# Business Intelligence

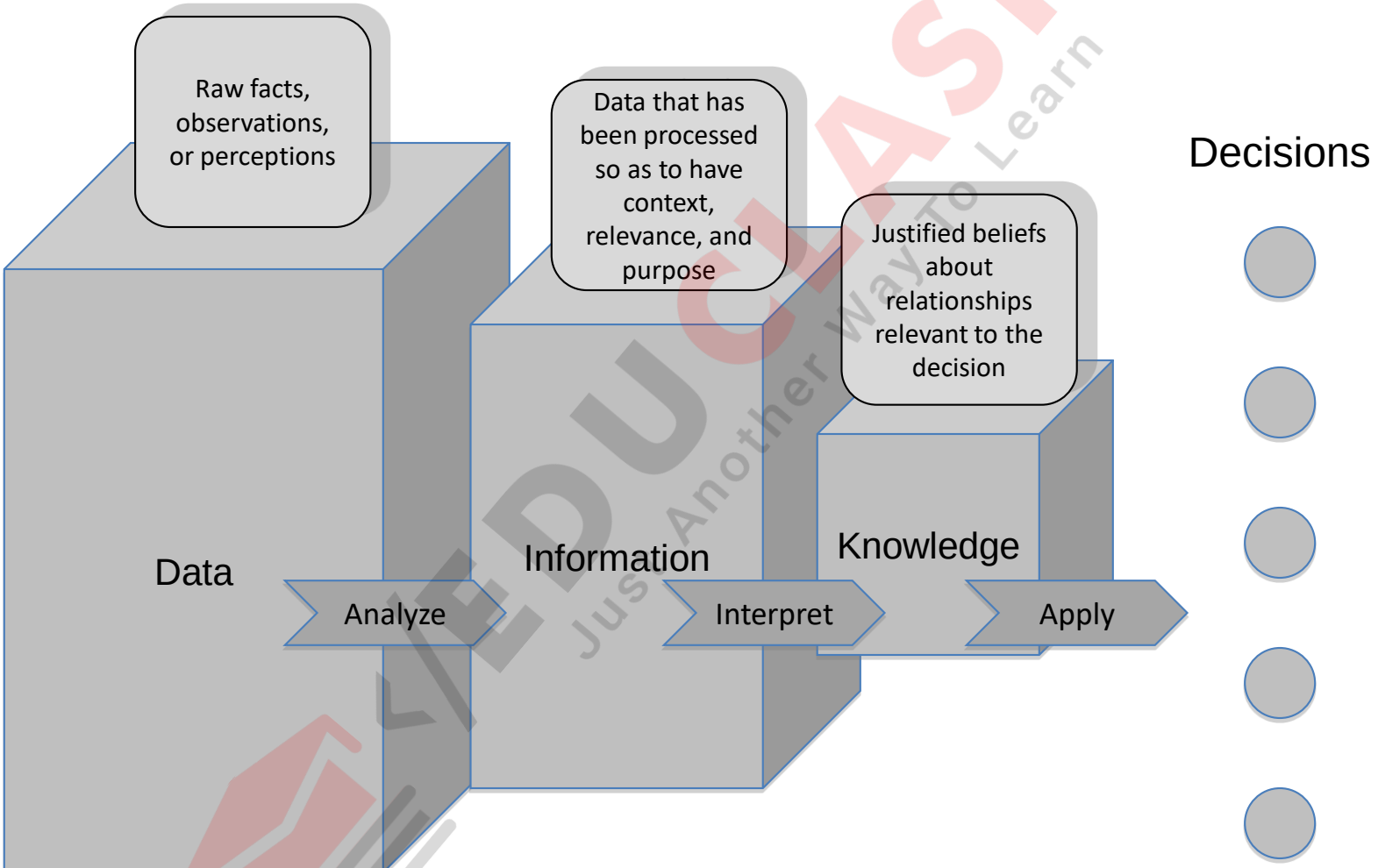
# Outline

- Examples of Business Intelligence (BI)
- Data, Information, and Knowledge
- What is BI
- Factors that drive BI
- BI and Related Technologies
- BI in contemporary organizations
  - Improvement in Operational Performance
  - Improvement in Customer Service
  - Identification of New Opportunities in Contemporary Organizations

# Business Intelligence – A Highly Important Field

- Benefits
  - Management effectively aided
  - Intellectual capital better deployed
  - Business operations improved
  - Customer service enhanced
  - New opportunities identified

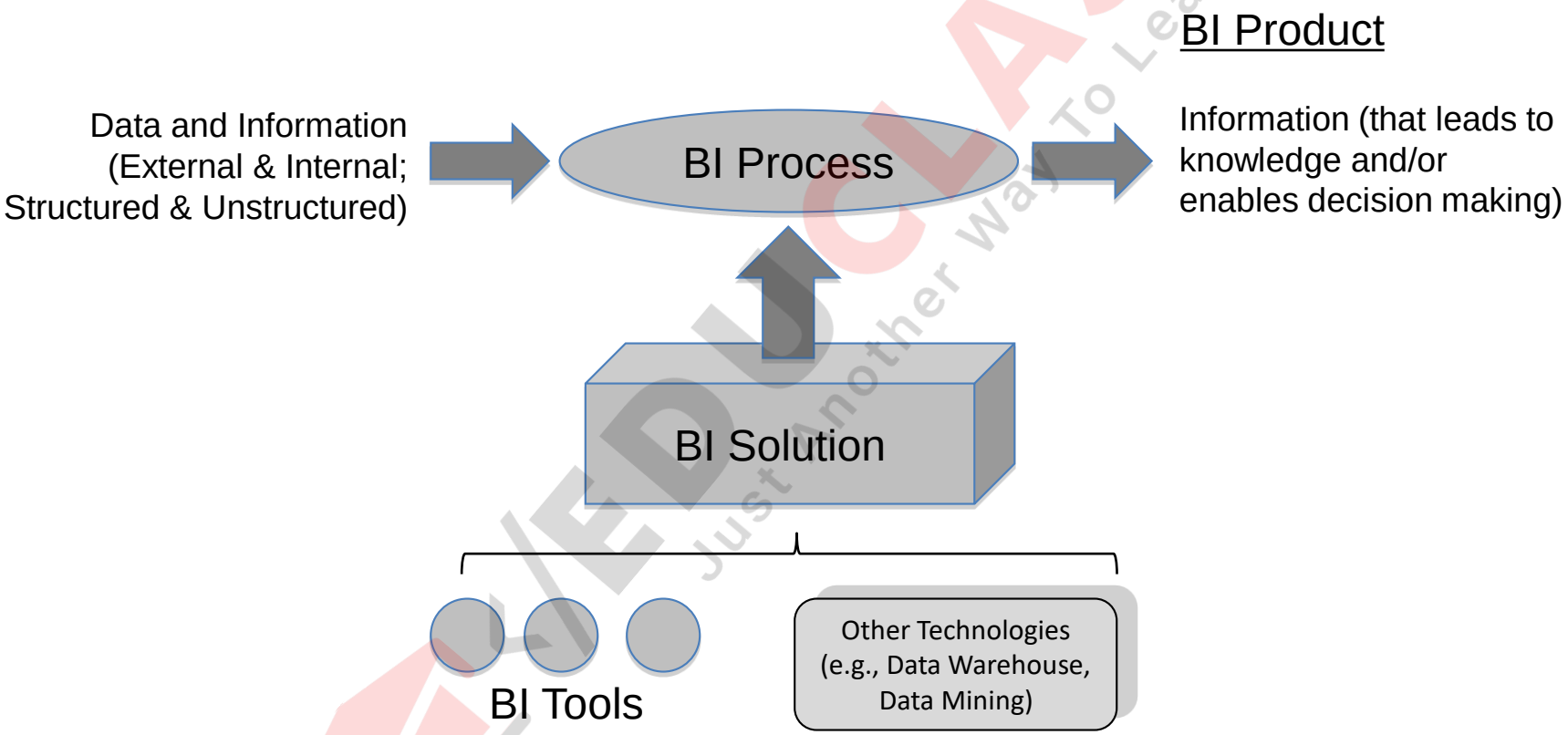
# Data, Information, Knowledge, and Decisions



# What is Business Intelligence (BI)?

- Information technology which provides decision makers with valuable information and knowledge by leveraging a variety of data sources as well as structured and unstructured information.
  - Data sources external or internal to the organization
  - Information quantitative or qualitative
  - Output: knowledge
  - Input: information and data
- Business intelligence tools: used in BI solutions
- Business solutions: support the BI process

# BI Product, Process, Solution, and Tools



# Factors that drive BI

- Exploding data volumes
  - Cheaper storage
  - More electronic connections (Internet, intranet,…)

**BI solutions provide managers the ability to more effectively utilize these larger data volumes**

# Factors that drive BI

- Need for quick reflexes
  - Faster pace of change (volatility)
  - Windows of opportunity close rapidly
  - Overcome processing delays
    - Converting data from variety of sources
    - Integrating information across sources
    - Making the results available to the decision maker

**BI solutions help address each of the three types of delays.**

# Factors that drive BI

- Technological Progress
  - Decision Support Systems (DSS)
  - Enterprise Resource Planning Systems (ERPS)
  - Data warehousing
  - Data mining
  - Text mining

**BI vendors have the necessary inputs for developing effective BI tools, and organizations adopting them have the platform to make BI solutions most effective**

# BI is not KM

Knowledge Management (KM)

- Inputs
  - Information
  - Knowledge
- Output
  - Creation of new knowledge
  - Conversion to another form of knowledge
  - Application of knowledge in making a decision

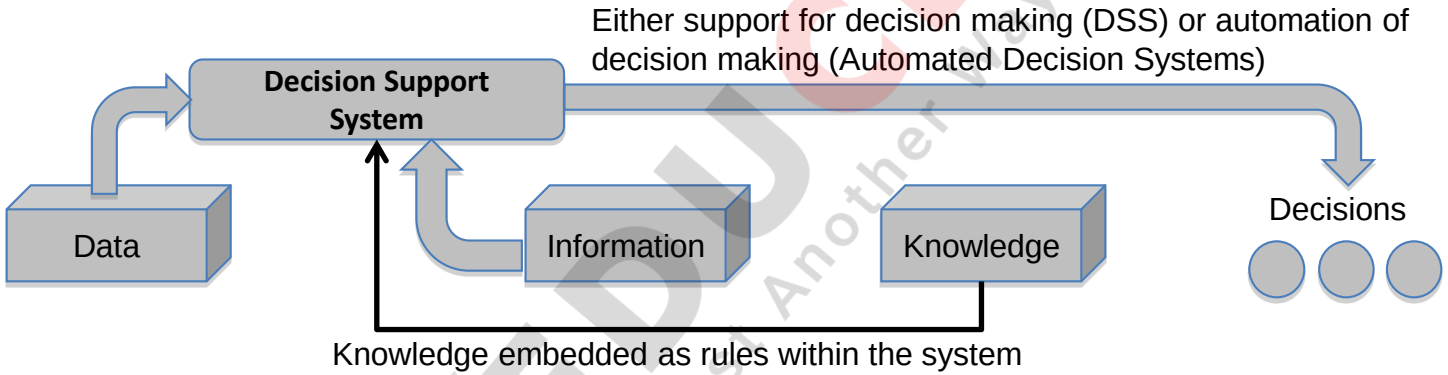
Business Intelligence (BI)

- Inputs
  - Data
  - Information
- Output
  - Information presented in a friendly fashion
  - New knowledge or insight

# Data warehousing, Data mining and Decision support systems

- Data warehouse
  - A single logical repository for an organizations data
- Data mining
  - The process of discovering hidden patterns from data stored electronically (ex. in a data warehouse)
- Decision support systems
  - Use data as input along with prior knowledge and external data to create rules that guide decisions
- Business Intelligence
  - Presents information to individuals with little technical expertise

# Roles of Data, Information, and Knowledge in Decision Support Systems



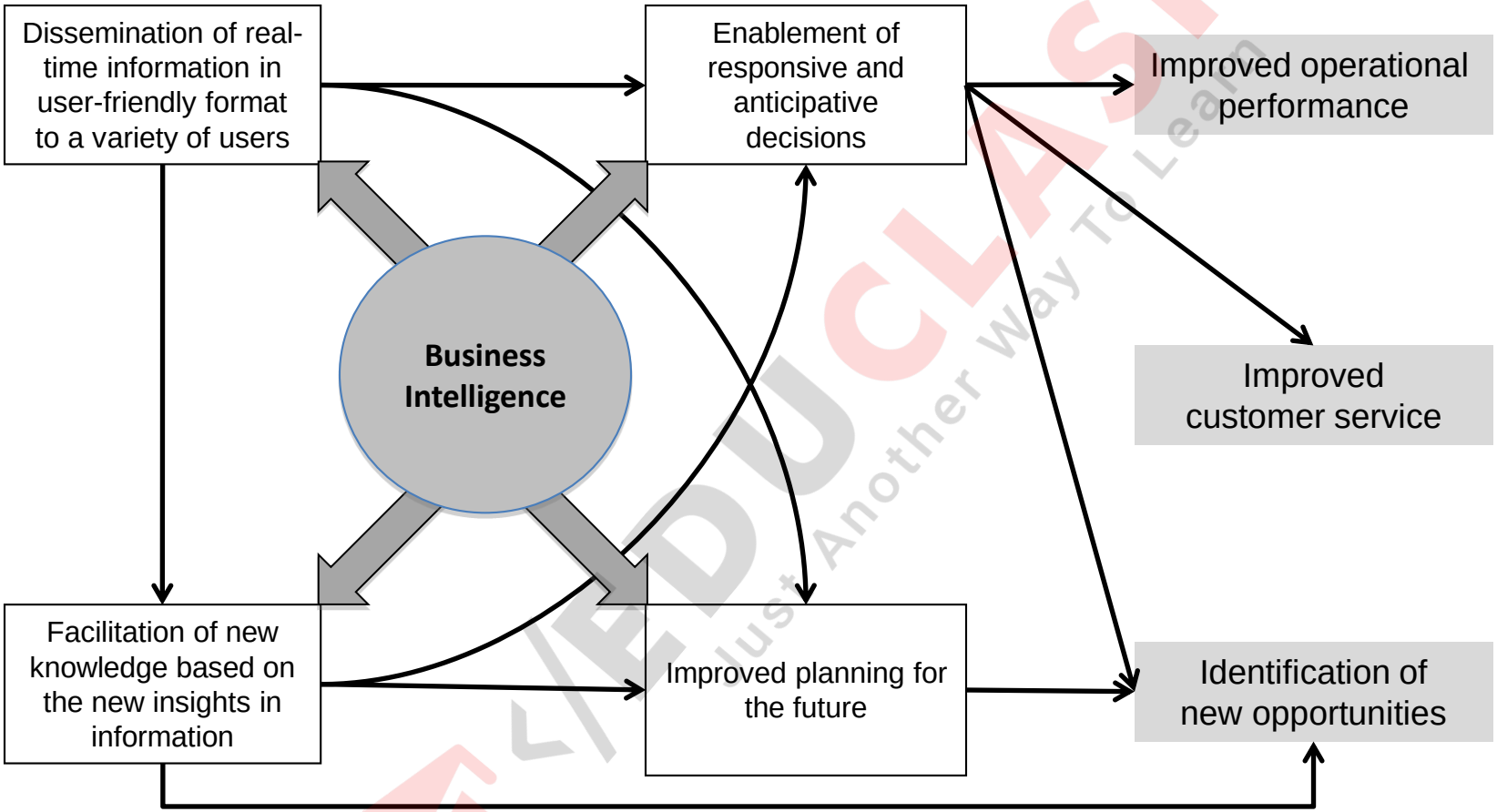
# Four Contributions of BI

- Dissemination of user-friendly, real-time information
- Creation of new knowledge based on the past
- Responsive and anticipative decisions
  - Decision-making based more closely on all the latest information
  - Incorporate predictions regarding the future
- Improved planning for the future
  - More effective use of information
  - Use of past data for predictions about the future
  - Development of knowledge based on information about the past

# Three Benefits of BI to Organizational Success

- Improvement in operational performance
  - Provide real-time information on performance of Org.
  - Help make organizations more efficient
- Improvement in customer service
  - Improve quality of customer service provided
  - Identify problems and potential solutions quickly
  - Reduce customer concerns and improve retention
- Identification of new opportunities
  - Facilitate new insights through discovery of unknown patterns
  - Track innovative projects more effectively

# Impacts of Business Intelligence



# BI Applications

# Data Mining Applications

- Some application domains
  - Data Mining for Financial data analysis
  - Data Mining for Retail and Telecommunication Industries
  - Data Mining in Science and Engineering
  - Data Mining for Intrusion Detection and Prevention
  - Data Mining and Recommender Systems

# Financial Data Analysis

- Financial data collected in banks and financial institutions are often relatively complete, reliable, and of high quality
- Design and construction of data warehouses for multidimensional data analysis and data mining
  - View the debt and revenue changes by month, by region, by sector, and by other factors
- Loan payment prediction/consumer credit policy analysis
  - feature selection and attribute relevance ranking
  - Loan payment performance
  - Consumer credit rating

# Financial Data Analysis

- Classification and clustering of customers for targeted marketing
  - multidimensional segmentation by nearest-neighbor, classification, decision trees, etc. to identify customer groups or associate a new customer to an appropriate customer group
- Detection of money laundering and other financial crimes
  - integration of from multiple DBs (e.g., bank transactions, federal/state crime history DBs)
  - Tools: data visualization, linkage analysis, classification, clustering tools, outlier analysis, and sequential pattern analysis tools (find unusual access sequences)

# Retail & Telcomm. Industries

- Retail industry: huge amounts of data on sales, customer shopping history, e-commerce, etc.
- Applications of retail data mining
  - Identify customer buying behaviors
  - Discover customer shopping patterns and trends
  - Improve the quality of customer service
  - Achieve better customer retention and satisfaction
  - Enhance goods consumption ratios
  - Design more effective goods transportation and distribution policies
- Telcomm. and many other industries: Share many similar goals and expectations of retail data mining

# Retail Industry

- Design and construction of data warehouses
- Multidimensional analysis of sales, customers, products, time, and region
- Analysis of the effectiveness of sales campaigns
- Customer retention: Analysis of customer loyalty
  - Use customer loyalty card information to register sequences of purchases of particular customers
  - Use sequential pattern mining to investigate changes in customer consumption or loyalty
  - Suggest adjustments on the pricing and variety of goods
- Product recommendation
- Fraudulent analysis and the identification of usual patterns
- Use of visualization tools in data analysis

# Science and Engineering

- Data warehouses and data preprocessing
  - Resolving inconsistencies or incompatible data collected in diverse environments and different periods (e.g. eco-system studies)
- Mining complex data types
  - Spatiotemporal, biological data
- Visualization tools and domain-specific knowledge
- Data mining in computer science: monitoring systems, software bugs, network intrusion

# Intrusion Detection and Prevention

- Majority of intrusion detection and prevention systems use
  - Signature-based detection: use signatures, attack patterns that are preconfigured and predetermined by domain experts
  - Anomaly-based detection: build profiles (models of normal behavior) and detect those that are substantially deviate from the profiles
- What data mining can help
  - New data mining algorithms for intrusion detection
  - Association, correlation, and pattern analysis help select and build classifiers
  - Analysis of stream data: outlier detection, clustering, model shifting
  - Visualization and querying tools