Six Sigma Quality: Concepts & Cases- Volume I
STATISTICAL TOOLS IN SIX SIGMA DMAIC PROCESS WITH MINITAB® APPLICATIONS

CHAPTER 2

GETTING STARTED WITH MINITAB
INTRODUCTION TO MINITAB®
STATISTICAL SOFTWARE

CHAPTER OUTLINE

Objective and Overview

MINITAB Statistical Software: An Overview

Worksheet (Data Window)

Session Window

History Window

Analyzing Your Data

Graphing Your Data: Scale, Labels, Data View, Multiple Graphs, Data Options

Printing and Saving Your Work

Command Sequence Used In This Text

Preparing Your Report

Changing data from Numeric to Text or Text to Numeric

Editing Your Graphs and Plots

An Interactive Session with MINITAB

This chapter presents a few examples on learning MINITAB statistical software including partial instructions. The book contains numerous cases, examples and step-wise computer instructions. For details, see Chapter 2 of the book.

AN INTERACTIVE SESSION WITH MINITAB (RELEASE 15)

1. START MINITAB USING THE FOLLOWING COMMAND SEQUENCE

Start ➢ **Programs** ➢ **MINITAB** (or double click on the MINITAB 16 icon)

2. ENTER THE DATA IN MINITAB WORKSHEET

Table 2.1 below shows the number of orders received by a company for the past 50 weeks. Enter this data in the MINITAB worksheet. Label column C1 of the MINITAB worksheet as **No. of Orders** and enter the 50 values in this column. You may enter the values in any order (row or column wise) but make sure all 50 values are in one column (C1). You may enter only part of data if you wish or open the file **ORDERS.MTW** from the CD.

Table 2.1

Number of Orders for the past 50 weeks (No. of Orders)

137	128	163	163	176	193	170	90	179	131	139	152	134
183	164	172	112	198	87	157	188	136	125	143	141	169
:												
:												
142	94	170	133	134	142	142	157	96	163	163		

3. SORT THE DATA

From the main menu, select the following command sequence

Data ➢ **Sort**

Complete the **Sort** dialog box that is displayed. Double click on **C1 No. of Orders** on the left side. This will appear under **Sort column(s) box**. Next, click in the **By Column** box then type **C1** or double click again on **C1 No. of Orders** on the left pane. Don't check the **Descending** box if you want to sort the data in increasing order. Click on the circle to the left of **Column(s) of current worksheet** and type **C2** in the box below it. Click **OK**. The sorted data will be stored in column C2. Name this column **Sorted**.

4. GENERATE PATTERNED DATA IN THE WORKSHEET

If you want to generate a sequence of numbers, for example, numbers 1 through 50, use the following command sequence

Calc ➤ Make Patterned Data ➤ Simple Set of Numbers

Complete the **Simple Set of Numbers** dialog box by typing the following response

Store patterned data in	**C3**	(or, any column of your choice)
From first value	**1**	
To last value	**50**	
In steps of	**1**	
:		
List the whole sequence	**1**	times

Click **OK** and the numbers 1 through 50 will be stored in column **C3** of the worksheet. Label this column **Week**.

5. GENERATE RANDOM DATA

You can also generate random data from various distributions. To generate 100 random numbers from a normal distribution, use the following command sequence

Calc ➤ Random Data ➤ Normal

Complete the **Normal Distribution dialog** box by typing the following response

Number of rows of data to generate   **100**

:

:

Standard deviation   **5**

Click **OK** and 100 random numbers from normal distribution with mean 50 and standard deviation 5 will be generated and stored in column C4. Name this column **Random No.**

6. ROUNDING

Suppose we want to round the values generated in step 5 to whole numbers. Since the data is stored in column C4, first click anywhere in this column then select

Editor ➤ Format Column ➤ Numeric

:

:

Click on the circle to the left of **Fixed decimal with** and type **0** in the box if you want to round the data to whole numbers. Click **OK**. If you want to round to two or three places, type 2 or 3 in the box then click **OK**. If you typed a **0**, the rounded values will be displayed in column C4.

7. DOING A SIMPLE ANALYSIS

Here we will show how to compute descriptive statistics for a set of data. Column C1 of your worksheet should have the number of orders for 50 weeks (from Table 2.1). To calculate the descriptive statistics for this data, follow the command sequence below

<p align="center">Stat ➢ Basic Statistics ➢ Display Descriptive Statistics</p>

In the **Display Descriptive Statistics** dialog box………………then click on the **Statistics** box. The dialog box in Figure 2.9 will be displayed
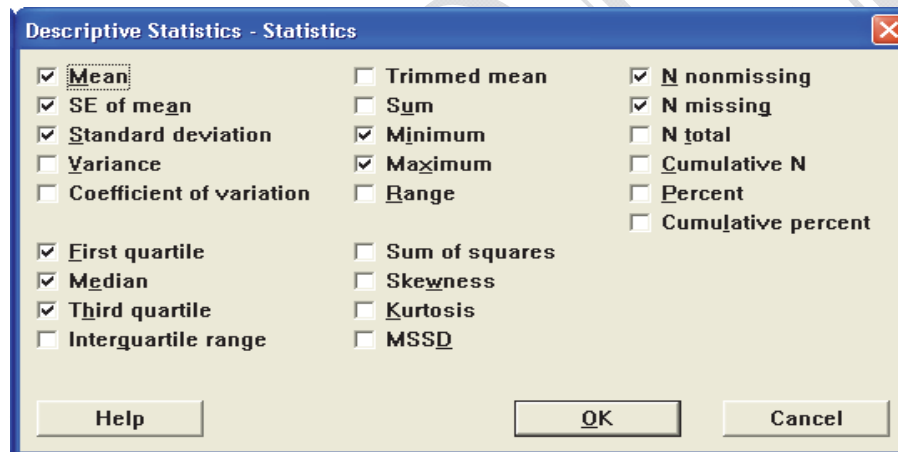

<p align="center">Figure 2.9: Descriptive Statistics Dialog Box</p>

Note that some commonly used statistics are already selected. You may select others and then click **OK**. You will be back to **Display Descriptive Statistics** dialog box. Click **OK** and the selected statistics will be calculated and displayed on the Session window as shown in Table 2.2.

<p align="center">Table 2.2</p>

Descriptive Statistics: No. of Orders

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3
No. of Orders	50	0	144.52	4.10	29.02	81.00	130.25	142.50	164.75

Variable	Maximum
No. of Orders	198.00

You can also construct simple graphs of your data by clicking on **Graphs** box under **Display Descriptive Statistics** dialog box. To do the graphs, use the following command sequence

<div align="center">

Stat ➢ Basic Statistics ➢ Display Descriptive Statistics

</div>

In the **Display Descriptive Statistics** dialog box, double click on **No. of Orders** on the left side so that it appears under the **Variables** box then click the **Graphs** box. Check the graphs you want and click **OK**. You will be back to the **Display Descriptive Statistics** dialog box. Click **OK** and the selected graphs for your data will be displayed one at a time.

8. CONSTRUCTING GRAPHS USING GRAPH MENU COMMAND

You can construct a variety of graphs and charts using the **Graph** command. We have explained here how you can do a stem-and-leaf plot, scatter plot and a time series plot.

Construct a Stem-and-leaf plot of No. of Orders (stored in column C1): From the main menu, select the command sequence

<div align="center">

Graph ➢ Stem-and-leaf

</div>

…………………., click on it so that it appears under the **Graph variables** box then click **OK**. The stem-and-leaf plot shown in Figure 2.10 will be displayed.
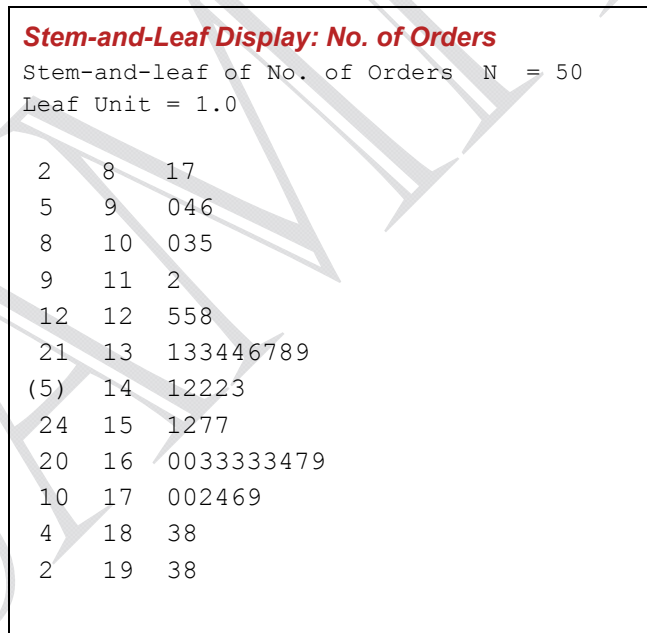
```
Stem-and-Leaf Display: No. of Orders
Stem-and-leaf of No. of Orders  N  = 50
Leaf Unit = 1.0

  2    8    17
  5    9    046
  8   10    035
  9   11    2
 12   12    558
 21   13    133446789
(5)   14    12223
 24   15    1277
 20   16    0033333479
 10   17    002469
  4   18    38
  2   19    38
```

<div align="center">

Figure 2.10: Stem-and-leaf Plot

</div>

Construct a Scatter Plot: Select the command sequence

      Graph ➢ Scatterplot

In the scatterplots dialog box, select **Simple** then click **OK. Scatterplot-simple** dialog box will be displayed. Type or select **No. of Orders** for **Y variables** and **Week** for **X variables**. Click **OK**. The scatter plot (shown below) of number of orders for 50 weeks will be shown on the graphics window (Figure 2.11).
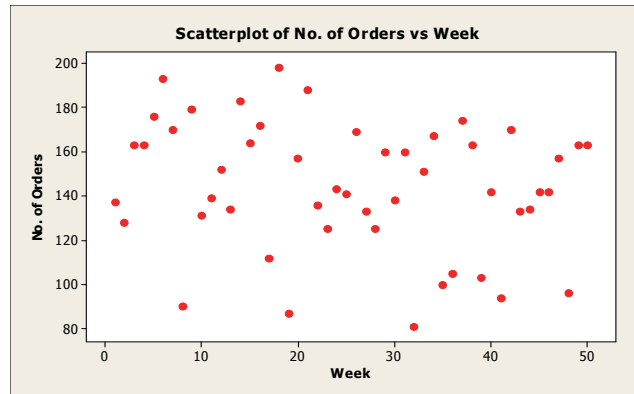

Figure 2.11: Scatterplot of Number of Orders

CONSTRUCT A TIME SERIES PLOT

A time series plot displays data over time. Suppose we want to construct a time series plot of number of orders for the past 50 weeks. Select the command sequence

Graph ➢ Time Series Plot

In the **Time Series Plot** dialog box, click on **Simple** and then click **OK**. In the **Time Series Plot-simple** dialog box, select or double click **No. of Orders** so that it appears under the **Series** box. Click **OK**. The time series plot shown in Figure 2.12 will be displayed on the graphics screen.

Figure 2.12: A Time-Series Plot of Number of Orders

9. SAVING YOUR WORK

By now you should have data in four columns C1, C2, C3, and C4 of the worksheet. You can save your work using

File ➢ Save Current Worksheet as

Type a file name and click **Save** to save your data. Note that Minitab automatically adds an extension **.MTW** to the file indicating that this is a Minitab worksheet.

Note: If you save your worksheet using **File ➢ Save Worksheet** command, only your data will be saved. If you want to save your data and all of your work, save your file as a project file. Use the command sequence

File ➢ Save Project As

and type a name for your project. Your work will be saved as a Minitab project. The project file has an extension **.MPJ** (Minitab Project).

At this point, you should save your data and work. Insert a CD in appropriate drive and click on **File ➢ Save Project As**, type a name for your project (for example, **Test Project**) and click **Save**. Your data with all your work will be saved under the project name.

10. VIEWING AND EDITING THE CONTENTS OF MINITAB PROJECT FILE

When you save your work as Minitab project, the project file saves all your work including worksheets (containing data), history of all the commands, the graphs you created, all the analyses you performed and more. To see many pieces of your project, use the following command sequence: **Window ➢ Project Manager**

The project manager window shown in Figure 2.13 will be displayed.
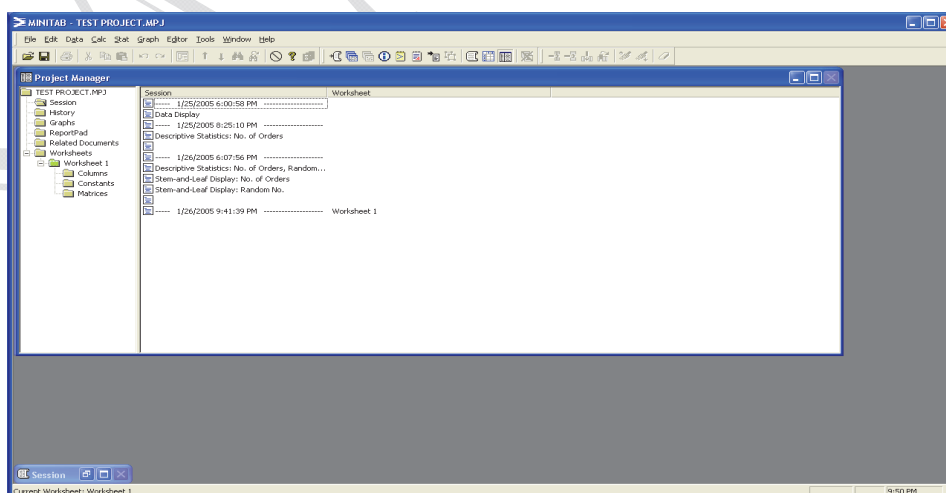

Figure 2.13: The Project Manager Window

The project manager contains several folders including session, history, graphs, report pad, related documents, and worksheets (left pane of the above figure). You can click on these folders to see their contents. You can also edit these folders by right clicking and selecting several options.

Click on the **Session** folder. You will see a list of all session window output by command and also some of the graphs you created. You can edit the contents of this folder, print, edit the graphs, or append the session window contents or graphs to the **Report Pad**.

If you click on **History** folder, you will see the list of all the commands you used. You can use these commands to create macros or you can repeat the command sequences and re- execute them.

Experiment with other folders. The **Graph** folder contains a list of graphs you created. You can edit these graphs or append the graphs to Report Pad. The **Report Pad** folder allows you to edit reports of the project work. You can also copy and paste the contents of **Report Pad** folder to a word processing program.

- To open a new project, choose
  File ➢ New ➢ Minitab project then click **OK**.
- To open a previously saved project, choose
  File ➢ Open Project
  Select the project file you want to open and click **Open**.
- To save a project, choose
  File ➢ Save Project As

11. USING MINITAB CALCULATOR

You can use the calculator to do column operations, arithmetic operations, comparison operations, logical operations, function evaluations and more. Suppose you want to add the values in Column C1 and C4 of your data and store the results in column C5. From the main menu select the following command sequence

Calc ➢ Calculator

Complete the Calculator dialog box as shown below

Store result in variable   **C5**

Expression   **C1+C4**

Click **OK.** The values in columns C1 and C4 will be added and the result will be displayed in column C5.

The functions and operations can be selected from the **Functions** box. To learn more about the functions, click **HELP** in the calculator dialog box.

12. PRINTING YOUR WORK

Printing Session window: You can print the content of Session window, graph, or the data. Recall that the session window displays all your results. To print the output, click on the session window to make it active then choose

File ➢ Print Session Window then Click **OK**.

Printing a Graph: To print a graph, click any where on the graph to make it active then choose

File ➢ Print Graph

If you have several graphs and you want to print them all, you can go to the Graphs folder in Project Manager, select and print all the graphs. To do this, select the following command sequence **Window ➢ Project Manager** then click on the **Graphs** folder in the left pane of **Project Manager**.

On the right pane, click on the first graph title and drag down to select all the graphs you want to print. Right click on the highlighted area, choose **Print** and click **OK**.

13. EDITING SESSION WINDOW OUTPUT

You can edit the output displayed on the session screen to organize, put headings or subheadings, or to organize your work in a report format. The session window is read-only by default. Before you can edit the content of this window, click on the session window to make it active then from the main menu, select

Editor ➢ Output Editable

This will enable session window editing. If there is a check mark next to **Output Editable** then the session window is already enabled. Once in edit mode, you can add or delete text, add titles, and organize the content of the session window. By enabling the command in the session window, you can write and execute commands from the session window. To do this, select

Editor ➢ Enable Commands

This will display the command prompt MTB **>** on the session window. You can now write and execute commands. If the command prompt is enabled, the session window will display all the commands executed using the main menu.

14. TOOLBARS

Just below the Menu Bar are the Toolbars. The Toolbars can be used to issue commands easily. These Toolbars are detachable and can be dragged to other places for easy access. The detached Toolbars are shown in Figure 2.14. When you start MINITAB, you will see the Toolbars in a single row below the Menu Bar. The buttons on the Toolbar change and become

active depending on which window is active. To see the name of a button on the Toolbar, click on the button with your mouse.
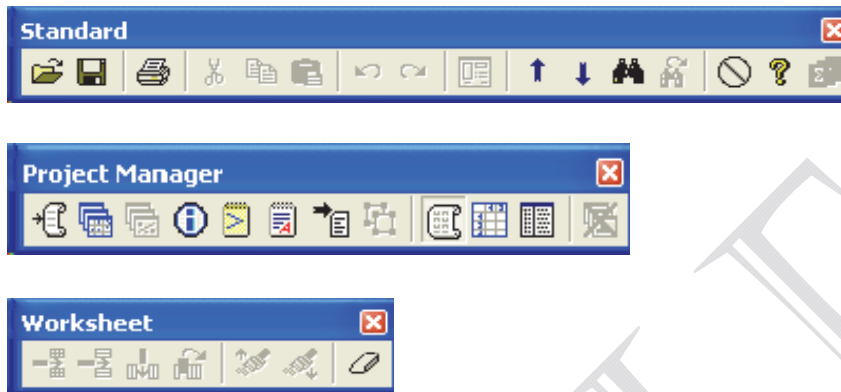
Figure 2.14: Toolbars

15. EXITING MINITAB

To exit MINITAB, use the command sequence,

    File ➢ Exit