

18AIE423T-BUSINESS
INTELLIGENCE AND ANALYTICS

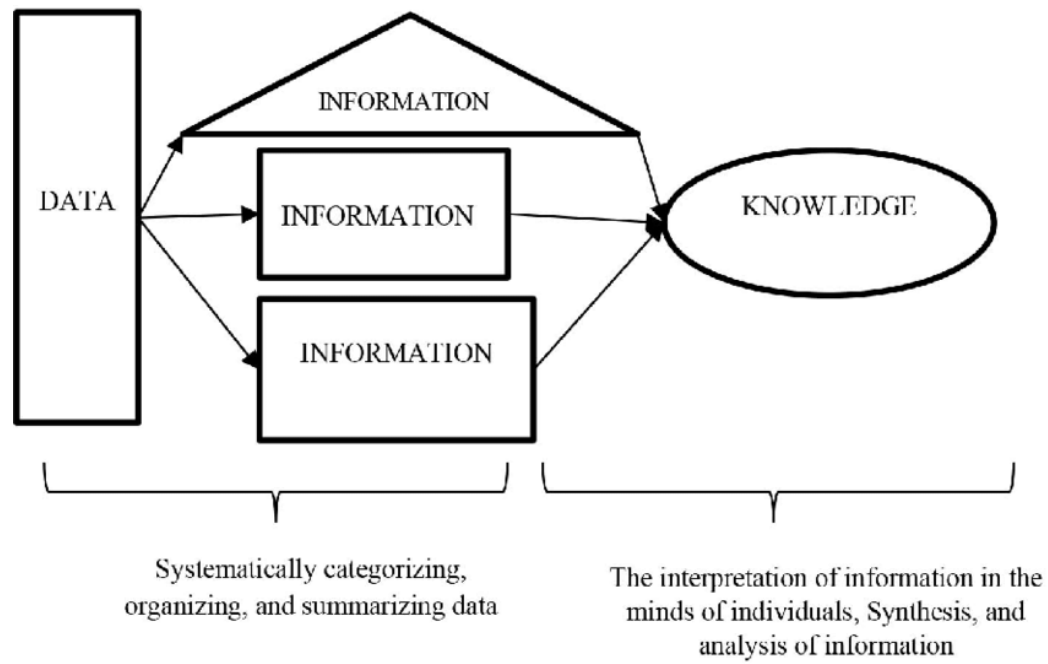
BUSINESS INTELLIGENCE AND ANALYTICS

- Business intelligence (BI) and analytics refers to the collective infrastructure, tools, applications, and other resources that generate data and insights, which in turn inform how businesses make decisions, uncover revenue opportunities, and evaluate performance.

UNIT-1 BUSINESS INTELLIGENCE

- 1.DATA, INFORMATION AND KNOWLEDGE
- 2.EFFECTIVE AND TIMELY DECISION
- 3.ROLE OF MATHEMATICAL MODELS
- 4.BUSINESS INTELLIGENCE &ARCHITECTURES
- 5.CYCLE OF A BUSINESS INTELLIGENCE ANALYSIS
- 6.ENABLEING FACTORS IN BUSINESS INTELLIGENCE PROJECTS
- 7.DEVELOPMENT OF A BUSINESS INTELLIGENCE SYSTEM
- 8.ETHICS AND BUSINESS INTELLIGENCE

DATA, INFORMATION AND KNOWLEDGE



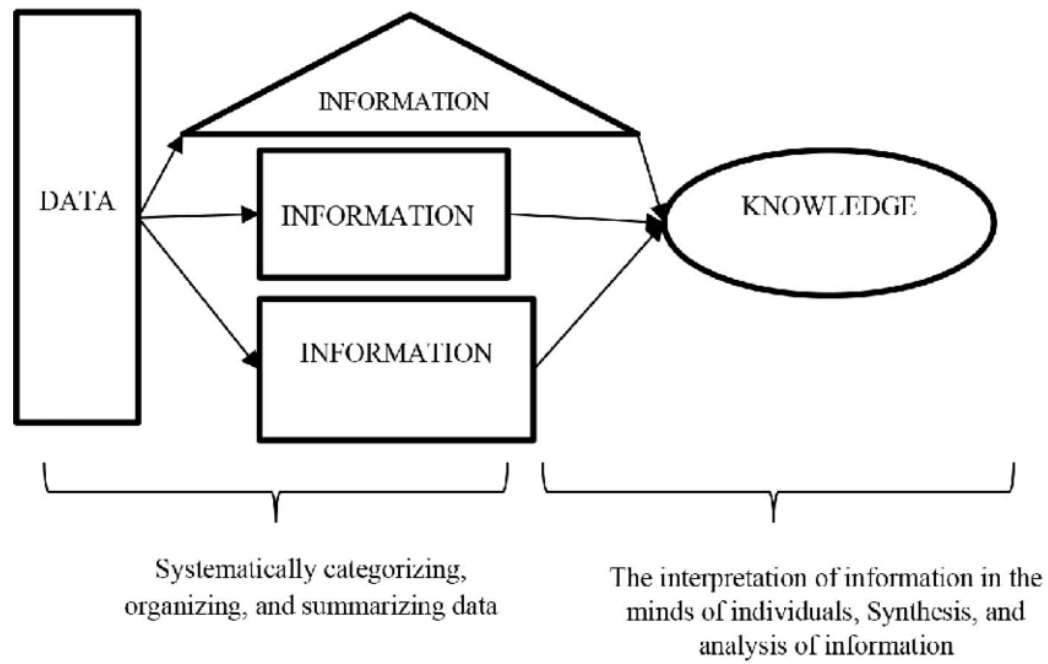
- **Data**

- This is the raw material, like individual puzzle pieces. In business intelligence, data can be anything from customer names and purchase history to website traffic numbers or product inventory levels. For example, in a retail store, data could be the daily sales figures, the number of products in stock, or customer feedback ratings.

- **Information**

- This is when you start organizing and analyzing the data to make sense of it. Going back to the puzzle analogy, information is when you start putting those puzzle pieces together to see a clearer picture. In business intelligence, this might mean combining sales data with marketing campaign results to understand which strategies are most effective. In a manufacturing setting, it could be correlating production rates with quality control metrics to optimize processes.

DATA, INFORMATION AND KNOWLEDGE



- **Knowledge**
 - This is the insight or understanding gained from analyzing information. It's the "aha" moment when patterns or trends emerge from the data that can be used to make informed decisions. For instance, in an e-commerce platform, knowledge could be realizing that certain products sell better during specific seasons, allowing the company to plan inventory and promotions accordingly. In a healthcare setting, knowledge might involve identifying trends in patient outcomes based on treatment protocols, leading to improved care practices.
 - So, in essence:
 - **Data** is the raw facts and figures.
 - **Information** is the organized and analyzed data that gives context.
 - **Knowledge** is the actionable insights gained from understanding the information.

EFFECTIVE AND TIMELY DECISION



- Business Intelligence (BI) empowers **effective and timely decision-making** with **real-time use cases and a diagram**.
- **Making Better Decisions with BI**
 - Imagine you're running a bakery. Traditionally, you might rely on intuition or experience to decide how many muffins to bake each day. But what if you could leverage data to make informed choices. BI helps you do just that! It analyzes data you collect to reveal insights that guide better decisions.
- **Real-time Benefits**
 - The beauty of BI lies in its ability to **process data as it happens**, allowing for **immediate action**.
 - This image depicts a traffic management center utilizing real-time traffic data for timely decision making.
 - **Raw data** is collected from sensors on roads and highways.
 - This data is then **processed** to show traffic flow, incidents, and congestion.
 - **Information analysts** see these visualizations and identify trouble spots.
 - Based on this information, they can make **timely decisions** such as:
 - Issuing traffic advisories.
 - Diverting traffic.
 - Adjusting traffic light timings.

Decision Making Process using Business Intelligence (BI) System



EFFECTIVE AND TIMELY DECISION

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Making Better Decisions with BI

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EFFECTIVE AND TIMELY DECISION

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Scenario 1: Peak Hour Rush - Your BI system shows a sudden surge in customer traffic. You can quickly decide to:

- **Call in extra staff to handle the rush.**
- **Adjust oven settings to bake more muffins faster.**

Scenario 2: Low Sales of Blueberry Muffins - Real-time data reveals low sales of blueberry muffins. You can:

- **Offer discounts or promotions to boost sales.**
- **Decide to bake fewer blueberry muffins the next day.**

BI in Action : Decision making process



Real-time Data: Sales figures and inventory levels are continuously fed into the BI system.

BI Analysis: Powerful algorithms analyze the data to identify trends, patterns, and potential issues.

Insights & Trends: The system reveals valuable insights, like peak hour sales or declining muffin sales.

Decision Support: Based on these insights, BI suggests actionable options.

Effective Decisions: You can make informed decisions, like calling in extra staff or adjusting baking plans.

- **With BI, you're not just reacting to situations; you're proactively making choices based on real-time data, leading to:**
 - **Reduced costs** through optimized inventory management.
 - **Increased sales** by catering to customer preferences.
 - **Improved efficiency** by streamlining operations based on real-time demand.

BI empowers you to transform data into a powerful tool for making effective and

BI in Action : Decision making process

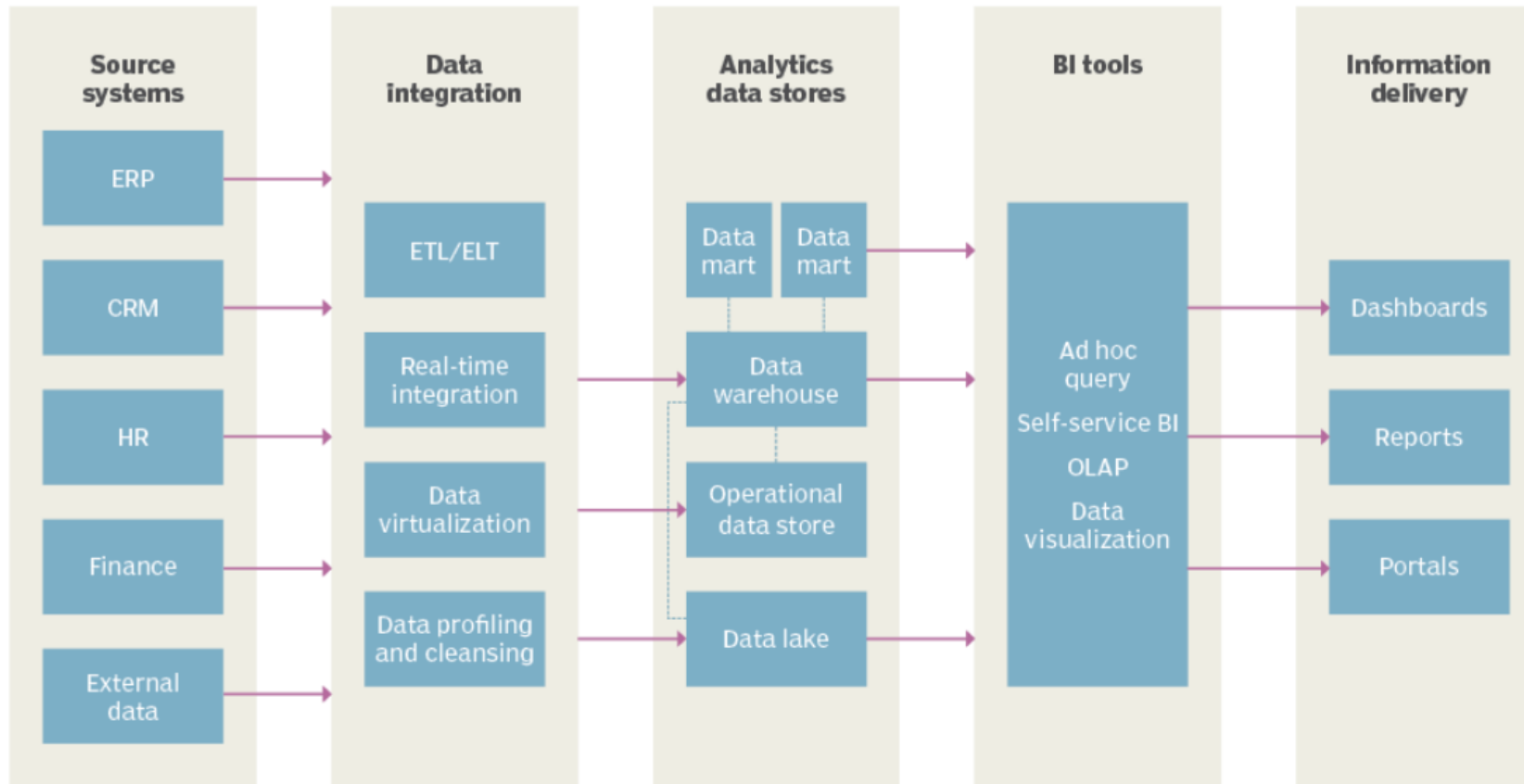
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BI empowers you to transform data into a powerful tool for making effective and timely decisions, giving your bakery a competitive edge.

Sample diagram of a business intelligence architecture



Types of BI and its architecture with real-time use case

Reporting BI: This is the bread and butter of BI, focusing on generating reports and dashboards with **historical data**.

- Use Case: A retail store uses reporting BI to track daily sales figures and identify top-selling products.

Analytical BI: This type delves deeper, using **data mining and analytics techniques** to uncover patterns and trends.

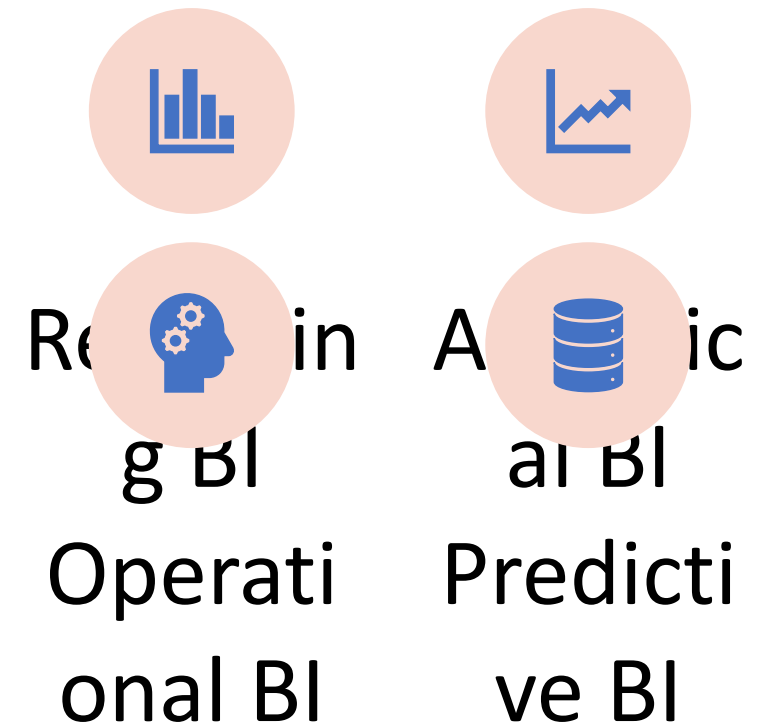
- Use Case: A manufacturing company uses analytical BI to analyze production line data and identify areas for improvement.

Operational BI: This focuses on **real-time data** to monitor **ongoing business processes** and make immediate decisions.

- Use Case: A hospital uses operational BI to track patient wait times and optimize resource allocation.

Predictive BI: This type leverages advanced analytics and machine learning to **predict future trends** and customer behavior.

- Use Case: An e-commerce platform uses predictive BI to recommend products to customers based on their purchase history.



BI Architectures

Traditional BI Architecture

- This separates data storage (data warehouse) from the analysis tools (data marts).

Think of it as a library: The data warehouse is the main library with all the books (data), and data marts are smaller collections focusing on specific departments or functions.

Cloud-Based Architecture

- This leverages cloud computing for data storage, processing and analysis.

Imagine a digital library: All the data and tools are accessible online, offering scalability and flexibility.

BI Architectures – Real time use case

Traditional BI
Architecture



A social media company wants to track user engagement in real-time (Operational BI). They can use a **cloud-based BI architecture** to:



- Collect real-time data on likes, shares, and comments.
- Analyze the data to identify trending topics and adjust content strategy immediately.

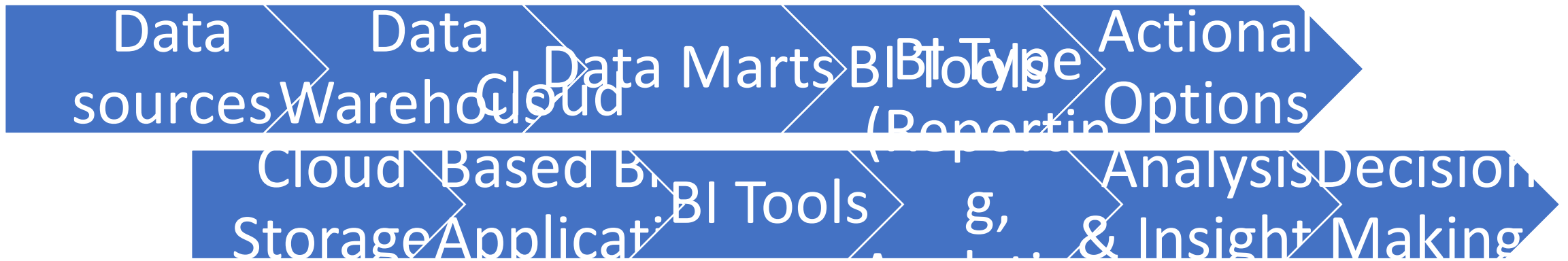
Cloud-
Based
Architecture



A bank wants to analyze customer spending patterns to predict potential fraud (Predictive BI). They might use a **traditional BI architecture** with:

- A data warehouse storing historical customer transaction data.
- Data marts focusing on fraud analysis, allowing them to identify suspicious activity patterns and prevent fraud attempts.

BI Architecture



Real-time Data: Sales figures and inventory levels are continuously fed into the BI system.

- Data is collected from various sources.
- In a traditional architecture, data flows to a central data warehouse for storage. Data marts can be created for specific analysis needs.
- In a cloud-based architecture, data might be stored directly in cloud storage.
- BI tools analyze the data based on the chosen BI type (reporting, analytical, etc.).
- The analysis provides insights for effective decision-making.
- By understanding different BI types and architectures, businesses can choose the right solution to gain valuable insights from their data and make data-driven decisions in real-time.

Cycle of a Business Intelligence Analysis

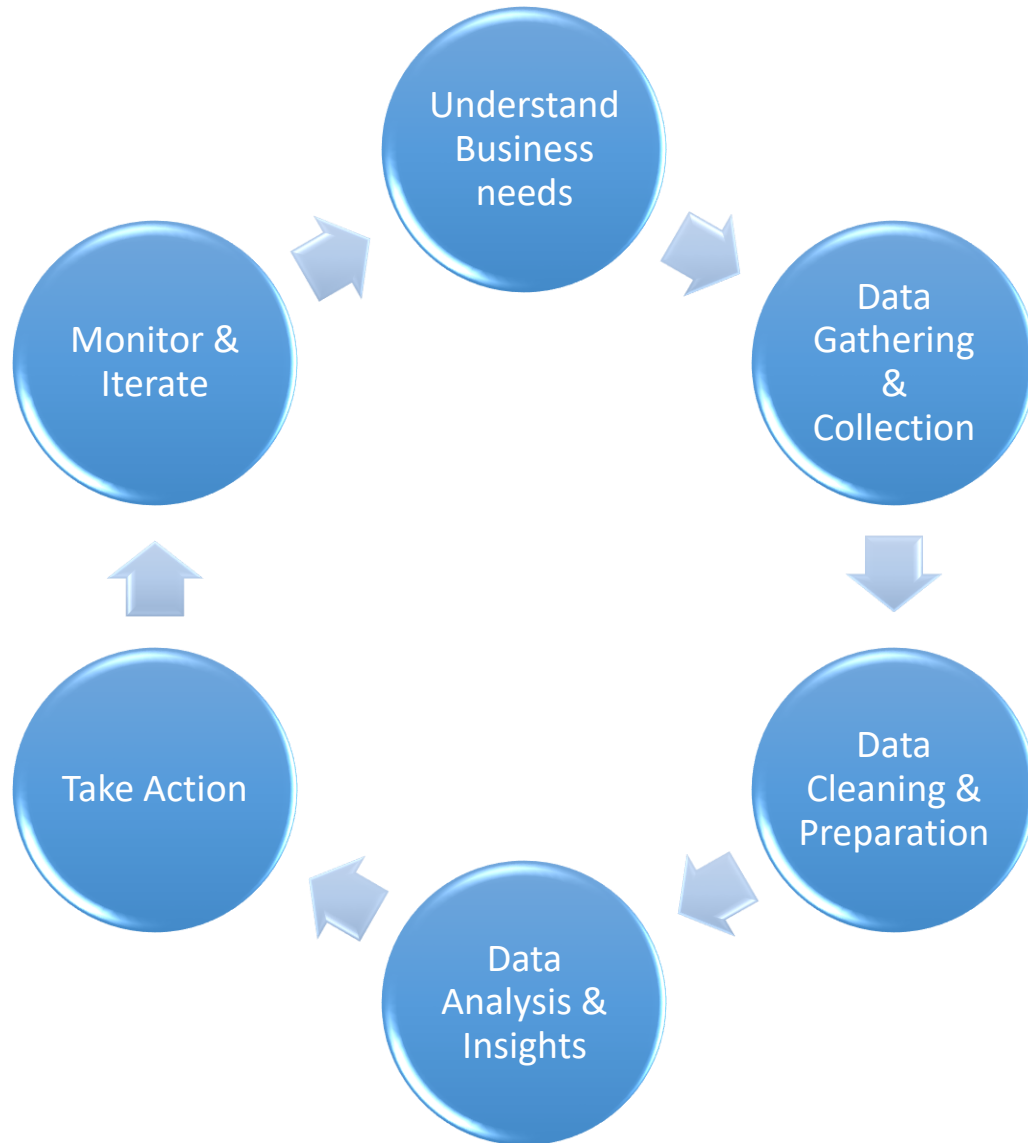
The Business Intelligence (BI) Analysis Cycle into simpler terms with a helpful diagram and real-life examples:

The BI Analysis Cycle

Imagine the BI Analysis Cycle as a loop with six key stages that continuously improve your business decisions through data. Here's a breakdown of each stage:

- **Understanding Business Needs:** This is where you ask questions like "What are we trying to achieve?" or "What problems are we facing?". Think of a clothing retailer. They might want to understand customer buying trends to optimize their stock.
- **Data Gathering:** Here, you collect relevant data from various sources like sales figures, customer demographics, and website traffic. In our clothing store example, this would involve sales data, customer information, and website analytics.
- **Data Cleaning & Preparation:** Not all data is perfect! You may need to fix errors, remove duplicates, and format it consistently for analysis. Imagine the clothing store's data might have missing sizes or misspelled product names. Cleaning ensures accuracy.
- **Data Analysis & Insights:** This is where the magic happens! You use BI tools to analyze the cleaned data, identify patterns, and generate insights. For the clothing store, this could involve analyzing which styles and sizes sell best by location or demographic.
- **Taking Action:** Based on the insights, you make data-driven decisions to improve your business. The clothing store might decide to stock more of their best-selling items in certain locations or offer targeted promotions.
- **Monitoring & Iteration:** The BI cycle is continuous. You monitor the results of your actions, see if they're effective, and refine your approach as needed. The clothing store might track sales changes after implementing their decisions and adjust their strategy accordingly.

Cycle of a Business Intelligence Analysis



Imagine a ride-hailing app like Uber.

They use the bicycle to:

- Understand Needs: Reduce rider wait times and optimize driver efficiency.
- Data Gathering: Track ride requests, driver locations, and traffic patterns.
- Data Analysis: Identify peak demand areas, analyze driver routes, and predict wait times.
- Taking Action: Adjust pricing dynamically based on demand, suggest optimal routes to drivers, and strategically position drivers.
- Monitoring & Iteration: Track the impact of changes, gather user feedback, and refine their strategy for continuous improvement.

By following the BI Analysis Cycle, businesses can leverage data to make smarter choices, improve efficiency, and gain a competitive edge.

Enabling Factors in BI Projects: Keys to success

The Business Intelligence (BI) project might have a well-defined cycle, but its success relies on several crucial enabling factors. Here's a breakdown of these factors with a diagram and real-world examples to illustrate their importance:

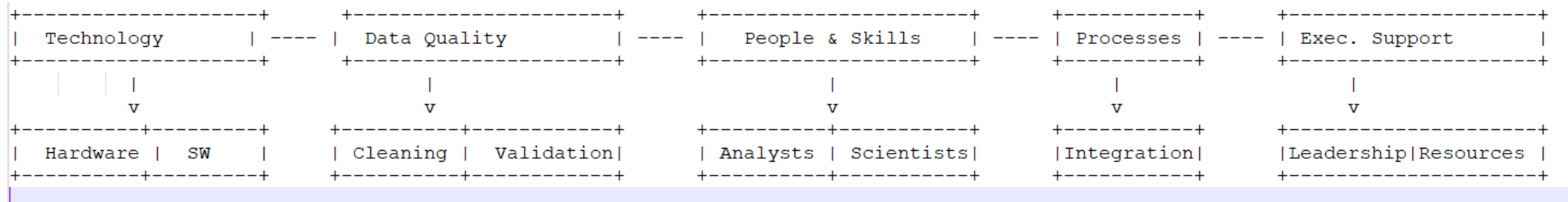
Enabling Factors for BI Projects

Imagine these factors as the building blocks that support a successful BI project. Here are the key ones:

- 1. Technology:** This includes hardware, software, and data storage solutions. Powerful computers, robust data warehouses, and user-friendly BI tools are essential for efficient data processing, analysis, and visualization.
 - Real-time Use Case:** A retail giant uses advanced analytics software to analyze customer behavior on their website in real-time. This allows them to tailor product recommendations and promotions for each visitor, boosting sales.
- 2. Data Quality:** Clean, accurate, and consistent data is the foundation of any BI project. Processes for data cleansing, validation, and governance ensure reliable insights.
 - Real-time Use Case:** A healthcare provider implements a data quality framework to ensure patient records are accurate and complete. This enables them to analyze trends, predict potential outbreaks, and deliver better patient care.
- 3. People & Skills:** A skilled team is crucial. BI analysts, data scientists, and business users who understand data and how to interpret it are essential for success.
 - Real-time Use Case:** A bank invests in training its marketing team on data analysis tools. This empowers them to analyze customer demographics and target their marketing campaigns more effectively.

Enabling Factors in BI Projects: Keys to success

4. **Business Process & Culture:** BI should be integrated into existing business processes. Fostering a data-driven culture where data is valued and used for decision-making is critical.
 - **Real-time Use Case:** A manufacturing company encourages all departments to share data and collaborate on BI initiatives. This holistic approach helps them identify production bottlenecks and optimize their operations.
5. **Executive Support:** Strong leadership buy-in is essential. Executives who champion BI projects and allocate necessary resources ensure their success.
 - **Real-time Use Case:** A CEO mandates the use of data-driven insights for all strategic decisions within the company. This commitment from leadership drives the adoption of BI across the organization.



Interconnectedness of Enabling Factors

- These factors are interconnected. For instance, good data quality allows for robust analysis using powerful technology. A skilled team can then translate insights into actionable decisions with executive support.

DEVELOPMENT OF A BUSINESS INTELLIGENCE SYSTEM

Real-Time Use Case:

Imagine a clothing retail chain is building a BI system.

Needs: They want to understand customer buying trends and optimize inventory.

Data Sources: Sales data, customer demographics, website analytics, and fashion trend reports.

Data Transformation: Clean and organize customer data, categorize products, and format website traffic data.

Data Warehouse & Mart Design: A central data warehouse stores all information, with a separate data mart focusing on customer purchases and trends.

BI Tools: They choose a user-friendly BI tool with features for sales analysis and customer segmentation.

Reports & Dashboards: They develop reports on popular styles and create dashboards showing sales by region and customer demographics.

Deployment & Training: The system is rolled out to store managers and buyers, with training on using the dashboards to make data-driven decisions about stock levels and promotions.

By following these steps and focusing on your specific needs, you can develop a BI system that empowers your business with valuable data insights. Remember, your BI system is an ongoing process. As your needs evolve, you can adapt and refine it to continuously improve your decision-making

DEVELOPMENT OF A BUSINESS INTELLIGENCE SYSTEM

Imagine you're building a house to gather and understand information about your business. Here's a breakdown of the development process for a Business Intelligence (BI) system, explained simply with real-world examples:

- 1. Define Your Needs (Laying the Foundation):** Just like a house needs a blueprint, your BI system needs clear goals. Ask questions like:
 - What problems are we trying to solve? (e.g., Reduce marketing campaign waste)
 - What decisions need data support? (e.g., Optimizing product inventory)
- 2. Identify Data Sources (Gathering Materials):** Data is the building material for your BI system. It can come from various sources:
 - Internal Data: Sales figures, customer records, website traffic (Imagine bricks from your company's existing operations)
 - External Data: Market research, industry trends (Imagine pre-fabricated walls with valuable external insights)
- 3. Data Extraction & Transformation (Preparing the Materials):** The data might not be ready-to-use. You might need to:
 - Extract: Pull data from different sources (Think of collecting bricks and walls from different locations)
 - Transform: Clean, format, and organize the data for consistency (Imagine shaping the bricks and walls to fit together)
- 4. Data Warehouse & Data Mart Design (Building the Structure):** A data warehouse acts as a central repository for all your data, while a data mart focuses on specific business areas. Think of them as:
 - Data Warehouse: The main house structure storing all the information (like a central storage room)
 - Data Mart: Focused sections for specific departments (like a dedicated kitchen or marketing room)
- 5. Choosing BI Tools (The Tools & Tech):** There are various BI software options to help you analyze data and generate insights. Choose one that:
 - Meets your needs (budget, complexity)
 - Integrates with your existing systems
 - Offers user-friendly dashboards and visualizations (Imagine hammers, saws, and easy-to-use blueprints for data analysis)
- 6. Develop Reports & Dashboards (Creating Visibility):** Turn your data into clear and actionable insights through:
 - Reports: Detailed breakdowns of specific data sets (Think of blueprints for specific reports on sales or marketing)
 - Dashboards: Real-time visual representations of key metrics (Imagine control panels showing sales figures and customer trends)
- 7. Deployment & Training (Moving In & Learning the Ropes):** Make your BI system accessible to authorized users and provide training on:
 - Using the BI tools and dashboards
 - Interpreting the data and insights

ETHICS AND BUSINESS INTELLIGENCE

Business Intelligence (BI) systems are powerful tools, but with great power comes great responsibility. Here's a breakdown of key ethical considerations for building a BI system, along with real-world examples:

1. Data Privacy:

- Ethical Principle: Respect user privacy by being transparent about data collection and usage.
- Real-time Use Case: An e-commerce website informs users about what data they collect (purchase history, browsing behavior) and how it's used to personalize product recommendations (improves user experience but protects privacy with transparency).

2. Data Security:

- Ethical Principle: Securely store and protect sensitive data from unauthorized access or breaches.
- Real-time Use Case: A healthcare provider encrypts patient data and restricts access only to authorized medical personnel (ensures patient data confidentiality and reduces risk of identity theft).

3. Fairness & Bias:

- Ethical Principle: Avoid algorithms or data sets that perpetuate bias or discrimination.
- Real-time Use Case: A bank reviews its loan approval algorithms to ensure they don't unfairly disadvantage certain demographics based on past data (promotes fair lending practices and avoids perpetuating societal biases).

4. Transparency & Explainability:

- Ethical Principle: Ensure users understand how data is analyzed and how it generates insights.
- Real-time Use Case: A social media platform explains how user engagement data is used to curate news feeds, allowing users to make informed choices about their data usage (increases user trust and empowers informed decision-making).

5. Accountability & Oversight:

- Ethical Principle: Establish clear ownership and accountability for data collection, analysis, and decision-making.
- Real-time Use Case: A city government appoints a data ethics committee to review the use of citizen data in traffic management systems (ensures responsible use of data and avoids misuse for surveillance).

ETHICS AND BUSINESS INTELLIGENCE

- Remember: Ethical considerations are not a one-time fix. Regularly review your BI system and practices to ensure they remain ethical and responsible.
- Additional Tips:
 - • Obtain user consent for data collection whenever possible.
 - • Anonymize data whenever it doesn't affect analysis.
 - • Be clear about the limitations of your data and avoid drawing misleading conclusions.