

UNIT 1

OVERVIEW OF BUSINESS ANALYTICS

Definitions and Examples in Business Intelligence -Need, Features and Use of Business Intelligence (BI)-BI Components-Data Warehouse -Business Performance Management. User Interface Business Analytics: Introduction to Business Analytics (BA) –Need-Components (Business Context, Technology, Data Science) -Types (Descriptive, Predictive and Prescriptive) -Business Intelligence versus Business Analytics

1.1.What is Business Intelligence?

BI(Business Intelligence) is a set of processes, architectures, and technologies that convert raw data into meaningful information that drives profitable business actions. It is a suite of software and services to transform data into actionable intelligence and knowledge.

BI has a direct impact on organization's strategic, tactical and operational business decisions. BI supports fact-based decision making using historical data rather than assumptions and gut feeling.

BI tools perform data analysis and create reports, summaries, dashboards, maps, graphs, and charts to provide users with detailed intelligence about the nature of the business.

Business intelligence: definition

Business intelligence is defined as a process of collecting and processing business information to derive insights and make profitable business decisions. It is also used as an umbrella term, which bundles business intelligence software along with other tools, applications and best practices used to collect intelligent business insights, analyze the information for optimizing overall business performance.

Business intelligence depends on the process of business research to gather data. Analysis of the collected data by using comprehensive technological tools helps in getting actionable insights. The business intelligence comprises of collection, analysis, and presentation of business-related information and is more often considered as an outcome of business research enabling smarter business actions.

The goal of business intelligence is to collect information and analyze it; so that a forward-thinking organization like yours can make better business decisions. Some of the trends related to business intelligence shortly are as follows:

- Increased investment in AI technology
- Big data
- The increasing importance of data governance
- Increase in self-service business intelligence software and tools
- Data interpretation through storytelling
- Collaborative business intelligence
- Embedded business intelligence
- Cloud analytics

The **Fig.1** presents an understanding of BI. A BI system in other words is a combination of data warehousing and decision support systems. The figure also reveals how data from disparate sources can be extracted and stored to be retrieved for analysis. The basic BI functions and reports are shown in fig 1. The primary activities include gathering, preparing and analyzing data. The data itself must be of high quality. The various sources of data is collected, transformed, cleansed, loaded and stored in a warehouse. The relevant data is for a specific business area that is extracted from the data warehouse. A BI organization fully exploits data at every phase of the BI architecture as it progresses through various levels of informational metamorphosis. The raw data is born in operational environments, where transactional data pours in from every source and every corner of the enterprise. Therefore, that is the business intelligent organization vision: A natural flow of data, from genesis to action. In addition, at each step in the flow, the data is fully exploited to ensure the increase of information value for the enterprise. The challenge for BI, of course, is to build any organizations vision

BI provides many benefits to companies utilizing it. It can eliminate a lot of the guesswork within an organization, enhance communication among departments while coordinating activities, and enable companies to respond quickly to changes in financial conditions, customer preferences, and supply chain operations. BI improves the overall performance of the company using it.

Information is often regarded as the second most important resource a company has (a company's most valuable assets are its people). So when a company can make decisions based on timely and accurate information, the company can improve its performance. BI also expedites decision-making, as acting quickly and correctly on information before competing businesses do can often result in competitively superior performance. It can also improve customer experience, allowing for the timely and appropriate response to customer problems and priorities.

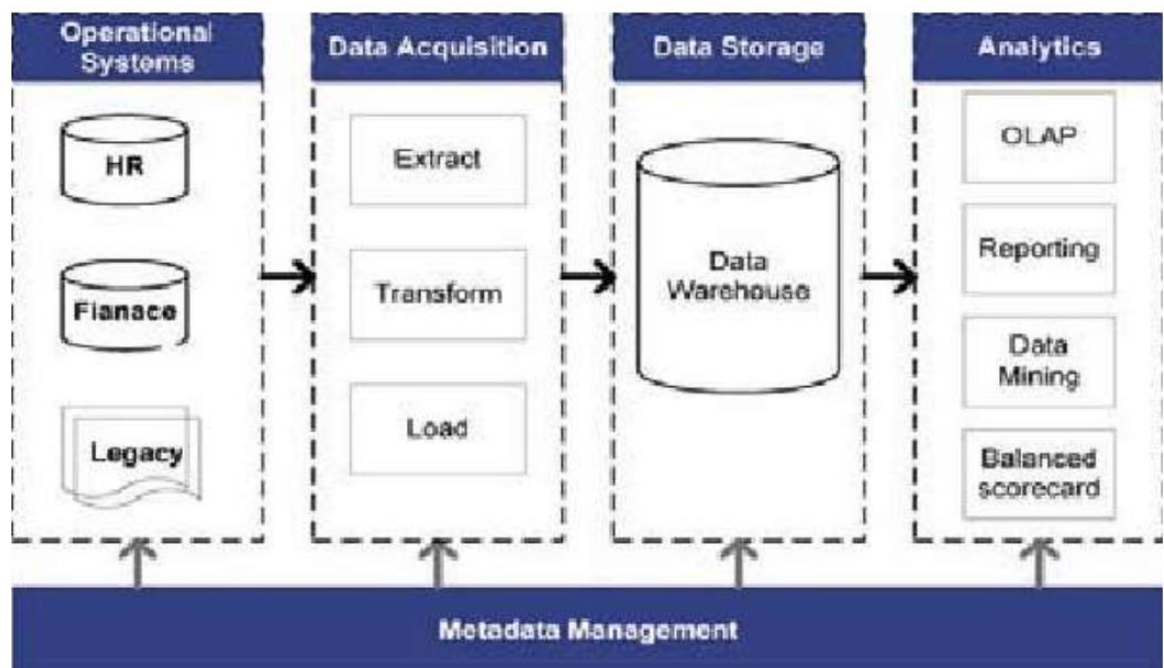


Figure 1. Business Intelligence System

A solid BI architecture framework consists of:

1. **Collection of data:** The first step is related to the collection of relevant data from various external and internal sources which can be databases, ERP- or CRM systems, flat files, or APIs, just to name a few.
2. **Data integration:** At this stage, the data collected is integrated into a centralized system, often with the help of ETL processes. Here the data is also cleaned and prepared for analysis.
3. **Storage of data:** This is where data warehousing comes into the picture. A warehouse is a place in which structured data is stored. It makes it available for querying and analysis.

4. **Data analysis:** After the information is processed, stored, and cleaned it is ready to be analyzed. With the help of the right tools, the data is visualized and used for strategic decision-making.
5. **Distribution of data:** The data, now in the form of graphs and charts, is distributed in different formats. This can be online reporting, dashboarding, or embedding solutions.
6. **Reaction based on insights:** The final stage of the architecture process is to extract actionable insights from the data and use them to make improved decisions to ensure company growth.

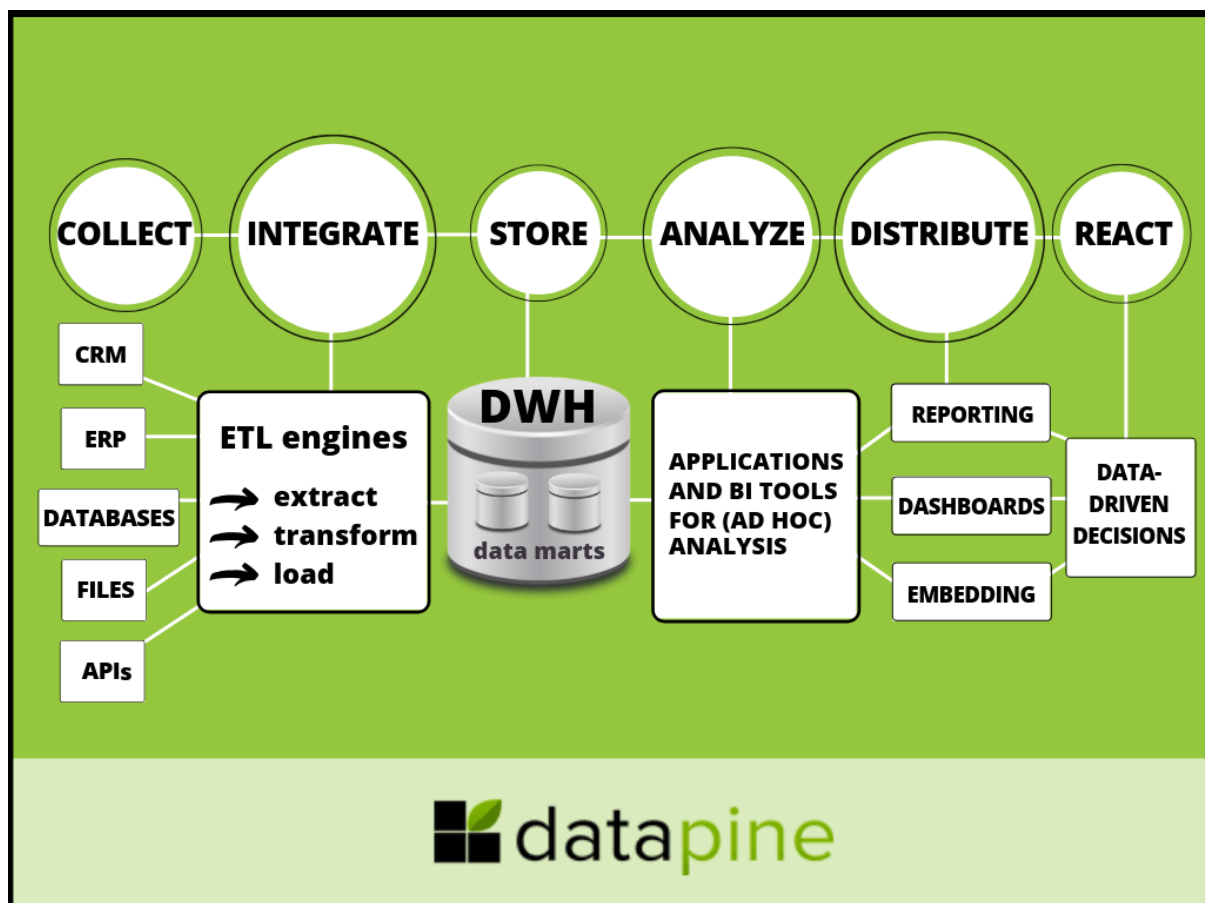


Figure 2: Role of BI in decision making

How the BI process works



STEP 1

Data from source systems is integrated and loaded into a data warehouse or other analytics repository.



STEP 2

Data sets are organized into analytics data models or OLAP cubes to prepare them for analysis.



STEP 3

BI analysts, other analytics professionals and business users run analytical queries against the data.



STEP 4

The query results are built into data visualizations, dashboards, reports and online portals.



STEP 5

Business executives and workers use the information for decision-making and strategic planning.

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1.2.Examples

Example 1:

A restaurant owner wants to understand the preference of his customers, type of cuisine they like, and why they like that specific cuisine. The restaurant went on to conduct a survey using business intelligence software and feedback is collected from customers about different types of cuisines. The restaurant owner using prominent features in the software analyzes the customer mindset and derives valuable insights about cuisines served in the restaurant. Empowered with information about what cuisine is liked by what people and what cuisine is ordered most on what day, etc., he then creates business strategies that are appealing as well as satisfying for his customers and profitable for his business.

Example 2:

A hotel owner uses BI analytical applications to gather statistical information regarding average occupancy and room rate. It helps to find aggregate revenue generated per room.

It also collects statistics on market share and data from customer surveys from each hotel to decide its competitive position in various markets.

By analyzing these trends year by year, month by month and day by day helps management to offer discounts on room rentals.

Example 3:

A bank gives branch managers access to BI applications. It helps branch manager to determine who are the most profitable customers and which customers they should work on.

The use of BI tools frees information technology staff from the task of generating analytical reports for the departments. It also gives department personnel access to a richer data source.

Some other examples

With many enterprise data warehouses and data lakes now storing petabytes or more of both structured and unstructured data, business intelligence systems are becoming essential enterprise infrastructure for providing real-time consumption of data by all members of an organization. Access to such data can no longer be siloed to the confines of the data science department alone.

1. Business intelligence enables precision marketing in the banking industry

Ellie Mae provides software to leading financial institutions to automate their mortgage applications — ensuring for regulatory compliance and high loan quality.

With about 35% market share of U.S. mortgage applications, Ellie Mae manages a significant amount of important customer data. However, before implementing a proper business intelligence system, this list was filled with duplicate records and contained a significant amount of stale or incorrect information.

By implementing systems to properly cleanse and deduplicate data, analysts no longer have to rely on siloed spreadsheets dispersed across different divisions. They can now make sound strategic business decisions derived from their shared analyses. Quality data now delivers trusted insights to BI users, while sales, product, and financial analytics enable precision marketing through better segmentation and identification of cross-sales opportunities.

2. BI creates real-time insights for agile decision-making in social media

XING is a career-based social networking platform based in Hamburg, Germany. The platform has more than 15 million members, producing over 50 million system events per day, and the underlying data is heavily regulated by the GDPR.

Managing this type of data scale and governance is complex. XING accumulates a number of small files and diverse file formats from their analytics systems. The company needs the ability to process and aggregate this data to produce consumable formats for analysts and managers.

By bridging and centralizing their various data systems, XING was able to dramatically reduce the processing overhead of their transformation jobs and simplify the integration process to allow for less technical members of the organization to become more involved. By doing so, management can get real-time access into user behavior, allowing them to make much faster decisions on the product roadmap.

3. BI facilitates production planning in manufacturing

SKF is a global manufacturer and supplier of bearings, seals, mechatronics, and lubrication systems. Based in Sweden, the company is represented in more than 130 countries worldwide and has approximately 17,000 distributor locations.

As SKF has such broad geographic coverage and product diversity, they need to constantly forecast market size and product demand to adjust their manufacturing. Traditionally, SKF analysts — like so many analysts — created and maintained those forecasts in complex Excel files. However, the overhead of maintaining and reconciling disparate analyses can be overwhelming. SKF often needed days to produce a simple demand forecast.

“We weren’t able to distribute data from the files in any standardized way. We realized we needed a data vault or data warehouse that would represent a single source of truth, would be easy to maintain and update, and would house data that could be understood and used by everyone in the organization.” — Fritz Ulrich Dettmer, Manager of Business Intelligence.

By centralizing their data assets into a single system, SKF was quickly able to start sharing their data and analyses between a number of different departments within the organization — including sales, manufacturing planning, application engineering, business development, and management. As they produce a large number of product variants, they are now able to quickly

aggregate demand forecasts, no longer needing to debate data integrity between departments. This allows management to efficiently plan their future manufacturing.

4. Business intelligence improves sales and stock analysis

Kidiliz Group is an international children's fashion company that operates in over 40 countries around the world, with 15 in-house and licensed brands. Based in France, the company generates over 50% of its revenue outside its home country and sells through over 11,000 retail locations, including 830 of its own stores.

As Kidiliz began collecting a large amount of retail data in their legacy ERPs, they realized they needed to build better business intelligence systems to allow for more effective analysis of sales and inventory across their retail network. The company is well known for its adaptability to changing fashion trends and thus having a robust data system for tracking customer and product data was essential to operational success.

Kidiliz developed and integrated 20 data flows on retail activity — such as register transactions across their network. They are now able to analyze their sales and stock data to learn how to provide the best experience to their end customers by streamlining their in-store experiences.

5. Modern BI tools accelerate insights in the restaurant business

Groupe Flo owns and operates a number of high quality restaurant brands across France. As part of their technology modernization program, the group set out to build a strong business intelligence system to allow them to recover and process all the receipts for their restaurants, which include over 328 million line items per year across their 300 sites.

Before developing their modern BI system, much of their integrations and analytics were performed manually, which made processing large amounts of receipt data infeasible. Furthermore, legacy systems didn't allow the marketing department to drill down into more granular data — such as sales of a single restaurant at a specific time of day.

By automating the integration processes, Groupe Flo is able to transmit restaurant data to headquarters within 10 minutes of creation and then consolidate it for consumption by the next morning. In addition to speeding up their analyses, they can now also cross-reference their sales data with other data sources — such as weather and holiday datasets — to get better

insight into customer patterns. This provides Groupe Flo valuable insights that they can directly use to adjust operational aspects such as store and labor hours.

6. Business intelligence allows for real-time insights in sports betting

Tipico is a leading international provider of sports betting and casino games for online and retail businesses. Every day, Tipico's data warehouse processes 675GB of data and receives 150GB of real-time messages from numerous internal and external systems.

Tipico deployed a business intelligence system entirely on AWS that integrates data from as many as 60 data sources, manages about 50TB of data, sends data to 20 external systems, provides real-time alerting to analysts and IT, and allows for quickly deploying and testing AI models.

Both analysts and non-technical managers can easily query a single, self-service system to get comprehensive operational and customer data. This allows them to quickly respond to changes in the business and provide a better product for their customers.

Going forward, Tipico believes they'll be able to use this integrated data to provide real-time product customization to their end-users to significantly increase customer experience and retention.

1.3.Need -Why is BI important?

- Measurement: creating KPI (Key Performance Indicators) based on historic data
- Identify and set benchmarks for varied processes.
- With BI systems organizations can identify market trends and spot business problems that need to be addressed.
- BI helps on data visualization that enhances the data quality and thereby the quality of decision making.
- BI systems can be used not just by enterprises but SME (Small and Medium Enterprises)
- Increase Revenue
- Decrease Risk
- **Boost productivity**

- With a BI program, It is possible for businesses to create reports with a single click thus saves lots of time and resources. It also allows employees to be more productive on their tasks.
- **To improve visibility**
 - BI also helps to improve the visibility of these processes and make it possible to identify any areas which need attention.
- **Fix Accountability**
 - BI system assigns accountability in the organization as there must be someone who should own accountability and ownership for the organization's performance against its set goals.
- **It gives a bird's eye view:**
 - BI system also helps organizations as decision makers get an overall bird's eye view through typical BI features like dashboards and scorecards.
- **It streamlines business processes:**
 - BI takes out all complexity associated with business processes. It also automates analytics by offering predictive analysis, computer modeling, benchmarking and other methodologies.
- **It allows for easy analytics.**
 - BI software has democratized its usage, allowing even nontechnical or non-analysts users to collect and process data quickly. This also allows putting the power of analytics from the hand's many people.

1.4.Features of Business Intelligence

Some key features of business intelligence

Business Intelligence Features



1. Reporting

With an intuitive platform, you can create and distribute reports on the fly without IT assistance. Schedule reports automatically to ensure delivery at recurring times. Set built-in alerts to distribute reports when you meet specific conditions.

Leverage conditional formatting capabilities to highlight cells within reports when a particular condition is satisfied. Interactive reporting inclusions let you interact with different report views and filter, drill down, pivot, sort, resize rows and columns, add totals and more.

2. Advanced Analytics

Advanced analytics allows you to perform complex data manipulation and analysis. It facilitates regression analysis to analyze relationships between dependent and independent variables.

If you're curious about how a future decision will affect your business, you can run a what-if analysis using past data to predict potential outcomes. What-if analysis tools give you an objective view of the risks and rewards involved in each decision.

Modern BI tools also support scenario analysis to compare potential outcomes based on dynamic parameters. Perform statistical analysis using advanced functions like mean, median, mode, standard deviation and more.

3. Data Visualization

Beautiful and interactive data visualizations let you present complex information in simple formats. BI tools like Tableau and Power BI can create advanced and sophisticated visualizations that effectively convey data.

4. Geospatial Analysis

Find locations on the fly in map view with geographic map search functionality. Applications using location intelligence can take your information and transform it into graphical and cartographic representations, simplifying your geographical data.

5. Mobile BI

Mobile business intelligence refers to accessing data and performing analysis on mobile devices and tablets. Mobile BI provides on-the-go access to KPIs, metrics and dashboards to make intelligent business decisions.

6. Data Management

Data management involves preparing, blending, exploring and cleaning data for analysis. Combine multiple data sets to create a new one.

Explore data to uncover trends, patterns, characteristics and points of interest while describing them using visualization tools. Perform OLAP operations like drill-up, drill-down, and slice and dice to facilitate in-depth data analysis.

7. Self-Service Analytics

A robust BI platform should enable everyone in your organization to interact with data and derive meaningful insights regardless of their skills. Self-service analytics capabilities help you foster data culture by making information accessible to everyone. The right BI solution establishes a secured and governed environment to protect data and ensure integrity without compromising agility and innovation.

8. Data Integration

The most powerful BI solution fails if it can't connect to existing data sources. The right analytics platform provides optimized native connections to perform faster analysis, no matter where the data resides.

You can query the database quickly without writing custom code. It should seamlessly integrate with the existing data strategy without investing in additional products, thus disrupting your current data infrastructure.

It facilitates connections to various platforms, including ERP and CRM tools, eCommerce and big data solutions, cloud file storage systems and more.

9. Predictive Analytics

You need to make accurate predictions to thrive in the dynamic business world. Predictive analytics leverages data mining, machine learning, statistics and artificial intelligence to analyze current and historical data to make accurate forecasts.

10. User-Specific Security

Suppose you need to restrict certain users' access to particular data sets. Your BI tool should allow you to personalize your BI features and applications to individuals or groups of users. Some solutions provide user-specific data sources, where a single application pulls data from different sources depending on who's using it.

11. Augmented Analytics

Augmented analytics employs machine learning automation to improve data profiling and quality. Set alerts and notifications or display outliers/anomalies when data changes. Find new segments or clusters in the dataset automatically. Detect fundamental insights such as variances, correlations, trends and associations before exploring the data actively.

Use text- and voice-based searching to find relevant data using natural language statements.

1.5. Framework of Business Intelligence

More and more businesses are moving towards business intelligence. The reason for this movement is the business environment. Organizations are forced to capture, store and interpret

data. This data is at the core of business success. Organizations require correct information for any decision-making process.

Business intelligence combines data warehousing, business analytics, performance, strategy and user interface. Business receives data from various sources. This data is capture in the data warehouse where it is stored, organized and summarized as per further utilization. Authorized users can access this data and work on it to get desired results. This result than are shared to executives for decision-making process. These data results can be published through dashboards or share points.

Business Intelligence Architecture and Components

The main components of business intelligence are data warehouse, business analytics and business performance management and user interface.

There are five components of Business Intelligence. They are:

1. **OLAP (Online Analytical Processing):** It helps executives in sorting and selecting aggregate of data in order to monitor it strategically.
2. **Corporate Performance Management (CPM)/Advanced Analytics:** This tool helps with the statistics of certain product or service. It also helps in predicting the performance of particular product in market.
3. **Real-time BI:** Real time BI helps businesses in keeping updated with the changing marketing trends. While clients are engaged on the website, marketing team can announce special offers and grab client's attention. This is possible with real-time BI
4. **Data warehousing:** It involves storage of large amounts of data to the benefit of different divisions of an organization.
5. **Data sources:** This involves taking raw data and creating systematic data sources with the help of various software applications. BI tools put these datasets to create pie charts, graphs or tables etc.

1. Online Analytical Processing (OLAP)

OLAP or Online Analytical Processing is a concept in which data is analyzed through multiple dimensions with help of structure called cube. OLAP helps in converting data into information.

The main objective of OLAP is to summarize information for decision making process from large data base. The report generated through OLAP can be presented in a format as per the requirement of end user.

The advantages of OLAP are as follows:

- It ensures that response to query is quicker consistently.
- It provides facility to work with data which are difficult to query through SQL.
- It lets user create view with the help of spreadsheet.

There are three types of OLAP multi-dimensional OLAP, relational OLAP and Hybrid OLAP. In multi-dimensional OLAP data is usually stored in proprietary structure suitable for multi-dimensional analysis. In relational OLAP data base is structure through standard database in star or snowflake schema. A combination of multi-dimensional OLAP and relational OLAP is the hybrid OLAP.

2. Corporate Performance Management

Corporate Performance Management (CPM) encompasses methods, metrics, activities, and systems, which are used to monitor and manage the business performance of a company. CPM software processes the focused information to turn it into operational plans.

This process and methodology offer business owners an integrated approach to planning, forecasting for finance, sales, marketing, HR, and operations. When this methodology is implemented, it joins company strategies with plans and executions, thus helping a business succeed and improve.

CPM is an important component of business intelligence for companies that are looking for such changes as budget remodeling, cost-cutting, upgrading organization strategy, better KPIs alignment, and improving the process of financial planning.

According to software experts at Tricension, cloud-based CPM software makes it easier to deploy the process, reduce costs, and up the information speed and flexibility. It allows the

company to automate numerous manual tasks, and improve the alignment between finance and operations.

3. Real-Time Business Intelligence

Real-time business intelligence (RTBI) is used when sorting, and analyzing business data and operations have to be done at the collection stage. Real-time BI allows the company to get insights into the business process as quickly as possible to take strategic action.

This BI component is demanded when live business insight is required, which is not a rarity in the fast-paced environment of some industries. RTBI is becoming especially popular in fast-paced modern society. Using software designed for RTBI, a company can create quick responses to real-time trends over email, apps, messengers, etc.

For example, RTBI can help create special offers at the most suitable time possible to get the highest conversion rate. Another example is limited-time specials for restaurants or supermarkets that have to do with perishable products and high demands at certain times of the day.

All of the above can be done while the client is on the website and near one of the company's physical locations.

4. Data Warehouse and Data Mart

A data warehouse is a large collection of business data used to help an organization make decisions. Once the data that is needed has been identified, it's time to extract and load it into the data warehouse. This process is what's referred to as "extract, transform, load" (ETL) and is a crucial component of loading data from multiple sources into one unified data repository.

Data warehouse is developed as an integration of multiple heterogeneous data sources. As the data source have their own data protocol, data processing is required while data warehousing.

Data warehouse provides information with time as function. This gives historical perspective to the information.

Once data is captured into the data warehouse, it cannot be changed.

Data within the data warehouse is maintained in form of star schema, snowflake schema and galaxy schema.

Data warehouse has subject oriented data. This subject oriented data could be information such as sales, customer name, etc. Data warehouse excludes information, which is not useful for decision-making process.

Data Mart

The data mart is that portion of the access layer of the data warehouse which is utilized by the end user. Therefore, data mart is a subset of the data warehouse. Data mart is usually assigned to a specific business unit within the enterprise. Data mart is used to slice data warehouse into a different business unit. Typically, ownership of the data mart is given to that particular business unit or department.

The primary utility of data mart is business intelligence. A data mart requires very less investment compared to data warehouse and therefore it is apt for smaller business. Set up time for data mart is very less again making it practical for smaller business.

The main advantages of data mart are as follows:

- It provides easy access to daily used data.
- It improves decision making process for end user.
- It is easy to create and maintain.

5. Data sourcing :

Business Intelligence is about extracting information from multiple sources of data. The data might be: text documents – e.g. memos or reports or email messages; photographs and images; sounds; formatted tables; web pages and URL lists. The key to data sourcing is to obtain the information in electronic form. So typical sources of data might include: scanners; digital cameras; database queries; web searches; computer file access etc.

For the business intelligence process and methodology to be integrated, it is important to have the right understanding of the data sources. Pulling raw data from different sources, internal and external is vital to the diverse analysis options.

Companies tend to store huge amounts of operational data. BI needs to navigate between the data sources. In most companies, mainframe legacy systems create a foundation for the data centers because they can deal with large volumes of data. However, such data is usually difficult to procure since many legacy apps are often obsolete or proprietary. Operational data sources to take advantage of are:

› Enterprise Resource Planning – stores a large amount of transaction data, which can be used in BI environments.

› CRM (Customer Relationship Management) – an excellent source of data for BI since these systems store and analyze customer behavior and important data, such as purchase activity.

› E-Commerce Apps – these apps can be a great source of data for BI since they offer real-time sales activity.

Other sources are numerous company databases, flat files, web services (apps), RSS feeds, and more.

1.6.Business Analytics

What is business analytics?

Business analytics (BA) is a set of disciplines and technologies for solving business problems using data analysis, statistical models and other quantitative methods. It involves an iterative, methodical exploration of an organization's data, with an emphasis on statistical analysis, to drive decision-making.

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, BA starts with several foundational processes:

- Determine the business goal of the analysis.

- Select an analysis methodology.
- Get business data to support the analysis, often from various systems and sources.
- Cleanse and integrate data into a single repository, such as a data warehouse or data mart.



1.7.Three types of Business Analytics

Types of business analytics

Different types of business analytics include the following:

- descriptive analytics, which tracks key performance indicators (KPIs) to understand the present state of a business;
- predictive analytics, which analyzes trend data to assess the likelihood of future outcomes; and
- prescriptive analytics, which uses past performance to generate recommendations for handling similar situations in the future.

Types of Business Analytics Methods

	Descriptive	Diagnostic	Predictive	Prescriptive
Purpose	Use summary statistics on past data to describe What has happened?	Use descriptive and/ or statistical methods to discover why it happened?	Use statistical and/ or machine learning models to predict what could happen?	Use optimization, machine & deep learning models to decide what should we do?
Examples	<ul style="list-style-type: none"> How satisfied are my customers? How many orders were fulfilled vs returned by different product categories? 	<ul style="list-style-type: none"> What are the main reasons for order returns? Which type of customers are more likely to return the orders? 	<ul style="list-style-type: none"> Predict order volume for different products for next month? Which customers are likely to churn and stop using our services? 	<ul style="list-style-type: none"> Supply Chain optimization, YouTube suggestions, ChatBots, digital assistants like Alexa, Siri etc.
Popular Tools (Not exhaustive)	<ul style="list-style-type: none"> MS Excel SQL Tableau QlikView PowerBI 	<ul style="list-style-type: none"> SQL R/ R-Studio Python SAS SPSS 	<ul style="list-style-type: none"> R/ R-Studio Python SAS Alteryx SPSS 	<ul style="list-style-type: none"> Python Spark TensorFlow PyTorch Cloud Platforms

1. Descriptive analytics:

- This first type of analytics provides the facts stating what has happened. It is the simplest type that “allows you to condense big data into smaller, more useful nuggets of information.”
- The objective is to summarize the results and to understand what is going on.
- Descriptive analytics helps a business learn from its past behavior and how it will impact the future.
- It provides information that helps to understand the performance of the business on an overall aggregate level.

- It is also an important step in explaining the current raw data to the various stakeholders.
- This is more like a management information system (MIS), where an MIS gathers data from multiple online systems, analyzes the information, and reports data to aid in management decision-making. The key techniques used are data aggregation and data mining to summarize the past data of understanding the data's underlying behavior and not for any predictions.
- These are the start of the data analytics value chain and are the most valuable to uncover any patterns.
- A **simple example** of descriptive analytics is to assess credit risk: we can predict a consumer's likely financial riskiness by seeing their balance amount against the credit limit. It is also used to analyze the sales cycle of a store. Also, it can be used to categorize the customers based on their product preferences, purchase transactions, how often they purchase. In the context of social media, descriptive analytics offers an overview of the performance metrics: the total of posts, mentions, followers, comments, page views, reviews, the average time is taken to respond, and so on.

2. Predictive analytics:

- Predictive analytics uses the gathered data and descriptive and diagnostic analytics results to tell what is likely to happen in the future on a granular level.
- This is where the earlier steps' insights can be used into actionable insights for decision-making. Its use involves forecasting the future, predicting the market trends, changing customer behaviors, and analyzing competitors to optimize and build strategies to maximize the business results.
- The predictions are made by analyzing the past data, detecting patterns, casual relationships in the data, and then extrapolating them in the future. For instance, a bank to predict which customer is likely to default will need all the past data about which customers have defaulted to predict. The inferential statistics, training algorithms for regression, classification, and segmentation come under this type of business analytics. It uses the techniques to segment the data into groups, apply clustering methods, heuristic rules, decision trees to project future outcomes.

- The predictive analysis can also be used to generate, test, and evaluate hypotheses. It is useful to understand whether a set of features are explaining or predicting other features. For example, it can validate a person's hypothesis inhibiting from a certain region, age group, gender defaults in its credit card payments. This is especially useful when some of the features are actions determined by the business decision-makers. One of the applications of prescriptive analysis is sentiment analysis.
- Predictive analytics is **extensively used in every industry**: finance, healthcare, social media, sports, energy, manufacturing. One of the most frequent applications is in retail, where the retailers are always using predictive analytics to predict and improve their sales positions. Amazon's recommendation engines are a classic example where on making one purchase, the engine shows the list of other similar items that the buyers have purchased

3. Prescriptive analytics:

- These analytics reveal why you should take a particular action. Prescriptive analytics enable optimization, simulation, decision modeling and provide the best possible analysis for business decisions and actions.
- Building on predictive analytics, prescriptive analysis is the next step that helps in exploiting the future. It essentially tells the business what should be done. Using simulation and optimization, it advises on the possible outcomes and suggests actions that can maximize the key business metrics. The focus here is on how to make it happen.
- It can be defined as a business optimization data analytics that provides insights on "what should a business do" to solve a problem. It explores several possible outcomes and suggests actions depending on the results of descriptive, diagnostic, and predictive analytics of the data. The prescriptive analysis uses a feedback system that constantly learns, updates the relationship between the action and the results.
- It does not predict one possible future but rather multiple future outcomes. It is an advanced analytics concept based on optimization and simulation. Optimization helps understand how to achieve the best outcome and identify the data uncertainties to make better decisions. The other approach of prescriptive analytics is a simulation in which all the key performance areas are combined to design the correct metric goals. This ensures whether the key performance metrics are included in the solution.
- The prescriptive analysis is performed when scenario analysis simulates the future under various sets of assumptions and combines it with different optimization

techniques. It uses statistical models and machine learning algorithms to estimate the probabilities, optimizing and recommending actions. A prescriptive model can recommend the best course of action for any pre-specified outcome as it can predict the possible results based on a different choice of action. Waymo, Google's self-driving car, is an example of prescriptive analytics. Recommendation engines are a use case of prescriptive analysis.

- Prescriptive analytics can be applied to almost any industry where the population is to be targeted or grouped. It also has its applications in marketing, financial markets, and the transportation industry. In social media, grouping the customers under one bucket based on their characteristics can use prescriptive analytics to optimize the offering to each group. Similarly, it can be applied in the transportation sector to save time and resources by optimizing the best routes. In the financial markets, the researchers heavily rely on statistical modeling to maximize the returns and manage risk and profitability.

1.8.Benefits of business analytics

Business analytics benefits impact every corner of your organization. When data across departments consolidates into a single source, it syncs up everyone in the end-to-end process. This ensures there are no gaps in data or communication, thus unlocking benefits such as:

Data-driven decisions: With business analytics, hard decisions become smarter—and by smart, that means that they are backed up by data. Quantifying root causes and clearly identifying trends creates a smarter way to look at the future of an organization, whether it be HR budgets, marketing campaigns, manufacturing and supply chain needs, or sales outreach programs.

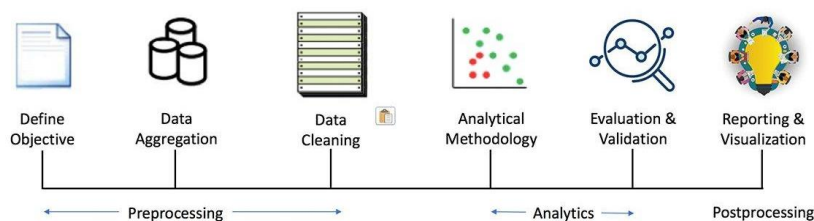
Easy visualization: Business analytics software can take unwieldy amounts of data and turn it into simple-yet-effective visualizations. This accomplishes two things. First, it makes insights much more accessible for business users with just a few clicks. Second, by putting data in a visual format, new ideas can be uncovered simply by viewing the data in a different format.

Modeling the what-if scenario: Predictive analytics creates models for users to look for trends and patterns that will affect future outcomes. This previously was the domain of experienced data scientists, but with business analytics software powered by machine learning, these models can be generated within the platform. That gives business users the ability to quickly tweak the model by creating what-if scenarios with slightly different variables without any need to create sophisticated algorithms.

Go augmented: All of the points above consider the ways that business data analytics expedite user-driven insights. But when business analytics software is powered by machine learning and artificial intelligence, the power of augmented analytics is unlocked. Augmented analytics uses the ability to self-learn, adapt, and process bulk quantities of data to automate processes and generate insights without human bias.

1.9. Business Analytics Components

Components of Business Analytics



1. Define Objective

This is the foremost step. Without having a clear understanding of business goals, questions we need to answer, and problems we ought to solve, none of the following steps will deliver. This also helps us to translate business objectives into analytics objective and map data requirements.

2. Data Aggregation

The process of having a centralized location for the data, extracting and loading the relevant data by putting relevant filters, and creating subsets of data is the core aspect of Data Aggregation. This is where the data is transformed depending upon the business requirement. Also data pertaining from various sources are combined to have one large dataset. The format of the data is also sometimes changed at this step to make it compatible with the tool being used to achieve the objectives.

3. Data Cleaning

Data Cleaning is an extremely important component of business analytics because the data in its raw form sometimes is not directly usable. As the other components of Business Analytics use mathematics, statistics, and computer programming, the data must be compatible with these streams of study.

For example, for applying statistics, the data mustn't have any extreme values (also known as outliers), while for mathematics, there should be no blank cells or missing values (as matrix operations become difficult) while for programming, the concept of type casting plays a role where the data is made sure to be in the right format (i.e. correct class or data type).

Also, the concepts of multicollinearity and curse of dimensionality come in play as the business analyst has to make sure that there are no implicit or explicit duplicate columns. The importance of getting rid of the unnecessary columns can only be understood once a good grasp of statistics is there. Other aspects include the resampling of data (under-sampling, oversampling, hybrid-sampling) removal of duplicate rows, etc.

4. Analytical Methodology

Having a detailed understanding of the different type of analytics out there dominate this component as this is where the analysts have to identify the method with which they will go to achieve their end goal. If the end goal is to understand what is the present situation of the business then that requires a different set of methods while if there is a need to identify which has happened in the past or what can happen in the future, then a different technique is required. Here, having the know-how of various procedures, methods, and algorithms is important, and knowing what to use, when makes one business analyst stand apart from the other.

5. Evaluation and Validation

Once the results come out, the next task is to understand if the result stands true given a different situation or not. This is where predictive models are used and their evaluation and validation are conducted whereas, for other methods, various simulation techniques are put to

use to identify the most plausible outcome, thus providing provide a very reliable result. Here also, the business analyst needs to learn a range of techniques to identify the shortcoming in their method, work on it, improve it, and make their insights stable and valuable.

6. Reporting and Data Visualization

Perhaps the most important and often overlooked component of the discipline is the aspect of communicating the results in an easy to understand way. This requires innovation and creativity and is the reason that this field is open to all and not only to mathematicians, statisticians, or computer programmers. To quickly make people understand the complex insights discovered over weeks or even months, reports or presentations are created that have simple tables, bullet points, etc. On top of all this, visualizing the data plays a major role here as it allows the people in the leadership positions to quickly view where the organization is coming from and perhaps where they are headed. Business Analytics ought to know the various ways of visualizing the data, the transformation required to be done on the data to make it possible, and finding innovative ways to string together different information in a smooth storytelling method.

1.10. Difference Between Business Intelligence vs Business Analytics

Business Intelligence is the process comprising of technologies and strategies incorporated by the enterprise industries to analyze the existing business data which provides past (historical), current and predictive events of the business operations. Business Analytics is the process of technologies and strategies used to continue exploring and to extract the insights and performance from the past business information to drive successful future business planning.

Following is the difference between Business Intelligence and Business Analytics are as follows:

1. Business Intelligence uses past and current data whereas Business Analytics uses past data to extract insights and run the business operations that drive the customer needs and increase productivity.
2. Business Intelligence mostly concentrates on reporting the analyzed data whereas Business Analytics concentrates on multiple tools that perform different operational applications using different tools.
3. Business Intelligence almost comes under Business Analytics where Business Analytics contains Business Intelligence, data warehousing, information management, enterprise applications and governance, risk and security compliances.
4. Business Intelligence is the way of analyzing the existing data whereas Business Analytics will have Business Intelligence reports acts as inputs for the analytics to process the extracted information in a more sophisticated way to visualize the analyzed data.
5. Business Intelligence uses statistical analysis, predictive analysis, and predictive modeling to set the current trends and figure out the reasons for current outcomes or happenings whereas Business Analytics have no control over huge amounts of Data to retrieve, analyze, report and publish the data.
6. Business Intelligence consists more as User Interface Dashboards to carry out the analysis and operations whereas Business Analytics has a lot of tools to work upon and that also needs some software application knowledge to carry out the tasks to be done.
7. Business Intelligence gives insights or information about the data itself rather than making extra transformations or conversions to give data insights and on the other side Business Analytics involves the way of problem-solving by enabling the technologies by transforming the raw form of data into a meaningful way to convey the solution in an easy way.
8. Business Intelligence can be applied more to structured data from enterprise applications such as Financial Software Systems or Enterprise Resource Planning (ERP) to get insight from the past financial information or from the past financial transactions and in the areas of supply chain and operations. Business Analytics can be applied to both unstructured and semi-structured data by transforming them into some meaningful data before analyzing it to get insights from that data.
9. Business Intelligence consumes the data in the same format to get insights out of it whereas Business Analytics transforms or breaks the existing data into different forms or elements and studying them as a whole to get some insights out of it.

10. In Business Intelligence, the data can be produced in the form of Dashboards, reports or pivot tables for different users like executives, managers and for analysts respectively whereas Business Analytics uses past Business Intelligence capabilities and information to help the customers' highly productive in getting their jobs done.
11. Business Intelligence is the content of data what you are having with you whereas Business Analytics is the way how you are using or operating on that data to get your insights of out of that data.
12. Business Intelligence is all about accessing the big data Business Analytics is the use of different latest technological methodologies to handle the big data.
13. Business Intelligence is used to run the businesses effectively whereas Business Analytics is the way of changing the business to make it more productive and operations effective.
14. As Business Intelligence being the subset of Business Analytics and the benefits of Business Analytics are causing BA to get more popular and drawing attention from business users to get more useful things out of it.
15. Business Intelligence incorporates different tools and methodologies for use in the stages of data analysis in which the common types of tools include, data reporting, Real-Time analysis, Mapping Analysis, Online Analytical Processing, Dashboarding, etc., and Business Analytics incorporates different stages and phases of analyses such as SWOT analysis, use case modelling, predictive modelling, data modelling user stories, requirement analysis, functional requirement and non-functional requirement analysis etc.,

Business Intelligence and Business Analytics Comparison Table

Below is the comparison table between Business Analytics and Business Intelligence.

BASIS FOR COMPARISON	Business Intelligence	Business Analytics
Definition	Analyses past and present to drive current business needs	Analyses past data to drive current business

Usage	To run current business operations	To change business operations and improve productivity
Ease of Operations	For current business operations	For future business operations
Tools	SAP Business Objects, QlikSense, TIBCO, PowerBI etc.,	Word processing, Google docs, MS Visio, MS Office Tools etc.,
Applications	Apply to all large-scale companies to run current business operations	Applies to companies where future growth and productivity as its goal
Field	Comes under Business Analytics	Contains Data warehouse, information management etc.,

Two marks

1. What is Business Intelligence?
2. What is the need of Business intelligence?
3. List some of the features of business intelligence.
4. What is Business Analytics?
5. Difference between Business Intelligence and Business Analytics.
6. List the components of Business Intelligence.
7. List some of the examples of Business Intelligence.
8. List the components of Business Analytics.
9. List the different types of business analytics.
10. What is the need of Business Analytics?

10 marks

1. Explain about various components of Business Intelligence?
2. Explain various features of Business intelligence in detail?
3. Explain about the different types of Business Analytics?
4. Explain about the components of Business Analytics?
5. Compare and contrast Business Intelligence and Business Analytics.