1.Introduction

Welcome to the e learning session on the concept of Graphical representation of data.

Large, scattered data needs to be organized, condensed and presented so that it is meaningful. The organized and condensed data can be presented in different ways, tabular or graphic.

In previous sessions, we have seen how data can be organized and presented in a tabular format.

In this paper, we will look at presenting the data in a graphical or diagrammatic fashion.

At the end of this session, you will be able to:

- Explain what graphical representation of data means
- · Give real-life examples where data is graphically represented
- Highlight the importance of presenting data in graphical and diagrammatic formats

• Explain the guidelines to be followed while preparing graphs and diagrams to represent and present data

- List the advantages of graphical and diagrammatic representation of data
- List the limitations of presenting data in the graphical and diagrammatic format
- · Explain how to choose which type of graph to use in different situations

• Graphical representation deals with presenting organized and condensed data in a visual format, so as to make it easy for the viewer or reader to grasp and derive meaning from the data.

Data is typically organized, condensed and analysed to derive meaning, and is used frequently by organizations as inputs in decision-making.

By presenting the analysed data in well designed graphs, it helps reduce the time to grasp and make sense of the data, and therefore helps in faster decision-making. Graphical representation is used extensively by organizations and professionals in various situations, to highlight important messages.

For example, a sales manager may use a line graph on a time series chart to highlight the performance of his area over the last 8 Financial quarters, as shown in the figure.

You will notice that it is easier to grasp the meaning from the chart than from the table.

In a stock market, the variation of the price of a stock over a period of time can be depicted using a line chart.

Sometime it is also shown using an area chart.

Several observations can be made by looking at this chart.

Here, we can make out at a glance the price variation of the stock, and whether the stock has

appreciated, or depreciated over the time period. It is possible to make out the highs

and lows of the price of the stock over the time period.

It also helps at a glance compare how the stock performed in the first part of the year versus the second part of the year.

Companies while presenting their annual reports make use of graphs and diagrams to highlight important messages.

For example, a growing company can highlight its fast growth by depicting its revenues over the last 5 years on a line chart.

A company which consistently pays out dividends to its share holders can show the dividends paid out in the last 10 years using a bar chart.

In the field of sports, graphical representation is used to present analysis of a sports person'sperformance from various perspectives.

Let us take for example the batting statistics of Rahul Dravid

With the help of a pie chart we can show the comparison of the number of centuries scored on home grounds versus the ones scored on foreign soil.

We can also show the number of times he has scored more than 30, 40, 50 runs and so on, using a bar chart.

We can also classify the centuries scored against different countries and represent as a pie chart.

Thus, various aspects of his performance can be depicted using different types of graphs and diagrams.

2. Uses of Graphical Representation of Data

The media regularly uses charts and graphs to present data. There is a popular saying that a picture is worth a thousand words and nowhere is this truer than when data is graphically represented.

The print and online media has limited space to present data; hence graphic representation of data is a necessity for these media, especially when it comes to presenting large amounts of data.

It is also noticed that people's attention span in the modern day has become limited. This has happened due to a variety of factors like the internet, cable television etc.

Graphic representation of data draws people's attention to information that would be otherwise cumbersome, daunting or boring to read and grasp. The television media has also resorted to graphic representation of data in many instances, most notably during election coverage.

Election results are now presented to us in a graphic form like pie charts so as to give the viewer the big picture in a very easy to understand manner.

Many media houses make their graphic representation of data even more attractive by using attractive graphics to represent data. this is also done commonly in newspaper and magazines for example if the month wise sales of car have to be presented in graphical form the sales figures may actually be presented in the form of a car. A larger car representing higher sales then a smaller car or 1 car representing 1,000 cars sold of a particular brand.

Top corporate executives have very little time to examine huge amounts of data. These managers are decision makers and often have to make quick decisions in a short span of time. Graphical representation of data helps them grasp the macro picture and take decisions quickly. In another case of practical application of graphical representation of data

In Academic presentations especially of projects undertaken make use of graphical representation of data to highlight findings. Most projects which are done at the masters or doctorate level include a large amount of raw data which is collected from primary sources. This raw data can be presented in a concise manner via graphical representation. The availability of software which includes inbuilt tools that easily

facilitate graphical representation has also helped in increasing the use of graphs and diagrams in academic presentations.

It makes it easy for the reader or the viewer to grasp and understand the data whenever it is presented in an attractive, graphical format. It also makes for interesting viewing.

So, graphical representation is an important and useful technique which is applied in almost every walk of life in day-to-day situations.

3. Types of Graphical Representation of Data

There are several advantages of presenting the data in a graphical manner.

Some of them are as follows:

A well constructed graph or chart brings meaning to data. It is also easier to grasp and remember the data presented through a graph when compared to tabular data, because of the visual impact that a graph brings.

It is easy to attract the attention of the reader with a well designed graph, especially when several colours and a good choice of fonts are used.

You can draw attention to certain portions of the data by using different colours and text sizes. You can drive home important messages by focussing on certain portions of the data.

The example here shows the share of various countries in production of rice. It is evident from the pie chart that India is one of the largest producers of rice and produces almost 20% of the total rice produced in the world. In the tabular format, it is not as easy to highlight this fact as in the graph.

Another advantage of graphs is that it removes complexity. A layman will also be able to understand simple charts, maps and pictures.

Graphs and charts help a great deal in interpretation and analysis of data. For example: The prices of stocks and commodities are usually analyzed after plotting the data on time series charts. The analysis helps traders and investors to take decisions on buying or selling the stocks.

Graphs are also quite helpful in depicting several statistical concepts such as mode, median, normal distribution, time series analysis and so on.

Hence well designed charts bring out the meaning and substance of data in an easy to view form. Graphs are much more interesting and pleasing to view then plain numbers. Many people prefer pictures to text, hence graphs become more appealing.

4. Guidelines on Graphical Representation of Data

Certain guidelines should be always followed while preparing graphs and diagrams to ensure completeness and to ensure that there is no ambiguity in what is presented.

Some of them are:

Title:

A graph or diagram should always have an appropriate title, and if necessary, should also have a sub-title.

The title should be concise and convey what is presented in the graph clearly.

The title should stand out from the rest of the chart. It can be presented in bold either at the top or at the bottom of the graph.

It is very important that the title is properly presented because it is the first impression a reader or viewer is going to form on the data. Poorly worded or misspelt titles may put-off or confuse a reader.

Scale:

Scale is the numerical system used to define an axis on a graph. Let's take for example a company whose revenues have grown from 15 crores to 50 crores over 5 years. When the revenues are shown over a period of 5 years, the x-axis represents the years. They y-axis represents the revenues. On the x-axis, each number represents one year.

On the y-axis, each number represents 10 crores.

1) The scale is determined by the data to be presented.

In the example shown, if each number represented one crore instead of 10 crores, it would be very difficult to show all the data points on the y-axis, and the graph will look disproportionate, or skewed.

Therefore it is important to choose the right scale for each axis while presenting data.

If a scale is wrongly used it can misrepresent data. This can happen if different scales are used to represent the same data. Thus it is very important to publish the scale used along with the graph to give a clear picture to the reader. A reader can verify the authenticity of a graph by using the scale.

2) Size and Proportion:

Two other aspects to be borne in mind while using graphs are the size and proportion. The size of the graph should neither be too small or too large. The proportion is the ratio of the length to the breadth of the graph. As a thumb rule, it is recommended that a proportion of 1.4:1 be used for graphs. Any side can be the longer side, but it should be slightly less than 1.5 times the shorter side.

3) Footnotes:

Many a time, certain clarifications or additional notes may need to be provided along with a graph, in order to bring in clarity. Such information should be provided as footnotes at the bottom of the graph, as shown in this example.

4) Acknowledgement of source of data:

If the data used to prepare the graphs is taken from an external source, it is important to acknowledge the data source. The example here shows the total imports of India over x years. This data has been compiled by the zzzzThe source of data has been acknowledged alongside the graph.

Now a days a lot of data is sourced from various sources like the internet, published material etc. It is important for us to let the reader know the source where the material has been sourced from. This is largely to distinguish from data that has been collected first hand. A reader should not get the wrong impression that secondary data is equal to data collected first hand while reading a graphic representation of this data. Hence it is very important t acknowledge the source of data. The source of data might also lend credibility to the data. This is especially true for macro-economic data sourced from Governmental agencies or from industry associations.

5) Attractive Presentation:

Another important aspect to be kept in mind is to make the graphs attractive and appealing to the viewer. This may be done with the use of different colours, by choosing fonts carefully, by choosing the right size and proportion, and so on.

5. Advantages and Disadvantages

While there are several advantages to presenting data in a graphical format, there are also

certain limitations. Let us look at some of them now.

Precision is not possible

A graph may not be a suitable tool to use, when precision of data is required.

Graphs cannot substitute tabulation. In fact, graphs are mostly presented using tabular data as the underlying.

Another limitation of graphs and charts is that too many details cannot be presented, as they will look cluttered, and can result in loss of clarity.

Graphs are unsuitable when it comes to mathematical treatment. Tabular data is suitable when mathematical treatment has to be done on the data. For example, it is difficult to calculate ratios by just using a graph. With tabular data, it is more easily achievable.

Another limitation of graphs is that small differences in large measurements cannot be brought out clearly.

In this example, percentage marks scored by 10 students is shown. There are very small differences in the marks scored by the last 3 students. It is difficult to see the differences in this graph.

Another limitation is that not all graphs are simple to construct and comprehend. For example when ratio graphs and multi-dimensional graphs are used, it may be difficult for the common man to understand. It may require some expertise on the part of the reader to comprehend such graphs.

The major danger of graphical representation of data is that people may get carried away by the form of the presentation and forget the substance. The viewer may be taken in by the pictures and forget the data.

Here are some guidelines which will help us to choose the right type of graph for a situation.

The first consideration is the purpose behind presenting the data. For example, if the purpose is to present revenues of a company for the last 5 years in an annual report, then a line chart with time plotted on the x-axis and revenues plotted on the y-axis

would be appropriate, as it would show clearly the revenue performance of the company over a period of time.

Another consideration is the nature of data to be presented. If the original data itself is presented, a simple graph might suffice. However, if derived data such as ratios are presented, a different type of graph such as a semi-logarithmic chart might be needed.

The time and resources available also will drive the choice of charts. For example, a map will require more resources and time than simple line charts and bar charts. It may require a professional cartographer to create the map.

Another important consideration is the audience for which the presentation is made. If the

presentation is meant for the general public, simple graphs such as time series of bar charts can be used.

When using graphs for important presentations a lot of time must be spent and care taken deliberating the type of graph to be used.

It is also important to choose colours that are pleasing to the eye.

The method of presentation is also important, this means- whether the data is going to be shown on a computer screen or as a print out. This is because different graphical presentations and colours look different depending on how they are presented. The importance of the data to be presented must never be lost.

Here is a quick summary of our learning from this session. We learnt: What graphical representation of data means

The importance of presenting data in graphical and diagrammatic formats

We then went on to learn about the guidelines to be followed while preparing graphs and diagrams to present data.

We then looked at the advantages as well as the limitations of presenting data in a graphical format.

We finally learnt how to choose the type of graph to use in different situations.