Unit-I: Introduction to Business Analytics

Business Analytics

Business analytics is the scientific process of transforming data into insight for making better decisions. Business analytics is used for data-driven or fact-based decision making, which is often seen as more objective than other alternatives for decision making.

The major goals of business analytics include:

- Providing real-time, actionable information aimed at superior business decision making.
- Providing tools at all levels of an organization to help decision making around customer goals and profits while comparing performance.
- Providing analysis that helps the business forecast the future with greater objectivity and accuracy.
- Providing the insight and understanding to support informed decisions and confident actions and providing the feedback that is needed to create a learning organization.

Types of Business Analytics

Business analytics can be grouped into three types: **descriptive analytics, predictive analytics,** and **prescriptive analytics**.

1. **Descriptive Analytics:** Descriptive analytics encompasses the set of techniques that describes what has happened in the past. Examples are data queries, reports, descriptive statistics, data visualization including data dashboards, some data-mining techniques, and basic what-if spreadsheet models. Descriptive analytics is used for understanding the trends in past data which can be useful for generating insights.

2. **Predictive Analytics:** Predictive analytics consists of techniques that use models constructed from past data to predict the future or ascertain the impact of one variable on another. While descriptive analytics is used for finding what has happened in the past, predictive analytics is used for predicting what is likely to happen in the future. Linear regression, time series analysis, some data-mining techniques, and simulation, often referred to as risk analysis, all fall under the banner of predictive analytics.

3. **Prescriptive Analytics:** Prescriptive analytics differ from descriptive or predictive analytics in that prescriptive analytics indicate a best course of action to take; that is, the output of a prescriptive model is a best decision. Prescriptive analytics assists users in finding the optimal solution to a problem or in making the right choice/decision among several alternatives. Operations research methodologies like linear programming and decision theory. Apart from operations research techniques, machine learning algorithms, metaheuristics, and advanced statistical models are used in prescriptive analytics

Importance of Analytics

1. More Informed Decision-Making

The primary use of analytics is to help organizations to take decisions backed by data. For example, consider a retail store that has to go for markdown for apparels sold by them. Many times, see discounts such as 20%, 40% etc. But the question is how do you decide right discount for a particular apparel? It is a complex decision-making process which requires data such as inventory, sell through rate etc.

2. Greater Revenue
Companies that embrace data and analytics initiatives can experience significant financial returns. Research by McKinsey shows organizations that invest in big data yield a six percent average increase in profits, which jumps to nine percent for investments spanning five years.

3. Improved Operational Efficiency
Beyond financial gains, analytics can be used to fine-tune business operations. In a recent KPMG report on emerging trends in infrastructure, it was found that many firms now use predictive analytics to anticipate maintenance and operational issues before they become larger problems.

4.Drive Innovation

An important objective of analytics is drive innovation. Today several products in the Market such as Amazon Go and Google Maps that are driven by analytics. There was a study published in 2016 in the Journal MIT Sloan Management Review that only 11% of the organizations use analytics to drive innovation.

5. Competitive advantage
Strategic theory identifies two ways to obtain a competitive advantage: differentiation or cost leadership. Differentiation strategies focus on "offering products or services that are perceived to be distinctively more valuable to customers than are competitive offerings, at a similar cost structure". Cost leadership strategies focus on offering similar products or services as competitors at lower cost structures.

Data for Business Analytics

Data
Data are numerical facts and figures that are collected through some type of measurement process. Information comes from analyzing data—that is, extracting meaning from data to support evaluation and decision making.

Data Sets and Databases
A data set is simply a collection of data. A database is a collection of related files containing records on people, places, or things.

Metrics and Data Classification

A **metric** is a unit of measurement that provides a way to objectively quantify performance. For example, senior managers might assess overall business performance using such metrics as net profit, return on investment, market share, and customer satisfaction. **Measurement** is the act of obtaining data associated with a metric. **Measures** are numerical values associated with a metric.

Metrics can be either discrete or continuous. A **discrete metric** is one that is derived from counting something. For example, a delivery is either on time or not; an order is complete or incomplete; or an invoice can have one, two, three, or any number of errors. **Continuous metrics** are based on a continuous scale of measurement. Any metrics involving dollars, length, time, volume, or weight are examples of continuous metric.

Another classification of data is by the type of measurement scale. Data may be classified into four groups:

1. Categorical (nominal) data, which are sorted into categories according to specified characteristics. For example, a firm's customers might be classified by their geographical region (North America, South America, Europe, and Pacific). Categorical data are usually counted or expressed as proportions or percentages.
2. Ordinal data, which can be ordered or ranked according to some relationship to one another. College football or basketball rankings are ordinal; a higher ranking signifies a stronger team but does not specify any numerical measure of strength. A common example in business is data
from survey scales—for example, rating a service as poor, average, good, very good, or excellent.
3. Interval data, which are ordinal but have constant differences between observations and have arbitrary zero points. Common examples are time and temperature.
4.Ratio data, which are continuous and have a natural zero. Most business and economic data, such as dollars and time, fall into this category.

Big Data

Big data is simply a set of data that cannot be managed, processed, or analyzed with commonly available software in a reasonable amount of time.
Examples:
1. Black box data captures the voice and recordings of flight crew members of helicopter and other aircraft along with the information pertaining to the performance of the aircraft.
2. Data of stock holdings where the decisions made by a customer on a share or equity of different companies.
3. Data from social media websites such as Facebook and Twitter that holds views and other information posted by millions of users across the globe.
4. Transport and meteorological data sources.
5. Data retrieved by search engines from different databases.
6. Metamorphic and Census data.
7. Connection-oriented data that includes sensory data.
8. Data from cloud storages that provides computing and data on demand.

V's of the Big Data or characteristics of the Big Data

Big data can be characterized by volume, value, variety, velocity, veracity and variability

Volume

Today, the large volume of data is generated because nowadays organizations collect and process data from a diverse range of sources such as application generated logs, machine-generated data, email data, weather and geographic information systems (GIS) data, survey data, reports, social media data. Big data analytics have the capability to compute gigantic volume of information. Data volumes have reached levels to terabytes (TB) or petabytes (PB). As an example, the financial industry produces voluminous data in terms of market data, quotes and financial trading.

Variety

The big data is heterogeneous. Data collected from various sources like applications, stock data, emails, geographical data, weather data, social media application data is difficult to handle as it comes from a variety of sources, and it is virtually impossible to convert this heterogeneous data to a conventional structured form for processing. Big data solutions need different types of processing tools to process heterogeneous data.

Velocity

The rate at which the data flows in the system and its environment is termed as velocity. With the Internet and mobile data coming in the lives of the consumer, the era witnesses high rate of data flow as the consumers carry

with their devices, a huge volume of streaming source of data that consist of geo-located images and audios. For example, the business Walmart creates about 2.5 petabytes per hour.

Veracity

The reliability and trustworthiness of data are termed as veracity of data. It also refers to the quality of the data. The point to focus on is "how accurate is all this data?" As an example, consider the tweets in Twitter posts. These posts contain hashtags, typos, abbreviations, etc. The data that is to be considered should be reliable, accurate and trustworthy.

Value

Value refers to the worthiness of the data being extracted. On one hand, if the organization has voluminous amount of data but unless it can be made useful for the organization, it is worthless. Even though there is an explicit association between data and insights, it does not definitely mean that there is value in big data. The original data received might have low value as compared to its volume. By analysing a large volume of data appropriately, high value and pronounced insights from the data can be obtained.

Variability

The variation in the flow rates of data is referred to as variability of data. The velocity of big data is inconsistent and has periodic troughs and peaks. As the big data is generated from myriad resources, complexity also has to be analysed. Complexity arises after collecting data from different sources as it has to connect, clean, match and transform the data.

Applications of Business Analytics (or) Business Analytics in Practice

1. Financial Analytics

Applications of analytics in finance are numerous and pervasive. Predictive models are used to forecast future financial performance, to assess the risk of investment portfolios and projects, and to construct financial instruments such as derivatives. Prescriptive models are used to construct optimal portfolios of investments, to allocate assets, and to create optimal capital budgeting plans. For example, GE Asset Management uses optimization models to decide how to invest its own cash received from insurance policies and other financial products, as well as the cash of its clients.

2. Human Resource (HR) Analytics

A relatively new area of application for analytics is the management of an organization's human resources (HR). The HR function is charged with ensuring that the organization (1) has the mix of skill sets necessary to meet its needs, (2) is hiring the highest-quality talent and providing an environment that retains it, and (3) achieves its organizational diversity goals. Companies has created an HR analytics team inside its corporate HR function. The team uses descriptive and predictive analytics to support employee hiring and to track and influence retention.

3. Marketing Analytics

Marketing is one of the fastest growing areas for the application of analytics. A better understanding of consumer behavior through the use of scanner data and data generated from social media has led to an increased interest in marketing analytics. As a result, descriptive, predictive, and prescriptive analytics are all heavily used in

marketing. A better understanding of consumer behavior through analytics leads to the better use of advertising budgets, more effective pricing strategies, improved forecasting of demand, improved product line management, and increased customer satisfaction and loyalty. For example, each year, companies use a predictive model to help support its annual up-front market. The upfront market is a period in late May when each television network sells the majority of its on-air advertising for the upcoming television season.

4. Health Care Analytics

The use of analytics in health care is on the increase because of pressure to simultaneously control cost and provide more effective treatment. Descriptive, predictive, and prescriptive analytics are used to improve patient, staff, and facility scheduling; patient flow; purchasing; and inventory control. A study by McKinsey Global Institute (MGI) and McKinsey & Company estimates that the health care system in the United States could save more than $300 billion per year by better utilizing analytics; these savings are approximately the equivalent of the entire gross domestic product of countries such as Finland, Singapore, and Ireland. The use of prescriptive analytics for diagnosis and treatment is relatively new, but it may prove to be the most important application of analytics in health care.

5. **Supply Chain Analytics**

One of the earliest applications of analytics was in logistics and supply chain management. The core service of companies such as UPS and FedEx is the efficient delivery of goods, and analytics has long been used to achieve efficiency. The optimal sorting of goods, vehicle and staff scheduling, and vehicle routing are all key to profitability for logistics companies such as UPS, FedEx, and others like them. Companies can benefit from better inventory and processing control and more efficient supply chains. Analytic tools used in this area span the entire spectrum of analytics. For example, the women's apparel manufacturer Bernard Claus, Inc., has successfully used descriptive analytics to present the status of its supply chain to managers visually. ConAgra Foods uses predictive and prescriptive analytics to better plan capacity utilization by incorporating the inherent uncertainty in commodities pricing. ConAgra realized a
100 percent return on their investment in analytics in under three months —an unheard of result for a major technology investment.

6. Analytics for Government and Nonprofits

Government agencies and other nonprofits have used analytics to drive out inefficiencies and increase the effectiveness and accountability of programs. Indeed, much of advanced analytics has its roots in the U.S. and English military dating back to World War II. Today, the use of analytics in government is becoming pervasive in everything from elections to tax collection. For example, the New York State Department has worked with IBM to use prescriptive analytics in the development of a more effective approach to tax collection. Likewise, nonprofit agencies have used analytics to ensure their effectiveness and accountability to their donors and clients. Catholic Relief Services (CRS) is the official international humanitarian agency of the U.S. Catholic community. CRS uses an analytical spreadsheet model to assist in the allocation of its annual budget based on the impact that its various relief efforts and programs will have in different countries.

7. **Sports Analytics**

The use of analytics for player evaluation and on-field strategy is now common, especially in professional sports. Examples are professional sports teams that use analytics to assess players for the incompetent and to decide how much to offer players in contract negotiations; professional motorcycle racing teams that use sophisticated optimization for gearbox design to gain competitive advantage; and teams that use analytics to assist with on-field decisions such as which pitchers to use in various games of a Major League Baseball playoff series. The use of analytics for off-the-field business decisions is also increasing rapidly. Ensuring customer satisfaction is important for any company, and fans are the customers of sports teams. Using prescriptive analytics, franchises

across several major sports dynamically adjust ticket prices throughout the season to reflect the relative attractiveness and potential demand for each game.

8. **Web Analytics**

Web analytics is the analysis of online activity, which includes, but is not limited to, visits to Web sites and social media sites such as Facebook and LinkedIn. Web analytics obviously has huge implications for promoting and selling products and services via the Internet. Leading companies apply descriptive and advanced analytics to data collected in online experiments to determine the best way to configure Web sites, position ads, and utilize social networks for the promotion of products and services. Online experimentation involves exposing various subgroups to different versions of a Web site and tracking the results.

Data Visualization

Data visualization is the process of displaying data (often in large quantities) in a meaningful fashion to provide insights that will support better decisions. Data visualization is also important both for building decision models and for interpreting their results.

Data Visualization Tools

1. Tableau

Tableau is a data visualization tool that can be used to create interactive graphs, charts, and maps. It allows you to connect to different data sources and create visualizations in minutes. Tableau Desktop is the original product. It's made for creating static visualizations that can be published on one or more web pages, but it doesn't create interactive maps. Tableau Public is the free distribution of the Desktop product with some limitations.

2. QlikView

QlikView is not just another data visualization tool, It is a data discovery platform that empowers the users to make faster, more informed decisions by accelerating analytics, revealing new business insights, and increasing the accuracy of results. It has been an intuitive software development kit that has been used in organizations around the world for many years. It can combine various kinds of data sources with visualizations in color-coded tables, bar charts, line graphs, pie charts, and sliders.

3. Microsoft Power BI

The Microsoft Power BI is the data visualization tool that is used for business intelligence type of data. It is and can be used for reporting, self-service analytics, and predictive analytics. Furthermore, it provides an end-user platform to create reports and share insights with others in their organization. It acts as a centralized repository for all your business data which can be accessed by all your business users. On top of all this, Power BI also provides for integration with other SaaS products like Google Analytics, MailChimp, Office 365, etc. Through such integrations, the reports created can be shared within the organization, and thus making it a very important tool for organizations looking for a centralized data reporting system.

4. Datawrapper

Datawrapper is an online data visualization tool that can be used in various contexts. It is very easy to use, and it has a clean and intuitive user interface**.** Datawrapper allows users to create charts and maps directly in the browser by uploading their data files. The charts and maps created in Datawrapper are responsive and designed for all kinds of devices, so readers will be able to view them on any device that they are using. Datawrapper is free for everyone; however, there are certain limitations in the free version.

5. Plotly

Plotly is a data visualization tool that is used to create interactive graphs, charts, and maps. User can also use Plotly to create a visualization of a dataset, then share the link of that visualization with the readers on social media or on the blog. Graphs made on Plotly are interactive and have a unique URL, so they're easy to share. Plotly's interface is easy to use and can create beautiful graphs in less time than ever before.

6. Sisense

Sisense is a data visualization tool that allows user to easily create interactive visualizations from the data. With Sisense, user can quickly and easily create extensive, informative dashboards that will help to understand the data better. It has a very powerful yet simple and intuitive interface that allows to drag-and-drop the data onto the canvas and create visualizations with a few clicks of a mouse. It is also fully integrated with several BI tools such as Microsoft Excel, BIRT, Pentaho, Qlikview & Tableau. Sisense utilizes multi-dimensional in-memory technology that is designed for Big Data. It also has an embedded artificial intelligence engine with predictive analytics, allowing to easily visualize data trends and discover hidden patterns in the data.

7. Excel

Microsoft Excel is a data visualization tool that has an easy interface, so it doesn't have to be difficult to work with. There are many different ways of visualizing data in Excel. Many data analysts use scatter plots to analyze statistical, scientific, medical, and economic data for purposes such as market research or financial planning.

8. Zoho Analytics

Zoho Analytics is a data visualization and reporting tool that can help user to easily create custom reports and dashboards. With Zoho Analytics, user can:

- Quickly create custom reports and dashboards with drag-and-drop ease.
- Get insights into the data with interactive charts and graphs.
- Share reports and dashboards with colleagues or customers in just a few clicks.

9. IBM Watson

Named after IBM founder Thomas J. Watson, this high-caliber data visualization tool uses analytical components and artificial intelligence to detect insights and patterns from both unstructured and structured data. Leveraging NLP (Natural Language Processing), IBM Watson's intelligent, self-service visualization tool guides users through the entire insight discovery operation.

10.Qlik Sense

Qlik Sense is a data analysis and visualization software. It operates with an associative QIX engine which enables the user to link and associate data from varied sources and carries out **dynamic searching** and selections. Qlik Sense serves as a data analytics platform for a wide range of users i.e. from non-technical to technical users.

Data Visualization charts

1. Area Charts

The area chart depends on line charts to display quantitative graphical data. The area between the axis and lines is commonly filled with colors, textures, and patterns. user can compare more than two quantities with area charts. It shows the trend changes over time and can be used to attract the attention of the users to know the total changes across the trends.

2. Line Charts

Line charts are mostly used charts to represent the data and are characterized by a series of data points connected by a straight line. Each point in the line corresponds to a data value in the given category. It shows the exact value of the plotted data. Line charts should only be used to measure the trends over a period of time, e.g. dates, months, and years

3. Bar Charts

Bar charts are mostly used graphs because they are simple to create and easy to understand. Bar charts are also called horizontal charts that represent the absolute data. They are useful to display the data that include negative values because it is possible to position the bars above and below the x-axis.

4. Column Charts

Column charts are similar to bar charts, and the only difference between these two is, column chart divides the same category data into the clusters and compares within the clusters. Also, it compares the data from other clusters.

5. Combo Charts

A combo chart is a combination of both the column charts and line charts that help you to make a quicker comparison of the data. The combo chart shows the relationship between two measures in a single visualization. It also helps to compare multiple measures with different values.

6. Pie Charts

A pie chart is a circular statistical chart, and it shows the whole data in parts. Each portion of a pie chart represents the percentages, and the sum of all parts should be equal to 100%. The whole data can be divided into slices to show the numerical propositions of each part of the data. Pie charts are mostly used to represent the same category of data. It helps users to understand the data quickly. They are widely used in education, the business world, and communication media.

7. Doughnut Charts

Doughnuts are similar to pie charts, and it is named doughnut chart because it looks similar to a doughnut. You can easily understand the data because doughnut charts show the whole data into the proposition. It is the most useful chart when you need to display various propositions that make up the final value.

8. Gauge Charts

A gauge chart is also known as a speedometer or dial chart. It uses the needle to read the data, and it shows the information on a dial. The gauge chart, it represents the value of each needle as it reads the data according to the axis or colored data. These charts are useful to compare the values between the variables either by using multiple needles on the same gauge or different gauges.

9. Funnel Charts

The funnel chart is a type of chart which is used to visualize the data that flows from one phase to another phase. In the funnel chart, the whole data is considered as 100%, and in each phase, it is represented as numerical propositions of the data.

10. Scatter Charts

Scatter charts are used to visualize the data using the dots that represent the values obtained from two different variables, such as the x-axis and y-axis. These charts are used to show the relationship between two different variables. It is also called a correlation plot because it shows how two variables are correlated to each other.

11. Bubble Charts

Bubble charts show the data in the form of a circle. The values of the variables are represented by the x-axis and y-axis. The size of the circle represents the measure of the variables.

12. Waterfall Charts

A waterfall chart is used to show how initial values are increasing and decreasing gradually by a series of values to arrive at the final value.

13. Tree Maps

Tree maps display hierarchical data set in a nested rectangle. At each level, hierarchy is represented by a color. The size of the space in the rectangle depends on the data values. The rectangular boxes are arranged in size from top left to bottom right.

Data Queries

Managers make numerous queries about data. For example, in the Purchase Orders database, they might be interested in finding all orders from a certain supplier, all orders for a particular item, or tracing orders by order data. To address these queries, user need to sort the data in some way. In other cases, managers might be interested in extracting a set of records having certain characteristics. This is termed filtering the data. For example, in the Purchase Orders database, a manager might be interested in extracting all records corresponding to a certain item.

Use Excel's Table command to convert a list of data into a named Excel Table. These tables have useful features, like sorting and filtering, to help organize and view data.

1.Create an Excel Table

1. Select a cell in the list of data that you prepared.

2. On the Ribbon, click the Insert tab.
3. In the Tables group, click the Table command.
4. In the Create Table dialog box, the range for your data should automatically appear, and the *My table has headers* option is checked. If necessary, you can adjust the range, and check box.
5. Click OK to accept these settings.

2.Perform Simple Sorts and Filters

Sort a List
1 Click a cell in the column you want to sort.
2 Click the Data tab.
3 Click a sort direction. Click A to Z to sort from lowest to highest — ascending order. Click Z to A to sort from highest to lowest — descending order.

Filter a List
1 Click a cell in a list.
2 Click the Data tab.
3 Click Filter.
4 Click an AutoFilter button . The Sort & Filter menu appears.
5 Click items to deselect the ones you do not want (changes to).
6 Click OK.

Statistical Methods for Summarizing Data

A **statistic** is a summary measure of data. baseball batting averages, airline on-time arrival performance, and economic statistics such as the Consumer Price Index are just a few examples. **Descriptive statistics** refers to methods of describing and summarizing data using tabular, visual, and quantitative techniques.

1.Frequency Distributions for Categorical Data

It is often useful to create a frequency distribution for a data set. A **frequency distribution** is a summary of data that shows the number (frequency) of observations in each of several nonoverlapping classes, typically referred to as **bins**.

2.Relative Frequency and Percent Frequency Distributions

A relative frequency distribution is a tabular summary of data showing the relative frequency for each bin. A percent frequency distribution summarizes the percent frequency of the data for each bin.

$$\text{Relative frequency of a bin} = \frac{\text{Frequency of the bin}}{n}$$

3.Frequency Distributions for Quantitative Data

The three steps necessary to define the classes for a frequency distribution with quantitative data are:

i. Determine the number of nonoverlapping bins. Bins are formed by specifying the ranges used to group the data. As a general guideline, we recommend using between 5 and 20 bins. For a small number of data items, as few as five or six bins may be used to summarize the data. For a larger number of data items, more bins are usually required.

ii. Determine the width of each bin. Second, choose a width for the bins. As a general guideline, we recommend that the width be the same for each bin. Thus, the choices of the number of bins and the width of bins are not independent decisions. A larger number of bins means a smaller bin width and vice versa.

APPROXIMATE BIN WIDTH

$$\frac{\textit{Largest data value} - \textit{smallest data value}}{\textit{Number of bins}}$$

iii. Determine the bin limits. Bin limits must be chosen so that each data item belongs to one and only one class. The lower bin limit identifies the smallest possible data value assigned to the bin. The upper bin limit identifies the largest possible data value assigned to the class.

4.Histogram

A graphical depiction of a frequency distribution for numerical data in the form of a column chart is called a **histogram**. A histogram is constructed by placing the variable of interest on the horizontal axis and the selected frequency measure (absolute frequency, relative frequency, or percent frequency) on the vertical axis.

5.Cumulative frequency distribution

A tabular summary of quantitative data showing the number of data values that are less than or equal to the upper-class limit of each bin. The **cumulative relative frequency** represents the proportion of the total number of observations that fall at or below the upper limit of each group.

6.Percentiles and Quartiles

Data are often expressed as *percentiles* and *quartiles*. A **percentile** is the value of a variable at which a specified (approximate) percentage of observations are below that value. Percentile score is frequently used in education to identify the position of a student in the group. The nth percentile is the value such that at least n percent of the data are below that value and at most (100 − n) percent are above that value. For instance, if the raw score of 54 corresponds to the 70th percentile, we know that approximately 70 percent of the students scored lower than this individual, and approximately 30 percent of the students scored higher.

Steps in Determining the Location of a Percentile

- **Step 1** Organize the numbers into an ascending-order array.
- **Step 2** Calculate the percentile location (i) by: $i = \frac{P(N)}{100}$
- **Step 3** Determine the location by either (a) or (b).

a. If i is a whole number, the P^{th} percentile is the average of the value at the i^{th} location and the value at the (i + 1) st location.

b. If i is not a whole number, the P^{th} percentile value is located at the whole-number part of i + 1.

Quartiles break the data into four parts. The 25th percentile is called the *first quartile*, *Q*1; the 50th percentile is called the *second quartile*, *Q*2; the 75th percentile is called the *third quartile*, *Q*3; and the 100th percentile is the *fourth quartile*, *Q*4. One-fourth of the data fall below the first quartile, one-half are below the second quartile, and three fourths are below the third quartile.

7.Cross-Tabulations

One of the most basic statistical tools used to summarize categorical data and examine the relationship between two categorical variables is cross-tabulation. A **cross-tabulation** is a tabular method that displays the number of observations in a data set for different subcategories of two categorical variables. A cross-tabulation table is often called a **contingency table**. The subcategories of the variables must be mutually exclusive and exhaustive, meaning that each observation can be classified into only one subcategory, and, taken together over all subcategories, they must constitute the complete data set.

Exploring Data Using PivotTables

A ***PivotTable*** is a tool that allows to create an interactive view of source data (commonly referred to as a PivotTable report). A PivotTable can help transform endless rows and columns of numbers into a meaningful presentation of data. user can easily create groupings of summary items: For example, combine Northern Region totals with Western Region totals, filter that data using a variety of views, and insert special formulas that perform new calculations. A PivotTable is comprised of four areas: Values, Rows, Columns, and Filters.

Create a PivotTable

1. Select the data user want to include in your PivotTable. (Make *sure to include the row and column labels)*
2. Click the Insert tab.
3. Click PivotTable then the Create PivotTable dialog box appears.
4. Click a data source (changes to). If you selected a range in the current workbook, the range appears here. If you are going to use an external data source, click here.
5. Click a worksheet option (changes to) to select where to place the report. If you want to place the PivotTable on the existing worksheet, click the cell in which you want to place the PivotTable, or type a location.
6. Click OK. Then Excel opens the PivotTable Field List.

7. Click to select the fields want to include in PivotTable.
8. Click and drag fields among the boxes (Row labels, column labels, filter and values boxes).
9. Click the next to Row Label or Column Label then choose sort and filter options.

Creating pivot chart

1. Select a cell in pivot table report.
2. Select PivotTable Tools > Analyze > PivotChart.
3. Select a chart.
4. Select OK.

Slicers and PivotTable Dashboards

Excel 2010 introduced slicers—a tool for drilling down to "slice" a PivotTable and display a subset of data.

To create a slicer for any of the columns in the database, click on the PivotTable and choose *Insert Slicer* from the *Analyze* tab in the *PivotTable Tools* ribbon.

Excel camera tool can easily take a picture of the chart or the data table and place it on the dashboard.

- Select the cell or range of cells for which user want an image.
- Click on the Excel Camera Tool icon in the Quick Access Toolbar.
- Go to the worksheet and click anywhere.