HUM 4167: Fundamentals of Business Analytics

Unit-1 Introduction

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Discussion on:

- ✓ What is Business Analytics?
- ✓ Evolution of Business Analytics
- ✓ Classification of Business Analytics
- ✓ Trends of Business Analytics
- ✓ Framework of Business Analytics
- ✓ Scope of Business Analytics
- ✓ Data for Business Analytics
- ✓ Decision Models
- ✓ Problem Solving and Decision Making

Analytics



Business

MEANING OF BUSINESS ANALYTICS

- Business analytics (BA) refers to
 - "The skills, technologies, practices for the continuous development of new insights and understanding of business performance based on data and statistical methods".
 - "The practice of exploration of an organization's data with the emphasis on statistical analysis". Business analytics is used by companies committed to data-driven decision making.











- "The statistical analysis of the data, a business has acquired in order to make decisions that are based on evidence rather than a guess".
- "A combination of data analytics, business intelligence and computer programming. It is the science of analysing data to find out patterns that will be helpful in developing strategies"

Analytics is a field which combines following into one -

- 1. Data,
- 2. Information technology,
- 3. Statistical analysis,
- 4. Quantitative methods and
- 5. Computer-based models

This all are combined to provide decision makers all the possible scenarios to make a well thought and researched decision.

BA is the scientific process of transforming data into insight for making better decisions (Source: INFORMS).

[data => information => knowledge => wisdom]

EVOLUTION OF BUSINESS ANALYTICS

- Business analytics has been existence since very long time and has evolved with availability of newer and better technologies.
- It has its roots in operations research, which was extensively used during World War II. Operations research was an analytical way to look at data to conduct military operations.
- Over a period of time, this technique started getting utilized for business.
 Here operation's research evolved into management science. Again, basis for management science remained same as operation research in data, decision making models, etc.

- As the economies started developing and companies became more and more competitive, management science evolved into-
 - Business intelligence,
 - Decision support systems and into
 - PC software.
 - Mainframe computers
 - ✓ Routine manual reporting
 - ✓ Optimization / simulation
 - ✓ AI / expert systems
 - ✓ Decision Support Systems
- ✓ Centralized/integrated data storage
- ✓ Emergence of data warehousing
- ✓ Dynamic ad-hoc reporting
- ✓ Information dashboards/scorecards
- ✓ Executive Information Systems

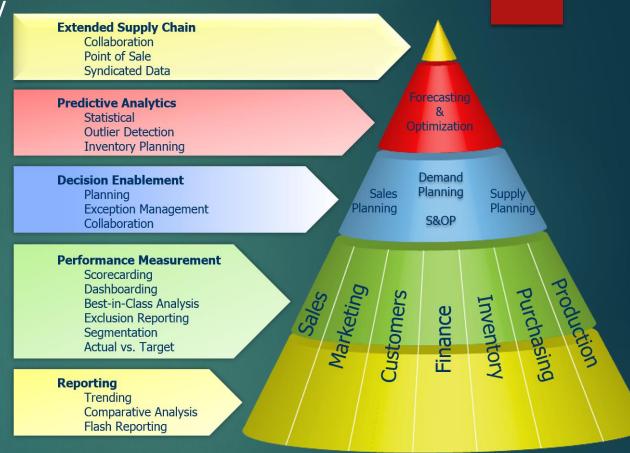
- MPPs, GPUs, IoT/sensors
- ✓ Social media/network analytics
- AI & machine learnining
- ✓ Deep learning, cognitive computing
- ✓ Big data analytics

Decision Support Systems Enterprise IS Integration Business Intelligence Analytics Big Data ...

- ✓ Mini/personal computers (PCs)
- ✓ Enterprise resource planning (ERP)
- ✓ Relational DBMS
- ✓ On-demand static reporting
- ✓ Enterprise Information Systems

- Software as a Service (SaaS & ?aaS)
- ✓ Cloud storage & computing
- Open source software
- ✓ Data/text/web mining
- ✓ Business Intelligence

- Time study exercise by Taylor
- Operations research (OR)
- Management science (MS)
- OR and MS with ICT
- Business intelligence
- Decision support systems
- Personal computer software



SIGNIFICANCE AND USAGES OF BUSINESS ANALYITCS

- To make data-driven decisions
- Converts available data into valuable information
- Eliminate guesswork
- Get faster answer to questions
- Get insight into customer behavior
- Get key business metrics reports when and where needed



- It impacts functioning of the whole organization and hence, can-
 - Improve profitability of the business
 - Increase market share and revenue and
 - Provide better return to a shareholder
 - Reduce overall cost
 - Sustain in competition
 - Monitor KPIs (Key Performance Indicators) and
 - React to changing trends in real time

- There is a strong relationship of BA with:
 - profitability of businesses
 - revenue of businesses
 - shareholder return
- BA enhances understanding of data
- BA is vital for businesses to remain competitive
- BA enables creation of informative reports

CHALLANGES FOR BUSINESS ANALYITCS

PRIMARY CHALLENGES TO SUCCEEDING WITH DATA-DRIVEN MARKETING*

ACCURACY OF CUSTOMER DATA



COST OF THIRD-PARTY DATA



LACK OF INTERNAL ANALYTICS CAPABILITIES





OOD DATA QUALITY CONCERNS*

Accuracy
Completeness
Consistency
Timeliness
Validity/Conformity
Uniqueness



*Data and info comes from the Dun and Bradstreet 9th Annual B2B Sales and Marketing Data Report.

- **1.Data Quality and Availability**: The quality of the analysis depends heavily on the quality of the data being used. Inaccurate, incomplete, or outdated data can lead to incorrect insights and decisions. Ensuring data quality and having access to relevant and comprehensive data can be a significant challenge.
- **2.Data Integration**: Many organizations have data stored in different systems and formats across various departments. Integrating this data to create a unified view can be complex and time-consuming, but it's essential for generating accurate insights.
- **3.Data Privacy and Security**: With the increasing focus on data privacy regulations, organizations must handle data responsibly and ensure compliance. Balancing the need for analytics with protecting sensitive customer information can be challenging.







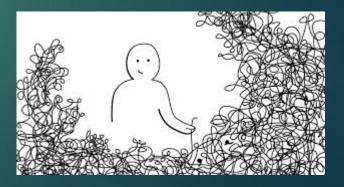
4. Talent Shortage: Skilled data analysts and data scientists are in high demand, and there's a shortage of professionals with the necessary expertise. Finding and retaining skilled personnel can be difficult, especially for smaller businesses with limited resources.



5. Change Management: Implementing business analytics often requires changes in processes and workflows. Resistance to change from employees, lack of understanding of the benefits, and difficulties in aligning the organization's culture with analytical thinking can hinder adoption.



6. Complexity of Tools and Techniques: Business analytics involves using various tools and techniques, such as statistical analysis, machine learning, and data visualization. Learning and using these tools effectively can be daunting, especially for non-technical users.



- **7. ROI and Value Demonstration**: While business analytics can yield valuable insights, it might be challenging to quantify its direct impact on the bottom line. Demonstrating a clear return on investment (ROI) for analytics initiatives can be important for securing continued support.
- **8. Scope Definition**: Defining the scope of business analytics projects is crucial. Without a clear understanding of objectives and scope, projects can become unwieldy and fail to deliver actionable insights.
- **9. Real-time Analysis**: In today's fast-paced business environment, real-time insights are becoming more critical. Processing and analyzing data in real-time to make timely decisions can be technically demanding and resource-intensive.







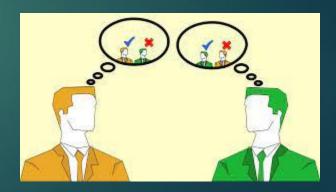
10. Cultural Resistance: Some organizations might have a culture that is resistant to data-driven decision-making. Convincing stakeholders to rely on data rather than intuition or experience can be a challenge.



11. Scale and Scalability: As businesses grow and generate more data, the analytics infrastructure must be able to scale accordingly. Ensuring that the systems can handle increasing data volumes and still provide timely insights can be a technical challenge.



12. Bias and Interpretation: Business analytics outcomes can sometimes be influenced by biases present in the data or the modeling process. Ensuring that the analysis is objective and the insights are interpreted correctly is essential.



USERS OF BUSINESS ANALYITCS

- ✓ Executives and Decision-Makers: Business leaders and executives use analytics to gain insights into overall business performance, set strategic goals, and make high-level decisions. They rely on analytics dashboards and reports to track key performance indicators (KPIs) and assess the health of the organization.
- ✓ **Marketing Professionals**: Marketers use business analytics to analyze customer behavior, preferences, and trends. This helps them optimize marketing campaigns, identify target audiences, allocate resources effectively, and measure the success of their efforts.
- ✓ **Financial Analysts**: Professionals in finance use analytics to manage budgets, forecast financial trends, evaluate investment opportunities, and assess the financial health of the organization. They might also use analytics to detect anomalies and fraud.
- ✓ **Supply Chain and Operations Managers**: These professionals use analytics to improve the efficiency of supply chain processes, manage inventory levels, predict demand, and optimize production schedules. Analytics can help them identify bottlenecks and streamline operations.

- ✓ Human Resources Managers: HR professionals use analytics to analyze employee data, track performance metrics, assess employee engagement, and make informed decisions related to hiring, retention, and talent development.
- ✓ **Sales Teams**: Sales professionals use analytics to track sales performance, analyze customer buying patterns, identify cross-selling and upselling opportunities, and forecast sales figures.
- ✓ Customer Service Teams: Analytics can help customer service teams identify common issues, track customer satisfaction levels, and optimize support processes to enhance the overall customer experience.
- ✓ **Data Analysts and Data Scientists**: These individuals are responsible for collecting, processing, and analyzing data to provide insights and recommendations. They use various analytical tools and techniques to uncover trends, patterns, and correlations within the data.
- ✓ Risk Management Professionals: Businesses use analytics to assess and manage risks, whether they are related to financial transactions, cybersecurity, compliance, or other areas. Analytics can help identify potential threats and vulnerabilities.

- ✓ **Healthcare Professionals**: In the healthcare industry, analytics is used to analyze patient data, optimize treatment plans, predict disease outbreaks, and improve hospital operations.
- ✓ Retailers and E-commerce Companies: Analytics is essential for understanding customer preferences, optimizing pricing strategies, managing inventory, and improving the online shopping experience.
- ✓ Manufacturing and Industrial Sectors: These sectors use analytics for predictive maintenance, quality control, process optimization, and resource allocation.
- ✓ Energy and Utilities: Analytics is used to monitor energy consumption patterns, optimize distribution networks, and improve overall operational efficiency.
- ✓ Public Sector and Government: Government agencies use analytics for policy-making, resource allocation, fraud detection, and improving public services.
- ✓ Transportation and Logistics: Analytics helps in route optimization, fleet management, and predicting maintenance needs for vehicles.

Retail Markdown Decisions

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

Analytics in Practice: ABC Entertainment

- •ABCE owns numerous hotels and casinos.
- Uses analytics to:
 - forecast demand for rooms
 - segment customers by gaming activities
- •Uses prescriptive models to:
 - set room rates
 - allocate rooms
 - offer perks and rewards to customers

COMPONENTS OF BUSINESS ANALYTICS

 There are 6 major components/categories in any analytics solution:

Components of Business Analytics

Data Mining

Text Mining

Forecasting

Predictive Analytics

Optimization

Visualization

 Data Mining — Create models by uncovering previously unknown trends and pattern in vast amounts of data e.g. detect insurance claims frauds, Retail Market basket analysis.

There are various statistical techniques through which data mining is achieved.

- Classification (when we know on which variables to classify the data e.g. age, demographics)
 - Regression
- Clustering (when we don't know on which factors to classify data)
 - **Associations & Sequencing Models**

- Text Mining Discover and extract meaningful patterns and relationships from text collections. E.g.
 - Understand sentiments of Customers on social media sites like Twitter,
 Face book, Blogs, Call centre scripts etc. which are used to improve the
 Product or Customer service or understand how competitors are doing.

- Forecasting Analyze & forecast processes that take place over the period of time. E.g.
 - Predict seasonal energy demand using historical trends,
 - Predict how many ice creams cones are required considering demand
- Predictive Analytics Create, manage and deploy predictive scoring models.
- E.g.
 - Customer churn & retention,
 - Credit Scoring,
 - Predicting failure in shop floor machinery

- **Optimization** Use of simulations techniques to identify scenarios which will produce best results.
- E.g. Sale price optimization,
 - Identifying optimal Inventory for maximum fulfilment & avoid stock outs.

 Visualization— Enhanced exploratory data analysis & output of modelling results with highly interactive statistical graphics.

Why Business Analytics

- Analytical Approach
- Non-analytical approach (Delphi Technique/ Grounded theory)

Analytical approach is better choice than non-analytical approach Why????

Using data to derive conclusions/decisions can deliver a significant higher chance of making a good, long-lasting decision over non-data driven approach.

More useful Applications as per the current requirements:

Risk management, fraud detection, revenue management, healthcare management Advantage:

Time saving, cost saving, more productive, competitive advantage, increased customer satisfaction, expanded sales/profits, etc.

BUSINESS AN ALYTICS APPLICATIONS

- Pricing decisions
- Financial and marketing activities
- Supply chain management
- Management of customer relationships
- Human resource planning
- Enterprise resource planning

CLASSIFIC ATION OF BUSINESS ANALYTICS

Descriptive analytics (DA)

uses data to understand past and present
 [prepares and analyzes historical data; identifying patterns from samples]

Predictive analytics (PA)

- analyzes past performance
- predict future [probabilities and trends]
- exploring relationship in data, which may not visible directly by DA.

Prescriptive analytics

- uses optimization techniques [determining new ways to evaluate, target business objectives with balancing possible constraints]

TRENDS IN BUSINESS ANALYTICS

Three basics:

Information, analysis and decisions

- Diagnostic analytics
 - Why did it happen
 - How did it happen
 - Mostly it is a shocks and market information
- Descriptive analytics (DA)
 - What is happening (standard reporting)
 - How many; how often, where (ad hoc reporting)
 - What exactly the problem (drill down)

Predictive analytics (PA)

- what actions are required (alerts)
- what could happen (simulation)
- what if the trend continues (forecasting)
- what will happen next (predictive modelling)

Prescriptive analytics

- how can we achieve the best outcome (optimization)
- how can we achieve the best outcome w.r.t. effects of variability (stochastic optimization)

It is a game between information and analysis. Analytics excellence leads to better decisions (Gartner)

Optimize Funnel Conversion

Big data analytics allows companies to track leads through the entire sales conversion process, from a click on an adword ad to the final transaction, in order to uncover insights on how the conversion process can be improved.

EXAMPLE:

CREDEM uses Data Analytics to predict which financial products or services a customer would appreciate, so it can better target consumers during the sales process. With these insights, the bank increased average revenue by 22 % and reduced costs by 9 %.



Behavioral Analytics:

With access to data on consumer behavior, companies can learn what prompts a customer to stick around longer, as well as learn more about their customer's characteristics and purchasing habits in order to improve marketing efforts and boost profits.

EXAMPLE

McDonalds tracks vast amounts of data in order to improve operations and boost the customer experience. The company looks at factors such as the design of the drive-thru, information provided on the menu, wait times, the size of orders and ordering patterns in order to optimize each restaurant to its particular market



Customer Segmentation

By accessing data about the consumer from multiple sources, such as social media data and transaction history, companies can better segment and target their customers and start to make personalized offers to those customers.

EXAMPLE:

Walmart combines public data, social data and internal data to monitor what customers and friends of customers are saying about a particular product online. The retailer uses this data to send targeted messages about the product, and to share discount offers. Walmart also uses data analysis to identify the context of an online message, such as if a reference to "salt" is about the movie or the condiment.

Company	Industry
Walmart	Retail



Predictive Support

Through sensors and other machine-generated data, companies can identify when a malfunction is likely to occur. The company can then pre-emptively order parts and make repairs in order to avoid downtime and lost profits.

EXAMPLE:

Southwest analyses sensor data on their planes in order to identify patterns that indicate a potential malfunction or safety issue. This allows the airline to address potential problems and make necessary repairs without interrupting flights or putting passengers in danger.

Company	Industry
Southwes t	Travel
airlines	



Market Basket Analysis & Pricing Optimization

By quickly pulling data together from multiple sources, retailers can better optimize their product selection and pricing, as well as decide where to target ads.

Example

P&G uses simulation models and predictive analytics in order to create the best design for its products. It creates and sorts through thousands of iterations in order to develop the best design for a disposable diaper, and uses predictive analytics to determine how moisture affects the fragrance molecules in dish soap, so the right fragrance comes out at the right time in the dishwashing process.

Company	Industry
Procter	Household
&	Retail
Gambl	



Coca-Cola uses an algorithm to ensure that its orange juice has a consistent taste throughout the year. The algorithm incorporates satellite imagery, crop yields, consumer preferences and details about the flavours that make up a particular fruit in order to determine how the juice should be blended.



Company	Industry
Coca-Cola Co.	Food

Predict Security Threats

Big data analytics can track trends in security breaches and allow companies to proactively go after threats before they strike.

Example:

With more than 1.5 billion items in its catalog, Amazon has a lot of product to keep track of and protect. It uses its cloud system, S3, to predict which items are most likely to be stolen, so it can better secure its warehouses.

Company	Industry
Amazon	Online Retail



Fraud Detection

Financial firms use big data to help them identify sophisticated fraud schemes by combining multiple points of data.

Example

Eg: Zions Bank uses data analytics to detect anomalies across channels that indicate potential fraud. The fraud team receives data from 140 sources—some in real-time—to monitor activity, such as if a customer makes a mobile banking transaction at the same time as a branch transaction.



THE BUSINESS ANALYTIC PROCESS



STEP-WISE PROCESS OF BUSINESS ANALYTICS

Define Business Objectives and Goals:

- Identify the specific business problems or questions you want to address with analytics.
- Clearly define the goals you aim to achieve through data analysis.

Data Collection:

- Gather relevant data from various sources, including internal databases, external datasets, spreadsheets, and more.
- Ensure data accuracy, completeness, and consistency.

Data Cleaning and Preparation:

- Cleanse the data by removing duplicates, correcting errors, and handling missing values.
- Transform the data into a format suitable for analysis, which might involve data normalization, aggregation, and feature engineering.

Data Exploration and Analysis:

- Use descriptive statistics, data visualization, and exploratory data analysis to understand the characteristics and patterns within the data.
- Identify trends, correlations, outliers, and potential insights.

Hypothesis Formulation:

 Based on the insights gained from data exploration, formulate hypotheses or questions to investigate further.

Model Selection and Building:

- Choose appropriate analytical models, algorithms, or statistical methods based on the nature of the data and the business objectives.
- Develop predictive or descriptive models using techniques like regression, classification, clustering, or time-series analysis.

Model Training and Validation:

- Split the data into training and validation sets to train the chosen models.
- Use validation techniques to assess the models' performance, accuracy, and generalization ability.

Model Interpretation:

- Understand the significance and impact of the model's features and parameters.
- Evaluate the model's strengths, limitations, and potential biases.

Insight Generation:

- Apply the trained model to new data or real-world scenarios to generate predictions or classifications.
- Extract insights from the model's output that are relevant to the business objectives.

• Translate the generated insights into actionable recommendations for decision-makers.

Collaborate with stakeholders to implement the recommended strategies or changes.

Monitoring and Optimization:

Decision-Making and Implementation:

- Continuously monitor the outcomes of implemented decisions and track their impact on key performance indicators (KPIs).
- Refine models and strategies based on real-world results and feedback.

Communication and Reporting:

- Summarize the analysis process, findings, and recommendations in a clear and concise manner.
 - Use data visualization and storytelling techniques to communicate complex insights to non-technical stakeholders.

Feedback Loop:

- Encourage a feedback loop between decision-makers, analysts, and other stakeholders to refine the analysis process over time.
 - Incorporate lessons learned from previous analyses into future projects.

POSSIBLE STRATEGIES FOR BUSINESS ANALYTICS

1. Competing ON Analytics

- Analytics is THE key competitive advantage
- Target Result Sustainable competitive advantage

2. Competing WITH Analytics

- Focus on one business process
- Target result Incremental profits

3. Improving With Analytics

- Culture of analytics
- Target result Continuous improvement

4. Revenue Through Analytics

- "Sell" data as a secondary product
- Improved margins or market share

5. Persevering Through Analytics

- Do what the competition does
- The price of entry

- ✓ Competing ON Analytics: This strategy involves making analytics itself a core competitive advantage. By emphasizing a data-driven approach across all aspects of the business, companies can continuously innovate and improve their products, services, and operations. The ultimate goal is to establish a sustainable competitive advantage based on the effective use of analytics.
- Competing WITH Analytics: This strategy involves using analytics to gain a competitive edge within a specific business process or area. By focusing on one particular aspect of the business (such as supply chain management, customer service, or marketing), companies can make incremental improvements that lead to increased profitability and efficiency.

- ✓ **Improving With Analytics:** This strategy centers around cultivating a culture of analytics within the organization. By encouraging employees at all levels to embrace data-driven decision-making and continuous improvement, companies can achieve better operational efficiency and enhance their overall performance over time.
- ✓ Revenue Through Analytics: In this strategy, companies explore the possibility of monetizing their data by "selling" it as a secondary product. By analyzing and packaging their data, they can offer valuable insights to other businesses or stakeholders, leading to improved financial outcomes such as increased margins or market share.
- ✓ Persevering Through Analytics: This strategy involves using analytics as a means to keep up with the competition and meet industry standards. While not necessarily a groundbreaking approach, it's seen as essential in certain markets to maintain relevance and avoid falling behind.

FRAMEWORK OF BUSINESS ANALYTICS

Statistics

- descriptive statistics
- inferential statistics
- forecasting
- modelling

Quantitative methods

- Simulation
- optimization
- modelling

• Information systems for business intelligence

- Big data, small data
- data marts, spreadsheets
- modelling

DATA FOR BUSINESS ANALYTICS

- VARIABLES
- DATA
 - collected facts and figures
- DATABASE
 - collection of computer files containing data
- INFORMATION
 - comes from analyzing data

Variables for Business Analytics

Variables: Categorical (Qualitative); Quantitative

Dependent

Endogenous

Explained Effect

Controlled Outcome

Regressand

Predictand

Response

Independent

Exogenous

Explanatory Cause

Control Covariate

Regressor Predictor

Stimulus

DATA ARCHITECTURE

- Big data and small data
- Primary and secondary data
- Quantitative and qualitative data
- Experimental and non-experimental data
- Structured and unstructured data
- Internal and External data
- Traditional and "New" data
- "Free" and Purchased data
- Historical data

DATA FOR BUSINESS ANALYTICS

Examples of using DATA in business:

- Annual reports
- Accounting audits
- Financial profitability analysis
- Economic trends
- Marketing research
- Operations management performance
- Human resource measurements

Visualization of data

- Example:
 - 1, 2, 50, 500 ..., Kharagpur, gender, 10k3002, xy@gov.in, Anything else?
- Data vs. Information 100.0, 0.0, 250.0, 150.0, 220.0, 300.0, 110.0

Is there any information?

Data for Business Analytics

Example 1.1 A Sales Transaction Database File

- 14	А	В	С	D	E	F	G	Н	
1	Sales Tra	nsactions	: July 14						11.40
2									475
3	Cust ID	Region	Payment	Transaction Code	Source	Amount	Product	Time Of Day	
4	10001	East	Paypal	93816545	Web	\$20.19	DVD	22:19	
5	10002	West	Credit	74083490	Web	\$17.85	DVD	13:27	
6	10003	North	Credit	64942368	Web	\$23.98	DVD	14:27	
7	10004	West	Paypal	70560957	Email	\$23.51	Book	15:38	
8	10005	South	Credit	35208817	Web	\$15.33	Book	15:21	
9	10006	West	Paypal	20978903	Email	\$17.30	DVD	13:11	Records
10	10007	East	Credit	80103311	Web	\$177.72	Book	21:59	
11	10008	West	Credit	14132683	Web	\$21.76	Book	4:04	
12	10009	West	Paypal	40128225	Web	\$15.92	DVD	19:35	
13	10010	South	Paypal	49073721	Web	\$23.39	DVD	13:26	

Entities

Fields or Attributes

Example 1.2: Classifying Data Elements in a Purchasing Database

2	А	В	С	D	Е	F		G	Н	- 1	J
1	Purchase Orders			7//							
2	n=1 + 270										
3	Supplier	Order No	Item No.	Item Description	Item Cost	Quantity	Co	st per order	A/P Terms (Month	Order Date	Arrival Date
4	Spacetime Technologies	A0111	6489	O-Ring	\$ 3.00	900	\$	2,700.00	25	10/10/11	10/18/11
5	Steelpin Inc.	A0115	5319	Shielded Cable/ft.	\$ 1.10	17,500	\$	19,250.00	30	08/20/11	08/31/11
6	Steelpin Inc.	A0123	4312	Bolt-nut package	\$ 3.75	4,250	\$	15,937.50	30	08/25/11	09/01/11
7	Steelpin Inc.	A0204	5319	Shielded Cable/ft.	\$ 1.10	16,500	\$	18,150.00	30	09/15/11	10/05/11
8	Steelpin Inc.	A0205	5677	Side Panel	\$195.00	120	\$	23,400.00	30	11/02/11	11/13/11
9	Steelpin Inc.	A0207	4312	Bolt-nut package	\$ 3.75	4,200	\$	15,750.00	30	09/01/11	09/10/11
10	Alum Sheeting	A0223	4224	Bolt-nut package	\$ 3.95	4,500	\$	17,775.00	30	10/15/11	10/20/11
11	Alum Sheeting	A0433	5417	Control Panel	\$255.00	500	\$	127,500.00	30	10/20/11	10/27/11
12	Alum Sheeting	A0443	1243	Airframe fasteners	\$ 4.25	10,000	\$	42,500.00	30	08/08/11	08/14/11
13	Alum Sheeting	A0446	5417	Control Panel	\$255.00	406	\$	103,530.00	30	09/01/11	09/10/11
14	Spacetime Technologies	A0533	9752	Gasket	\$ 4.05	1,500	\$	6,075.00	25	09/20/11	09/25/11
15	Spacetime Technologies	A0555	6489	O-Ring	\$ 3.00	1,100	\$	3,300.00	25	10/05/11	10/10/11

Classifying Data Elements in a Purchasing Database

	A	В	С	D	E	F	G	Н		J
1	Purchase Orders	D	C	D	E	F	G	п	-	J
2	i di cilase Olders									
3	Supplier	Order No	Item No.	Item Description	Item Cost	Quantity	Cost per orde	r A/P Terms (Mon	the Order Date	Arrival Date
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Figure 1.2

Data Analysis Process Flows

- Reporting: scorecards, dashboards
- Descriptive: statistics, historical
- Predictive: forecasting, recommendations
- Prescriptive: simulation, what-if
- Machine learning pattern discovery

Problem Solving and Decision Making

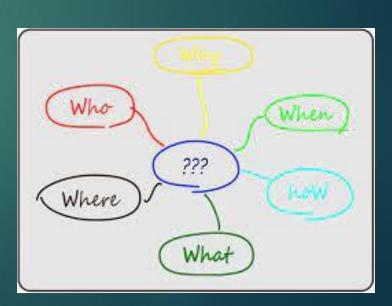
- BA represents only a portion of the overall problem solving and decision making process.
- Six steps in the problem solving process
 - 1. Recognizing the problem
 - 2. Defining the problem
 - 3. Structuring the problem
 - 4. Analyzing the problem
 - 5. Interpreting results and making a decision
 - 6. Implementing the solution

1. Recognizing the Problem

- Problems exist when there is a gap between what is happening and what we think should be happening.
- For example, costs are too high compared with competitors.

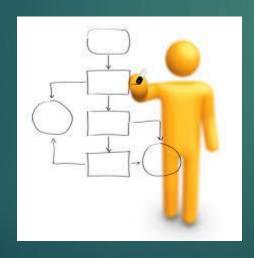


- 2. Defining the Problem
- Clearly defining the problem is not a trivial task.
- Complexity increases when the following occur:
 - large number of courses of action
 - several competing objectives
 - external groups are affected
 - problem owner and problem solver are not the same person
 - time constraints exist



3. Structuring the Problem

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





4. Analyzing the Problem

- Identifying and applying appropriate Business Analytics techniques
- Typically involves experimentation, statistical analysis, or a solution process





5. Interpreting Results and Making a Decision

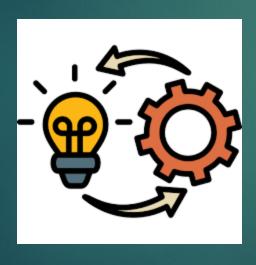
- Managers interpret the results from the analysis phase.
- Incorporate subjective judgment as needed.
- Understand limitations and model assumptions.
- Make a decision utilizing the above information.





6. Implementing the Solution

- Translate the results of the model back to the real world.
- Make the solution work in the organization by providing adequate training and resources.





MAIN SOFTWARE USED FOR BUSINESS ANALYITCS

- **1.Microsoft Excel**: Excel is one of the most widely used tools for basic data analysis, reporting, and visualization. It's suitable for smaller datasets and simpler analysis tasks.
- **2.Tableau**: Tableau is a powerful data visualization tool that allows users to create interactive and shareable dashboards and reports. It supports connecting to various data sources and is known for its user-friendly interface.
- **3.Power BI**: Microsoft Power BI is another popular data visualization and business intelligence tool. It enables users to connect to a wide range of data sources, create interactive reports, and share insights across organizations.
- **4.QlikView and Qlik Sense**: Qlik's tools, including QlikView and Qlik Sense, provide self-service data visualization and exploration capabilities, enabling users to uncover insights from their data.
- **5.IBM Cognos Analytics**: This is an enterprise-level business intelligence and analytics platform that supports various data sources, reporting, and dashboard creation.

- **6. SAS Business Analytics**: SAS offers a suite of analytics tools for data management, advanced analytics, and business intelligence. It's often used in industries like finance, healthcare, and government.
- 7. **R**: R is a programming language and environment for statistical computing and graphics. It's widely used for data analysis, statistical modeling, and creating custom analytics solutions.
- 8. **Python**: Python, with libraries like pandas, NumPy, and scikit-learn, is commonly used for data analysis, machine learning, and creating custom analytics workflows.
- **9. MATLAB**: MATLAB is a programming language and environment used for numerical computing, data analysis, and advanced analytics.
- **10. Alteryx**: Alteryx is a platform that enables data blending, preparation, and advanced analytics. It's often used for data preprocessing and cleaning before analysis. d creation.

- **11. Sisense**: Sisense is a business intelligence software that focuses on data visualization and dashboard creation, with capabilities for data integration and analytics.
- **12. Domo**: Domo is a cloud-based business intelligence platform that offers real-time data insights and dashboar
- **13. Google Analytics**: This is a widely used web analytics service that tracks and reports website traffic, providing insights into user behavior and website performance.
- **14. Splunk**: Splunk is known for its capabilities in processing and analyzing machinegenerated data, making it valuable for IT operations and security analytics.
- **15. Apache Hadoop and Spark**: These open-source frameworks are used for big data processing and analytics, enabling organizations to handle and analyze large volumes of data.

Analytics in Practice: Developing Effective Analytical Tools at Hewlett-Packard

- Will analytics solve the problem?
- Can they leverage an existing solution?
- •Is a decision model really needed? Guidelines for successful implementation:
- Use prototyping.
- Build insight, not black boxes.
- Remove unneeded complexity.
- Partner with end users in discovery and design.
- Develop an analytic champion.

