReader;

importjava.io.FileWriter;

importjava.io.IOException;

importjava.text.DecimalFormat;

importjava.util.ArrayList;

importjava.util.List;

importjavax.swing.JFileChooser;

importjavax.swing.JOptionPane;

importjavax.swing.table.DefaultTableModel;



```

public class CsvFrame extends javax.swing.JFrame {

    /** Creates new form CsvFrame */

    public CsvFrame() {

        initComponents();

        /* This method is called from within the constructor to initialize the form.
        * WARNING: Do NOT modify this code. The content of this method is always
        * regenerated by the Form Editor.*/

        @SuppressWarnings("unchecked")

        // <editor-fold defaultstate="collapsed" desc="Generated Code">

        private void initComponents() {

            jMenuBar2 = new javax.swing.JMenuBar();

            jMenu1 = new javax.swing.JMenu();

            jMenu2 = new javax.swing.JMenu();

            scrollPane = new javax.swing.JScrollPane();

            jTable1 = new javax.swing.JTable();

            jTextField1 = new javax.swing.JTextField();

            jTextField2 = new javax.swing.JTextField();

            jTextField3 = new javax.swing.JTextField();

            jTextField4 = new javax.swing.JTextField();

            jButton1 = new javax.swing.JButton();

            jButton2 = new javax.swing.JButton();

```

```

jButton3 = new javax.swing.JButton();

jButton4 = new javax.swing.JButton();

jButton5 = new javax.swing.JButton();

jLabel1 = new javax.swing.JLabel();

jTextField5 = new javax.swing.JTextField();

jTextField6 = new javax.swing.JTextField();

jMenuBar1 = new javax.swing.JMenuBar();

menuFile = new javax.swing.JMenu();

menuOpen = new javax.swing.JMenuItem();

menuSave = new javax.swing.JMenuItem();

menuExit = new javax.swing.JMenuItem();

```

```

jMenu1.setText("File");

jMenuBar2.add(jMenu1);

jMenu2.setText("Edit");

jMenuBar2.add(jMenu2);

```

```

setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

jTable1.setModel(new javax.swing.table.DefaultTableModel(

    new Object [][] {

        {null, null, null, null},

```

```
new String [] {
    "Title 1", "Title 2", "Title 3", "Title 4"
});

scrollView.setWebView(tableView);

jTextField1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jTextField1ActionPerformed(evt);
    }
});

jTextField4.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jTextField4ActionPerformed(evt);
    }
});

jButton1.setText("Forecast");
jButton1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton1ActionPerformed(evt);
    }
});
}
```

```

jButton2.setText("Mean of t");

jButton2.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton2ActionPerformed(evt);}

    });

jButton3.setText("Mean of y");

jButton3.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton3ActionPerformed(evt);}

    });

jButton4.setText("Rate");

jButton4.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton4ActionPerformed(evt);}

    });

jButton5.setText("constant");

jButton5.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton5ActionPerformed(evt);}

    });

jLabel1.setText("Year");

```

```

jTextField5.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jTextField5ActionPerformed(evt);    }

});

jTextField6.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jTextField6ActionPerformed(evt);}

});

menuFile.setText("File");

menuOpen.setText("Open");

menuOpen.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        menuOpenActionPerformed(evt);}

});

menuFile.add(menuOpen);

menuSave.setText("Save");

menuSave.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        menuSaveActionPerformed(evt);}

});

menuFile.add(menuSave);

```

```

menuExit.setText("Exit");

menuExit.addActionListener(new java.awt.event.ActionListener() {

public void actionPerformed(java.awt.event.ActionEvent evt) {

menuExitActionPerformed(evt);}

});

menuFile.add(menuExit);

jMenuBar1.add(menuFile);

setJMenuBar(jMenuBar1);

javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());

getContentPane().setLayout(layout);

layout.setHorizontalGroup(

layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)

.addGroup(layout.createSequentialGroup()

.addGap(20, 20, 20)

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)

.addGroup(layout.createSequentialGroup()

.addGap(10, 10, 10)

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)

.addComponent(jButton2)

.addComponent(jButton3))

.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)

```

```

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)

.addComponent(jTextField1,          javax.swing.GroupLayout.DEFAULT_SIZE,          76,
Short.MAX_VALUE)

.addComponent(jTextField2))

.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)

.addGroup(layout.createSequentialGroup())

.addComponent(jButton4,          javax.swing.GroupLayout.PREFERRED_SIZE,          75,
javax.swing.GroupLayout.PREFERRED_SIZE)

.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)

.addComponent(jTextField4,          javax.swing.GroupLayout.PREFERRED_SIZE,          57,
javax.swing.GroupLayout.PREFERRED_SIZE))

.addGroup(layout.createSequentialGroup())

.addComponent(jButton5)

.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)

.addComponent(jTextField3,          javax.swing.GroupLayout.PREFERRED_SIZE,          57,
javax.swing.GroupLayout.PREFERRED_SIZE)))

.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)

.addComponent(jTextField5)

.addComponent(jLabel1,          javax.swing.GroupLayout.DEFAULT_SIZE,          48,
Short.MAX_VALUE))

.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)

```

```

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)

.addComponent(jButton1,
                javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)

.addComponent(jTextField6)))

.addComponent(scrollPane,
                javax.swing.GroupLayout.PREFERRED_SIZE,
                489,
javax.swing.GroupLayout.PREFERRED_SIZE))

.addGap(31, 31, 31));

layout.setVerticalGroup(

layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)

.addGroup(layout.createSequentialGroup())

.addContainerGap()

.addComponent(scrollPane,
                javax.swing.GroupLayout.PREFERRED_SIZE,
                199,
javax.swing.GroupLayout.PREFERRED_SIZE)

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)

.addGroup(layout.createSequentialGroup())

.addGap(24, 24, 24)

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)

.addComponent(jTextField2,
                javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)

.addComponent(jTextField3,
                javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)

.addComponent(jButton3)

.addComponent(jButton5)

```



```

.addComponent(jTextField5, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)

.addComponent(jTextField6, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)))

.addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)

.addComponent(jButton1)

.addComponent(jTextField1, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)

.addComponent(jButton2)

.addComponent(jButton4)

.addComponent(jTextField4, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)

.addComponent(jLabel1)))

.addContainerGap(40, Short.MAX_VALUE));

pack();
} // </editor-fold>

```

String location;

```
public float mean( ArrayList<Integer> values){
```

```
float sum=0;
```

```
for(int i =0 ;i<values.size();i++){
```

```
sum =sum+values.get(i);}
```

```
return sum/values.size();}
```

```

public float sumOfSquare( ArrayList<Integer> values){

    float sum=0;

    for(int i =0;i<values.size();i++){

        sum = sum + (values.get(i)*values.get(i));}

    return sum;}

public float sumOfProducts( ArrayList<Integer> value1,ArrayList<Integer> value2){

    float sum=0;

    for(int i =0;i<value1.size();i++){

        sum = sum+(value1.get(i)*value2.get(i));}

    return sum;}

private void menuSaveActionPerformed(java.awt.event.ActionEventevt) {

    String line="";

    int y=0,z=0;// y- column, z - row

    try {

        location = JOptionPane.showInputDialog("Please Enter A Location");

        FileWriter writer =new FileWriter(location);

        while(z<jTable1.getRowCount()-1){

            if (z==0){// titles

                while (y<jTable1.getColumnCount()){

                    if (y<jTable1.getColumnCount()-1){ // writes the values separated by commas as long as 't's not
the end of column

```

```

line = line+jTable1.getColumnName(y) +",";

}else{ line = line+jTable1.getColumnName(y);} // writes the last value of the column without a
comma after 't'

y++; }

}else{

while (y<jTable1.getColumnCount()){

if (y<jTable1.getColumnCount()-1){

line = line+jTable1.getValueAt(z-1,y).toString()+",";

}else{line = line+jTable1.getValueAt(z-1,y).toString(); }

y++;}}

line=line+"\n";

writer.write(line);

line="";

y=0;

z++;}

writer.close();

} catch (IOException ex) {

}

// TODO add your handling code here:

// JFileChooser chooser = new JFileChooser(); File f = chooser.s;

}

```

```

ArrayList<Integer>nValue = new ArrayList<Integer>();

ArrayList<Integer>yrValue = new ArrayList<Integer>();

ArrayList<Integer>mValue = new ArrayList<Integer>();

ArrayList<Integer>tValue = new ArrayList<Integer>();

DecimalFormatdf = new DecimalFormat("#.00");

ArrayList<Integer>yValue = new ArrayList<Integer>();

private void menuOpenActionPerformed(java.awt.event.ActionEventevt) {

// TODO add your handling code here:

DefaultTableModel model = new DefaultTableModel();      // indisnatiating an object of type
model because its the type taken in by the table

jTable1.setModel(model);                                // set the created object the table

JFileChooserjfc = new JFileChooser();

jfc.setFileSelectionMode(JFileChooser.FILES_AND_DIRECTORIES);

int i = jfc.showOpenDialog(jfc);

if (i == JFileChooser.CANCEL_OPTION) {

jfc.cancelSelection();}

if (i == JFileChooser.APPROVE_OPTION) {

File file = jfc.getSelectedFile();

try {

BufferedReaderbr = new BufferedReader(new FileReader(file.getAbsolutePath()));

```

```

String line;                                // this string is going to be used to

int r = 0, c = 0;

while ((line = br.readLine()) != null) {

model.addRow(new Object[]{""}); //adds a row into the table.

String[] value = line.split(","); //separating each word that is separated by commas and storing it in
an array called value

while (c < value.length+1) {

if(c==0){if (r == 0) { //
model.addColumn("t");}}

if (r != 0) {

jTable1.setValueAt(r, r - 1, c);

tValue.add(r);

} }

else{

if (r == 0) { //

model.addColumn(value[c-1]);}

if (r != 0) {

jTable1.setValueAt(value[c-1], r - 1, c);

//yValue.add(Integer.getInteger(value[1]));

//zValue.add(Integer.getInteger(value[2]));

} }

```

```

c++;

if (r != 0) {

yValue.add(Integer.parseInt(value[0]));}

c = 0;

r++;}

} catch (Exception ex) {

JOptionPane.showMessageDialog(null, "Error Openin File" + ex);    }

} }

private void menuExitActionPerformed(java.awt.event.ActionEvent evt) {

// TODO add your handling code here:

this.dispose();    }

private void jTextField1ActionPerformed(java.awt.event.ActionEvent evt) {

// TODO add your handling code here:

double total = 0.00;    }

private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {

jTextField6.setText(""+df.format((Double.parseDouble(jTextField4.getText().toString())*Double.parseDouble(jTextField5.getText().toString()))+Double.parseDouble(jTextField3.getText().toString())));

}

private void jButton2ActionPerformed(java.awt.event.ActionEvent evt) {

try{

jTextField1.setText(""+df.format(mean(tValue)));} // TODO add your handling code here:}

```

```

catch(Exception er){

System.out.print(""+er);}

}

```

```

private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {

jTextField2.setText(""+df.format( mean(yValue)));

// TODO add your handling code here:

}

```

```

private void jTextField4ActionPerformed(java.awt.event.ActionEvent evt) {

// TODO add your handling code here:

}

```

```

private void jButton4ActionPerformed(java.awt.event.ActionEvent evt) {

jTextField4.setText(""+df.format( sumOfProducts(tValue, yValue)/sumOfSquare(tValue)));
// TODO add your handling code here:

}

```

```

private void jButton5ActionPerformed(java.awt.event.ActionEvent evt) {

float constant
=mean(tValue)+(sumOfProducts(tValue,yValue)*mean(yValue)/sumOfSquare(tValue));

jTextField3.setText(""+df.format(constant));

// TODO add your handling code here:

}

```

```

private void jTextField5ActionPerformed(java.awt.event.ActionEvent evt) {

```

```
// TODO add your handling code here:
```

```
}
```

```
private void jTextField6ActionPerformed(java.awt.event.ActionEvent evt) {
```

```
// TODO add your handling code here:
```

```
}
```

```
/* @param args the command line arguments*/
```

```
public static void main(String args[]) {
```

```
try {
    for (javax.swing.UIManager.LookAndFeelInfo info :
        javax.swing.UIManager.getInstalledLookAndFeels()) {
```

```
    if ("Nimbus".equals(info.getName())) {
```

```
        javax.swing.UIManager.setLookAndFeel(info.getClassName());
```

```
        break;}}
```

```
    } catch (ClassNotFoundException ex) {
```

```
        java.util.logging.Logger.getLogger(CsvFrame.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
```

```
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(CsvFrame.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
```

```
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(CsvFrame.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
```

```
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(CsvFrame.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);}
```



```
//</editor-fold>
```

```
/* Create and display the form */
```

```
java.awt.EventQueue.invokeLater(new Runnable() {
```

```
@Override
```

```
public void run() {
```

```
newCsvFrame().setVisible(true);}); }
```

```
// Variables declaration
```

```
private javax.swing.JButton jButton1;
```

```
private javax.swing.JButton jButton2;
```

```
private javax.swing.JButton jButton3;
```

```
private javax.swing.JButton jButton4;
```

```
private javax.swing.JButton jButton5;
```

```
private javax.swing.JLabel jLabel1;
```

```
private javax.swing.JMenu jMenu1;
```

```
private javax.swing.JMenu jMenu2;
```

```
private javax.swing.JMenuBar jMenuBar1;
```

```
private javax.swing.JMenuBar jMenuBar2;
```

```
private javax.swing.JTable jTable1;
```

```
private javax.swing.JTextField jTextField1;
```

```
private javax.swing.JTextField jTextField2;
```

```
private javax.swing.JTextField jTextField3;
```

```
private javax.swing.JTextField jTextField4;  
private javax.swing.JTextField jTextField5;  
private javax.swing.JTextField jTextField6;  
private javax.swing.JMenuItem menuItemExit;  
private javax.swing.JMenuItem menuItemFile;  
private javax.swing.JMenuItem menuItemOpen;  
private javax.swing.JMenuItem menuItemSave;  
private javax.swing.JScrollPane scrollPane;  
  
// End of variables declaration  
  
}
```