

Business Statistics & Analytics for Decision Making

Module 5: Business Analytics

Analytics is the systematic computational analysis of data or statistics. It is used for the discovery, interpretation, and communication of meaningful patterns in data. It also entails applying data patterns towards effective decision-making. It can be valuable in areas rich with recorded information; analytics relies on the simultaneous application of statistics, computer programming and operations research to quantify performance.

Analytics Vs Analysis

Data analysis focuses on the process of examining past data through business understanding, data understanding, data preparation, modelling and evaluation, and deployment. It is a subset of data analytics, which takes multiple data analysis processes to focus on why an event happened and what may happen in the future based on the previous data

Business analytics (BA) refers to the skills, technologies, and practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning. Business analytics focuses on developing new insights and understanding of business performance based on data and statistical methods.

In order for a business to have a holistic view of the market and how a company competes efficiently within that market requires a robust analytic environment which includes:

- **Descriptive** Analytics, which use data aggregation and data mining to provide insight into the past and answer: "What has happened?"
- **Predictive** Analytics, which use statistical models and forecasting techniques to understand the future and answer: "What could happen?"
- **Prescriptive** Analytics, which use optimization and simulation algorithms to advice on possible outcomes and answer: "What should we do?"

Descriptive Analytics: Insight into the past

Descriptive analysis or statistics does exactly what the name implies: they "describe", or summarize, raw data and make it something that is interpretable by humans. They are analytics that describe the past. The past refers to any point of time that an event has occurred, whether it is one minute ago, or one year ago. Descriptive analytics are useful because they allow us to learn from past behaviours, and understand how they might influence future outcomes.

Predictive Analytics: Understanding the future

Predictive analytics has its roots in the ability to “predict” what might happen. These analytics are about understanding the future. Predictive analytics provides companies with actionable insights based on data. Predictive analytics provides estimates about the likelihood of a future outcome. It is important to remember that no statistical algorithm can “predict” the future with 100% certainty. Companies use these statistics to forecast what might happen in the future. This is because the foundation of predictive analytics is based on probabilities.

Prescriptive Analytics: Advise on possible outcomes

The relatively new field of prescriptive analytics allows users to “prescribe” a number of different possible actions and guide them towards a solution. In a nutshell, these analytics are all about providing advice. Prescriptive analytics attempts to quantify the effect of future decisions in order to advise on possible outcomes before the decisions are actually made. At their best, prescriptive analytics predict not only what will happen, but also why it will happen, providing recommendations regarding actions that will take advantage of the predictions.

Difference between Data Mining and Data Analysis:

Based on	Data Mining	Data Analysis
Definition	It is the process of extracting important pattern from large datasets.	It is the process of analysing and organizing raw data in order to determine useful information and decisions
Function	It is used in discovering hidden patterns in raw data sets.	In this all operations are involved in examining data sets to fine conclusions.
Data set	In this data set are generally large and structured.	Dataset can be large, medium or small, Also structured, semi structured, unstructured.
Models	Often require mathematical and statistical models	Analytical and business intelligence models

Based on	Data Mining	Data Analysis
Visualization	It generally does not require visualization	Surely requires Data visualization.
Goal	Prime goal is to make data useable.	It is used to make data driven decisions.
Required Knowledge	It involves the intersection of machine learning, statistics, and databases.	It requires the knowledge of computer science, statistics, mathematics, subject knowledge AI/Machine Learning.
Output	It shows the data trends and patterns.	The output is verified or discarded hypothesis

Industrial Problem Solving Process:

1. Recognise a problem
2. Define the problem
3. Structure the problem
4. Analyse the problem
5. Interpret result and make a decisions
6. Implement the solution

Recognise a problem:

Problem exists when there is a gap between what is happening and what we think should be happen.

For example: Cost are too high compared with the competitors.

Define a problem:

- Clearly defining the problem is not an easy task.
- What is the part of problem? and what not?
- Complexity increases when the following occur:
 - Large number of courses of action
 - The problem belongs to a group not an individual
 - Competing objectives
 - External groups are affected
 - Problem owner and problem solver are not the same person
 - Time limitation exists

Structure the problem:

- Stating goals and objectives
- Characterising the possible decisions
- Identifying the constraints or restrictions

Analyse the problem:

Analytics involves some sort of experimentation or solution process such as, evaluating different scenarios, analysing the risk associated with various decision alternatives finding the solution that meets certain goals, or determining the optimal solution.

Interpret result and make a decisions:

- What do the results found by the model mean for the application?
- Models cannot capture every detail of the real problem. Managers must understand the limitations of models and their underlying assumptions and often incorporate judgment into making a decision.

Implement the solution:

- Translate results of the model back to the real world
- Requires producing adequate resources, motivating employees, eliminating resistance to change, modifying organisational policies, and developing trust.

SWOT:

A SWOT analysis will **help you identify areas of your business that are performing well**. These areas are your critical success factors and they give your business its competitive advantage. Identifying these strengths can help you make sure you maintain them so you don't lose your competitive advantage

SWOT stands for **Strengths, Weaknesses, Opportunities, and Threats**. Strengths and weaknesses are internal to your company—things that you have some control over and can change. Examples include who is on your team, your patents and intellectual property, and your location

SWOT Analysis



Business Analytics in Decision Making:

Business analytics allows Executives to make decisions based on statistical facts. Those facts can be used to guide choices about future company growth by evaluating a long-term view of the market and competition.

A decision-making process is a series of steps taken by an individual to determine the best option or course of action to meet their needs. In a business context, it is a set of steps taken by managers in an enterprise to determine the planned path for business initiatives and to set specific actions in motion.

A data-driven decision makes use of information from different forms of analytics to identify, understand and prioritize the actions needed. Analytics allows for a more informed understanding of current processes as well as how those processes can be improved upon or even replaced with newer, better ones.

SPSS, the Statistical Package for the Social Sciences) has been developed by three students at the University of Stanford (Norman H. Nie, C. Hadlai (Tex) Hull and Dale H. Bent).

SPSS is the set of software programs that are combined together in a single package.

Features of SPSS

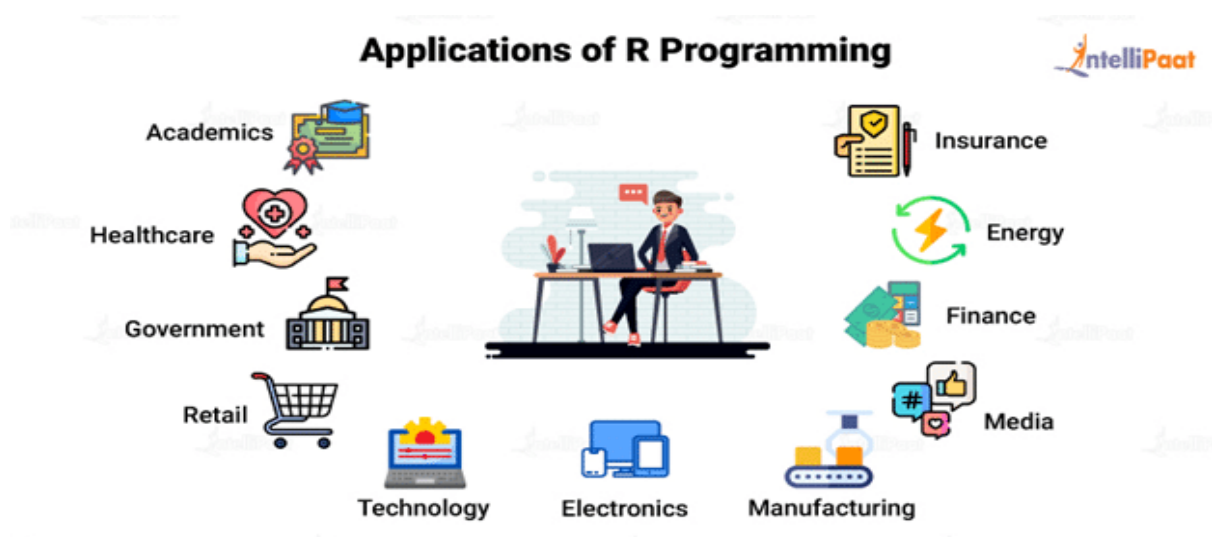
Creating tables and charts containing frequency counts or summary statistics over (groups of) cases and variables. Running inferential statistics such as ANOVA, regression and factor analysis. Saving data and output in a wide variety of file formats.

Applications of SPSS:

SPSS is used by market researchers, health researchers, survey companies, government entities, education researchers, marketing organizations, data miners, and many more for processing and analysing survey data

R is a programming language for statistical computing and graphics supported by the R Core Team and the R Foundation for Statistical Computing. Created by statisticians Ross Ihaka and Robert Gentleman, R is used among data miners and statisticians for data analysis and developing statistical software. Users have created packages to augment the functions of the R language.

Applications of R



R is also used to **support the business decision-making process**. R's data visualization powers can represent the findings of data analysis in multiple graphical formats like candlestick charts, density plots, and drawdown plots of high quality.

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general-purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems.

Python is commonly used for developing websites and software, task automation, data analysis, and data visualization. Since it's relatively easy to learn, Python has been adopted by many non-programmers such as accountants and scientists, for a variety of everyday tasks, like organizing finances.