Apex Institute of Technology
Department of Computer Science & Engineering

Introduction to Data Science
(CSF-284)

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DISCOVER . **LEARN** . EMPOWER

Business Analytics

Business Analytics is the use of:

- data,

- information technology,

- statistical analysis,

- quantitative methods, and

- mathematical or computer-based models to help managers gain improved insight about their business operations and make better, fact-based decisions.

Examples of Applications

- **Pricing**
  - setting prices for consumer and industrial goods, government contracts, and maintenance contracts

- **Customer segmentation**
  - identifying and targeting key customer groups in retail, insurance, and credit card industries

- **Merchandising**
  - determining brands to buy, quantities, and allocations

- **Location**
  - finding the best location for bank branches and ATMs, or where to service industrial equipment

- **Social Media**
  - understand trends and customer perceptions; assist marketing managers and product designers
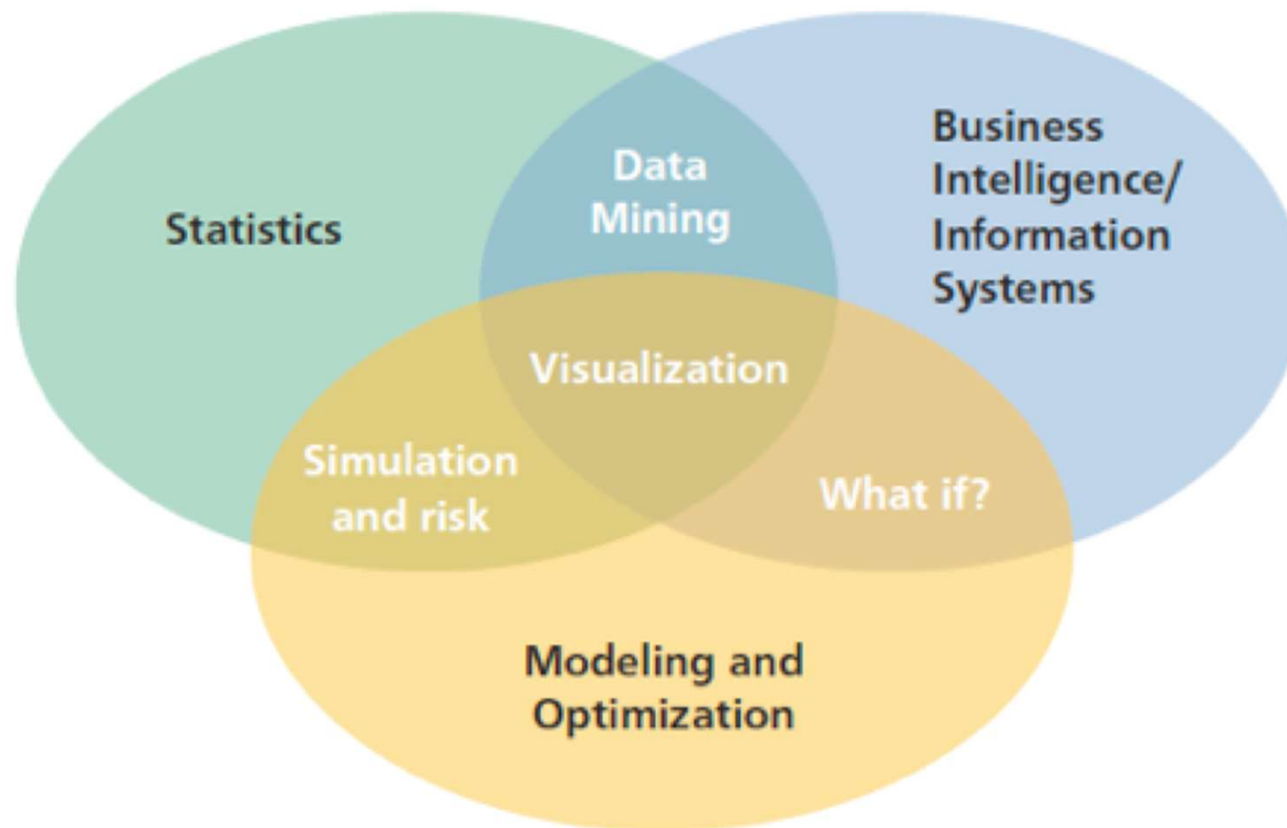
Evolution of Business Analytics

- Business intelligence
- Information Systems
- Statistics
- Operations research/Management science
- Decision support systems

A Visual Perspective of Business Analytics
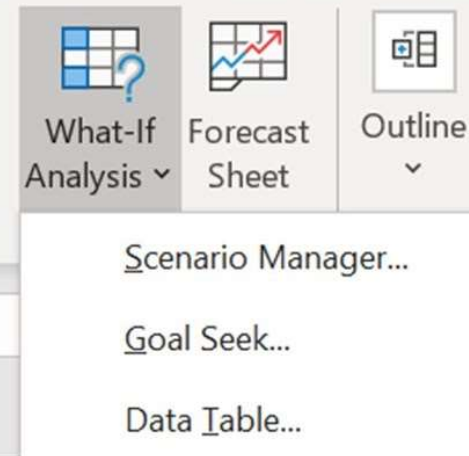
What-If Analysis is **the process of changing the values in cells to see how those changes will affect the outcome of formulas on the worksheet**. Three kinds of What-If Analysis tools come with Excel: Scenarios, Goal Seek, and Data Tables.

Impacts and Challenges

- **Benefits**
  - …reduced costs, better risk management, faster decisions, better productivity and enhanced bottom-line performance such as profitability and customer satisfaction.

- **Challenges**
  - …lack of understanding of how to use analytics, competing business priorities, insufficient analytical skills, difficulty in getting good data and sharing information, and not understanding the benefits versus perceived costs of analytics studies.

Scope of Business Analytics

- **Descriptive analytics**: the use of data to understand past and current business performance and make informed decisions

- **Predictive analytics**: predict the future by examining historical data, detecting patterns or relationships in these data, and then extrapolating these relationships forward in time.

- **Prescriptive analytics**: identify the best alternatives to minimize or maximize some objective

Tools

- Database queries and analysis
- Dashboards to report key performance measures
- Data visualization
- Statistical methods
- Spreadsheets and predictive models
- Scenario and "what-if" analyses
- Simulation
- Forecasting
- Data and text mining
- Optimization
- Social media, web, and text analytics

Example: Retail Markdown Decisions

- Most department stores clear seasonal inventory by reducing prices.
- *Key question*: When to reduce the price and by how much to maximize revenue?
- Potential applications of analytics:
  - <u>Descriptive analytics</u>: examine historical data for similar products (prices, units sold, advertising .etc)
  - <u>Predictive analytics</u>: predict sales based on price
  - <u>Prescriptive analytics</u>: find the best sets of pricing and advertising to maximize sales revenue

Software Support

- IBM Cognos Express
  - An integrated business intelligence and planning solution designed to meet the needs of midsize companies, provides reporting, analysis, dashboard, scorecard, planning, budgeting and forecasting capabilities.

- SAS Analytics
  - Predictive modeling and data mining, visualization, forecasting, optimization and model management, statistical analysis, text analytics, and more.

- Tableau Software
  - Simple drag and drop tools for visualizing data from spreadsheets and other databases.

Examples of Data Sources and Uses

▶ Annual reports

▶ Accounting audits

▶ Financial profitability analysis

▶ Economic trends

▶ Marketing research

▶ Operations management performance

▶ Human resource measurements

▶ Web behavior

*page views, visitor's country, time of view, length of time, origin and destination paths, products they searched for and viewed, products purchased, what reviews they read, and many others.

Data Sets and Databases

- **Data set** - a collection of data.
  - Examples: Marketing survey responses, a table of historical stock prices, and a collection of measurements of dimensions of a manufactured item.

- **Database** - a collection of related files containing records on people, places, or things.
  - A database file is usually organized in a two-dimensional table, where the columns correspond to each individual element of data (called *fields*, or *attributes*), and the rows represent records of related data elements.

Example: A Sales Transaction Database File

	A	B	C	D	E	F	G	H
1	Sales Transactions: July 14							
2								
3	Cust ID	Region	Payment	Transaction Code	Source	Amount	Product	Time Of Day
4	10001	East	Paypal	93816545	Web	$20.19	DVD	22:19
5	10002	West	Credit	74083490	Web	$17.85	DVD	13:27
6	10003	North	Credit	64942368	Web	$23.98	DVD	14:27
7	10004	West	Paypal	70560957	Email	$23.51	Book	15:38
8	10005	South	Credit	35208817	Web	$15.33	Book	15:21
9	10006	West	Paypal	20978903	Email	$17.30	DVD	13:11
10	10007	East	Credit	80103311	Web	$177.72	Book	21:59
11	10008	West	Credit	14132683	Web	$21.76	Book	4:04
12	10009	West	Paypal	40128225	Web	$15.92	DVD	19:35
13	10010	South	Paypal	49073721	Web	$23.39	DVD	13:26

Records

Entities

Fields or Attributes

Business Analytics

- Business analytics bridges the gap between information technology and business by using analytics to provide data-driven recommendations. The business part requires deep business understanding, while the analytics part requires an understanding of data, statistics and computer science.

- According to <u>LinkedIn Talent Solutions</u>, a business analyst acts as a **communicator, facilitator and mediator**, and seeks the best ways to improve processes and increase effectiveness through technology, strategy, analytic solutions, and more.

Working of Business Analytics

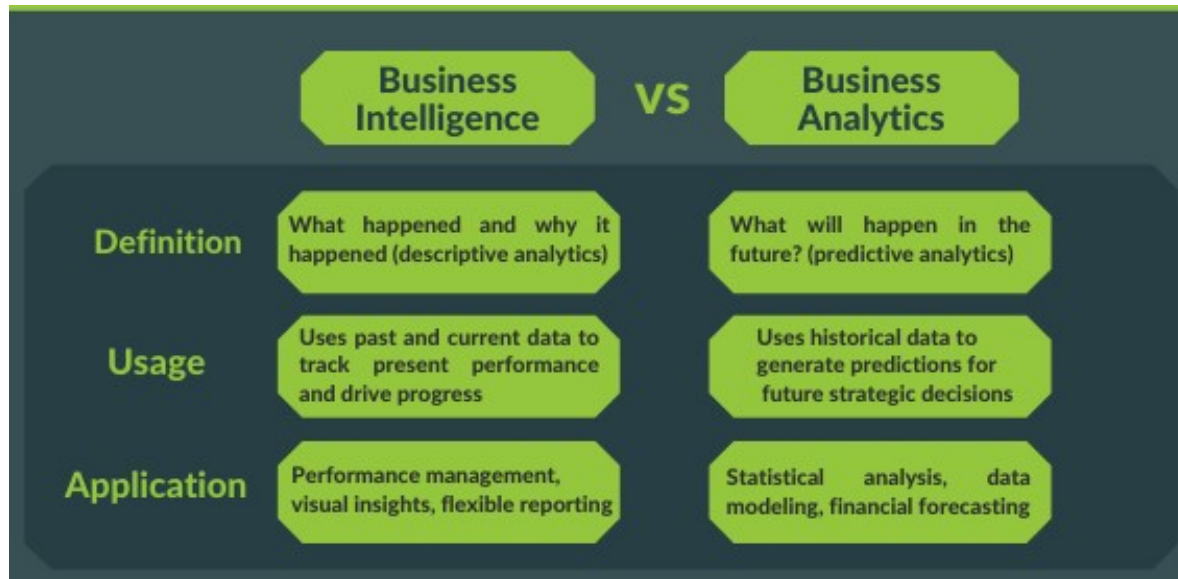- It is placed in the middle of two different dimensions — the Management region (changes are required) and the Technical region (analysts decide) what information or inputs the developer needs to know.

- Precisely, it drives the following purposes.

  - Analyze past data and derive analysis

  - Use analytics to solve management-level problems.

  - Deduce ways to implement analysis to improvise the future of the firm.

Skills of Business Analytics

- **Data Interpretation:** Businesses manage a vast amount of data. As a business analyst, you should have the ability to clean data and make it useful for interpretation.

- **Data Visualization and storytelling:** Data visualization is an evolving discipline, and Tableau defines data visualization as a graphical representation of data and information. A business analyst uses such visual elements as charts, graphs and maps, and provides an accessible way to see and understand trends, outliers and patterns in data.

- **Analytical reasoning ability:** Consists of logical reasoning, critical thinking, communication, research and data analysis. A business analyst requires these to apply descriptive, predictive and prescriptive analytics in business situations to solve business problems.

Skills of Business Analytics

- **Mathematical and statistical skills:** The ability to collect, organize and interpret numerical data is used for modeling, inference, estimation and forecasting in business analytics.

- **Written and communication skills:** If you have better communication skills, it becomes easy to influence the management team to recommend improvements and increase business opportunities.

Business Intelligence **VS** Business Analytics

	Business Intelligence	Business Analytics
Definition	What happened and why it happened (descriptive analytics)	What will happen in the future? (predictive analytics)
Usage	Uses past and current data to track present performance and drive progress	Uses historical data to generate predictions for future strategic decisions
Application	Performance management, visual insights, flexible reporting	Statistical analysis, data modeling, financial forecasting

BI

Backward Looking

Catalogue past data, drill-down query

Primarily answers predefined questions like

what has happened, when did it happen, who, what is the trend, how often?

Main focus on functions and process

Includes
- Reporting (KPIs, Metrics)
- Ad Hoc Querying
- OLAP (Cubes, Slice & Dice, Drilling)
- Operational/ Real-Time BI
- Dashboards/Scorecards
- Automated Monitoring/Alerting

BA

Forward Looking

Predicts Future Trends

Used to derive new insights by answering questions like

what will likely happen if these trends continue, what's next?

Main focus on data and reporting

Includes
- Statistical/Quantitative Analysis
- Data Mining
- Predictive Modelling / Analytics
- Text Analytics
- Big Data Analytics
- Multivariate Testing

- Business intelligence (BI) is **software that ingests business data and presents it in user-friendly views such as reports, dashboards, charts and graphs**.
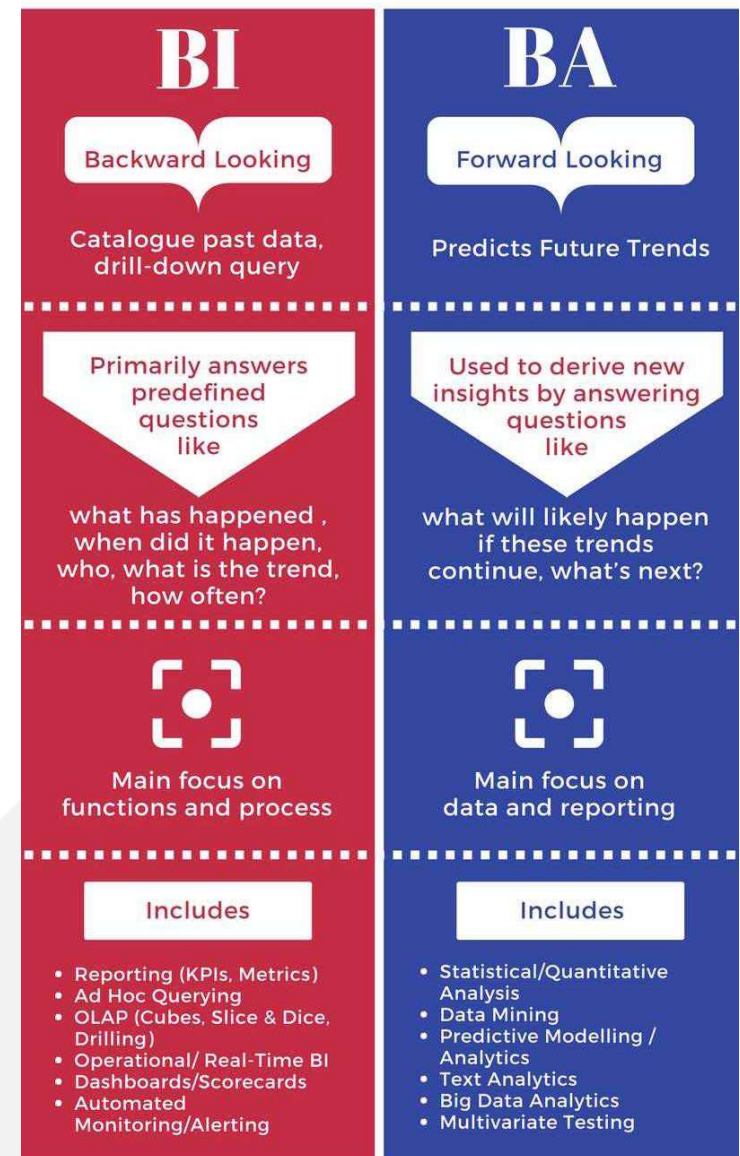
Business Analytics vs Business Intelligence

- Business analytics itself can be considered as a very [major subset of business intelligence](#).

- BA is all about gathering data inputs all around the firm and rendering analytics to improvise future performance, whereas BI is about inspecting the company's data and deduce what's happening around, which again sounds similar to Business Analytics.

- The difference is: BI works more on 'whats' whereas BA works on 'hows' and 'whys'.

Difference between Data Science and business analytics

- Data Science is the science of data study using statistics, **algorithms**, and technology whereas Business Analytics is the **Statistical study** of business data.

- Data Science is a relatively **recent development** in the field of analytics whereas Business Analytics has been in place ever since a late 19th century.

- Data Science involves a lot of **coding skills** whereas Business Analytics does not involve much coding.

- Data Science is a **superset of Business Analytics**. So, a person with Data Science skills can do Business Analytics but not vice versa.

Difference between Data Science and business analytics

- Data Science being a step ahead of Business Analytics is a **luxury**. However, Business Analytics is mandatory for a business to understand the working and gain insights.

- Data Science analysis results **cannot be used in day to day decision making** of the company whereas Business Analytics is vital in management taking key decisions.

- Data Science **does not answer a clear-cut question**. The questions are mostly general. Business Analytics, however, answers very **specific business-related questions** mostly financial.

- Data Science uses both **structured and unstructured data** whereas Business Analytics uses mostly **structured data**.

Difference between Data Science and business analytics

- Data Science has the potential to take leaps and bounds especially with the coming up of **Machine Learning and Artificial Intelligence** whereas Business Analytics is still taking slow steps.

- Data Science depends on a **large extent on the availability of data** whereas Business Analytics is not.

- The **cost** of investing in Data Science is **high** whereas that of Business Analytics is **low**.

- Data Science can keep **pace with the Data of today**. Data has grown and branched into a variety of data. Data Scientists are equipped with the **right skills** to deal with this. Business Analysts, however, do not possess this.

Homework

- Discuss the role of business analytics.
- Take a scenario to differentiate between data scientist and business analyst.

References

- **Text Books:**
  - Principles of Data Science by Sinan Ozdemir, (2016) PACKT.
  - Data Science For Dummies by Lillian Pierson (2015)
  - https://jsom.utdallas.edu/blog/business-analytics-vs-data-science
  - https://www.educba.com/data-science-vs-business-analytics/
- **Reference Books:**
  - R1. Data Science For Dummies by Lillian Pierson (2015)
  - R2. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking by Foster Provost, Tom Fawcett
- **Journals:**
  - http://www.ijsmsjournal.org/ijsms-v4i4p137.html
  - https://www.springer.com/journal/41060

Thank you

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