1. Introduction to Area Charts

Welcome to the e-learning session on Area and Bubble charts.

At the end of this session, you will be able to:
- Define Area Charts
- Identify the practical uses of Area Charts
- Explain the steps involved in constructing Area Charts
- How to read and analyse an Area chart
- Understand the advantages & limitations of Area Charts
- Define Bubble Charts
- Identify the practical uses of Bubble Charts
- Understand how to construct Bubble Charts
- Understand the advantages and limitations of Bubble Charts

In previous sessions we have learnt about the need and importance of graphical representation of data. In this session we will look at two charts that are used to graphically represent data namely the area chart and the bubble chart.
An area chart is based on a line chart. It is also called an area graph. It is used to display quantitative data graphically.

Area charts are similar to line charts but the area below the lines is normally marked or shaded using different colours. This makes the graphical representation more colourful and attractive and more importantly helps distinguish different types of data clearly.
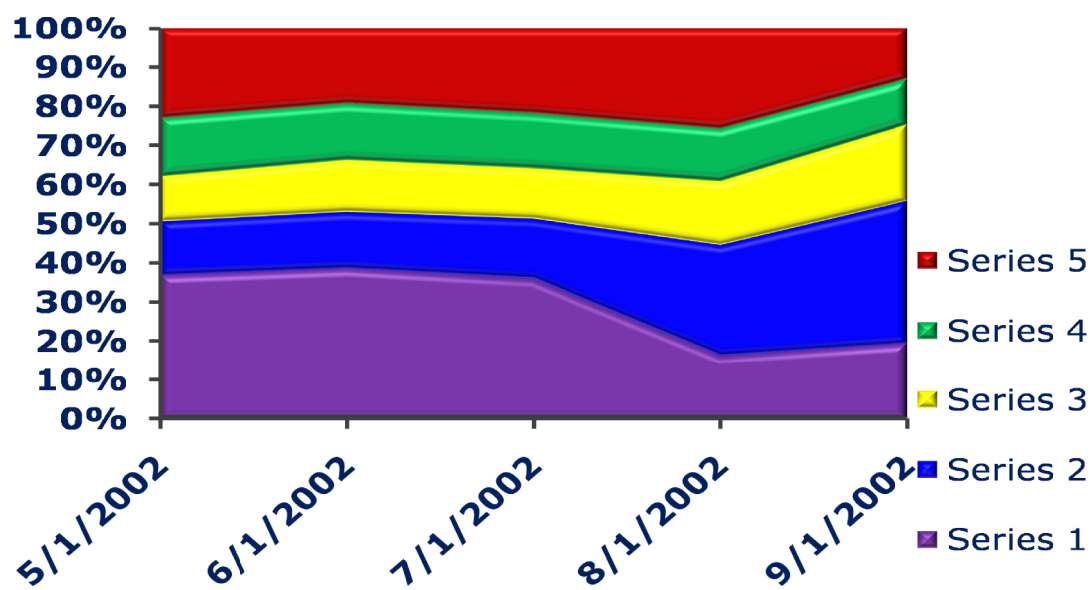
Figure 1

The area in an area chart represents the amount or quantity of data for a particular time period or at a particular point in time. An area chart is useful in presenting any type of time series data.

Figure 2
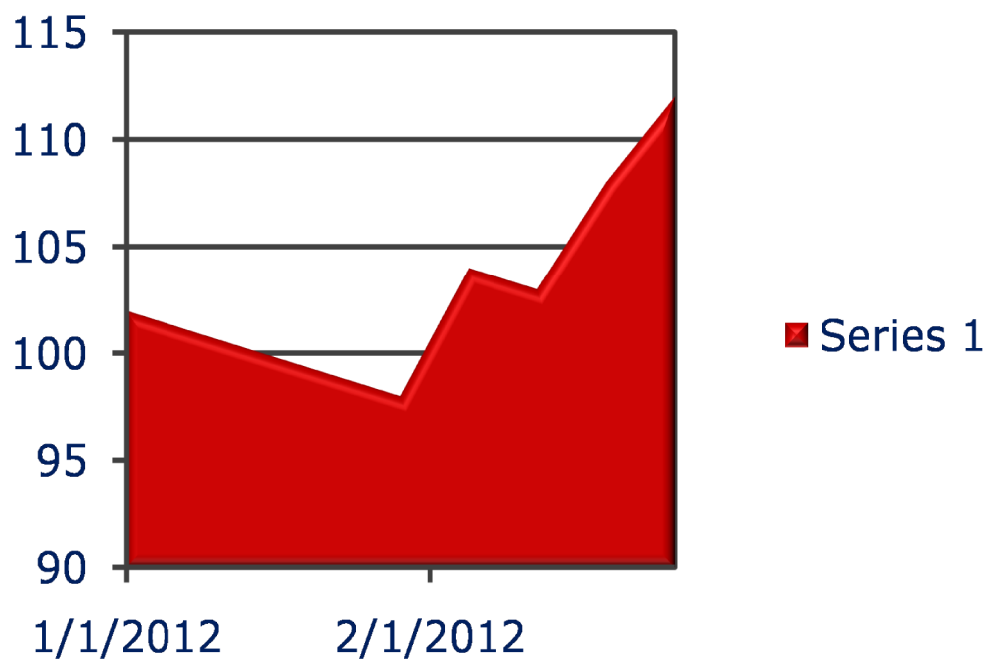
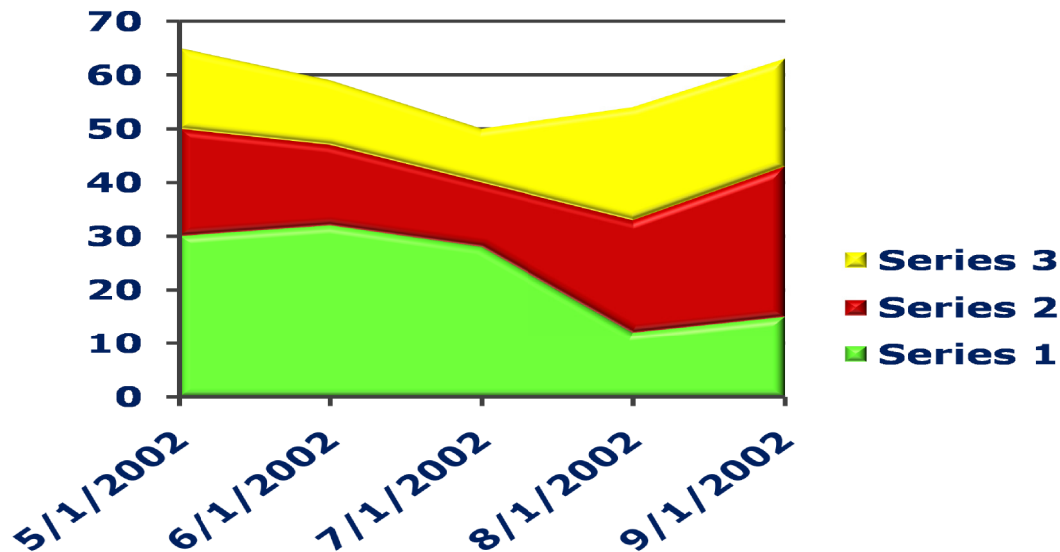It is possible to show Cumulated Time series data in a stacked format in an area chart.

Figure 3

2. Practical use of Area Charts

When there are two or more series to be represented graphically via a line chart- an area chart is useful in showing the area common to the two or more series of data and also area which sets these multiple series of data apart.

Figure 4

Thus, area charts are very useful for presenting economic and financial data. They are also useful when presenting comparative and trend analysis.

Like line charts, area charts show how some data has changed and moved (increased or decreased) over a period of time. They are mainly constructed when we plot data that changes, moves- up and downs over a period of time.
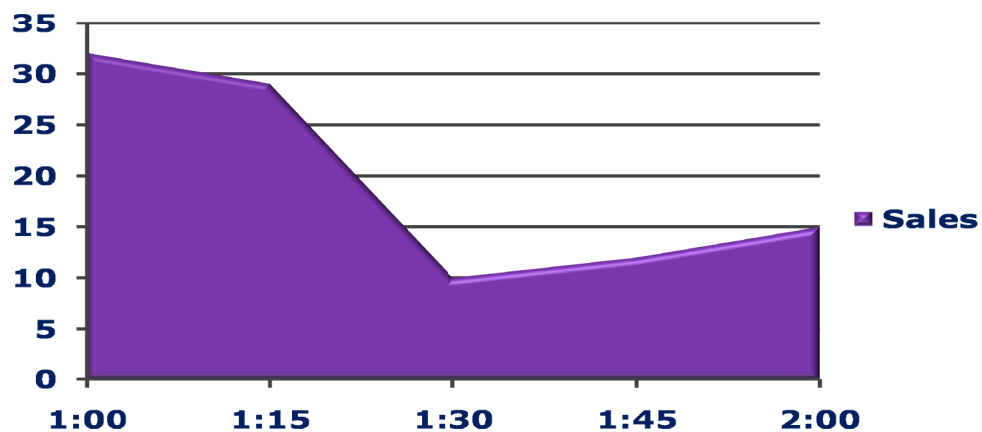
Data that is arranged in the form of columns or rows can be plotted in an area chart.

Figure 5
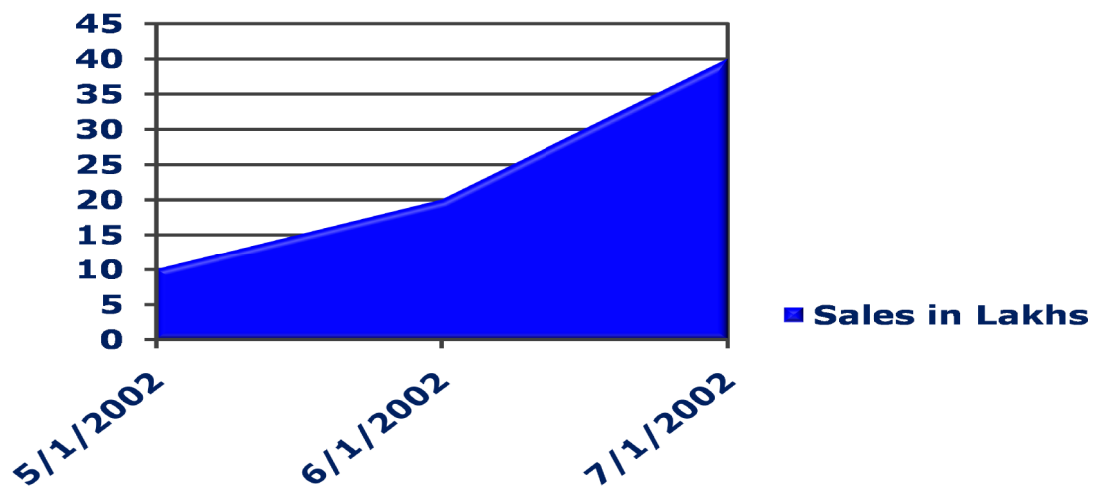
Area charts highlight the amount of change over a period of time and can be used to draw attention to the total value across a trend. For example, data that represents sales over a particular period of time can be plotted in an area chart to emphasize the total sales.

Figure 6

Thus, to construct an area chart the same steps that were involved in constructing line charts are used.

Step 1:

Figure 7

| Years	X Comp	Y Comp	Z Comp
1-1-2005	1	1.5	1.75
1-1-2006	1.5	2	1.5
1-1-2007	2	1.75	3.5
1-1-2008	3	2.5	3.1
1-1-2009	4	3.5	3.8

Identify the range of data which is to be graphically represented.

Let us look at the example. Here sales figures of a company are presented. We can see the years under our study are 2005,2006,2007,2008 and 2009 and the corresponding sales figures for each of these years. 2005- Rs 1 crore for company x 1.5 crores for company y and 1.75 crores for company and so on for the other years.

Hence we can see the range of years is 2005 to 2008 and the range of sales figures is between 1 and 4 crores.
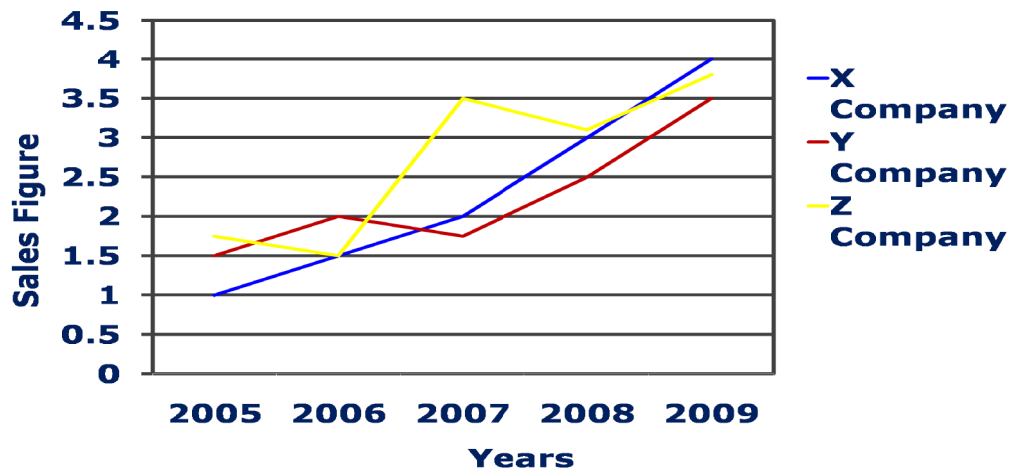
Step 2:

Figure 8
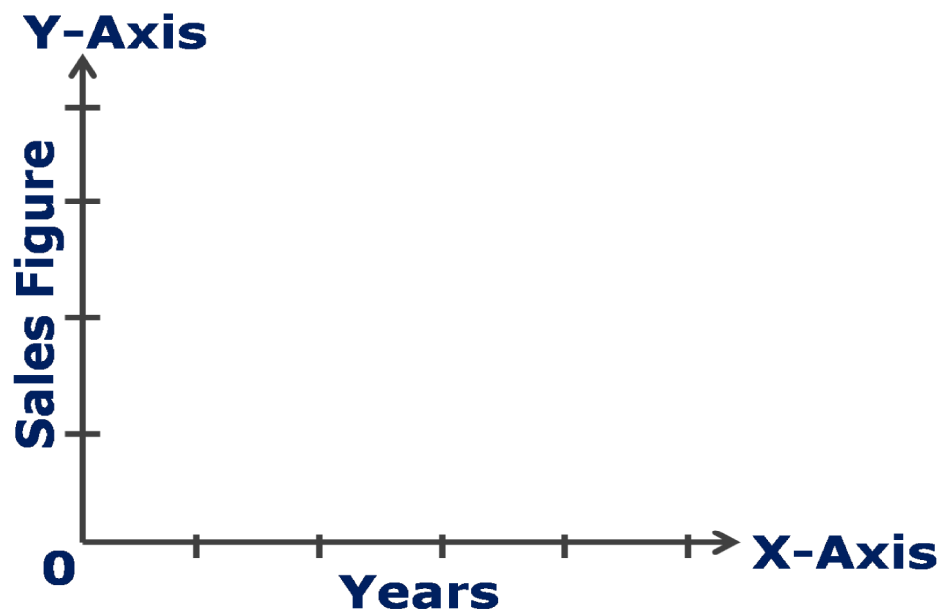
Plot the ranges on a graph sheet- The x axis will have the independent variable i.e. the years and the y axis will have the dependent variable the sales figures. Choose a suitable scale to

represent the data. A scale of 2 Cms for each year is used on the x axis and 2 Cms for every Rs 50 lakhs is used on the y axis.
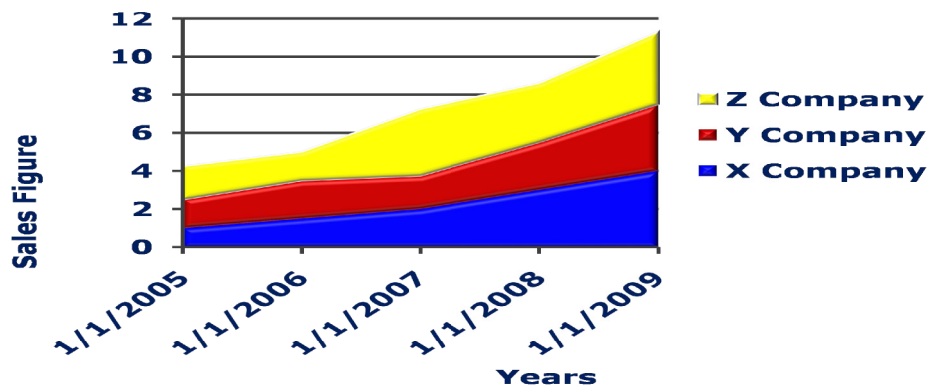
Step 3:

Figure 9

Plot the data within the graph and construct line charts. In our example we will have 3 line charts. One for company x, one for company y and one for company Z.
Till this point what we do is similar to constructing line charts.

Figure 10

In step 4 we will shade the area between each of the lines we constructed and thus get an area chart. When shading the area in between lines different colours are used to highlight the area represented by different data. Thus a stacked area chart is constructed to shows the relationship of various parts to a whole.

In our example the entire sales of 3 companies together forms the entire data. Individual sales figures for each company form parts of the entire data. Stacked area charts show the trend of contribution for each value over a period of time. Thus area charts are useful in depicting incremental data and for comparisons between series of data.

# 3. Presentation, Advantages and Limitations of Area Charts

Figure 11
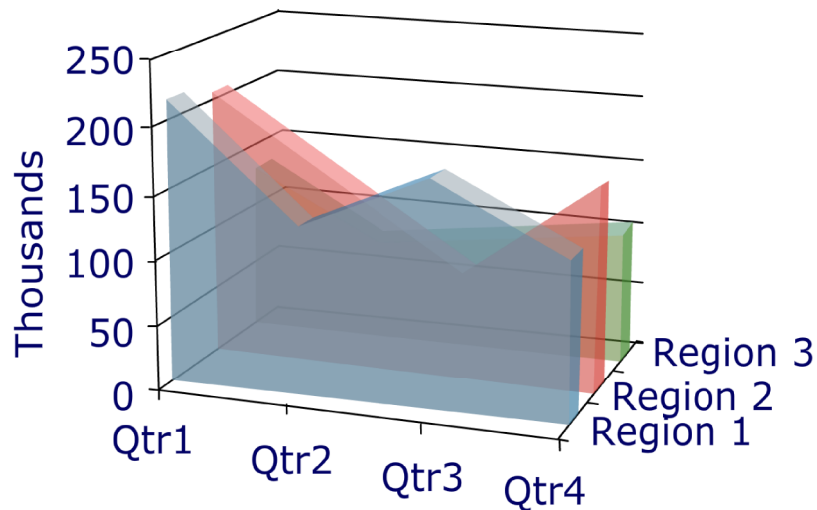
Area charts also be depicted in a three dimensional form. Here in addition to horizontal x axis and the vertical y axis we have a third axis to represent the depth. When constructing 3 dimensional area charts it is advisable to use a line chart instead of a non-stacked area chart. This is because if a non-stacked area chart is used data from one series maybe hidden by data from another series. 3 dimensional area charts are easily constructed using the tools available in software like MS excel. While using software to create area charts they may be presented in a transparent form so as prevent any ambiguity to the viewer.

How do we read and analyse area charts. Here we will cover the essential information to be presented in area charts:

The Title:
Figure 12
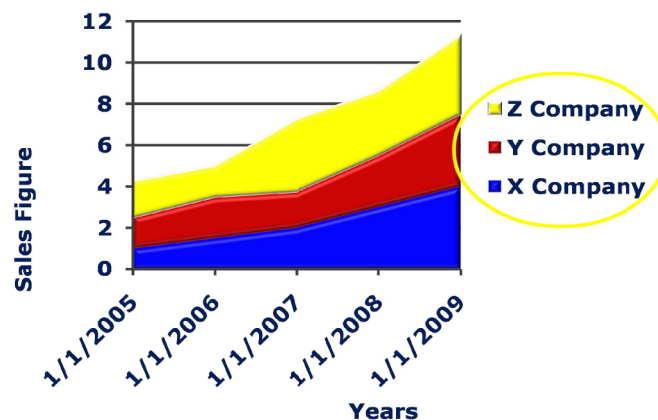
+The title offers a short explanation of what is in your chart. This helps the reader identify what they are about to look at. It can be creative or simple as long as it tells what is in the chart. The title of the chart in our example tells the reader that the graph contains information about the comparison of sales figures of 3 organizations from the year 2005 to 2009.

The Legend:

Figure 13
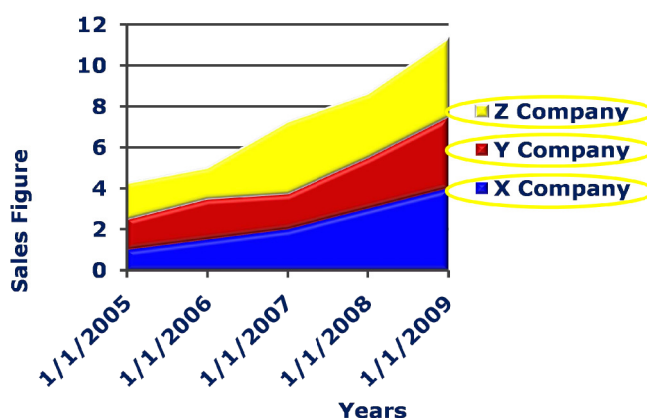
The legend tells the reader what each shaded area represents. Just like on a map, the legend helps the reader understand what they are looking at. This legend tells us that the blue area represents sales figures of company x, the red area sales figures of company y and the yellow area sales of company z.

The Source:
The source explains where you found the information that is in your chart. This is especially important when using secondary data. It is important to give credit to those who collected your data. In our example we can say that we sourced this data from the 3 company's profit and loss accounts.
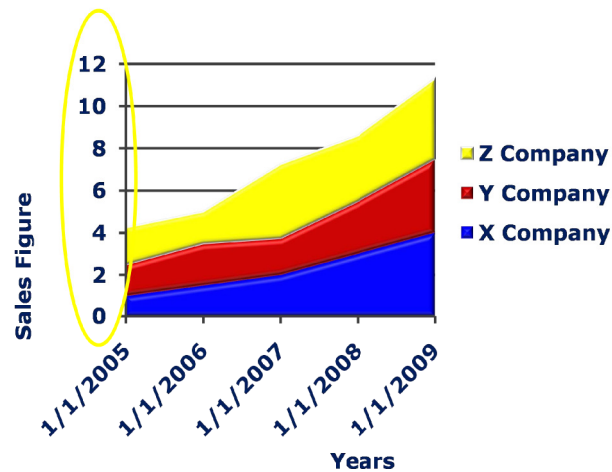
Y-Axis:

Figure 14

In area graphs, the y-axis runs vertically (up and down). Typically, the y-axis has numbers for the amounts being measured (the dependent variable). The y-axis usually starts counting at 0 and can be divided into as many equal parts as you want to. In this area graph, the y-axis is measuring the sales figures of the three companies under review.

The Data:
The most important part of your graph is the information, or data, it contains. Area graphs can present more than one group of data at a time. In this graph, three sets of data are presented-one set for each company.

X-Axis:

Figure 15
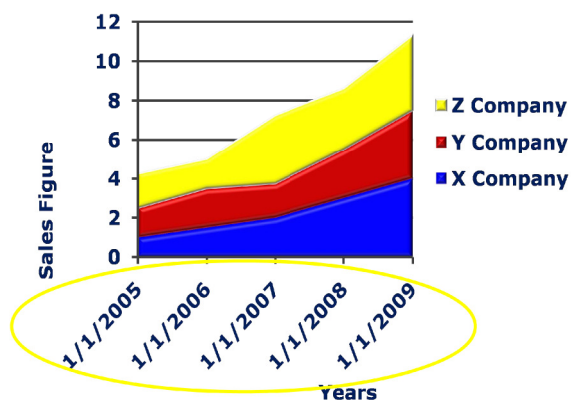
In area graphs, like the one in our example, the x-axis runs horizontally (flat). Typically, the x-axis has numbers representing different time periods or names of things being compared. In this area graph, the x-axis measures different calendar years.

Advantages of Area charts:

- ✦ The area chart scores over the line chart by virtue of the fact that it is more pleasing to the eye and this helps the viewer capture the trend faster than when viewing a line chart

- ✦ It is visually more effective than the line chart as it uses colour shading of area to highlight data represented

- ✦ Area charts are very useful to study incremental data for similar subjects

- ✦ Area charts are useful in giving the viewer the big picture or macro view of data

Limitations of Area Charts:

- ✦ When we have to compare a large number of variables area charts may not be as suitable as line charts
- ✦ Area charts are not able to give the viewer specific details very easily

4. Introduction to Bubble Charts

A bubble chart is a type of chart where each plotted entry is defined in terms of three distinct numeric parameters.

A bubble chart is constructed using 3 sets of values:
1. one value is represented by the bubble's location on the x-axis,
2. one by its location on the y-axis, and
3. the third by its value as represented by its relative size.

Bubble charts can facilitate the understanding of economic, social, medical and other scientific relationships.

The data displayed on a bubble chart can be compared in terms of their size as well as their relative positions with respect to each numeric axis. Since both X and Y axes of the bubble chart are numeric scales, the position of plot is an indicator of two distinct numeric values. The **area** of the plot or how large the bubble is going to be depends on the magnitude of a third numeric characteristic.

Figure 16
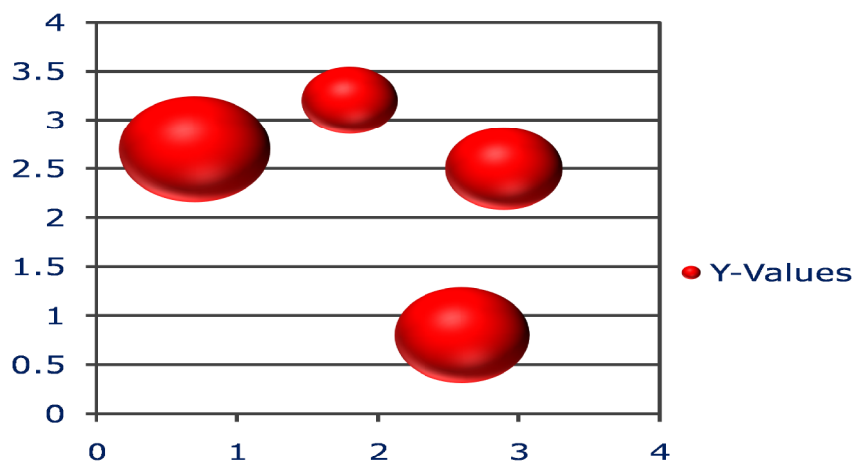
One of the main concerns when using data to construct a bubble chart is that the area of the bubble or circle should be proportional to the square of the radius. Hence if when constructing a bubble chart the scale used is the radius as your third data point, you will disproportionally emphasize the third factor. To get a properly weighted scale, one should take the square root of the magnitude of this third metric. However, many bubble charts are rendered without this correction.

A bubble charts is considered a "variation of a **scatter plot,** in which these types of charts data points are replaced with bubbles. This type of chart can be used instead of a Scatter chart if your data has three data series, each of which contains a set of values.

Bubble charts, according to Berman, can "be used in project management to compare the risk

and reward among projects. In a chart each project can be represented by a bubble, the axis can represent the net present value and probability of success and the size of the bubble can represent the overall cost of the project".

When do we use a Bubble Chart?

Bubble charts are often used to present financial data.
This is because multiple criteria can be displayed like revenues & income over a period of time. We use a Bubble chart when we want specific values to be visually represented in a chart; we achieve this by constructing bubbles of different sizes.

Bubble charts can be used when our inputs are of the following type:

- Three input values per data point: Three input values are required for each bubble. These values can be either in rows or columns; however they must be in the following order: x value, y value, and then size value.

Figure 17

| Time (X Value)	Revenue & Income (Y Value)	Size Value
1990	2.7	5
2000	3.2	10
2010	0.8	2

- Multiple data series: Plotting multiple data series in a Bubble chart (multiple bubble series) is similar to plotting multiple data series in a Scatter chart (multiple scatter series). While Scatter charts use a single set of x values and multiple sets of y values, Bubble charts use a single set of x values and multiple sets of both y values and size values.

Figure 18

Multiple Bubble Series for One Year
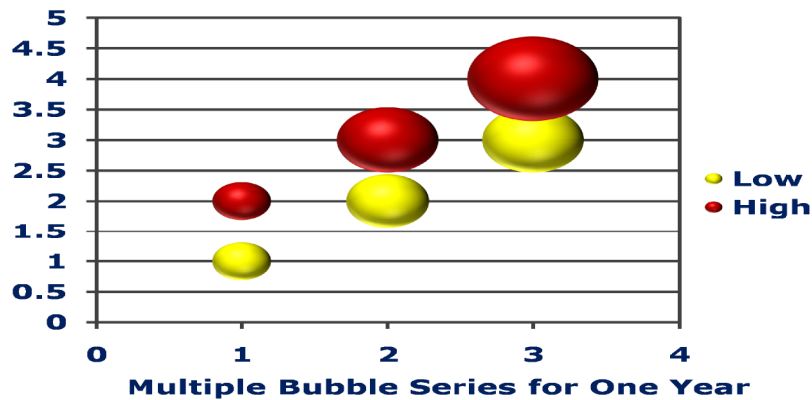
How to construct a Bubble chart:
Figure 19

Top 10 Films by Worldwide Grosses
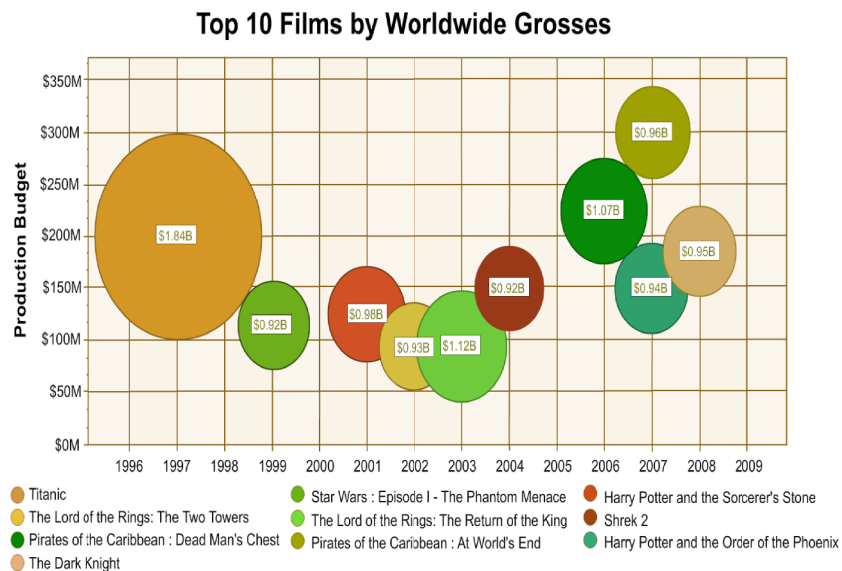
Let us study our Bubble Chart example in depth.This chart example explains the top 10 films considering they are worldwide grosses, in the world of films grosses are used to signify money earned by a particular film the years under review are 1996 to 2009, the production budgets of our films range from about 48 millions US dollars to 340 million dollars, the years are plotted on the x axis and the production budgets are plotted on the y axis.

The size of each bubble is determined by the amount of money the movie earned ,from our bubble chart we can easily see that the movie titanic is the largest bubble this movie earned 1.04 billion dollars hence it is represented by a very large bubble as compared to movie Shreak 2 which earned only 0.92 billion dollars.

In our chart we can also notice that the movie pirates of the Caribbean at world end was made at a very high production budget of 300 million dollars and earned only point 96 billion dollars in this bubble chart it is easy for the reader to get facts about the success of movies, similar bubble chart can be constructed to depict revenues of companies against cost over particular periods of time.

Figure 20

	A	B	C
1	Number of Products	Sales	Market Share %
2	14	$12,200.00	15%
3	20	$60,000.00	23%
4	18	$24,400.00	10%

Let's take an another example of a bubble chart in the data displayed the first column gives us the number of products sold by a particular company 14, 20, 18 respectively in our example.

The second column gives us the sales figures and the third column gives us the market share in percentage terms.

The size of the bubbles is determined by the values in the 3rd data series. In our example the following bubble chart displays bubble sizes that correspond the values in the third column of the sample data which is market share in percentage terms ,take a look at our bubble chart on the x axis we have the number of products sold by the organization on the y axis we have the sales figures ,we can see the bubbles and clearly notice that for the third series of data the bubble is the largest it is because for these products the company has the highest market share among the 3 set of products under review. Bubble charts are often used to present financial data; you must use a bubble chart when you want specific values to be more visually represented in your chart by different bubble sizes.

5. Advantages and Limitations of Bubble Charts

Now we will examine the advantages and limitations of Bubble charts.

Advantages:
- Even though strictly speaking the bubbles do not add new information; however being able to see the magnitudes of the differences in size helps the viewer sort through information
- These charts display three variables without using 3D graphs
- The visual size makes it very easy to make relative comparisons
- These charts convey more information than a line graph
- Different colours can be used to differentiate between different types of data

Limitations:
- Due to circle sizes, it can be difficult to ascertain actual values (at best the circle sizes represent estimates)
- Improper scaling can easily skew graph
- Circles may clutter graph this makes this type of chart difficult to read and understand
- Bubble charts cannot be used to display a lot of data

Here's a summary of our learning in this session:

• We have learnt about area charts and bubble charts.

• We have understood the practical applications of these charts and their advantages

 and limitations.

• We have also learnt the steps involved in constructing area and bubble charts.