

EXAMINATION

NOTES

CLASS : M.COM 1ST SEM

SUBJECT: BUSINESS ANALYTICS

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UNIT 1

BUSINESS ANALYTICS

Business analytics is the process of transforming data into insights to improve business decisions. Data management, data visualization, predictive modeling, data mining, forecasting simulation, and optimization are some of the tools used to create insights from data.

Data-driven companies treat their data as a business asset and actively look for ways to turn it into a competitive advantage. Success with business analytics depends on data quality, skilled analysts who understand the technologies and the business, and a commitment to using data to gain insights that inform business decisions.

***How business analytics works**

Before any data analysis takes place, business analytics starts with several foundational processes:

- Determining the business goal of the analysis.
- Selecting an analysis methodology.
- Getting business data to support the analysis, often from various systems and sources.
- Cleansing and integrating data into a single repository, such as a data warehouse or data mart.

Initial analysis is typically performed on a smaller sample data set. Analytics tools range from spreadsheets with statistical functions to complex data mining and predictive modeling applications. Patterns and relationships in the raw data are revealed. Then new questions are asked, and the analytic process repeats until the business goal is met.

Deployment of predictive models for business analytics involves a statistical process known as scoring and uses records typically located in a database. Scores help enterprises make informed, real-time decisions within applications and business processes.

Business analytics also supports tactical decision-making in response to unforeseen events. Often the decision-making is automated using artificial intelligence to support real-time responses.

***Types of business analytics**

Different types of business analytics include the following:

- Descriptive analytics tracks key performance indicators (KPIs) to understand the present state of a business.
- Predictive analytics analyzes trend data to assess the likelihood of future outcomes.
- Prescriptive analytics uses past performance to generate recommendations for handling similar situations in the future.

Some schools of thought include a fourth approach, diagnostic analytics. It's similar to descriptive analytics, analyzing the state of a business and diagnosing why certain events and outcomes happened.

***Benefits of business analytics**

The key benefit of business analytics is that it can help organizations identify patterns in data and generate new insights. With this information, they can improve existing processes and identify new strategies. Some other benefits of business analytics include the following:

- **Improved decision-making.** Business analytics provides actionable insights that spur organizations to make more informed, data-driven decisions.

- **Business optimization.** Business analytics can identify and help mitigate recurring issues that keep processes from operating smoothly, such as steps in a workflow that take longer than they should. Also, resource allocation and use can be monitored to identify ways to cut costs.
- **Competitive advantage.** Data on market trends can be analyzed to identify patterns and trends that lead to better strategies for reaching customers and responding quickly to demand trends.
- **Personalized customer service and marketing.** Business analytics provides metrics on different types of customers and their buying preferences that can be used to create more personalized service and marketing strategies that improve customer engagement and provide a better customer experience.

***Common challenges of business analytics**

Businesses might encounter both business analytics and BI challenges when trying to implement a business analytics strategy:

- **Too many data sources.** There is an increasingly large spectrum of internet-connected devices generating business data. In many cases, they're generating different types of data that must be integrated into an analytics strategy. However, the more complex a data set becomes, the harder it is to use it as part of an analytics framework.
- **Lack of skills.** The demand for employees with the data analytics skills necessary to process BA data has grown. Some businesses, particularly small and medium-sized businesses, might have difficulty hiring people with the expertise and skills they need.
- **Data storage limitations.** Before a business can begin to decide how it will process data, it must decide where to store it. For instance, a data lake can be used to capture large volumes of unstructured data.

***Business analytics tools**

There are several business analytics and BI tools that can automate advanced data analytics functions. In many cases, they require few of the specialized skills or deep knowledge of the programming languages used in data science.

These tools help businesses organize and make use of the massive amounts of data that modern internet of things and enterprise cloud applications generate. They come as part of supply chain management, enterprise resource planning and customer relationship management applications.

Business analytics tools are used in many ways. For example, they can identify customers who are likely to cancel a service offering subscription. A company would first take aggregate data from enterprise applications, using a Data Ops analytics platform like Data Kitchen. Then it would use a business analytics tool to present that data to employees and help them identify customers at risk of canceling a contract or becoming less engaged with the company.

When choosing a business analytics tool, organizations should consider the following:

- The sources where their data comes from.
- The type of data being analyzed.
- How easy the tool is to use.

A good business analytics tool is intuitive and user-friendly. It also provides a full suite of features for more advanced analytics.

A sampling of business analytics tools as compiled by Gartner includes Amazon Quick Sight, Domo, Google Looker, Microsoft Power BI, Micro Strategy, Qlik Sense, SAP Business Objects BI Suite, Sisense Fusion Analytics and Tableau.

***Roles and responsibilities of a business analyst**

Business analytics professionals' main responsibility is to collect and analyze data to influence strategic decisions that a business makes. Some initiatives they might provide analysis for include the following:

- Identifying strategic opportunities from data patterns.
- Identifying potential problems facing the business and coming up with solutions.
- Creating a budget and business forecast.
- Monitoring progress with business initiatives.
- Reporting progress on business objectives back to stakeholders.
- Understanding KPIs.
- Understanding regulatory and reporting requirements.

Business analysts must have a mixture of hard skills and soft skills. A business analyst doesn't need a deep understanding of IT but does need to understand how systems work together. Some business analysts start their career in an IT-centric role and then move into a business analytics role.

When recruiting for these jobs, employers typically look for detail-oriented people with good communications skills. They need to have capabilities in some or all of these areas: cost-benefit analysis; process modeling; stakeholder analysis; analytical problem-solving; and IT systems, particularly databases, data visualization, data management, business analytics and business intelligence.

BUSINESS INTELLIGENCE

Business intelligence (BI) is a technology-driven process for analyzing data and delivering actionable information that helps executives, managers and workers make informed business decisions.

***Business Analytics Process**

- **Data mining:** Using databases, statistics, and machine learning (ML) to uncover trends in large datasets
- **Reporting:** Sharing data analysis to stakeholders so they can draw conclusions and make decisions
- **Performance metrics and benchmarking:** Comparing current performance data to historical data to track performance against goals, typically using customized dashboards
- **Descriptive analytics:** Using preliminary data analysis to find out what happened
- **Querying:** Asking the data-specific questions, BI pulling the answers from the data sets
- **Statistical analysis:** Taking the results from descriptive analytics and further exploring the data using statistics such as how this trend happened and why
- **Data visualization:** Turning data analysis into visual representations such as charts, graphs, and histograms to more easily consume data
- **Visual analysis:** Exploring data through visual storytelling to communicate insights on the fly and stay in the flow of analysis
- **Data preparation:** Compiling multiple data sources, identifying the dimensions and measurements, and preparing it for data analysis

BUSINESS ANALYTICS RELATION WITH DECISION MAKING

1. Comprehensive Data Analysis

Business intelligence helps analyse vast amounts of data. They transform raw data into actionable insights enabling business leaders to make informed decisions.

By analysing data, businesses can gain insights into key performance indicators and customer preferences and behaviour, for example, helping them to identify trends and make data-driven decisions.

2. Data Visualisation

One of the significant benefits of BI tools is data visualisation. By providing a clear picture of complex data through charts and graphs, decision-makers can easily understand how to streamline processes and interpret data.

This visualisation helps the organisation and decision-makers in better decisions, identifying areas of improvement and making strategic choices.

3. Predictive Analytics

BI tools leverage machine learning and artificial intelligence to offer predictive analytics. This feature helps businesses to foresee future market trends, and their customer behaviour and preferences, leading to better resource allocation and improved decision-making.

Predictive analytics provides a competitive edge by enabling businesses to adapt quickly to market changes.

4. Enhanced Data Governance

Effective data management is crucial for maintaining data quality and accuracy line business intelligence. Business intelligence ensures data governance by managing and analysing data consistently across the business.

This results in reliable data-driven insights embracing business intelligence, allowing for better decision-making and streamlined processes.

5. Real-Time Reporting

Generating reports in real time is another key advantage of using business intelligence. These reports provide up-to-date information on the performance of key metrics used, market trends, and business operations.

Real-time reporting helps decision makers to make timely and well-informed decisions based on the most current data.

6. Identifying Customer Behaviour and Preferences

BI tools are instrumental in analysing customer behaviour and customer preferences beforehand. By understanding customer needs and identifying market trends, businesses can tailor their strategies to meet customer expectations.

This leads to more sales, enhanced customer satisfaction and a better competitive advantage in the market.

7. Cost Reduction and Efficiency

Finally, business intelligence contributes to cost reduction and operational efficiency. By using key performance indicators providing a comprehensive view of business operations, BI tools help in identifying areas where resources can be optimised.

This results in streamlined processes and operations, reduced costs, and ultimately, effective decision-making processes.

AN INFORMED DECISION

An informed decision is a choice that individuals make once they have all the information related to the decision topic. It involves analyzing potential outcomes, benefits and risks associated with each option, then deciding which choice is the best for you.

Distinctive competence is a unique set of capabilities that a company possesses, setting it apart from its competitors. In the realm of product management and operations, distinctive competence often refers to the unique ways a company manages its products and operations to gain a competitive edge.

Understanding distinctive competence is crucial for any business, as it helps to identify the unique strengths that can be leveraged for competitive advantage. This article delves into the concept of distinctive competence in product management and operations, providing an in-depth understanding of how it works and how it can be utilized effectively.

DISTINCTIVE COMPETENCE: AN OVERVIEW

Distinctive competence refers to the unique capabilities or skills that a company possesses, which sets it apart from its competitors. These competencies can be in any area of business, but they are often related to product management and operations.

These unique capabilities can include superior product design, efficient manufacturing processes, innovative marketing strategies, or exceptional customer service. The key is that these competencies are distinctive to the company and cannot be easily replicated by competitors.

Distinctive Competence in Product Management

In the context of product management, distinctive competence can refer to the unique ways a company manages its product portfolio. This could include innovative product development processes, superior product design, or exceptional product lifecycle management.

For example, a company may have a distinctive competence in developing products that meet specific customer needs, or in managing the lifecycle of its products to maximize profitability. This distinctive competence gives the company a competitive edge in the market.

Distinctive Competence in Operations

When it comes to operations, distinctive competence can refer to the unique ways a company manages its operations to achieve efficiency and effectiveness. This could include superior supply chain management, efficient production processes, or innovative operational strategies.

For instance, a company may have a distinctive competence in managing its supply chain to minimize costs and maximize efficiency. This distinctive competence gives the company a competitive advantage in the market.

***Importance of Distinctive Competence**

Distinctive competence is crucial for a company's success as it provides a competitive edge in the market. It allows a company to differentiate itself from its competitors, attract customers, and achieve superior performance.

By identifying and leveraging its distinctive competences, a company can create unique value for its customers, which can lead to increased customer loyalty and higher market share. Moreover, distinctive competences can also enable a company to achieve cost leadership, as they often involve more efficient and effective ways of doing things.

1. Competitive Advantage

One of the main benefits of distinctive competence is that it provides a competitive advantage. By having unique capabilities that competitors cannot easily replicate, a company can differentiate itself in the market and attract more customers.

For example, a company with a distinctive competence in product design may be able to create products that are more appealing to customers, leading to higher sales and market share. Similarly, a company with a distinctive competence in operations may be able to produce products more efficiently, leading to lower costs and higher profits.

2. Customer Loyalty

Distinctive competence can also lead to increased customer loyalty. By providing unique value that meets the specific needs of customers, a company can build strong relationships with its customers, leading to repeat business and referrals.

For instance, a company with a distinctive competence in customer service may be able to provide exceptional service that exceeds customer expectations, leading to high customer satisfaction and loyalty.

3. Developing Distinctive Competence

Developing distinctive competence involves identifying the unique capabilities that a company possesses and leveraging them for competitive advantage. This requires a deep understanding of the company's strengths and weaknesses, as well as the competitive landscape.

Once the distinctive competences have been identified, the company can then focus on strengthening these competences and integrating them into its business strategy. This can involve investing in resources, developing skills, and implementing processes that support these competences.

4. Identifying distinctive competences

The first step in developing distinctive competence is to identify the unique capabilities that a company possesses. This can be done through a thorough analysis of the company's resources, capabilities, and competences.

Resources refer to the tangible and intangible assets that a company has, such as financial resources, physical assets, human resources, and intellectual property. Capabilities refer to the company's ability to use these resources effectively to perform certain activities. Competences refer to the company's ability to integrate and coordinate its resources and capabilities to achieve its objectives.

5. Strengthening distinctive competences

Once the distinctive competences have been identified, the next step is to strengthen them. This can involve investing in resources, developing skills, and implementing processes that support these competences.

For example, if a company has a distinctive competence in product design, it may invest in advanced design tools, train its designers in the latest design techniques, and implement a design process that encourages creativity and innovation.

***Examples of Distinctive Competence**

There are many examples of companies that have leveraged their distinctive competences for competitive advantage. These examples illustrate how distinctive competence can be used in different areas of business, including product management and operations.

For instance, Apple Inc. is known for its distinctive competence in product design and innovation. The company's ability to create innovative products that are aesthetically pleasing and easy to use has set it apart from its competitors and made it one of the most valuable companies in the world.

Apple Inc.

Apple Inc. is a prime example of a company that has leveraged its distinctive competence for competitive advantage. The company's distinctive competence lies in its ability to design and develop innovative products that are aesthetically pleasing and easy to use.

This distinctive competence has allowed Apple to create a strong brand and a loyal customer base, and it has been a key factor in the company's success. From the iPhone to the iPad, Apple's products are known for their distinctive design and innovative features, which have set them apart from their competitors.

CREATING COMPETITIVE ADVANTAGE

Competitive advantage is the favorable position an organization seeks to be more profitable than its rivals. To gain and maintain a competitive advantage, an organization must demonstrate a greater comparative or differential value than its competitors and convey that information to its desired target market. For example, if a company advertises a product for a price that's lower than a similar product from a competitor, that company is likely to have a competitive advantage. The same is true if the advertised product costs more but offers unique features that customers are willing to pay for.

In the 1980s, professor Michael Porter at the Harvard Business School looked at successful businesses and created a framework for how leaders could think strategically about beating the competition. Porter suggested that companies analyze five important criteria, which Porter called the Five Forces, to gain an understanding for the competitive landscape. Once achieved, he recommended the use of three generic strategies to help leadership make the best choice about which type of competitive advantage they should pursue.

Porter's Five Forces is an alternate model to SWOT (Strengths, Weaknesses, Opportunities, Threats), an analysis tool credited to Albert Humphrey at the Stanford Research Institute to help companies get a sense of their position within a competitive landscape. Porter taught his students at Harvard about SWOT analysis but felt the tool had limitations because it placed too much focus on individual companies rather than on industries. Porter saw the need for a framework that also looked at the competitive landscape holistically, in the context of an entire industry. The simple framework that Porter developed for achieving a competitive advantage in the marketplace is still being taught in business schools today.

***Porter's techniques for analyzing competitors**

In his 1980 book *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, Porter maintains that the appeal of a market segment is determined by the following five competitive forces:

1. **Threat of new entrants.** How easy is it for a new competitor to enter the market?
2. **Rivalry among existing competitors.** How many competitors offer a similar product at a similar price?
3. **Threat of substitute products or services.** What is the likelihood a customer will switch to a similar product?
4. **Power of buyers.** How easy is it for buyers to drive prices down?
5. **Power of suppliers.** How easy it is for suppliers to drive prices up?

The first three forces are sometimes referred to as *horizontal competition*. Variables in horizontal competition include the possibility of new competitors entering the market, the rivalry among existing competitors, and the threat posed by substitute products or services.

The last two forces are sometimes referred to as vertical competition. Vertical competition is dependent upon supply chain; the price of raw materials; the cost of labor; and the customer's relationship with a product, brand or company.

***Porter's techniques for creating superior performance**

In his 1985 book *Competitive Advantage: Creating and Sustaining Superior Performance*, Porter proposed that once the potential for profitability in a market is established, the next step toward gaining a competitive advantage is to decide whether to use a low-cost approach or a differentiation approach. Once an organization decides between the two, a third element that Porter called *focus* needs to be made certain. This part of the framework identifies who the product or service should be marketed to. These techniques include the following:

1. **Cost leadership strategy.** Should the product or service be offered at a lower price than the competitors?

2. **Differentiation strategy.** Should the product or service have unique features or benefits that are so appealing that customers are willing to pay a premium price?
3. **Focus strategy.** Should the product or service target niche markets that are overlooked or underserved by competitors?

Porter also looked at competitive strategies from a long-term, sustainable angle and maintained that creating a sustainable competitive advantage not only boosts a company's image in the marketplace but also affects valuation and the potential for future earnings.

***How to create a sustainable competitive advantage**

Sustainable competitive advantage refers to maintaining a favorable position over the long term, which can boost a company's image in the marketplace, its valuation and its future earning potential.

Strategic management expert Jay B. Barney published an article in 1991 that took Porter's ideas and expanded upon them, adding an element for sustaining a competitive advantage over time. Barney's article, titled "Firm Resources and Sustained Competitive Advantage," suggested that instead of just looking at outside influences when analyzing the competitive landscape, companies should also look inward to achieve sustainable competitive advantage.

Barney wrote that previous frameworks, including Porter's, were based on the incorrect assumption that all companies within the same industry shared the same attributes. It is each company's differences, Barney pointed out, that should be exploited to gain a competitive advantage.

***Resource-based view and VRIN**

Barney proposed using a framework called the resource-based view (RBV). This competitive advantage framework places emphasis on a company's core

competencies as well as the combination of skills and resources that make a company unique compared to the competition.

Barney maintained that for resources to hold potential as sources of sustainable competitive advantage, they should be valuable, rare, inimitable and non-substitutable (VRIN), defined as the following:

- **Valuable.** Does the resource have greater value, in terms of costs and benefits, than similar resources in competing companies?
- **Rare.** Is the resource scarce when compared to the relative demand for its use or what it produces?
- **Inimitable.** Can the resource be imitated or copied easily?
- **Non-substitutable.** How difficult is it to replace the resource with a substitute?

Barney categorized resources as either tangible or intangible. Tangible resources, such as technology, can be bought by other competitors to gain a competitive advantage. However, intangible resources, such as positive brand recognition, cannot be bought and are the main source of sustainable competitive advantage.

To leverage their core competencies, companies can start by identifying their key resources and then use the VRIN framework to determine if the resource is robust enough to provide sustainable competitive advantage.

ANALYTICAL COMPETITOR

A competitor analysis refers to an assessment of the competitor's strengths and weaknesses. This type of analysis helps you determine how you compare with indirect and direct competitors in the same market. Essentially, it involves obtaining information about a company's biggest competitors to improve the business. It involves reviewing the way competitors promote themselves, engage with their customers and develop new products. The primary goals of a competitor analysis include the following:

To identify the strongest competitors

To determine the competitors' strategies

To anticipate their actions

To anticipate their reactions based on your actions

To influence their actions in a way that benefits you

Having this information can help you create, implement and adjust strategies to improve the company's efforts. It also helps you identify any potential threats to the business. Many businesses conduct competitor analysis through impressions, conjectures and intuition. Conducting a thorough analysis at various stages of business can ensure that you evaluate every possibility and action.

***Benefits of a competitor analysis**

Now that you understand the definition of a competitive analysis, consider whether it's useful for the development of the business. Here are some benefits this type of analysis provides:

Helps build better marketing strategies: When you understand the competitor is spending their advertising budget and how and where they're interacting with their customers, you can build your own marketing efforts.

Identifies under-served opportunities: Conducting a competitor analysis helps identify any products or services that customers want but don't currently have access to. When you determine these under-served opportunities, it gives you a chance to devise a solution to fill the customers' needs.

Lets you capitalize on their weaknesses: When you understand your competitor's weaknesses, you can use them to your advantage. For example, if they don't have the resources or capabilities to do something and you do, you can help fill that need and grow in the market.

Helps you make well-informed decisions: Whether you're planning for the future or making real-time decisions, using a competitor analysis can help you make more strategic decisions and investments.

***How to identify competitors**

A competitor refers to any business or company in the same industry that offers a similar product or service. While it's important to identify your existing competitors, you can also benefit from having information regarding your potential competitors that may enter the market in the future. Here are some simple ways to identify competitors:

1. Conduct market research

Determine what other companies offer a similar product or service in your market. You can also consult with the sales team to identify which competitors often materialize throughout the sales process. Other tools that help you find competitors include surveys, consumer reports and demographic data. [Read more: 20 Market Research Tools \(With Importance and Types\)](#)

2. Seek customer feedback

Ask your customers which other businesses, products or services they were or are considering. This can help identify competitors you may not have previously known. You can also ask about specific factors that influenced the customer's decisions to identify areas of improvement or marketable advantages.

3. Use the internet

To better identify your competitors, gather information by reviewing customer conversations via online communities and forums. Since many customers seek advice or recommendations online, this can help you determine your competitors. Look for online resources and forums within your exact location or demographic to find the most prominent competitors in the market. [Related: Indirect Competitors: Definition and How To Manage Them](#)

4. Check social media

Analyze the social media activities that competitors use. This includes the social media platforms, the type of content they share and the type of resources they provide for customers. [Related: How To Conduct a Social Media Sentiment Analysis \(With Tips\)](#)

5. Perform keyword research

Conduct an SEO analysis to identify companies competing for the same place in search engine rankings. If a website competes for the same keywords, it may be a competitor. You can use the keywords, content, strategies and pricing of the most prominent search results to evaluate the operations and advantages of these competitors.

UNIT 11

ANALYTICAL METHODS AND MODELS

Descriptive Analytics is a field of business intelligence with expertise in statistical analysis, waiting for history, and other data. Descriptive Analytics professionals find the data to question and study; they pose the questions that need answers; they translate these queries into mathematical models and apply them to their chosen data. Using descriptive analytics in data visualization is a practice that can greatly aid and improve people's decision-making. Their decisions are taken from over-reliance, wishful thinking, and in isolation. Descriptive analytics is a rapidly growing field with a promising future. It offers the ability to make better business decisions and understand how customers interact with companies and products. General techniques used in descriptive analytics include; Data collection, Data preparation, exploratory data analysis, data visualization, statistical analysis, and predictive modeling. In this article, we will go through Descriptive Analytics: Steps, Techniques, Use Cases, and Examples. in detail.

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Descriptive Analysis Techniques

The techniques for descriptive analysis are the most common descriptive methods of data analysis for qualitative data. Descriptive data analysis techniques are used to describe the subjects of a study in detail, identifying patterns and trends, and providing insights into how subjects behave.

Some of the most common descriptive analysis methods for descriptive analysis statistics are:

- The frequency distribution is a method that provides an overview of all the responses to a question.
- The bar chart is a visual representation that displays how responses vary on different dimensions.
- The pie chart displays how responses vary on different dimensions.
- A scatterplot displays how two variables relate to each other.
- A histogram provides an overview of all the responses to a question, with each response grouped into bins according to some criterion such as age or income level.

Importance of Discriptive Analysis

1. Monitoring social media activity

A significant touchpoint in the sales process is social media. Therefore, it is essential to have the ability to measure and present engagement metrics across a complex constellation of campaigns and social networks in order to identify the most effective strategies for digital marketing. Fortunately, descriptive analytics will be included by default in marketing reports on social media engagement. Measures of social media engagement include clicks, likes, shares, detail expands, bounce rates, and more. These metrics are all easily summed up using descriptive techniques.

For instance, a business might be curious to know which social media account is bringing in the most visitors to its website. They can quickly compare data about various channels using dashboards, visualizations, and descriptive statistics. Similarly to this, marketing teams can examine particularly shareable content and compare, for example, blog posts and videos, to determine which generates the most clicks.

Although none of this data draws clear conclusions (since it doesn't assess cause and effect), it is still useful. Teams can use it to create hypotheses or make educated assumptions about where to spend their time and money.

2. Streaming and Online Shopping

Descriptive analytics are used to spot trends by subscription streaming services like Spotify and Netflix as well as e-commerce websites like Amazon and eBay. Descriptive metrics are useful for identifying what users and consumers are currently most interested in. For instance, Spotify uses descriptive analytics to find out which albums or artists its subscribers are enjoying. Amazon compares customer purchases using descriptive analytics. These insights influence the recommendation engines in both cases to work with are influenced by these insights.

While Netflix goes even further in its application of descriptive analytics. Netflix, a business that places a high value on data, uses descriptive analytics to determine which genres and TV shows are most popular with its audience. Decisions about new content creation, marketing strategies, and even which production companies they work with.

3. Learning management systems

Many institutions now use online/offline hybrid learning, from traditional education to corporate training. A common component of this is learning management systems or LMSs for those in the know. LMS platforms keep track of everything, including user participation, attendance, test results, and in the case of e-learning programs even the length of time it takes students to finish a course. Descriptive-analytical reports provide a high-level overview of what is working and what is not by summarizing this data.

Teachers and training specialists can monitor goals at the individual and organizational levels using these data. They can examine grade distributions or discover the most well-liked teaching aids. And even though they won't always understand why, it might be possible to deduce from the data that, for instance, videos are more popular than written documents. The first step in improving course design and improving learner outcomes is to present this information.

The Five Steps Descriptive Data Science Involves

Determining the metrics you want to output is typically the first step in applying descriptive analytics, and presenting them in the proper format is the final step. The procedures to generate your own descriptive analytics are listed below.

Step 1: Define business metrics

Defining the metrics you wish to measure is the first step. These should represent the main organization's objectives of each segment or the organization as a whole. For instance, a company that prioritizes expansion may track quarterly revenue growth, and its accounts receivable department may monitor metrics like days sales outstanding and other measures of how long does it take to get payment from a customer?

Step 2: Identify data required

Find the data you require to generate the desired stats. The data may be dispersed over numerous programmes and files at some businesses. Businesses that use ERP systems can already have the majority or all of the data they require in the databases of their systems. Some indicators might also need information from outside sources, like social media platforms, e-commerce websites, and databases used for industry benchmarking.

Step 3: Extract and preprocess data

When data is gathered from several sources, extracting, integrating, and preprocessing it before analysis is a time-consuming but necessary step to ensure accuracy. This procedure could include data cleansing to eliminate conflicts and inaccuracies in data from diverse sources and convert the data into a format compatible with descriptive-analytical tools. Advanced data analytics employ the method of data modeling to help prepare, shape, and organize corporate data. Data modeling is a framework for describing and formatting data inside information systems.

Step 4: Data Analysis

Businesses can utilize a variety of technologies, such as spreadsheets and business intelligence (BI) tools, to do descriptive analytics. In descriptive analytics, applying simple mathematical operations to one or more variables is a common step. For example, sales managers could monitor the average profit per transaction or the monthly revenue from new clients. Executives and financial professionals may keep an eye on financial indicators like the gross profit margin, or the ratio of gross profit to sales.

Step 5: Present data

Data that is presented in visually appealing forms, such as pie charts, bar charts, and line graphs, is typically easier for stakeholders to understand. But some people, like financial professionals, could like information that is provided in the form of figures and tables.

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***What Is Predictive Analytics?**

Predictive analytics is the use of statistics and modeling techniques to forecast future outcomes. Current and historical data patterns are examined and plotted to determine the likelihood that those patterns will repeat.

Businesses use predictive analytics to fine-tune their operations and decide whether new products are worth the investment. Investors use predictive analytics to decide where to put their money. Internet retailers use predictive analytics to fine-tune purchase recommendations to their users and increase sales.

***Types of Predictive Analytical Models**

There are three common techniques used in predictive analytics: Decision trees, neural networks, and regression.

1. Decision Trees

If you want to understand what leads to someone's decisions, you may find it useful to build a decision tree.

This type of model places data into different sections based on certain variables, such as price or market capitalization. Just as the name implies, it looks like a tree with individual branches and leaves. Branches indicate the choices available while individual leaves represent a particular decision.

Decision trees are easy to understand and dissect. They're useful when you need to make a decision quickly.⁶

2. Regression

This is the model that is used the most in statistical analysis. Use it when you want to decipher patterns in large sets of data and when there's a linear relationship between the inputs.

This method works by figuring out a formula, which represents the relationship between all the inputs found in the dataset.

For example, you can use regression to figure out how price and other key factors can shape the performance of a stock.⁶

3. Neural Networks

Neural networks were developed as a form of predictive analytics by imitating the way the human brain works. This model can deal with complex data relationships using artificial intelligence and pattern recognition.

Use this method if you have any of several hurdles that you need to overcome. For example, you may have too much data on hand, or don't have the formula you need to find a relationship between the inputs and outputs in your dataset, or need to make predictions rather than come up with explanations.⁶

If you've already used decision trees and regression as models, you can confirm your findings with neural networks.⁶

4. Cluster Models

Clustering is a method of aggregating data that share similar attributes. For example, Amazon.com can cluster sales based on the quantity purchased, or on the average account age of its consumers.

separating data into similar groups based on shared features, analysts may be able to identify other characteristics that define future activity.

5. Time Series Modeling

In some cases, data relates to time, and specific predictive analytics rely on the relationship between what happens when. These types of models assess inputs at specific frequencies such as daily, weekly, or monthly iterations.

Then, analytical models can seek seasonality, trends, or behavioral patterns based on timing.

This type of predictive model is useful to predict when peak customer service periods are needed or when specific sales can be expected to jump.

***Benefits of Predictive Analytics**

As mentioned above, predictive analytics can help anticipate outcomes when there are no obvious answers available.

Investors, financial professionals, and business leaders use models to help reduce risk. For instance, an investor or an advisor can use models to help craft an investment portfolio with an appropriate level of risk, considering factors such as age, family responsibilities, and goals.⁸

Businesses use them to keep their costs down. They can determine the likelihood of success or failure of a product before it is developed. Or they can set aside capital for production improvements before the manufacturing process begins.⁸

***Criticism of Predictive Analytics**

The use of predictive analytics has been criticized and, in some cases, legally restricted due to perceived inequities in its outcomes. Most commonly, this involves predictive models that result in statistical discrimination against racial or ethnic groups in areas such as credit scoring, home lending, employment, or risk of criminal behavior.

A famous example of this is the now illegal practice of redlining in home lending by banks. Regardless of the accuracy of the predictions, their use is discouraged as they perpetuate discriminatory lending practices and contribute to the decline of redlined neighborhoods.

DATA MINING

Data mining is the process of searching and analyzing a large batch of raw data in order to identify patterns and extract useful information.

Companies use data mining software to learn more about their customers. It can help them to develop more effective marketing strategies, increase sales, and decrease costs. Data mining relies on effective data collection, warehousing, and computer processing.

- Data mining is the process of analyzing a large batch of information to discern trends and patterns.
- Data mining can be used by corporations for everything from learning about what customers are interested in or want to buy to fraud detection and spam filtering.
- Data mining programs break down patterns and connections in data based on what information users request or provide.
- Social media companies use data mining techniques to commodify their users in order to generate profit.
- This use of data mining has come under criticism as users are often unaware of the data mining happening with their personal information, especially when it is used to influence preferences.

***The Data Mining Process**

To be most effective, data analysts generally follow a certain flow of tasks along the data mining process. Without this structure, an analyst may encounter an issue in the middle of their analysis that could have easily been prevented had they prepared for it earlier. The data mining process is usually broken into the following steps.

Step 1: Understand the Business

Before any data is touched, extracted, cleaned, or analyzed, it is important to understand the underlying entity and the project at hand. What are the goals the company is trying to achieve by mining data? What is their current business

situation? What are the findings of a SWOT analysis? Before looking at any data, the mining process starts by understanding what will define success at the end of the process.

Step 2: Understand the Data

Once the business problem has been clearly defined, it's time to start thinking about data. This includes what sources are available, how they will be secured and stored, how the information will be gathered, and what the final outcome or analysis may look like. This step also includes determining the limits of the data, storage, security, and collection and assesses how these constraints will affect the data mining process.

Step 3: Prepare the Data

Data is gathered, uploaded, extracted, or calculated. It is then cleaned, standardized, scrubbed for outliers, assessed for mistakes, and checked for reasonableness. During this stage of data mining, the data may also be checked for size as an oversized collection of information may unnecessarily slow computations and analysis.

Step 4: Build the Model

With a clean data set in hand, it's time to crunch the numbers. Data scientists use the types of data mining above to search for relationships, trends, associations, or sequential patterns. The data may also be fed into predictive models to assess how previous bits of information may translate into future outcomes.

Step 5: Evaluate the Results

The data-centered aspect of data mining concludes by assessing the findings of the data model or models. The outcomes from the analysis may be aggregated, interpreted, and presented to decision-makers that have largely been excluded from the data mining process to this point. In this step, organizations can choose to make decisions based on the findings.

Step 6: Implement Change and Monitor

The data mining process concludes with management taking steps in response to the findings of the analysis. The company may decide the information was not strong enough or the findings were not relevant, or the company may strategically pivot based on findings. In either case, management reviews the ultimate impacts of the business and recreates future data mining loops by identifying new business problems or opportunities.

***Applications of Data Mining**

In today's age of information, almost any department, industry, sector, or company can make use of data mining.

1.Sales

Data mining encourages smarter, more efficient use of capital to drive revenue growth. Consider the point-of-sale register at your favorite local coffee shop. For every sale, that coffeehouse collects the time a purchase was made and what products were sold. Using this information, the shop can strategically craft its product line.

2. Marketing

Once the coffeehouse knows its ideal line-up, it's time to implement the changes. However, to make its marketing efforts more effective, the store can use data mining to understand where its clients see ads, what demographics to target, where to place digital ads, and what marketing strategies most resonate with customers. This includes aligning marketing campaigns, promotional offers, cross-sell offers, and programs to the findings of data mining.

3. Manufacturing

For companies that produce their own goods, data mining plays an integral part in analyzing how much each raw material costs, what materials are being used most efficiently, how time is spent along the manufacturing process, and what bottlenecks negatively impact the process. Data mining helps ensure the flow of goods is uninterrupted.

4. Fraud Detection

The heart of data mining is finding patterns, trends, and correlations that link data points together. Therefore, a company can use data mining to identify outliers or correlations that should not exist. For example, a company may analyze its cash flow and find a reoccurring transaction to an unknown account. If this is unexpected, the company may wish to investigate whether funds are being mismanaged.

5. Human Resources

Human resources departments often have a wide range of data available for processing including data on retention, promotions, salary ranges, company benefits, use of those benefits, and employee satisfaction surveys. Data mining

can correlate this data to get a better understanding of why employees leave and what entices new hires.

6. Customer Service

Customer satisfaction may be caused (or destroyed) by many events or interactions. Imagine a company that ships goods. A customer may be dissatisfied with shipping times, shipping quality, or communications. The same customer may be frustrated with long telephone wait times or slow e-mail responses. Data mining gathers operational information about customer interactions and summarizes the findings to pinpoint weak points and highlight what the company is doing right.

***Advantages and Disadvantages of Data Mining**

Pros of Data Mining

- It drives profitability and efficiency
- It can be applied to any type of data and business problem
- It can reveal hidden information and trends

Cons of Data Mining

- It is complex
- Results and benefits are not guaranteed
- It can be expensive

MACHINE LEARNING ENVIRONMENT

The environments are managed and versioned entities within your Machine Learning workspace that enable reproducible, auditable, and portable machine learning workflows across various compute targets. You can use an Environment object to: Develop your training script.

***Types of learning environments**

- Learner-centered environment.
- Knowledge-centered environment.
- Assessment-centered environment.
- Community-centered environment.
- Healthy and safe learning environment.

1. Step 1: Downloading Anaconda. ...
2. Step 2: Installing Anaconda. ...
3. Step 3: Updating Anaconda. ...
4. Step 4: Downloading CUDA Toolkit and cuDNN. ...
5. Step 5: Adding cuDNN in the Environment Path. ...
6. Step 6: Making an environment for Anaconda. ...
7. Step 7: Installing Deep Learning Libraries.

Step 1: Downloading Anaconda

First, we will download anaconda package with python for your software platform. Anaconda is an open-source and free platform for developing ML algorithms using python.

You can click on the link given to download the 32 or 64-bit version and get started:

Download the software based on your version. Here we have taken Windows, but you can take one based on your OS.

Step 2: Installing Anaconda

After you download the setup, it is easy to install Anaconda. You just need to open the wizard and click on the next instructions on the screen.

It takes a few minutes for the initial set-up.

Step 3: Updating Anaconda

Step 4: Downloading CUDA Toolkit and cuDNN

1. Click on the link to download CUDA Toolkit version 8.0 or 9.0.
2. Download cuDNN

Install the current version of cuDNN. Then, choose your version and CUDA based on your operating system. Finally, create an account with the help of your email id and become a member to access the software.

Step 5: Adding cuDNN in the Environment Path

It is a crucial step. So make sure you follow it carefully.

- a. Open the run dialogue with the help of (Win + R) and run the following command: sysdm.cpl.
- b. Go to system properties in windows 10, and click on the 'Advanced' tab.
- c. Click on the environment variables.
- d. Type the following path environment :

C: \cudnn-9.0-windows 10-x64-v7\cuda\bin

Step 6: Making an environment for Anaconda

Coming to the last stages in setting up Anaconda, let us try to create an environment in Anaconda. We will make an Anaconda environment for every different usage. So it doesn't interrupt the initial environment.

- a. Make a conda environment with the name "tensor" (this could be any name):

Conda create -n tensor pip python =3.6

- b. Type in the below command to activate the environment:

Activate tensor

(tensor) C:>

Step 7: Installing Deep Learning Libraries

Here we will download all the relevant deep learning libraries required to begin your deep learning journey.

a. Tensor flow

It is an open-source machine learning framework for powering deep neural networks with high-level code. The Google Brain team developed it and released it in 2015. It is most commonly used with python, but it can run in any other programming language.

***Role of Machine Learning in Business Analytics process**

A number of organizations can benefit significantly from machine learning in business analytics. First off, offering precise predictions and insights equips organizations with improved decision-making abilities. Organizations may gain a

competitive edge, optimize operations, and spot growth possibilities with data-driven decisions. Additionally, machine learning boosts productivity by automating difficult analytical processes, freeing up resources for more advanced strategic tasks that need human experience. Process simplification increases productivity and reduces costs.

Secondly, machine learning makes it possible to customize client interactions, which increases client satisfaction and loyalty. Businesses are able to give recommendations, marketing efforts, and interactions that are specifically tuned to the behavior, preferences, and feedback of their customers. This type of personalization improves client satisfaction and engagement, which eventually stimulates business growth. Machine learning also reduces risks by being able to spot trends and irregularities instantly. Machine learning algorithms assist firms in proactively identifying and addressing possible dangers, and protecting their assets and reputation, whether it be in the areas of fraud detection, cyber security, or compliance.

***Machine learning importance in decision making**

Machine learning-driven predictive analytics is a game-changer, reshaping the decision-making landscape with its profound impact and transformative capabilities.

Through predictive analytics, businesses comprehensively understand historical data, empowering decision-makers to anticipate future trends and behaviors. This foresight is crucial in developing proactive strategies that adapt to dynamic market conditions and customer preferences.

The integration of Machine Learning in Predictive Analytics elevates decision-making to new heights. By harnessing advanced algorithms, businesses achieve increased accuracy in predictions, reducing the margin of error and enabling confident choices.

The benefits of using Machine Learning in Predictive Analytics for decision-making extend beyond accuracy. Real-time insights into customer behavior, market shifts, and emerging trends empower organizations to stay ahead of the competition and capitalize on opportunities with a data-driven edge.

Case studies provide tangible evidence of Machine Learning's impact on decision-making. From personalized marketing campaigns that boost customer engagement to supply chain optimizations that streamline operations, success stories demonstrate the transformative power of Machine Learning-driven Predictive Analytics across diverse industries.

Embracing the fusion of Machine Learning and Predictive Analytics is not merely an option but a necessity for businesses seeking assistance from top machine learning companies to thrive in the digital age. The unprecedented level of foresight and precision it brings to decision-making ensures that organizations can confidently navigate uncertainties and propel themselves toward success.

Machine Learning is the powerhouse that supercharges Predictive Analytics, transforming raw data into actionable insights.

Machine Learning algorithms are pivotal in enhancing predictive analytics by recognizing intricate patterns and relationships within vast datasets. This ability enables businesses to make accurate predictions and highly precise data-driven decisions. You can also use **Machine Learning for fraud detection**.

In the realm of Predictive Analytics, three primary types of Machine Learning techniques take center stage:

- **Supervised Learning:** This approach involves training the model with labeled data, where the outcome is known. The model learns to map input features to the desired output, making it suitable for tasks like classification and regression.
- **Unsupervised Learning:** Unlike supervised learning, unsupervised learning uses unlabeled data, allowing the model to discover hidden patterns and structures within the data. Clustering and dimensionality reduction are typical applications of unsupervised learning in predictive analytics.
- **Reinforcement Learning:** This type of learning operates on a reward-based system, where the model learns to make decisions through trial and error. Reinforcement learning finds application in scenarios where an agent interacts with an environment to achieve specific goals.

- An overview of the predictive analytics process with top Machine Learning companies entails several key steps. Starting with data collection and preprocessing, data are transformed into an analysis-ready format.
- Machine Learning models are then trained on historical data, fine-tuning parameters to optimize performance. Once the model is trained, it is deployed to make predictions on new, unseen data, providing valuable insights that drive strategic decision-making.
- The symbiotic relationship between Machine Learning and Predictive Analytics is reshaping industries, empowering businesses to make proactive decisions that lay the foundation for a successful future.

PRESCRIPTIVE ANALYTICS

Prescriptive analytics is a type of data analytics that focuses on discovering the best course of action in a situation based on that data at hand. It is interested in the “how” to achieve the desired outcome or eliminate a potential problem. This branch of analytics builds on predictive analytics but offers more dynamic decisions about how best to proceed, a process that involves providing several options and breaking down the possible implications of each.

Those working with prescriptive analytics are tasked with making timely decisions. For example, if sales are dropping, Prescriptive Analysts provide guidance on if it is best to increase marketing, slash prices, or discontinue the product. Additionally, if an item is selling well, they ensure that inventory is adequately stocked.

Companies that are driven by big data, such as Facebook, Netflix, and Apple, use a combination of prescriptive analytics and AI for more informed decision-making. This form of analytics is often thought of as the last step in the business analytics process. Although prescriptive analytics is the most sought-after form of analytics by organizations, few have the resources necessary to perform it. That’s because it requires state-of-the-art data practices and technologies, such as machine learning, computer science, AI, advanced algorithms, and business rules, as well as various tools and software.

***Benefits of Using Prescriptive Analytics**

Here are just a few of the many benefits of using prescriptive analytics at your workplace:

- **Generates revenue:** By having a clear idea of what customers are purchasing and why, a company can speed up sales cycles and find new avenues into sales, such as cross-up selling.
- **Cuts down on expenses:** Using algorithmic models allows a company can incorporate a better system for managing inventory. This subsequently reduces the costs associated with long-term stock storage and provides a level of transparency within an organization.
- **Manages the gross margin:** Prescriptive analytics models help businesses gather information about the best mix of products to focus on. By studying current and projected market conditions, as well as customers' purchasing patterns, a business can become more productive and profitable.

***7 Best Tools for Prescriptive Analytics**

As more and more data is created, the tools with which this data is stored, organized, analyzed, and visualized, are becoming more essential for businesses. Dozens of helpful prescriptive analytics platforms, software packages, and tools are currently on the market. The following are the seven most-used tools in 2021:

- **Sisene** is a powerful tool that helps users easily create visually appealing, interactive reports based on data. Sisene features several tools that make it user-friendly, such as a straightforward user interface and a drag-and-drop feature. It is especially helpful for analytics teams who need to have a holistic view of data without relying too heavily on the IT department for help.
- **RapidMiner** is an open data analytics platform that provides AI and prescriptive analytics to businesses. The graphical interface on its centralized platform helps users with all stages of predictive analysis. RapidMiner also comes with scripting support for a variety of programming languages.
- **Improvado** was designed by marketers, for marketers. This data analytics tool offers automated reports and dashboards that provide a convenient means for having data all in one place, and ensuring that it's available in real-time. Those using Improvado can collect data from various marketing platforms and aggregate it into one destination.
- **Looker** is a browser-based platform that operates completely in-database. This tool simplifies the process of choosing, designing, and customizing interactive visualizations, and offers users a variety of charts and graphs to select from for data visualizations. This platform is commonly used by teams operating in

organizations that prioritize having a user-friendly tool that is powerful enough to offer valuable insights and to present them visually.

- **KNIME** is an open-source business analytics tool that is helpful for integrating, reporting, and analyzing data. KNIME is mainly used for statistical modeling. Its visual interface has nodes that help users not only extract data but also present it. This platform is geared toward Data Scientists, whose job entails working with advanced machine learning, workflow control, and statistics.
- **Tableau** is one of the leading tools for data visualization. Its ease of use and power make this software one of the best options for those working with data. Tableau enables even non-technical users to design customized dashboards and worksheets that present data in a clear and understandable manner. It is able to integrate with hundreds of sources in order to input data. In addition, Tableau can output dozens of visualization types. This software incorporates intuitive drag-and-drop products that simplify data analysis. It allows users to combine multiple views of data to offer deeper insights. In addition, its dashboards can be published and shared live online with just a few clicks.
- **Alteryx** is a platform of business intelligence solutions that aids companies with providing quick and helpful answers to questions. It combines data from apps, business software, individual files, and datasets, helping teams to create processes in a manner that's more efficient and repeatable, and less prone to errors or risk. One of Alteryx's most appealing features is its ease of use, even for those without a background in IT. Alteryx's optimization tools provide insightful suggestions for variables and allow users to quickly select the most preferable set of circumstances that lead to the desired outcome.

***Role of Prescriptive Analytics in Business Decision Making**

- One of the most important capabilities to develop in any large business is being able to take a systematic approach to analytics.
- Making the right decisions is a challenge for businessmen, more so if there is limited data to support the decision-making process.
- What's more, past experiences aren't always reliable indicators of future outcomes, so decisions based only on historical data may sometimes be incorrect. Getting started with prescriptive analytics.
- But there are techniques, technology, and tools to help enterprises in this. Predictive analytics is now a popular way to predict future outcomes by aggregating and analyzing historical data.
- Often, predictive analytics is referred to as the "proactive component" of data analytics.

- But there's one more technique that's being adopted by businesses as part of their decision-making process, and that is prescriptive analytics.

UNIT- 111

BUSINESS ANALYTICS

Every single thing in the contemporary world is data-driven. In all companies, whether small-scale startups or multinational organizations, information is the most vital element.

Analyzing the data to map out relevant trends and information is equally and extremely important. There are tons of raw data present in the world, but it amounts to nothing if we cannot make sense of it. That's where Business Analytics comes into play.

The process of utilizing statistical tools and procedures to analyze and examine data relevant to businesses is known as business analytics. It mainly makes use of the following methods:

- Analytical Modelling
- Predictive Analysis
- Numerical Analysis

The main steps in the process of business analytics are to understand the data, structure the problem statement, come up with various strategies using statistical models, and then organize favorable ideas to reach an optimal solution.

With the use of business analytics, organizations may increase their productivity and efficiency by gaining insightful information and taking strategic business decisions.

***Some major benefits of Business Analytics are:**

- Improving customer service.

- Understanding the data better.
- Improving the organization's capability to prevent or predict fraud.
- Provides a competitive edge.

***APPLICATIONS OF BUSINESS ANALYTICS**

The world has witnessed significant changes and tremendous growth in organizations that have adopted the concepts and principles of business analytics. Business analytics can be applied to a wide range of industries.

The agriculture industry, medical industry, manufacturing and development industry, human resources, finance industry, and numerous other fields use business analytics to help businesses grow and keep their audience happy.

• FINANCE

- Business Analytics assists financial managers in managing their finances optimally and then taking relevant measures. Implementing business analytics in various sectors of finance(such as investment banking and budgeting) can prove to be highly fruitful for the finance industry.
- It helps in building future strategies for a new product by observing similar products and methodologies.
- In addition to this, business analytics can also be used to predict future loan defaulters.

• HUMAN RESOURCES MANAGEMENT (HRM)

- Human Resource Management is the process or practice of managing, hiring, organizing, training, and directing people in an organization in a strategic manner. Human Resources (or HR) professionals use business analytics in several ways.

- It helps them in analyzing large amounts of data to understand employees' needs and grievances and therefore assist them accordingly.
- Business analytics can be used by HR in determining the right candidates, the expected salaries as well as the trending retention rates in the industries.
- Moreover, HR professionals can leverage business analytics to forecast the trajectory of the organization and thus efficiently design appropriate training and development programs for trainees or employees.

• **PRODUCTION AND INVENTORY MANAGEMENT**

- Management is a key element in every organization. It aims to enhance the profits and productivity of an organization all the while trying to reduce overall costs.
- Business Analytics serves as a great tool for management and manufacturing. It is involved in every phase of product development. It supports analyzing the inventory measures and designing business solutions that are most suitable for products.
- It can help determine the costs and gauge the expected sales of products. This way the organizations can adapt to the latest styles and opportunities in the industry.
- Hence, business analytics stands as a boon for the diverse sectors of management, be it inventory management or product management.

• **CUSTOMER RELATIONSHIP MANAGEMENT (CRM)**

- Customer Relationship Management or CRM is the process of building and managing the organization's relationships as well as interactions with customers.
- Business analytics can be used in customer relationship management to understand the customer base better and therefore, implement

corresponding strategies. This helps significantly drive sales and amplifies the organization's profits.

- Customers' purchasing patterns, needs, buying behaviors, issues, feedback, and all the other indicators can be obtained and analyzed through business analytics methodologies. These indicators can then be used to foster long-lasting and loyal relationships between clients and the organization.

• **MARKETING**

- Marketing, when combined with business analytics can prove to be one of the best strategies an organization can implement.
- Business analytics helps the organization to know its users, their needs, behaviors, and purchasing styles to design and modify suitable plans and schemes.
- Sales can be optimized and user experience can be enhanced. Business analytics can help marketers know their target audience and their interest.
- It can also be used to evaluate and determine how well a product or a marketing strategy is performing in the market. Considering these factors, organizations can modify their strategies and implement better planning.

***WHY IS BUSINESS ANALYTICS IMPORTANT**

Business analytics is important for several reasons:

1. **Data-driven decision-making:** Business analytics provides organizations with the tools and insights needed to make data-driven decisions. By using data to inform decision-making, organizations can optimize their operations, improve efficiency, and achieve their goals more effectively.

2. **Competitive advantage:** Business analytics enables organizations to gain a competitive advantage by identifying opportunities and risks in the market, predicting customer behavior, and optimizing their operations. This can help businesses stay ahead of the competition and drive growth.
3. **Improved performance:** By analyzing data and identifying areas for improvement, organizations can optimize their operations and improve performance. This can lead to increased efficiency, cost savings, and higher profits.
4. **Better customer insights:** Business analytics can help organizations better understand their customers by analyzing customer behavior, preferences, and trends. This can help businesses tailor their products and services to meet customer needs and increase customer satisfaction.
5. **Risk management:** Business analytics can help organizations identify and mitigate risks by analyzing data and predicting potential outcomes. This can help businesses make more informed decisions and reduce the likelihood of negative consequences.

Overall, business analytics is important because it enables organizations to make data-driven decisions, gain a competitive advantage, improve performance, better understand customers, and manage risks effectively.

***FINANCIAL ANALYTICS**

Financial analytics is the use of tools and processes to combine and analyze datasets to gain insights into the financial performance of your organization. Bringing together data from all your systems gives you a holistic view of your business and broader insights which help you to predict and improve performance.

Why is it Important?

Modern financial analytics can be truly transformational—at both the departmental and organizational level. Your finance team will have more time to focus on deeper discovery and analysis. And new tools and techniques allow you to gain accurate and actionable insights that reduce costs and manage risks, improve profitability, and predict and plan for the future.

This helps transition the role of CFO from scorekeeper to being a key catalyst in wider business performance. Because ultimately, it helps you identify and assess your organization's value drivers—the factors that increase the worth of your business.

***HUMAN RESOURCE ANALYTICS**

HR analytics is considered to be a systematic identification and analysis of the people drivers of any specific business outcomes. In layman's terms, that means that HR analytics measures the successes and failures of how well the company is performing when it comes to its employees. Depending on the organization, HR analytics may also be referred to as workforce analytics, talent analytics or people analytics.

Using proper HR analytics software allows business managers to rely on actual data to make people-based decisions instead of relying on gut feelings. It can provide analysis of how well an employee is performing as well as insight into where job candidates are falling off of the hiring process. HR analytics measures a broad range of different types of data, but all of it is centered on the people function.

The Importance of HR Analytics

HR analytics came to be in the hopes that businesses could improve internal processes that relate to functions such as payroll, benefits, hiring, employee onboarding, employee performance and overall employee morale. It is the best way to use data in order to forge an understanding of how well a business is performing.

Without proper analytics, there is a high percentage chance that the business could unknowingly be losing money because of processes that just aren't resonating or

working well with its employees. Measuring data on employee processes has provided better insight and overall management to people teams everywhere.

Without proper HR analytics, executives wouldn't be able to make proper business decisions that relate to hiring, firing or promoting employees. If people don't feel like their job is valued or that they are performing at a high level and that the company sees that, then it can become difficult to retain high-performing employees. Without proper data oversight, it also becomes more difficult to shed the company of low-performers who aren't pulling their weight. The right data provides legal protection against improper employee-related decisions as they are made from more than just opinions and feelings.

***MARKETING ANALYTICS**

Marketing analytics is the process of tracking and analyzing data from marketing efforts, often to reach a quantitative goal. Insights gleaned from marketing analytics can enable organizations to improve their customer experiences, increase the return on investment (ROI) of marketing efforts, and craft future marketing strategies.

According to a report conducted by PwC, highly data-driven companies are three times more likely than their less data-driven counterparts to see significant improvements in decision-making. Whether you work with marketers or are one yourself, it's important to be familiar with the basics of marketing analytics and how it can inform your organization's decisions.

Marketing data sources

The data you use to track progress toward goals, gain customer insights, and drive strategic decisions must first be collected, aggregated, and organized. There are three types of customer data: first-party, second-party, and third-party.

- First-party data is collected directly from your users by your organization. It's considered the most valuable data type because you receive information about how your audience behaves, thinks, and feels.

- Second-party data is data that's shared by another organization about its customers (or its first-party data). It can be useful if your audience types are the same or have similar demographics, if your companies are running a promotion together, or if you have a partnership.
- Third-party data is data that's been collected and rented or sold by organizations that don't have a connection to your company or users. Although it's gathered in large volumes and can provide information about users similar to yours, third-party data isn't the most reliable because it doesn't come from your customers or a trusted second-party source.

While it's important to know that second- and third-party sources exist, first-party data is the most reliable of the three because it comes directly from your customers and speaks to their behaviors, beliefs, and feelings. Here are some ways to collect first-party data.

***Why is marketing analytics important**

Understanding how to gather, aggregate, and analyze data can enable you to extract useful insights you can use to make a data-informed impact on your organization.

1. Improve the User Experience

Collecting and analyzing your users' first-party data can reveal how they feel about their interactions with your product and website. Whether their feelings are explicitly stated (for instance, in a survey) or implicit in their behaviors (for instance, leaving the website shortly after loading the page), having this qualitative and quantitative information can allow your organization to make changes that address their needs and increase the potential for leads to become customers.

2. Calculate the Return on Investment of Marketing Efforts

Another important function of marketing analytics is calculating monetary gain that can be attributed to specific marketing channels or campaigns. To calculate the return on investment for a specific marketing effort, use the following formula:

$$\text{ROI} = (\text{Net Profit} / \text{Cost of Investment}) \times 100$$

For example, say you release a video explaining the benefits of your product that costs \$1,000 to produce. You track how many people navigate to the product page on your website immediately after watching the video and see that it led to 30 new customers in a given period. If your product costs \$50, and each new lead bought one, you can attribute \$1,500 of revenue to the video. The net profit, in this case, is \$500.

Plugging this into the ROI formula looks like this:

$$\text{ROI} = (\$500 / \$1,000) \times 100$$

$$\text{ROI} = (0.5) \times 100$$

$$\text{ROI} = 50\%$$

Any time ROI is a positive percentage, the marketing effort—in this case, the video—can be considered profitable. Without data to understand where leads are coming from, calculating the financial impact of specific efforts wouldn't be possible. ROI calculations can determine which marketing efforts drive the most sales and prove projects' value.

3. Plan Future Marketing Strategies

With knowledge of your customers and the ability to track your marketing efforts' return on investment, marketing analytics provides an opportunity to create data-driven strategies for your organization.

By analyzing marketing data, you can discover what's working, what hasn't worked, and how your customers feel about their experiences with your product and website. You can also get a full picture of the impact that marketing efforts are having on your company.

With that information, you can plan for the future. What should you do more of to reach your quantitative goals? Which effort failed to generate new leads and should be dropped from future plans? Data analytics helps you strategize and answer these kinds of questions.

***HEALTH CARE ANALYTICS**

Health care analytics is a subset of data analytics that uses both historical and current data to produce actionable insights, improve decision-making, and optimise outcomes within the health care industry. Health care analytics is not only used to benefit health care organisations but also to improve the patient experience and health outcomes.

***Data analytics in health care**

The health care industry is awash with valuable data in the form of detailed records. Industry regulations stipulate that health care providers must retain many records for a set period.

This means that health care has become a site of interest for those working with "big data", or large pools of unstructured data. As a still-developing field, big data analytics in health care offers the potential to reduce operation costs, improve efficiency, and treat patients.

***Predictive analytics in health care**

Predictive analytics uses historical data to identify past trends and project-associated future outcomes. In the health care industry, predictive analytics has many impactful uses, such as identifying a patient's risk for developing a health condition, streamlining treatment courses, and reducing a hospital's 30-day readmissions (which can result in costly fines).

A 2021 study conducted by a University of Michigan research team illustrates the positive impact of predictive analytics on patient treatment. During the study, researchers devised a sensitive blood test that predicted how well patients with HPV-positive throat cancer would respond to specific treatment courses. The researchers found that their method could predict treatment effectiveness many months earlier than traditional scans

***Prescriptive analytics in health care**

Prescriptive analytics uses historical data to identify an appropriate course of action. In the health care industry, prescriptive analytics is used to direct business decisions and literally prescribe treatment plans for patients. As a result, some of the most common uses of prescriptive analytics in health care include identifying a patient's

likelihood of developing diabetes, allocating ventilators for a hospital unit, and enhancing diagnostic imaging tools.

***Benefits of data analytics in health care**

Health care analytics benefits health businesses, hospital administrators, and patients. Although it can be tempting to imagine health care analysts working in a virtual data cloud, the reality is that their work has a tangible impact on how hospitals operate, provide treatment, and conduct medical research.

At a glance, some of the most common benefits of health care analytics include:

- Improved patient care, such as offering more effective courses of treatment
- Predictions for a patient's vulnerability to a particular medical condition
- Improved scheduling for both patients and staff
- Optimised resource allocation
- More efficient decision-making at the business and patient care level

SUPPLY CHAIN ANALYTICS

- Supply chain analytics uses data analytics to manage, improve, and support supply chain operations. Today, supply chains are of critical importance to the development and maintenance of the modern economy, providing not only luxury goods to consumers but also basic necessities like fuel and food.
- As distribution networks grow, so does the need for data professionals capable of ensuring they run without a hitch. That's where supply chain managers and analysts come in.
- In this article, you'll learn more about supply chain analytics, explore different types that are used every day, and find a list of its benefits. You'll also learn the principles underlying the digital transformation of supply chains, browse a list of common tools, and encounter some courses that can help get you started on this impactful career today.

***Benefits**

There are many benefits to using supply chain analytics. Some of the most common include:

- More efficient supply chain management

- Reduced operational costs
- Improved planning
- Better risk management
- Greater understanding of future events

***Types of analytics**

There are five primary types of supply chain analytics: descriptive, diagnostic, predictive, prescriptive, and cognitive. Here's how each functions.

1. Descriptive analytics

Descriptive analytics uses data to *describe* trends and relationships, such as supply chain performance or a warehouse's inventory levels. Logistics professionals use descriptive analytics, consequently, to understand how a supply chain and its parts are currently working.

2. Diagnostic analytics

Diagnostic analytics uses data to *diagnose* a supply chain problem, such as why shipments were delayed or sales targets were not made. Logistics professionals use diagnostic analytics to better understand the reasons that trends or relationships exist within the data and to better understand the factors contributing to them.

3. Predictive analytics

Predictive analytics uses data to *predict* future outcomes, such as forecasting future demand or anticipating possible maintenance needs. Logistics professionals use predictive analytics to construct statistical models that allow them to prepare for likely future events, whether common like seasonal demand fluctuations, or less common, like global disruptions.

4. Prescriptive analytics

Prescriptive analytics uses data to *prescribe* a course of action, such as the best way to improve inventory management or optimize operational efficiency. Logistics professionals use prescriptive analytics to design the solutions they need to overcome the potential problems they identified using descriptive and predictive analytics.

5. Cognitive analytics

Cognitive analytics uses advanced analytics techniques, such as artificial intelligence and machine learning, to quickly process large amounts of data and produce the most accurate answer. Logistics professionals use cognitive analytics to manage and understand the big data produced by supply chains every day.

THE FIVE CS OF SUPPLY CHAIN ANALYTICS

In a 2020 report by International Data Corporation (IDC) sponsored by IBM, author Simon Ellis outlines the importance of creating “thinking” supply chains that are “self-learning, intervention-free system[s].” To achieve this “smart” supply chain, Ellis notes that current supply chains must undergo a digital transformation that ensures they conform with his five C’s: connected, cyber aware, cognitively enabled, and comprehensive

Supply chain analysis plays an important role in this digital transformation. Here’s what each of the five C’s mean to supply chain analytics.

1. Connected

The “thinking” supply chain is connected to various sources, including social media and Internet of Things (IoT) devices that provide it with large amounts of unstructured data. At the same time, the supply chain is connected to traditional structured data sources like business-to-business (B2B) tools.

2. Collaborative

The “thinking” supply chain collaborates with the digital systems used by relevant suppliers and manufacturers. Using cloud technology, modern digitally integrated supply chains should be able to speak with the systems used by other organizations to ensure the most efficient communication between all relevant parties.

3. Cyber aware

While the “thinking” supply chain provides the opportunity for improved operations and collaboration, it also becomes vulnerable to cyber attacks and intrusions. As a result, Ellis notes that it’s important for modern supply chains to have hardened systems and databases that protect them from outside actors.

4. Cognitively enabled

The “thinking” supply chain uses artificial intelligence (AI) to automatically assess data and make decisions. Ultimately, Ellis sees the system as augmenting the work of logistical professionals, who would instead focus on specialized tasks while an AI would automatically manage the supply chain itself.

5. Comprehensive

The “thinking” supply chain is capable of scaling its analytic abilities with increased data. Furthermore, the system is capable of quickly analyzing this new data and making informed decisions.

sports analytics

Sports analytics is the analysis of sports data, including components of sports such as player performance, business operations, and recruitment. The data offers an advantage to both individuals and teams participating in a competition and sports enterprises. Sports analytics uses the application of mathematical and statistical rules to sports. It's divided into on-field and off-field analytics. On-field analytics enhance the performance of players and coaching staff by focusing on their strategies and fitness. Off-field analytics use statistics to assist the owners of the sport entities to arrive at decisions leading to increased growth and profitability of their business.

***Why is sports analytics important**

Advancement in technology has enabled easy and in-depth data collection, leading to developments in data analytics and machine technologies. This helps sports companies in their marketing strategies to increase their fan base and improve merchandise sales. It also helps them accumulate sponsorships and conduct simulation games on matches they are yet to play. Data analysis helps sports entities evaluate the performance of their athletes and assess the recruitment necessary to improve the team performance. It also evaluates the strong and weak areas of their challenger, enabling coaches to make the right decision on their tactics. The use of data helps increase income, reduce operating costs, and guarantee high returns on investments.

***What do sports data analysts do?**

The roles of a sports data analyst involve collecting and analyzing sports data, then updating individual players, coaches, or team managers who use this data to make informed decisions during or before sports competitions. These roles can be classified into two categories. The first is business, where data is used to improve the performance of a team or sports organization. The second category deals with the entertainment aspect and provides fans with details they want to know about athletes.

***Where do sports analysts work?**

Sports analysts apply their skills in various set-ups, which include:

1. Professional and college sports programs

Data analysis is important in all sports. Analysts help teams to get valuable information from the data and practise them to enhance the performance of the team. Analysts use figures from individual players to measure their performance and make informed decisions on how to use them in their team. They also provide information that helps in the recruitment of sports persons and diet programs to maximize their performance. Sports analysts use data to improve the participation of fans and increase sales of tickets and merchandise, leading to higher profitability.

2. Sport media companies

There is a surge in the application of data analytics by sports media outlets to aid in sports reporting. Sport media companies use sports analytics to enhance reporting of sports activities, involve fans, and increase the entertainment value offered by the media. Data analysts prepare this information on sports events and results, which also enables fans to appreciate the performance of an athlete or the outcome of a game.

3. Wearable technology companies

Wearable technology companies require sports analysts to help them develop quality products. These companies collect a lot of data from sports personalities. It's the responsibility of a sports analyst to analyze this data for specific results, which the company uses to develop optimum-performance products.

4. Training technology companies

There's an increase in technological developments to improve the performance of athletes. Training technology companies manufacture simulators and virtual reality devices. They employ sports analysts to ensure these devices are accurate. Sports analysts do this by deploying different simulations and game scenarios. The simulations help coaches and staff to come up with diverse tactical approaches in different situations during games.

5. Human performance labs

Companies employ sports analysts to help enhance the performance of athletes. They collect and analyze training data from individual athletes. They then analyze the data and develop efficient training programs aimed at improving their performance.

6. Sports gambling industry

Sports gambling is another area that has developed due to sports analytics. Sport betting companies and sports webpages employ sports analysts who use data to predict probable outcomes of matches. They use their skills to find value for bets on behalf of their customers.

***Data Analytics For Non profit organization**

The competition between nonprofits having similar missions and purposes increases as the nonprofit sector expands and thrives. Many nonprofit organizations experience growing discomforts as they aim to retain more valuable donors who frequently give as they develop over time. If you're a nonprofit looking to achieve that goal, you need to strengthen your bonds with your supporters and provide them with better services.

Understanding your supporters' interests, preferences, and behaviors is possible by having useful data about them. Consider sending email and direct mail appeals as an example. According to the data from both channels, email appeals are more effective at looking for supporters to help your cause and raise money for it. You send more email appeals going forward and spend less money on the less effective communication channel because you have concrete proof that your supporters

prefer email communication. That is one of the many ways how data analytics powers nonprofits.

*** Data analytics for the government sector**

Data is the most valuable asset today. There is an immense amount of data available in various forms and from various sources. Combine this with the most advanced technology and the concept of Big Data is born. For a precise definition. Big Data refers to huge volumes of structured and unstructured data. But the treasure is not in the size of the data. There may be several useful pieces of information in the massive sources of data. It may be highly complex and may also take a very long period to assemble useful pieces of information from this massive junk. This is where Big Data Analytics can be useful.

Big Data Analytics is the process of examining large data sets to thread out information such as hidden patterns, unknown correlations, market trends, and customer preferences. The finally streamlined pieces of information can help companies and more organizations make informed business decisions.

An important aspect that needs to be considered is that big data and data analytics can be extremely helpful for government agencies and departments in Federal as well as State levels. They are the ones who store and respond to massive amounts of data every day. Governments must make sense of the enormous amount of data they receive daily and try to make sense out of it to make critical decisions that affect millions of people. Navigating and then verifying the authenticity of this amount of information can be cumbersome. Inaccuracy can be disastrous. But these problems can be solved by implementing big data platforms.

1.Quick and improved decision making: Identification of trends and other insights enables faster decisions. Data can be accurately analyzed, and specific information can be generated. For example, the classification of a regions people can be made on income-levels, health, gender, and age among others. This can be

done in seconds using advanced data analytical tools. Specific government policies and or strategies can be implemented based on these pieces of information.

2. Easier data storage: Government agencies must collect, or people must submit personal information all the time. Tax and Insurance agencies are good examples of this. But the same data may have to be submitted multiple times, for each agency' requirement. This leads to additional expenditure, wastage of time and also the possibilities of mismatches between records. The public may enter submit different information each time or varied data to different agencies. Pre-filled forms with data generated from Big Data Analytics can speed up the processing time and remove errors. Moreover, storage of all data in a centralized place makes it easier for all government agencies to access the information from a shared pool.

3. Eradication of fraud: This has been one of the core benefits of Big Data. Big Data can help state government departments in uncovering crimes and other illegal activities that pose a security threat in society. Such data includes information of all sections of the public. Careful analysis of this can aid in identifying suspicious activities patterns that indicate fraud and or crimes.

4. Improved emergency response: Big Data analytics can be used for identifying in advance and responding to hazardous natural disasters and or health issues such as the recent Covid-19. Data from various sources including healthcare organizations, medical professionals and municipal records can be used to identify the spread of the diseases. Moreover, aid can be provided immediately as the needy section of people can be easily recognized.

5. Coordination between departments: The data collected or analyzed by different departments of state/federal governments can be stores on a single platform. Development of big data platforms and implementation of big data analytics will enable all government agencies to access data from a single source and work in the same direction. Moreover, there will be no delay in sharing of information between these departments. Accuracy of data is also a big advantage.

Moreover, workforce gaps that occur employees leave or retire from an agency can be identified immediately paving the way for new employees.

This post was meant to give an overview of how big data analytics is necessary for government agencies. But words will not be converted to actions without assistance from advanced technology and subject matter experts who can use this. SGS Technologie fills the gap as we are an experienced software development company and a big data analytical company headquartered in Jacksonville, Florida. SGS has 17+ tears of experience in providing IT services to various government agencies (state and federal). We invite queries or opportunities to discuss the big data solutions we can offer your agency.

UNIT IV

STATISTICIANS

Statisticians are experts who compile and analyze statistical data in order to solve problems for businesses, government organizations, and other institutions.

In their day to day work, statisticians determine the data a company will require to solve a problem and then apply mathematical theories to use that data to construct a solution. In many cases, they also source the data for companies by designing surveys, questionnaires, experiments, and polls.

If you're an analytical individual who enjoys using numbers and data to solve problems, then you might consider a career as a statistician.

In this article, you'll learn more about what you can expect from a career as a statistician, including their duties, potential salary, and work environment. At the end, you'll also find suggested courses that can help you learn the in-demand skills you'll need to excel in the field.

***What does a statistician do?**

A statistician applies statistical methods and models to specific problems in order to develop informed solutions. As a statistician, you'll analyze and interpret data to help businesses with important decisions, problems, and logistical scenarios. As a result, statisticians often use probability, calculus, mathematical modeling, and statistical analysis in their work.

***Primary duties and responsibilities**

Statisticians collect data in an organized and ethical fashion. You would do so through polls or surveys, but you must also consider bias and other factors when designing these data-collection tools.

You'll then analyze the data to find trends and relationships, present these findings comprehensively, and communicate them to your employer. You must also explain your process of discovering these findings and what they mean to the business.

***Why are statisticians important?**

Statisticians offer evidence to support important decisions, solutions, or projections, using analytical skills to perform such important tasks as spotting issues with marketing efficacy, projecting sales over the upcoming quarter, identifying stock market trends, and more.

As a statistician, you'll collect and analyze data to solve problems in every facet for a range of employers, from privately owned businesses to non-profit organizations.

***How to become a statistician**

To become a statistician, you'll need to gain the right credentials, possess critical job skills, and work to stand out from the crowded applicant pool to pique employers' interests. Here are some of the steps you'll likely take on the path to becoming a statistician:

1. Gain the right credentials.

In most cases, a statistician will need a master's degree. However, some companies will hire an entry-level statistician with a bachelor's degree in mathematics, economics, computer science, actuarial science, or a related field.

2. Develop your skills.

Statisticians need skills in mathematics, computer science, communication, and data analytics. You will also need industry awareness and knowledge and the ability to work on a team and collaborate with others. Companies place a high value on problem solvers who are skilled in their technical practices and communicate effectively.

3. Consider a certificate.

Statisticians don't need a professional certificate, but the American Statistical Association (ASA) offers two high-value certifications: the Accredited Professional Statistician (PStat) and Graduate Statistician (GStat). Adding a certificate to your resume could help you stand out to employers and potentially improve your chances of landing a job.

***Fields and industries**

Statisticians work in education, marketing, psychology, sports, and other fields that require statistical backing. Government, health care, and research industries hire many statisticians due to the high value of data and projections.

DATA SCIENTIST

A data scientist uses data to understand and explain the phenomena around them, and help organizations make better decisions. At the heart of it, data scientists are problem solvers. Because of the major insights they can offer businesses, they're also in demand. According to the US Bureau of Labor Statistics, careers in data are poised to grow rapidly in the coming years, making this a lucrative career choice with significant growth potential [1].

In this article, we'll discuss what data scientists do and how to become one. Afterward, if you're interested in pursuing a career as a data scientist, consider enrolling in the IBM Data Science Professional Certificate. You'll learn the tools, languages, and libraries used by professional data scientists, including Python and SQL.

***What does a data scientist do**

Data scientists determine the questions their team should be asking and figure out how to answer those questions using data. They often develop predictive models for theorizing and forecasting.

A data scientist might do the following tasks on a day-to-day basis:

- Find patterns and trends in datasets to uncover insights
- Create algorithms and data models to forecast outcomes
- Use machine learning techniques to improve the quality of data or product offerings
- Communicate recommendations to other teams and senior staff
- Deploy data tools such as Python, R, SAS, or SQL in data analysis
- Stay on top of innovations in the data science field

Thanks to this work, a data science career can be intellectually challenging and analytically satisfying, while also putting you at the forefront of new technologies.

To build a strong foundation in data science, including importing and cleaning data, check out the IBM Data Science Professional

DATA ENGINEER

A data engineer is an IT professional whose primary job is to prepare data for analytical or operational uses. This occupation includes duties such as designing and building systems for collecting, storing and analyzing data.

Data engineers are typically responsible for building data pipelines to bring together information from different source systems. These software engineers integrate, consolidate and cleanse data and structure it for use in analytics applications. They strive to make data easily accessible and to optimize their organization's big data ecosystem.

The amount of data an engineer works with varies by organization, particularly with respect to its size. The bigger the company, the more complex the analytics architecture and the more data the engineer is responsible for maintaining. Certain industries are more data-intensive, including healthcare, retail and financial services.

Data engineers work in conjunction with data science teams, improving data transparency and enabling businesses to make more trustworthy business decisions.

***Role of Data Engineer**

Data engineers focus on collecting and preparing data for use by data scientists and analysts. They take on the following three main roles:

(a) Generalists. Data engineers with a general focus typically work on small teams, doing end-to-end data collection, intake and processing. They might have more skills than most data engineers, but less knowledge of systems architecture.

A data scientist who wants to become a data engineer would fit well into the generalist role.

A generalist data engineer might undertake a project to create a dashboard for a small, metro-area food delivery service that displays the number of deliveries made each day for the past month and forecasts the delivery volume for the following month.

(b) Pipeline-centric engineers. These data engineers typically work on a data analytics team with more complicated data science projects across distributed systems. Midsize and large companies are more likely to need this role.

A regional food delivery company might undertake a pipeline-centric project to create a tool for data scientists and analysts to search metadata for information about deliveries. They might look at distance driven and drive time required for deliveries in the past month, then use that data in a predictive algorithm to see what it means for the company's future business.

© **Database -centric engineers.** These data engineers implement, maintain and populate analytics databases. This role typically exists at larger companies where data is distributed across several databases. These engineers work with pipelines, tune databases for efficient analysis and create table schemas using extract, transform and load (ETL) methods. The ETL process copies data from several sources into a single destination system.

A database-centric project at a large, national food delivery service would be to design an analytics database. In addition to creating the database, the data engineer would write the code to get data from where it's collected in the main application database into the analytics database.

***Responsibilities of Data engineer**

Data engineers often work as part of an analytics team alongside data scientists. Data engineers provide data in usable formats to the data scientists who run queries and algorithms against the information for predictive analytics, machine learning and data mining applications. Data engineers also deliver aggregated data to business executives, analysts and other end users so they can analyze it and apply the results to improve business operations.

Data engineers work with both structured and unstructured data. Structured data is information that can be organized into a formatted repository like a database. Unstructured data -- such as text, images, audio and video files -- doesn't conform to conventional data models. Data engineers must understand different approaches to data architecture and applications to handle both data types. A variety of big data technologies, such as open source data ingestion and processing frameworks, are also part of the data engineer's toolkit.

Although exact responsibilities for data engineers differ by organization, other typical responsibilities include the following:

- Build, test and maintain database pipeline architectures.
- Create methods for data validation.
- Acquire data.
- Clean data.
- Develop data set processes.
- Improve data reliability and quality.
- Develop algorithms to make data usable.
- Prepare data for prescriptive and predictive modeling.

***Data engineer skill set**

Data engineers are skilled in programming languages such as C#, Java, Python, R, Ruby, Scala and SQL. Python, R and SQL are the three primary languages data engineers use.

Engineers need to have a good understanding of ETL tools and representational state transfer-oriented APIs for creating and managing data integration jobs. These skills also help provide data analysts and business users with simplified access to prepared data sets.

Data engineers must understand data warehouses and data lakes and how they work. For instance, Hadoop data lakes that offload the processing and data storage work of established enterprise data warehouses support the big data analytics efforts of data engineers.

Data engineers must also understand NoSQL databases and Apache Spark systems, which are becoming common components of data workflows. Data engineers should have a knowledge of relational database systems as well, such as MySQL and PostgreSQL. Another focus is Lambda architecture, which supports unified data pipelines for batch and real-time processing.

SKILLS REQUIRED FOR ANALYTICS

The big data landscape has changed drastically, making it tough for professionals to know where to focus their growth. However, despite this changing field, there are a number of core business analytics skills that form the foundation of any solid business analytics career.

A great business analytics professional could be described as:

(1) A good communicator

Being able to present findings in a clear and concise manner is fundamental to making sure that all players understand insights and can put recommendations into practice. People working in analysis must be able to tell a story with data through strong writing and presentation skills.

(2) Inquisitive

People in this field should have natural curiosity and drive to continue learning and figuring out how things fit together. Even as analysts become managers, it's important to stay in touch with the industry and its changes.

(3) A problem solver

Professionals in analytics use a combination of logical thinking, predictive analytics and statistics to make recommendations that will solve problems and propel a business forward. In a profession that seeks to turn data into solutions, being a natural problem solver helps connect the dots.

(4) A critical thinker

Business analytics professionals need to think critically about not only the implications of the data they collect, but about what data they should be collecting in the first place. They are expected to analyze and highlight only the data that can be helpful in making decisions.

(5) A visualizer

Disorganized data doesn't help anyone. To create worth from data, analytics professionals need to be able to translate and visualize data in a concise and accurate way that's easy to digest.

(6) Both detail-oriented and a big picture thinker

While business analytics professionals have to be able to handle complex data, they also need to understand how their recommendations will affect the bottom line of a business. There's no point in having access to large quantities of information without knowing how it can be harnessed to analyze and improve tactics, processes and strategies.

***TECHNICAL SKILLS FOR ANALYTICS**

In a business landscape quickly becoming governed by big data, great analytics professionals are fulfilling the demand for technical expertise by wearing the hats of both developer and analyst.

Having both a conceptual and working understanding of tools and programming languages is important to translate data sources into tangible solutions.

Below are some of the top tools for business analytics professionals:

(1) SQL

SQL is the coding language of databases and one of the most important tools in an analytics professional's toolkit. Professionals write SQL queries to extract and analyze data from the transactions database and develop visualizations to present to stakeholders.

(2) Statistical languages

The two most common programming languages in analytics are R, for statistical analysis, and Python, for general programming. Knowledge in either of these languages can be beneficial when analyzing big data sets, but is not vital.

(3) Statistical software

While the ability to program is helpful for a career in analytics, being able to write code isn't necessarily required to work as an analytics professional. Apart from the above languages, statistical software such as SPSS, SAS, Sage, Mathematica, and even Excel can be used when managing and analyzing data.

***BIG DATA ANALYTICS**

Big data analytics uses advanced analytics on large structured and unstructured data collections to produce valuable business insights. It is used widely across industries as varied as health care, education, insurance, artificial intelligence, retail, and manufacturing to understand what's working and what's not to improve processes, systems, and profitability.

It comprises vast amounts of structured and unstructured data, which can offer important insights when analytics are applied. Big data analytics does this quickly

and efficiently so that health care providers can use the information to make informed, life-saving diagnoses.

In this guide, you'll learn more about big data analytics, why it's important, and its benefits for many different industries today. You'll also learn about types of analysis used in big data analytics, find a list of common tools used to perform it and find suggested courses that can help you get started on your data analytics professional journey.

***What is big data analytics?**

Big data analytics is the process of collecting, examining, and analysing large amounts of data to discover market trends, insights, and patterns that can help companies make better business decisions. This information is available quickly and efficiently so that companies can be agile in crafting plans to maintain their competitive advantage.

Technologies such as business intelligence (BI) tools and systems help organisations take unstructured and structured data from multiple sources. Users (typically employees) input queries into these tools to understand business operations and performance. Big data analytics uses the four data analysis methods to uncover meaningful insights and derive solutions.

For example, big data analytics is integral to the modern health care industry. As you can imagine, systems that must manage thousands of patient records, insurance plans, prescriptions, and vaccine information.

***The importance of big data analytics**

Big data analytics is important because it helps companies leverage their data to identify opportunities for improvement and optimisation. Across different business segments, increasing efficiency leads to overall more intelligent operations, higher profits, and satisfied customers. Big data analytics helps companies reduce costs and develop better, customer-centric products and services.

Data analytics helps provide insights that improve the way our society functions. In health care, big data analytics not only keeps track of and analyses individual records but it plays a critical role in measuring outcomes on a global scale. During the COVID-19 pandemic, big data-informed health ministries within each nation's

government on how to proceed with vaccinations and devised solutions for mitigating pandemic outbreaks in the future.

***Benefits of big data analytics**

Incorporating big data analytics into a business or organisation has several advantages. These include:

- **Cost reduction:** Big data can reduce costs in storing all business data in one place. Tracking analytics also helps companies find ways to work more efficiently to cut costs wherever possible.
- **Product development:** Developing and marketing new products, services, or brands is much easier when based on data collected from customers' needs and wants. Big data analytics also helps businesses understand product viability and to keep up with trends.
- **Strategic business decisions:** The ability to constantly analyse data helps businesses make better and faster decisions, such as cost and supply chain optimisation.
- **Customer experience:** Data-driven algorithms help marketing efforts (targeted ads, for example) and increase customer satisfaction by delivering an enhanced customer experience.
- **Risk management:** Businesses can identify risks by analysing data patterns and developing solutions for managing those risks.

The 7 Data Analysis Software You Need to Know

Today, there is more data than ever. In fact, according to research conducted by Statista, the global volume of data created, captured, copied, and consumed is projected to reach 181 zettabytes by 2025. The result is a lot of data to be sorted, cleaned, analysed, and visualised.

Just as there is a lot of data, so too is there a lot of software and tools available to work with it. Cloud-based data warehouses store huge amounts of business data. Some programs are specially designed for data modelling, and software visualises data in bright colours and diagrams. Faced with such an overwhelming choice, many inevitably wonder where to start.

We're here to help. Rather than listing all the tools you might encounter in your professional career, we've compiled seven essential data analysis software you

should know as you begin your data journey. Here, you'll encounter some of the most common data analysis software, learn what each does, and discover why it matters. Ultimately, you'll even find a suggested course to help you gain the skills you'll need to land an entry-level data analyst position.

1. Excel

Microsoft Excel is one of the most common software used for data analysis. In addition to offering spreadsheet functions capable of managing and organising large data sets, Excel also includes graphing tools and computing capabilities like automated summation or "AutoSum." Excel also includes Analysis ToolPak, which features data analysis tools capable of performing variance, regression, and statistical analysis.

Excel's simplicity and versatility make it a powerful data analysis tool suitable for managing, sorting, filtering, cleaning, analysing, and visualising data. If you're just starting out in data science, you should consider learning more about Excel to prepare for your future career.

2. Python

Python is routinely ranked as the most popular programming language in the world today. Unlike other programming languages, Python is relatively easy to learn and can be used for various tasks, including software, web development, and data analysis. In the world of data, Python is used to streamline, model, visualise, and analyse data using its built-in data analytics tools. One of the key features of Python that appeals to data analytics professionals is its many libraries, such as Pandas and Numpy, which offer a variety of powerful tools for many analytics needs.

Early professionals should learn Python to ensure they have a firm grasp of one of the most important programming languages used in data today.

3. R

R is an open-source programming language used for statistical computing and graphics.

Like Python, R is considered a relatively easy-to-learn programming language. Typically, it's used for statistical analysis, data visualisation, and data manipulation.

R's statistical focus is well-suited to statistical calculations, while the visualisation tools included within R make it an excellent language for creating compelling graphics like scatter plots and graphs.

Alongside Python, R is one of the most important programming languages used in data analysis. If you're considering a career in data, then you might want to spend time learning R.

4. Tableau

Tableau is a data visualisation software used primarily for business analytics and business intelligence.

Tableau is undoubtedly one of the most popular data visualisation platforms in the business world, particularly because it features an easily understood user interface and seamlessly turns data sets into comprehensible graphics. While business users enjoy it because of its ease of use, data analysts like it because it packs powerful tools that can perform advanced analytics functions like segmentation, cohort analysis, and predictive analysis.

Data visualisation is important because it allows data analysts to convey their findings to colleagues and stakeholders who might not otherwise understand them. If you're considering a future in business analytics or intelligence, then you might consider learning Tableau to prepare for the professional workplace.

5. MySQL

MySQL is an open-source relational database management system (RDBMS) that stores application data, particularly web-based ones. Popular amongst websites, MySQL has been used by such popular websites as Facebook, Twitter, and YouTube.

In data, a Structured Query Language (SQL) is used for managing relational database management systems, which use relational databases usually structured into tables. As a result, data professionals use MySQL to store data securely and perform routine data analysis. While the program has limitations, MySQL typically fits well within many businesses' existing data systems.

6. SAS

SAS is a well-known suite of statistical analysis software developed by the SAS Institute for various analytical purposes, including business intelligence, advanced analytics, and predictive analytics.

Analysts use SAS to retrieve, report, analyse, and visualise data. Business intelligence analysts and data analysts more broadly like SAS because it combines a variety of powerful analytic tools in one place and has an intuitive graphical user interface (GUI) that makes it easy to use. Furthermore, SAS is a reliable software suite that allows data analysts to perform much of their work—from managing data to cleaning and modelling it.

7. Jupyter Notebook

Jupyter Notebook is a web-based interactive environment for sharing computational documents or “notebooks.” Data analysts use Jupyter Notebooks to write and run code, clean data, data visualisation, machine learning, statistical analysis, and many other forms of data analysis. Furthermore, Jupyter Notebook allows users to combine data visualisations, code, comments, and numerous different programming languages in one place, allowing for an improved space to document a data analysis process and share them with others.

Whatever your professional data goals, you will likely benefit from using a tool like Jupyter Notebook to work through data problems and share your work with others.

TOP 10 DATA ANALYTICS COMPANIES IN INDIA (2024)

India has seen remarkable growth in the field of data analytics in recent years, with several businesses emerging as major participants in this industry. Here are 10 major Indian data analytics businesses that have made important contributions to the sector, listed below:

1. TATA Consultancy Services (TCS)

TCS, formed in 1968, is a renowned multinational IT services and consulting company that holds a dominant position in data analytics. They offer a wide range

of analytics solutions, including predictive modeling, data visualization, and machine learning. TCS leverages its vast domain expertise to provide data-driven insights, assisting organizations in making informed business decisions.

2. Infosys

Infosys, formed in 1981, is a global leader in consulting, technology, and outsourcing services. They provide advanced analytics solutions to clients across various industries, specifically focusing on customer, supply chain, and risk analytics. Combining profound industry knowledge with state-of-the-art analytics techniques, Infosys delivers business value to its clients.

3. Wipro

Wipro, incorporated in 1945, offers comprehensive data analytics services encompassing data management, data visualization, predictive analytics, and AI-driven insights. They specialize in helping businesses leverage data to enhance operational efficiency, improve customer experiences, and drive innovation. Wipro's analytics solutions cater to a wide range of industries, including banking, healthcare, and retail.

4. Accenture

Accenture is a globally recognized professional services company known for its proficiency in analytics and emerging technologies. Accenture India Private Limited was incorporated in 1991 to embrace the power of information and technology. Their data analytics solutions cover areas such as marketing analytics, risk analytics, and supply chain analytics. Accenture's analytics capabilities drive clients to transform their businesses through data-driven strategies and operational excellence.

5. Mu Sigma

Mu Sigma is a leading analytics and decision sciences company specializing in solving complex business problems using data-driven insights. They provide end-to-end analytics services, including data engineering, predictive modeling, and AI-driven decision support. Mu Sigma's unique approach combines analytics, technology, and domain expertise to deliver actionable insights.

6. Fractal Analytics

Fractal Analytics is a prominent provider of AI-powered analytics and decision science solutions. Their services include customer analytics, pricing analytics, and risk analytics. By leveraging advanced analytics algorithms and machine learning techniques, Fractal Analytics delivers personalized recommendations, driving growth for organi

7. Genpact

Genpact is a globally recognized professional services firm offering analytics solutions to drive digital transformation and business outcomes. Their analytics capabilities span across areas such as finance and accounting, supply chain, and customer experience. Genpact's tailored analytics solutions help businesses make data-driven decisions and achieve operational excellence.

8. EXL Service

EXL Service, founded in 1999, is a leading provider of analytics, operations management, and automation solutions. They empower business organizations to unlock the value of data through their expertise in data modeling, text analytics, and machine learning. EXL Service's analytics offerings are comprised of improving efficiency, optimizing processes, and lastly enhancing customer experiences.

9. Quantiphi

Quantiphi is an AI and data analytics company specializing in transforming businesses through advanced analytics and machine learning. They provide services such as data engineering, cognitive computing, and image recognition. Quantiphi's solutions enable clients to harness the full potential of their data and drive innovation across industries.

10. Happiest Minds Technologies

Happiest Minds Technologies is a digital transformation and IT services company offering data analytics solutions across industries. Their services include data management, advanced analytics, and data governance. The company helps varied organizations leverage data to gain a competitive edge and drive business growth.

These top 10 data analytics companies in India showcase expertise in various areas of data analytics. They utilize advanced technologies and methodologies to help businesses harness the power of data and make data-driven decisions.

JOB OPPORTUNITIES IN BUSINESS ANALYTICS

1. Operations research

National average salary: \$53,477 per year

Primary duties: Operations research analysts collect data and create modeling reports to present information to team leaders. Their primary goal is to identify areas of improvement and optimize efficiency in production and employees. Operations research analysts may also use analytical and mathematical skills to solve company problems. Related: What Is Operations Research and Why Is It Important?

2. Market research

National average salary: \$78,645 per year

Primary duties: Market research analysts use data to better understand market conditions and trends in an industry. They use this data to make recommendations on when to release a new product or service. Market research analysts may also measure the success of previous marketing campaigns while making recommendations on how to improve them to achieve better results. Related: What Is a Market Analysis?

3. Consultant

National average salary: \$75,020 per year

Primary duties: Consultants may work in a variety of industries, helping clients collect and interpret important data. They may also assist clients in creating reporting programs that collect the data most important to their goals. Some consultants may be a part of upgrading current business systems, making recommendations on new products.

4. Financial analyst

National average salary: \$73,812 per year

Primary duties: Financial analysts focus primarily on accounting and finance reports to make recommendations on how to improve revenue and profits. They may create reports that inform businesses of the previous year's performances. They may also be a part of planning meetings, identifying areas in which they can improve profits.

5. Programmer analyst

National average salary: \$75,515 per year

Primary duties: Programmer analysts are responsible for recommending the best software applications for a company. This may involve developing new programs, testing current ones or ensuring the maintenance and upkeep of programs the company currently uses. Programmer analysts also may be responsible for troubleshooting and updating coding within existing programs.

6. Computer systems analyst

National average salary: \$79,891 per year

Primary duties: Computer systems analysts make recommendations on both soft and hardware. They may also evaluate current systems and identify areas of improvement or more efficient ways the staff may use the programs. Computer systems analysts are also often in charge of maintaining the security of computer programs.

7. Business analyst

National average salary: \$83,763 per year

Primary duties: Business analysts use data to analyze the current processes of the business. They focus primarily on products, services and the different systems team members use to conduct the day-to-day of the business. Business analysts may also create reports, evaluating and analyzing trends, using this information to make recommendations.

8. Statistician

National average salary: \$86,547 per year

Primary duties: Statisticians apply or create mathematical concepts to create reports and make recommendations on improvements. They may work in many different industries, improving the way the company collects important data. Statisticians may also summarize data into easy-to-read reports to assist team leaders in making important business decisions.

9. Data scientist

National average salary: \$119,380 per year

Primary duties: Data scientists use a combination of science and mathematical skills to evaluate and interpret data. They may use this information to create reporting models that the company uses to create goals. Data scientists may also be responsible for coming up with data-driven solutions to complex business problems.

10. Data architect

National average salary: \$98,130 per year

Primary duties: Data architects identify the data collection needs of a business before then designing and programming a data management system. They determine the most efficient method of collecting internal and external data, while also streamlining the reporting systems of the data. Data architects may also be responsible for updating or troubleshooting the program.

11. Quantitative analyst

National average salary: \$147,576 per year

Primary duties: Quantitative analysts record and apply mathematical-statistical methods to minimize the risk of a business. They create detailed models to assist businesses in making important financial decisions with the goal of maximizing revenue. Quantitative analysts may also assist business leaders in collecting data that relates to funding or product or service pricing.