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Use of Data Visualization & its Techniques

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***Abstract*— Data visualization is a quite new field in computer science which deals with the computer graphic effects to reveal the patterns, relationships out of dataset. In this paper, first we get familiar with "What is Data Visualization?" and then we will look through the different ways to represent data visually.**

Keywords—Data Visualization; Computer Graphics; Dataset;Patterns

I. INTRODUCTION

Human has a long history with data visualization and today also data visualization is a hot topic. But the history of visualization is shaped to some extent by available technology and by pressing needs of the time, they include: maps on wall, primitive paintings on clays, table of numbers etc. are some kind data visualization but we may not call them under data visualization at this time.

Visualization is the graphical representation of information, where the goal of presentation is to provide the qualitative understanding of the information contents. It is the process of transforming concepts, objects and numbers into a visual form that will explain it easily and completely. The basic purpose of visualization is to create interactive visual representations of the information that exploit human's perceptual and cognitive capabilities of problem solving [1]

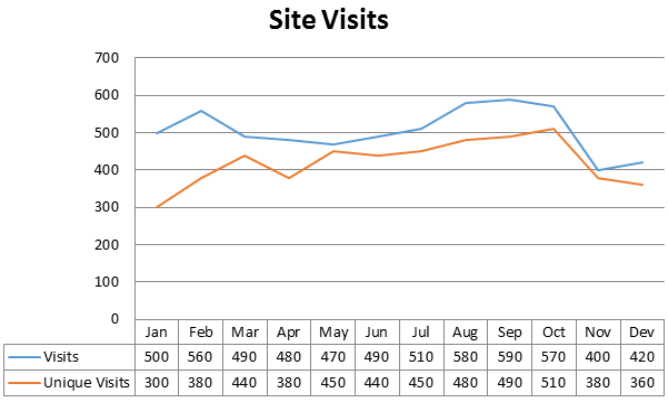
II. USE OF DATA VISUALIZATION

To see and understand pictures is one of the natural tendencies of human, and to understand numerical data is years of training skill from schools, and even so, lot of people are still not good with numerical data. From a well-drawn picture, one is much easier to find the trends and relations. It provides a powerful means to make sense of data and to then communicate what is discovered to others. Human keeps historical data to do analysis on it for future implementations as it provides better mental model of the information so human can take proper decision [2].

III. DATA VISUALIZATION TECHNIQUES

A. Line Graphs

A line graph or a line chart shows the relationship of one variable to another. They are most often used to track changes of the variable values over time. Line charts are also very useful when comparing multiple items over the same time period (see, Fig 1.1). The stacking lines with different colors are used to compare the individual values or trend for several variables.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dev
Visits	500	560	490	480	470	490	510	580	590	570	400	420
Unique Visits	300	380	440	380	450	440	450	480	490	510	380	360

Fig 1.1: Above Line graph shows the relationship of one variable to another. Here different category line graphs compare multiple items over a same time period.

B. Bar Charts

This visualization technique is most commonly used to compare the quantities of different categories or groups. Values of each category are represented using the bars. If the values of different categories are distinct enough then the differences in the height or length of bars can be detected by the human eye easily but if the values of the category are very close to each other or there are large number of bars to be displayed then it becomes more difficult to compare different bars with each other. Also, to help to provide better visual variance, bars can have different colors. Coloring the bars works best when most bars represents different range or status. Bar chart can be represented using single bar (see, Fig 2.1) or multiple bars (see, Fig 2.2) [3].

Vertical bar chart is an alternative for horizontal bar chart, which is used in the same way like horizontal bar chart but the bars are represented horizontally rather than representing it vertically.

Another type of bar chart is "High Low Open Close" chart or "floating bar" chart (see, Fig 2.3). It represents the low limit

and high limit of a value of each category unlike simple bar chart where only high limit is considered.

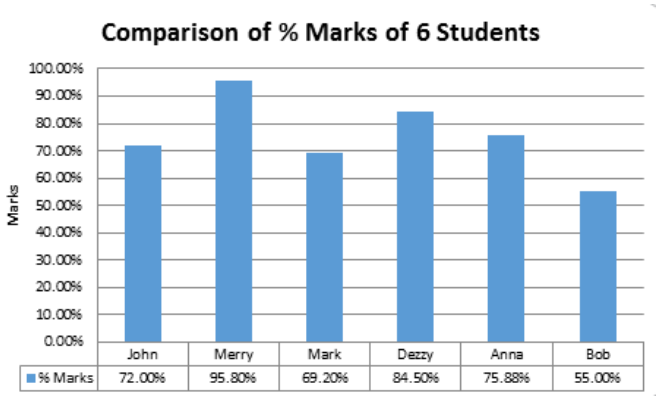


Fig 2.1: Above single-bar chart shows % marks (on y-axis) of 6 students (on x-axis).

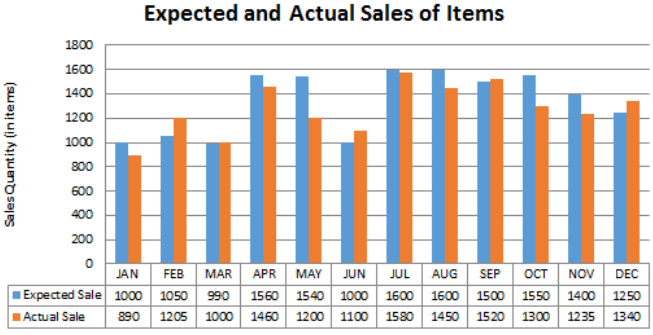


Fig 2.2: Above multi-bar chart shows the comparison between expected sale and actual sale in particular month.

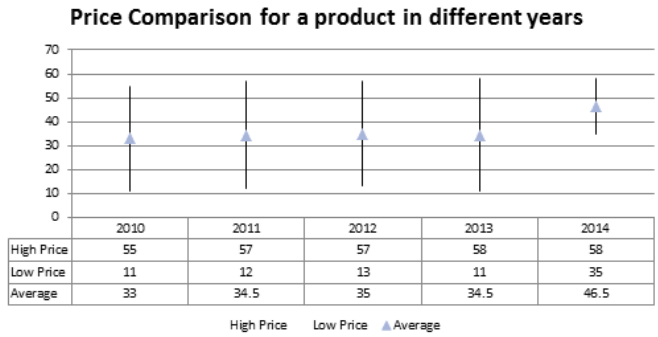


Fig 2.3: Above floating bar chart shows a price comparison of a product in different years.

C. Scatter Plots

This graph can also be known as XY Plot, plot chart, scattergram or scatter graph etc. It is two-dimensional graph that shows set of data in Cartesian coordinate. It shows the relationship between two variables in which one variable represents horizontal distance and another variable represents vertical distance of data point from the coordinate axis (See, Figure 3). Scatter graph shows how strong the relationships are between the variable.

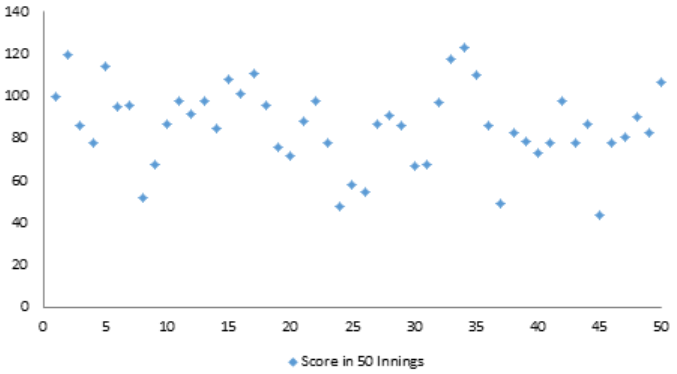


Fig 3.1: Above scatter plot shows the score on vertical axis and innings on horizontal axis.

D. Area Chart

Area chart is sometimes known as “area graph”. Area chart is used to display quantitative data in bounded area. This bounded area is drawn based on the line graph. First the line graph is generated (see, Fig 4.1) and then the area below it is shaded with different texture and hatching which finally produces area graph (See, Fig 4.2). As like line chart, graph chart also can be drawn on the basic of multiple series (see, Fig 4.3).

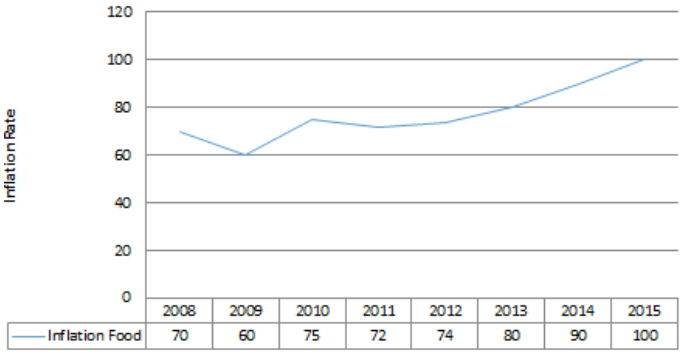


Fig 4.1: Line graph generated to generate the area chart.

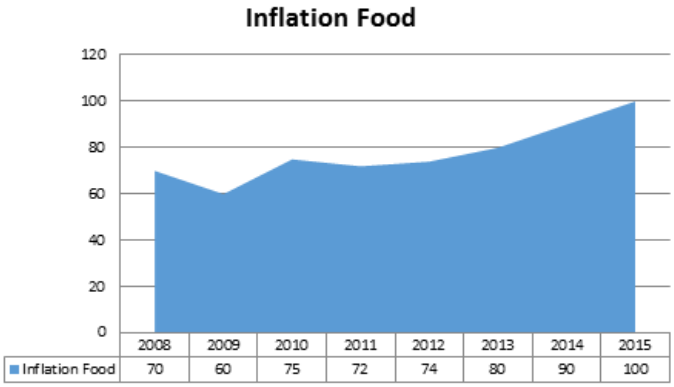


Fig 4.2: Area chart generate on the basis of line chart in figure 4.1

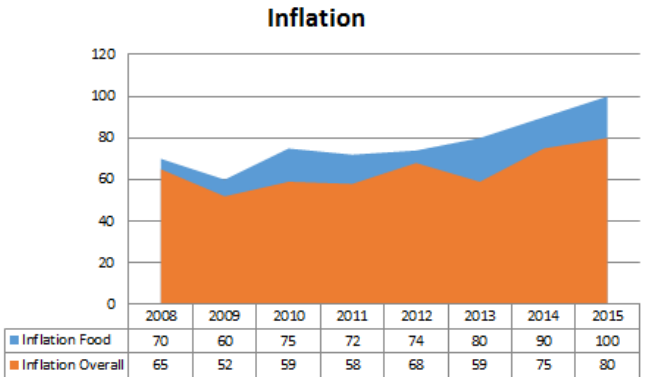


Fig 4.3: Multi Series Area chart.

E. Bubble Chart

In bubble chart, three different numeric parameters are used. One numeric value determines the position of bubble along x-axis, another defines the position of bubble along y-axis and third parameter is used to determine the size of a bubble. In this type of chart, one bubble is differentiated with other bubbles in terms of its position and its size (see, figure 5.1). Bubble chart is like a scatter plot but the data point is represented with a bubble and each bubble may have different value associated with it.

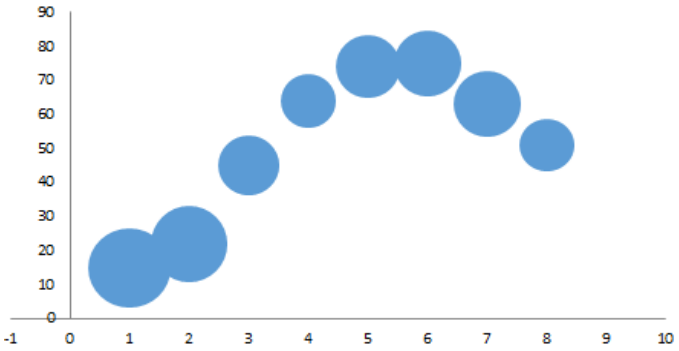


Fig 5.1: Bubble Chart

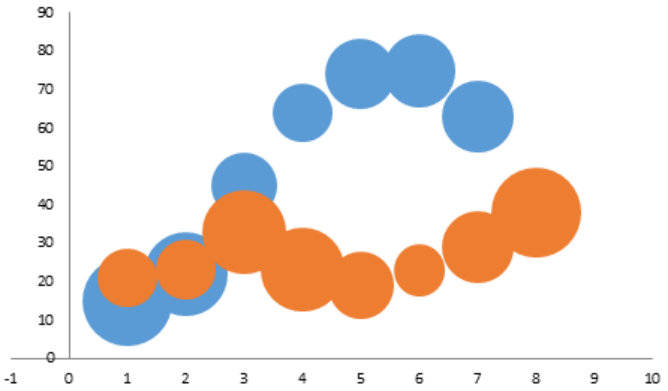


Fig 5.2: Multi Series Bubble Chart.

F. Pie Chart

A pie chart is sometimes referred circle graph. In pie chart, a circle is divided into different sections, where a circle defines a proportion in a whole quantity. The pie chart control is use to determines the size of data wedge as compare to other data wedges. In pie chart, each section represents the part of data that has common characteristics. Each section can be labeled to identify different data points. Most of the time the data points are represented in percentage and a circle is considered of hundred percent values (see Fig 6.1). Also this standard pie chart can be represented using different types like Doughnut pie chart (see, Fig 6.2) or exploding pie chart (see, Fig 6.3).

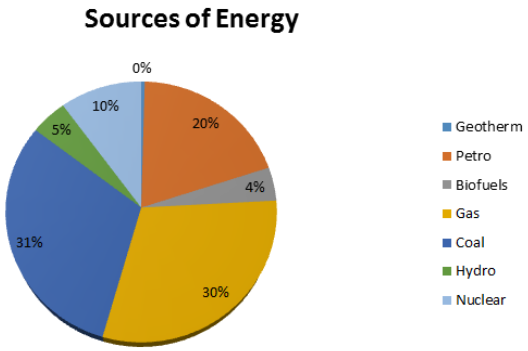


Fig 6.1: Standard pie chart

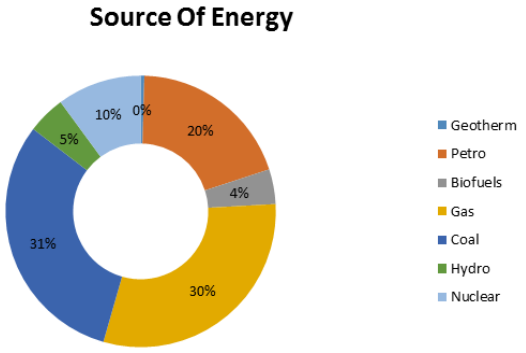


Fig 6.2: Doughnut pie chart

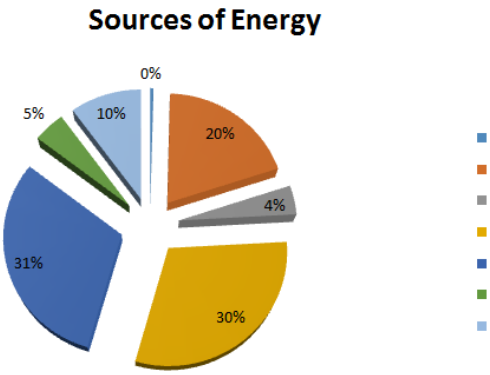


Fig 6.3: Exploding pie chart

IV. CONCULSION

In this paper, we discussed the standard data visualization techniques like line chart, bar chart, scatter plot, area chart, bubble chart and pie chart. With the wide range of available tools and charts, our report will look exactly the way we want. Data visualization helps to represent modern businesses leverage data into customized graphical form. Also, using data visualization techniques we can create, customize and share dashboards and visualization with the entire business team. We are concluding that accessing appropriate use and design is an important stage before evaluating data visualization influence.

V. REFERENCES

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[3] Adobe Flex, Advanced Data Visualization Developer Guide