

LEADERSHIP MOMENT

*“Only three things happen naturally
in organizations: friction, confusion,
and underperformance. Everything
else requires leadership.”*

Peter Drucker

Objectives & Reminders

Objectives for today

1. *Big Data Analytics*

I. *Decision Making*

II. *Mass data*

III. *Who uses it*

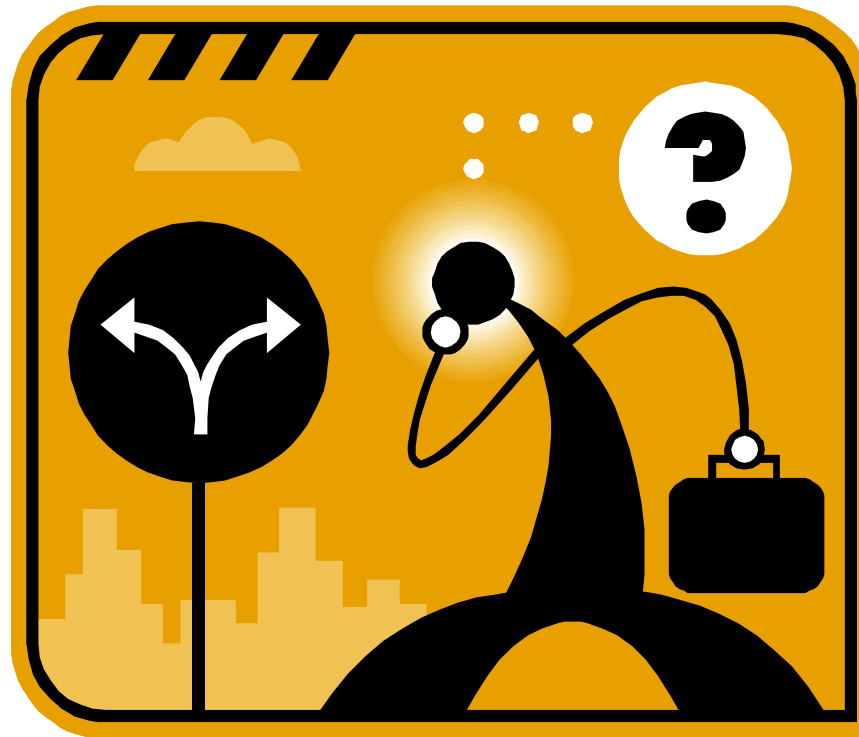
IV. *KS*



Reminders:

- ⦿ Market basket – individual submission
- ⦿ Kickstarter (5) – group submission
- ⦿ Lab Feb 13
- ⦿ Market Basket due by Feb 14th @ 23:55
- ⦿ Midterm – Feb 27th @ 6:30
- ⦿ Lab Mar 6
- ⦿ Lab Mar 13
- ⦿ Quiz Mar 31
- ⦿ FINAL project Update due by Mar 6th @ 23:55
- ⦿ FINAL Project due by Apr 7 @ 23:55
- ⦿ Final Presentations Apr 7 & 9
- ⦿ FINAL exam - TBD





BIG DATA ANALYTICS/DECISION MAKING

DATA-DRIVEN DECISION MAKING

- ③ We live in an era of big data.
 - ③ Whether you work in financial services, consumer goods, travel and transportation, or industrial products, analytics are becoming a competitive necessity for your organization.
- ③ What does the shift toward data-driven decision making mean for you?
 - ③ Start by thinking of yourself as a consumer of analytics

A BANKING EXAMPLE

- I don't know why we didn't get the mortgages off our books, I had a model strongly indicating that a lot of them wouldn't be repaid, and I sent it to the head of our mortgage business.” (Analyst)
- “If the analyst showed me a model, it wasn't in terms I could make sense of. I didn't even know his group was working on repayment probabilities.” (Manager)
- The bank ended up losing billions in bad loans.

BIG DATA CHARACTERISTICS

Traditional data

- ⊙ Documents
- ⊙ Finances
- ⊙ Stock reports
- ⊙ Personnel files

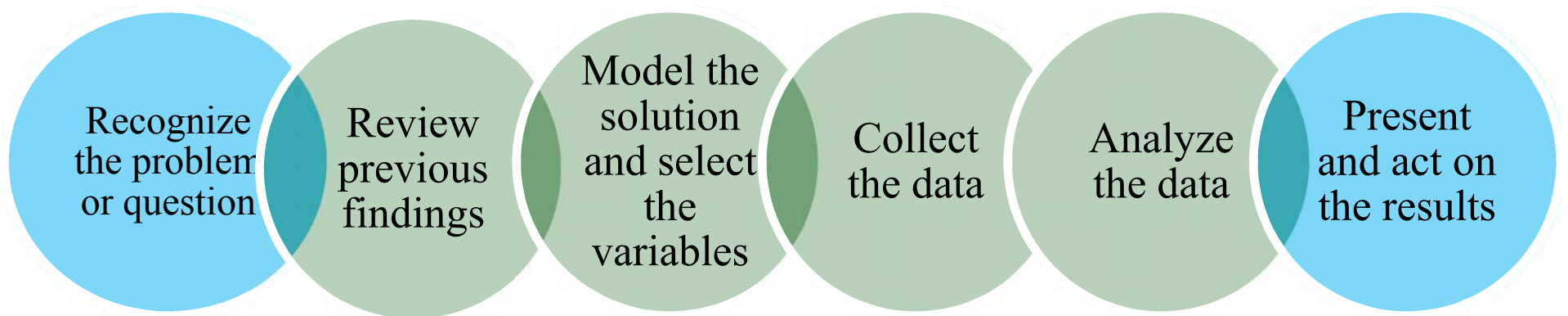
BIG DATA

- ⊙ Photographs
- ⊙ Audio/video
- ⊙ 3D models
- ⊙ Simulations
- ⊙ Location data

BIG DATA: VOLUME, VELOCITY, VARIETY (3V'S)

ANALYTICS-BASED DECISION MAKING-IN SIX KEY STEPS

When using big data to make big decisions, non-quants should focus on the first and the last steps of the process.



Adapted from “Keep up with Your Quants”, Harvard business review July-August 2013

GROUP EXERCISE

- ③ Why do managers make bad decisions? What challenges do they face?
- ③ How can Information Systems help for decision-making?

WHY DO MANAGERS MAKE BAD DECISIONS? WHAT CHALLENGES DO THEY FACE?

- ⊙ Poor decision making skills
- ⊙ Time pressures
- ⊙ Relying too much on intuition
- ⊙ Being over-confident in decision-making skills, intelligence or knowledge of the decision context
- ⊙ Going with the group (group think)
- ⊙ Addressing the wrong objective.

INFORMATION OVERLOAD

- Over 2.5 exabytes of data created annually
- Exponential growth in data storage capacity in organizations
- Directly related to Moore's Law
- Capacity increases as costs decrease

Drowning in data &
starving for information

Kilobyte (KB)

Megabyte (MB)

Gigabyte (GB)

Terabyte (TB)

Petabyte (PB)

Exabyte (EB)

OPERATIONAL DATA PROBLEMS

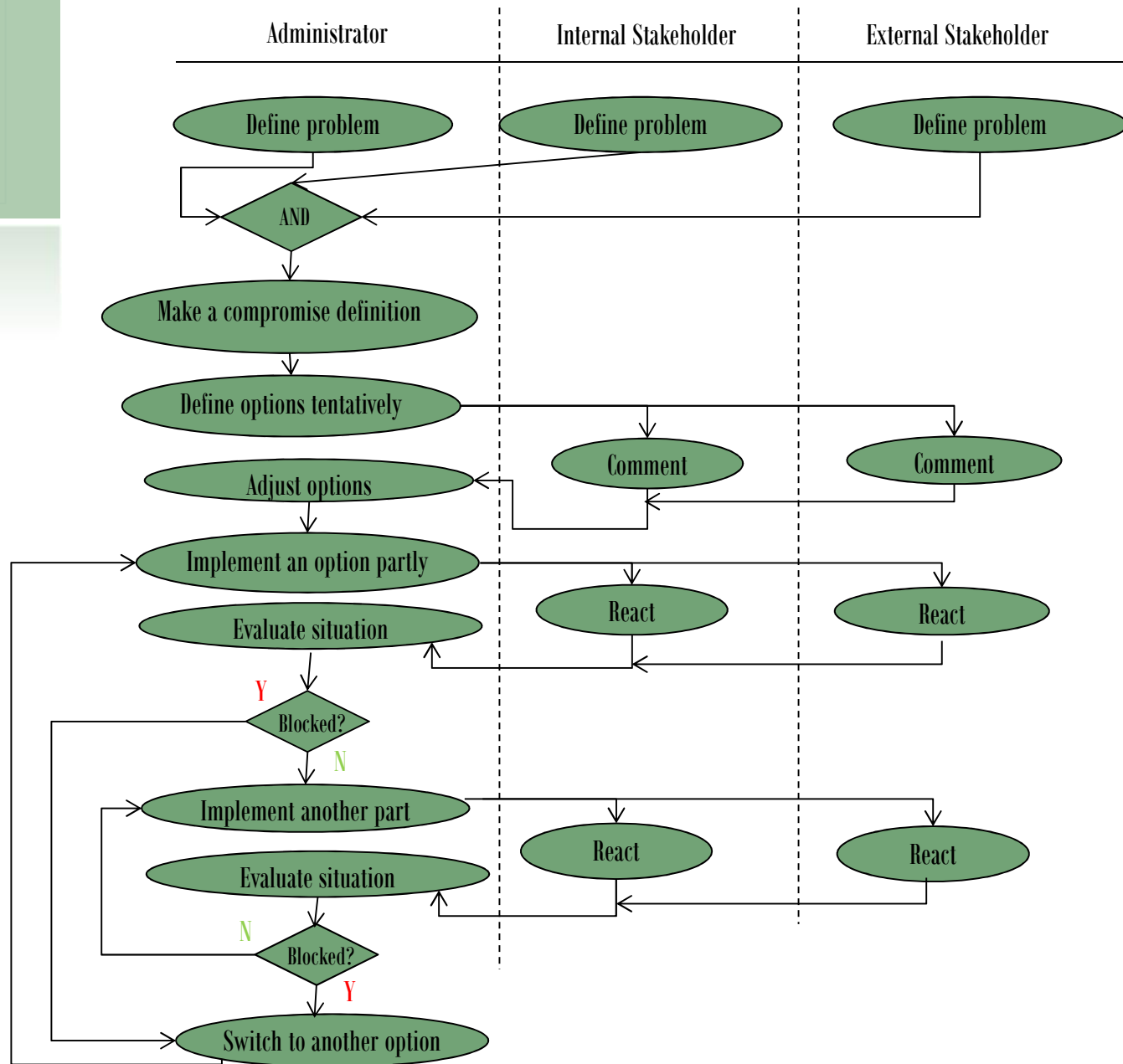
- Dirty data
- Missing values
- Inconsistent data
- Data not integrated

- Wrong data

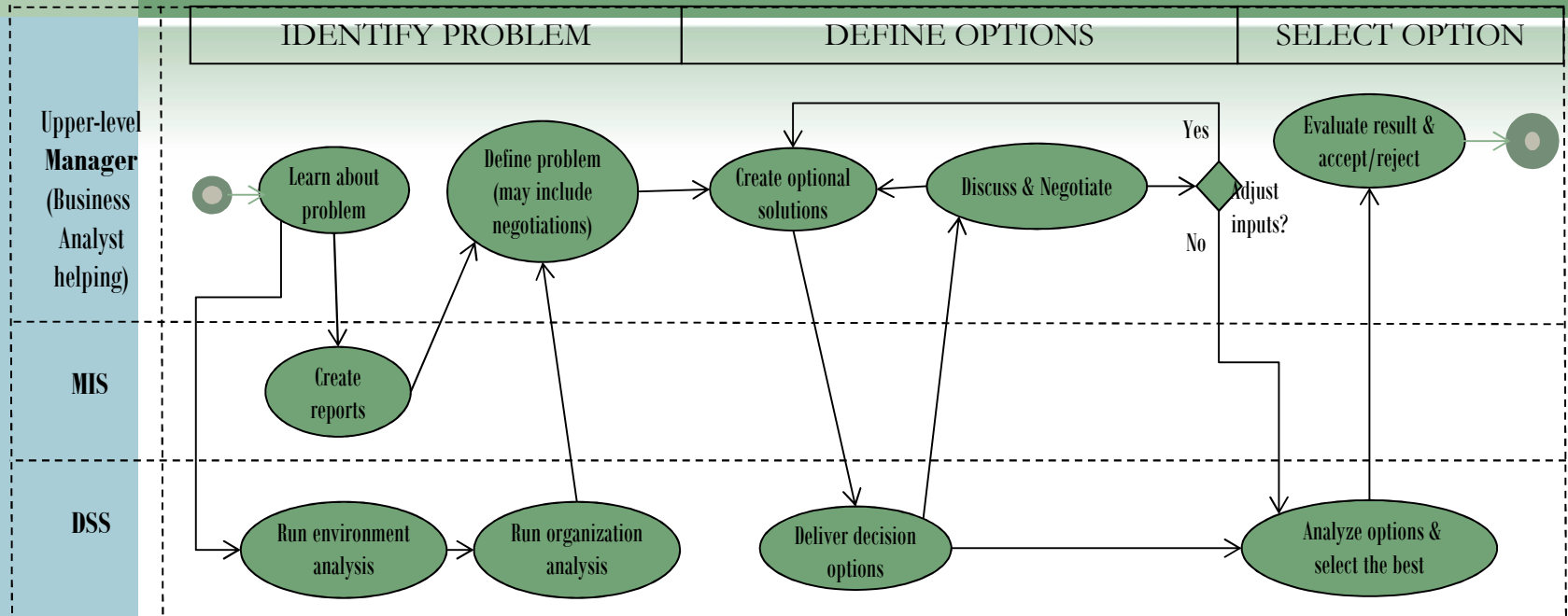
Raw Data Usually Unsuitable for Sophisticated Reporting or Data Mining

- Too much data
- Too many attributes
- Too many data points

Problem Solving – Process Diagram



HOW CAN INFORMATION SYSTEMS HELP FOR DECISION MAKING(DM)



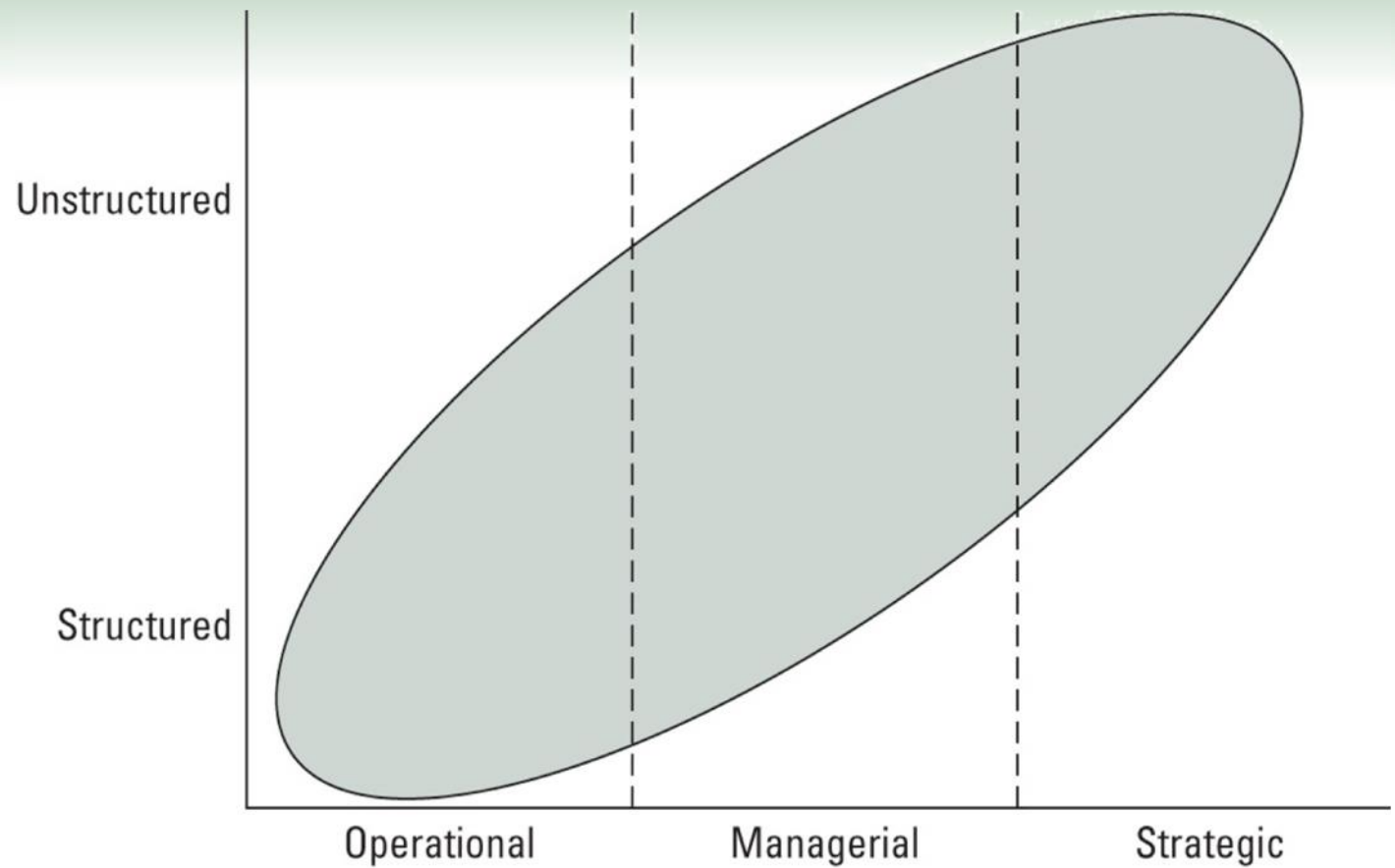
- ❖ IS can help rational DM.
- ❖ The role of MIS is to inform the user so that a potential problem in operations can be identified.
- ❖ Model-driven Decision support systems(DSS) can help with more steps and entire DM process – best option can be automatically delivered.
- ❖ People still make the final choice (decision).

DECISION MAKING LEVELS AND PROCESSES

- ◎ Decision making occurs on three levels:
 - ◎ Operational
 - ◎ Managerial
 - ◎ Strategic
- ◎ Decision making processes can be:
 - ◎ Structured: understood and accepted method for making the decision
 - ◎ Unstructured: no agreed-on decision making process



DECISION LEVEL & TYPE



- ◎ Big data is made up of 3 V's? what are they?
- ◎ VELOCITY
- ◎ VOLUME
- ◎ Variety

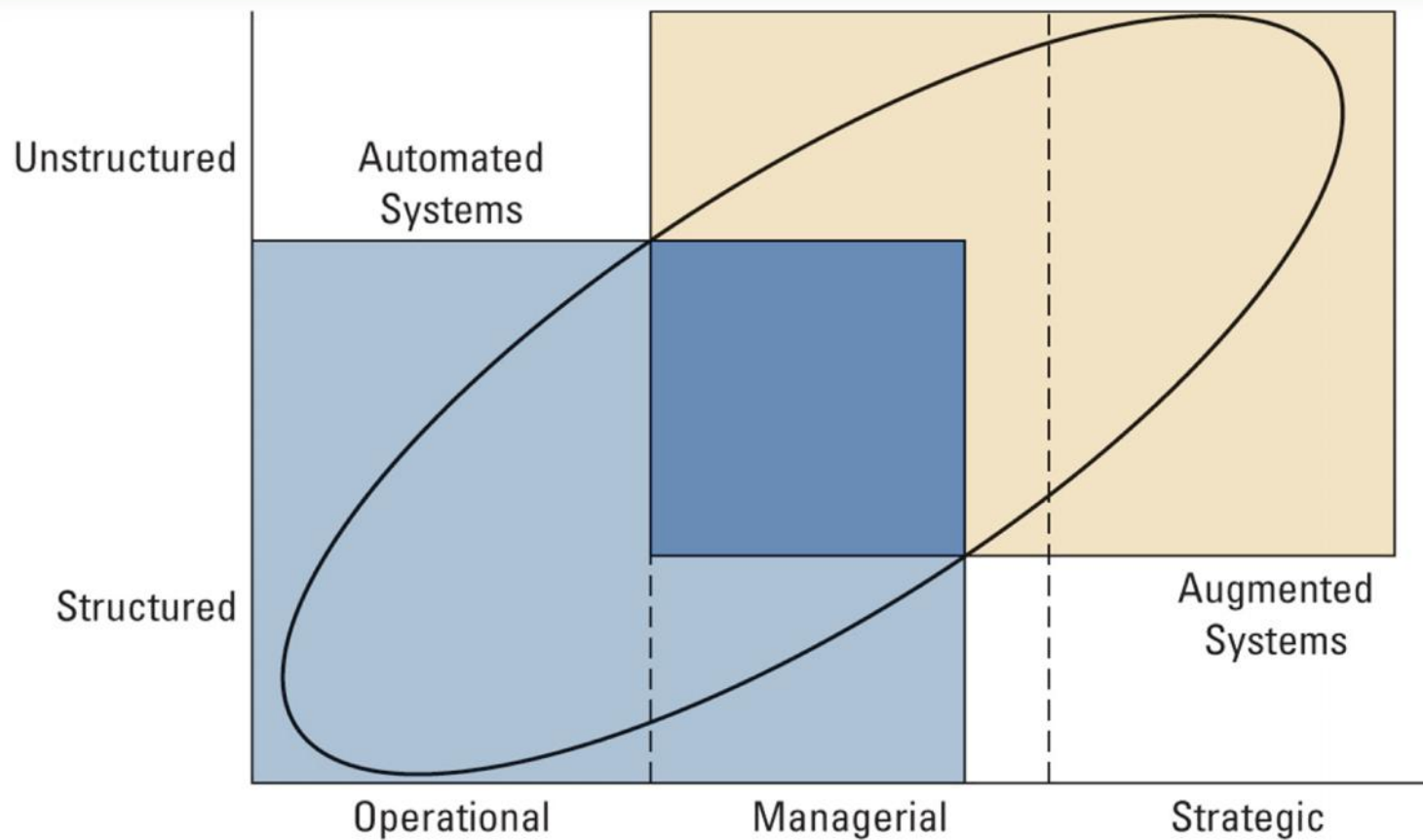
DECISION MAKING & INFORMATION SYSTEMS

Your Task:

To understand the information systems involved in decision making and data mining

RELATIONSHIPS

How Decision Level, Decision Type and IS Type Are Related



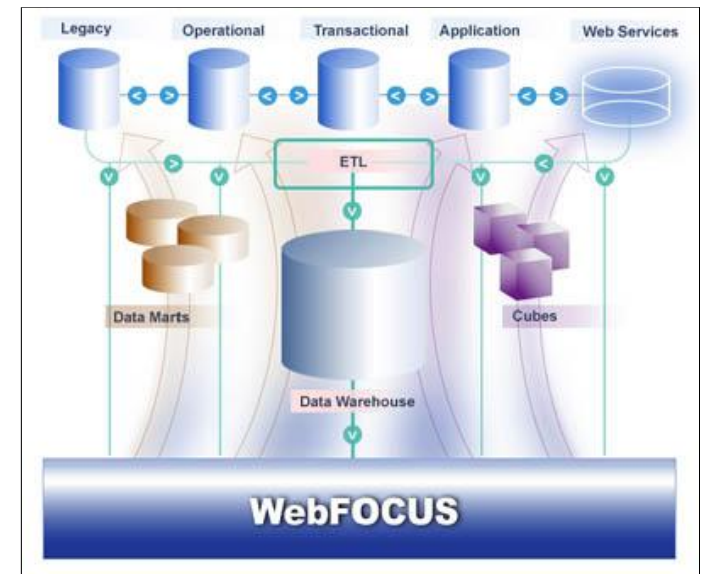
BUSINESS INFORMATION SYSTEMS

- ◎ Provide information for improving decision making
- ◎ Primary systems:
 - ◎ Reporting systems
 - ◎ Data-mining systems
 - ◎ Knowledge management systems
 - ◎ Expert systems



REPORTING SYSTEMS

- ⊙ Integrate data from multiple sources
- ⊙ Process data by sorting, grouping, summing, averaging, and comparing
- ⊙ Results formatted into reports
- ⊙ Improve decision making by providing right information to right user at right time



REPORTING TOOLS

🎯 Business Performance Management (dashboard) tools



🎯 video

DATA-MINING SYSTEMS

- ◎ Process data using statistical techniques
 - ◎ Regression analysis
 - ◎ Decision tree analysis
- ◎ Look for patterns and relationships to anticipate events or predict outcomes
 - ◎ Market-basket analysis
 - ◎ Predict donations



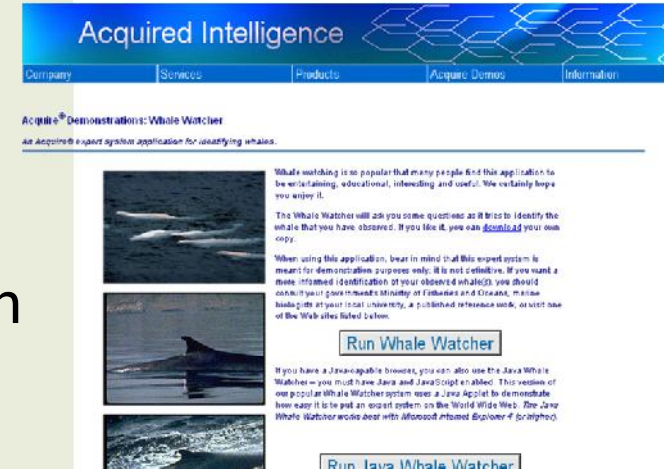
KNOWLEDGE-MANAGEMENT SYSTEMS

- ③ Creates value from intellectual capital
- ③ Collects and shares human knowledge
- ③ Fosters innovation
- ③ Improve customer service
- ③ Increases company organizational responsiveness



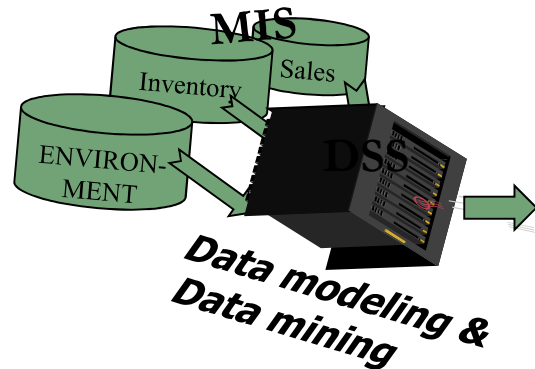
EXPERT SYSTEMS

- ◎ Encapsulate the knowledge of human experts in the form of If/Then rules
 - ◎ If condition is true, Then initiate procedure
- ◎ Improve diagnosis and decision making in non-experts
- ◎ An ACQUIRE expert system application for whale identification



Decision Support System (DSS)

- ◎ Managerial decision making about future is supported by DSS.



Outputs:

- Models
- Scenarios and outcomes
- Results of tests
- Relationships & patterns

- ❖ DSS Supports higher mgt. levels. Problems to solve are less structured than in routine situations where TPS (transactional processing systems) & MIS can do the work.
- ❖ DSS uses outputs from MIS and data from sources outside the company.
- ❖ Time horizon of DSS: Future - from close (day, week) to far (one+ years).

DSS, as the name suggests is ideal for making the right decisions for any business. Decision making is a critical process that involves considering all the major operations, forecasts, activities, planning and management of various functions.

SYSTEMS SUMMARY

Business Intelligence System	Characteristics	Competitive Advantage
Reporting Systems	Integrate and process data by sorting, grouping, summing, and formatting. Produce, administer, and deliver reports.	Improve decisions by providing relevant, accurate, and timely information to the right person.
Data-Mining Systems	Use sophisticated statistical techniques to find patterns and relationships.	Improve decisions by discovering patterns and relationships in data to predict future outcomes.
Knowledge Management Systems	Share knowledge of products, product uses, best practices, etc., among employees, managers, customers, and others.	Improve decisions by publishing employee and others' knowledge. Create value from existing intellectual capital. Foster innovation, improve customer service, increase organizational responsiveness, and reduce costs.
Expert Systems	Encode human knowledge in the form of If/Then rules and process those rules to make a diagnosis or recommendation.	Improve decision making by non-experts by encoding, saving, and processing expert knowledge.

T or ☒ F. DSS supports lower levels of management

WHAT ABOUT THE MASS OF DATA

Your Task:

To learn how organizations deal with the masses of data they collect

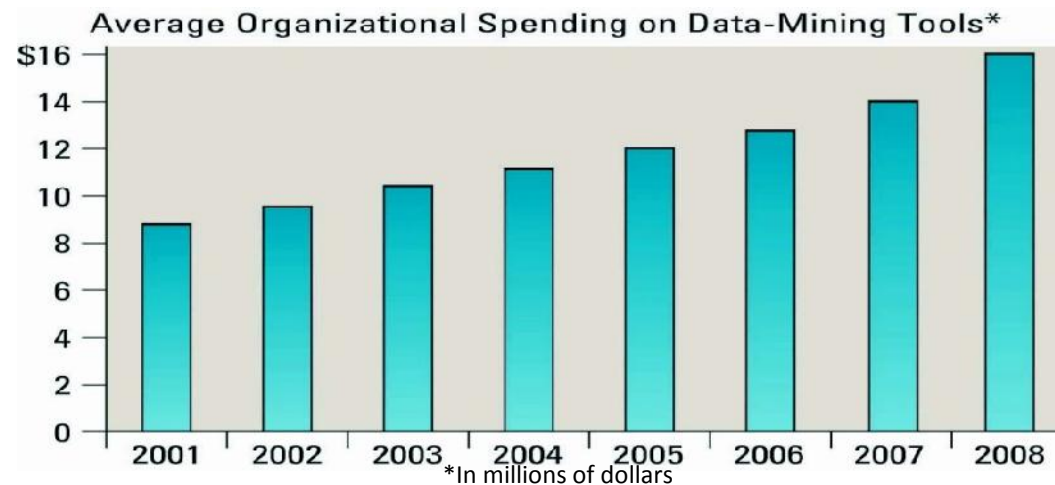
THE MASSES OF DATA



- ◎ Huge amounts of data being produced
 - ◎ Moore's Law
 - ◎ Massive amount of data on operations and customers has been collected
 - ◎ However, far too much data for manual analysis techniques

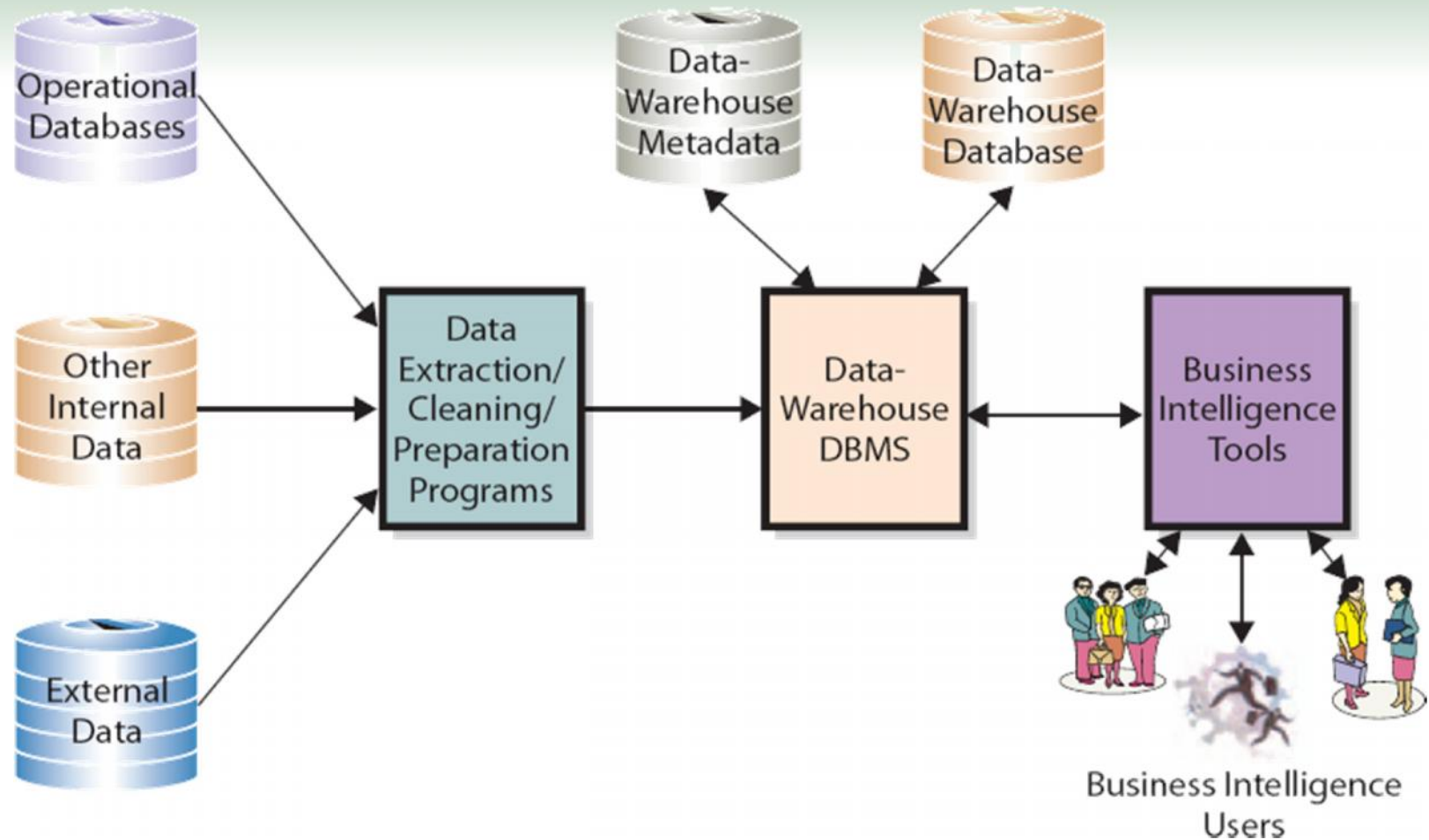


- ③ Amazon records purchase behavior for 50M active customers
- ③ Google stores information on more than 11B objects
- ③ Wal-Mart estimates that it has ~500 TB of data collected

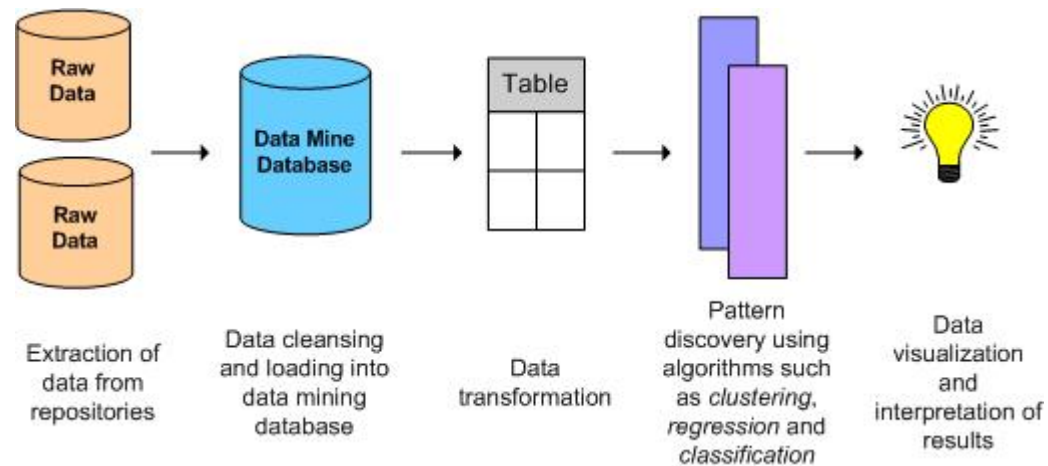


- ⊙ Consolidates and integrates multiple data sources (both internal and external)
- ⊙ May include also **metadata** – data about one or more aspects of data in the warehouse (creation time, purpose, method of creation, author, etc)
- ⊙ Large size and scope
- ⊙ Designed for analytics
- ⊙ Data managed (stored, edited, accessed) through a **database management system** (DBMS – e.g. IBM DB2, Oracle Database 11g, etc.)

COMPONENTS OF A DATA WAREHOUSE



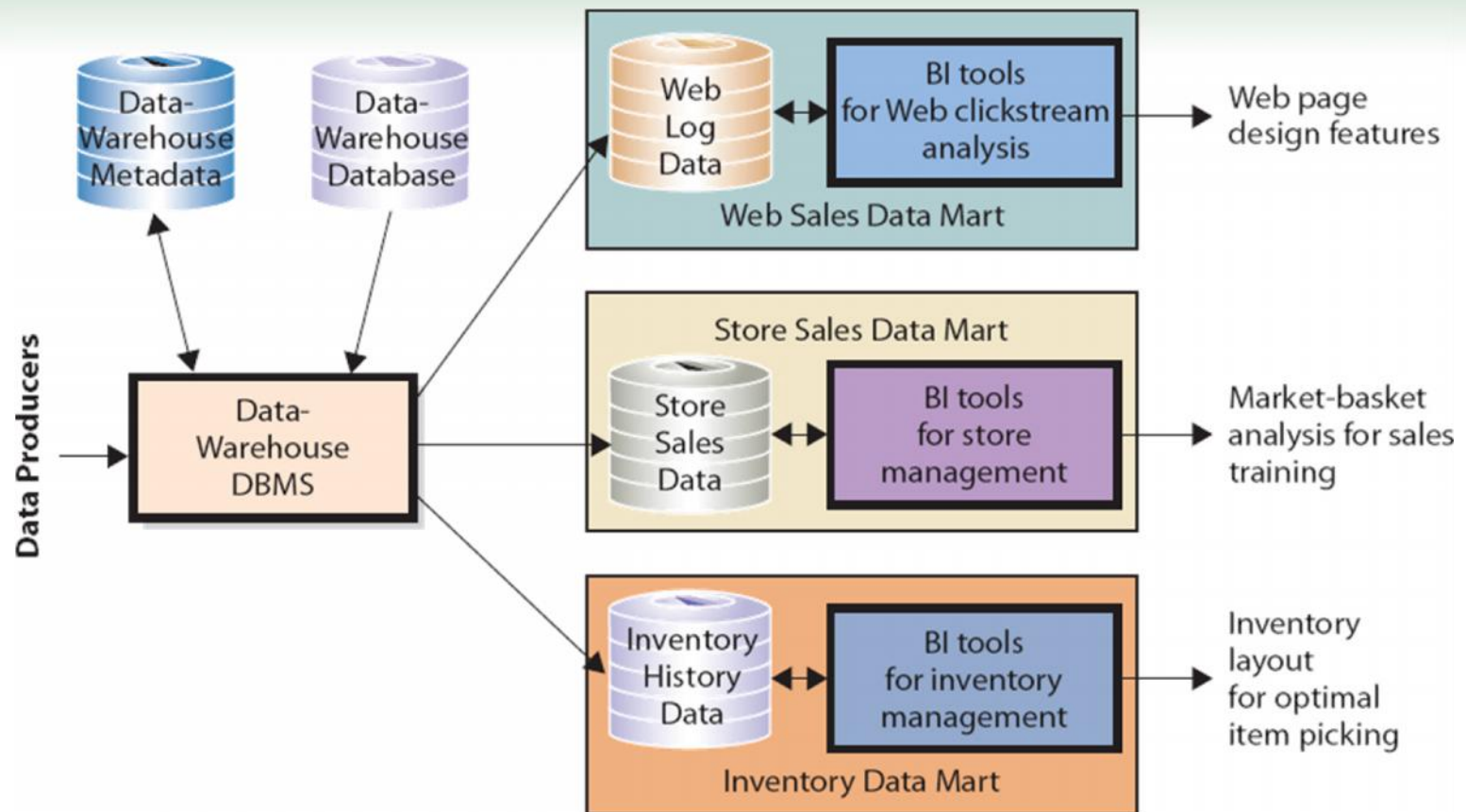
DATA MODELLING AND MINING-RAW TO RESULTS



- ◎ Data collection
 - ◎ Created to address particular needs
 - Business function
 - Problem
 - Opportunity
 - ◎ Smaller than data warehouse
 - ◎ Users may not have data management expertise
 - Knowledgeable analysts for specific function being looked at in Data Mart

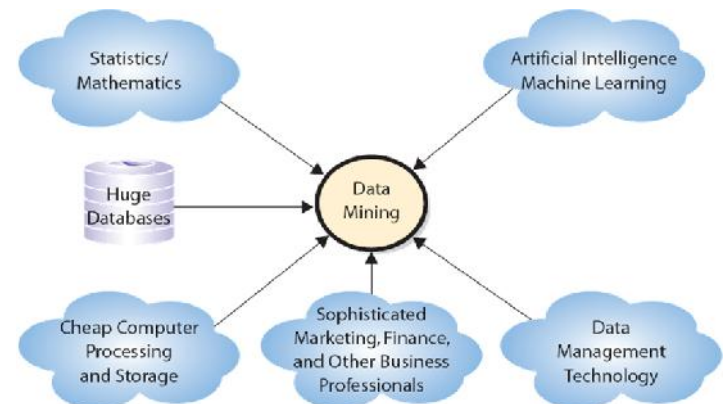


DATA MART EXAMPLES



GENERATING INSIGHTS -DATA MINING

- ◎ Application of statistical techniques to find patterns and relationships among data
- ◎ Knowledge discovery in databases (KDD)
- ◎ Two categories:
 - ◎ Unsupervised
 - ◎ Supervised



WHAT COULD DATA MINING RESULTS LOOK LIKE?

- ⊙ If-then rules
 - ⊙ If (income > \$50K) & (age > 30) & (location="TX USA") then Probability (catalog response)=0.15
- ⊙ Numeric functions
 - ⊙ Probability (catalog response) = function (x1, x2,..., xk)

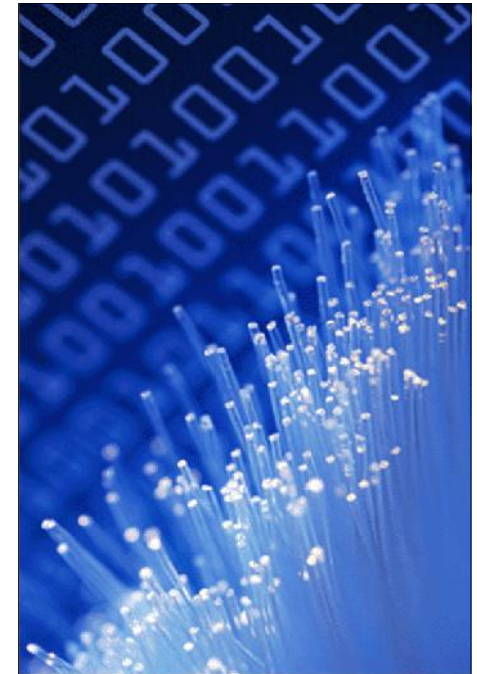


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WHY NOW?

- ③ Computing power is better and more affordable
- ③ Mature data mining algorithms and commercial data mining software products are readily available
- ③ Data is being warehoused
 - ③ improved data collection, networking, and data storage



WHO USES IT?

Your Task:
To figure out who uses data mining

MAJOR DATA MINING APPLICATION AREAS

- ◎ Marketing (e.g. CRM)
 - Customer loyalty/attrition
 - Market basket analysis
 - Direct marketing
 - Identify which prospects should be included in a mailing list to obtain the highest response rate
 - Market segmentation
 - Identify common characteristics of sets of customers who buy similar products from a company



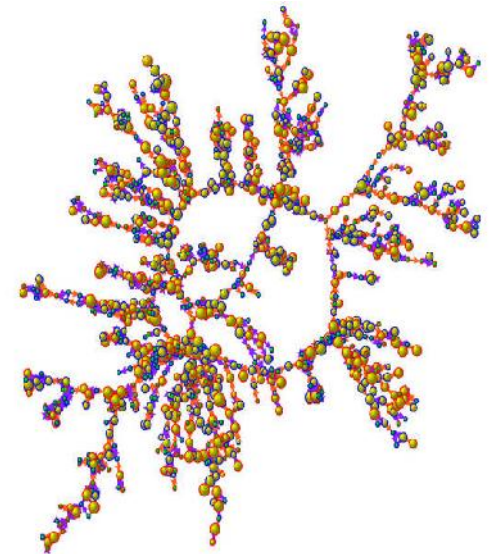
MAJOR DATA MINING APPLICATION AREAS



- ③ Assurance: fraud detection (telecommunication, credit)
- ③ Risk and Insurance: “People with good credit scores have fewer accidents.”
- ③ Text mining: E-mail spam filtering
- ③ Finance: Portfolio management, stock prediction

AN EXAMPLE OF APPLICATION

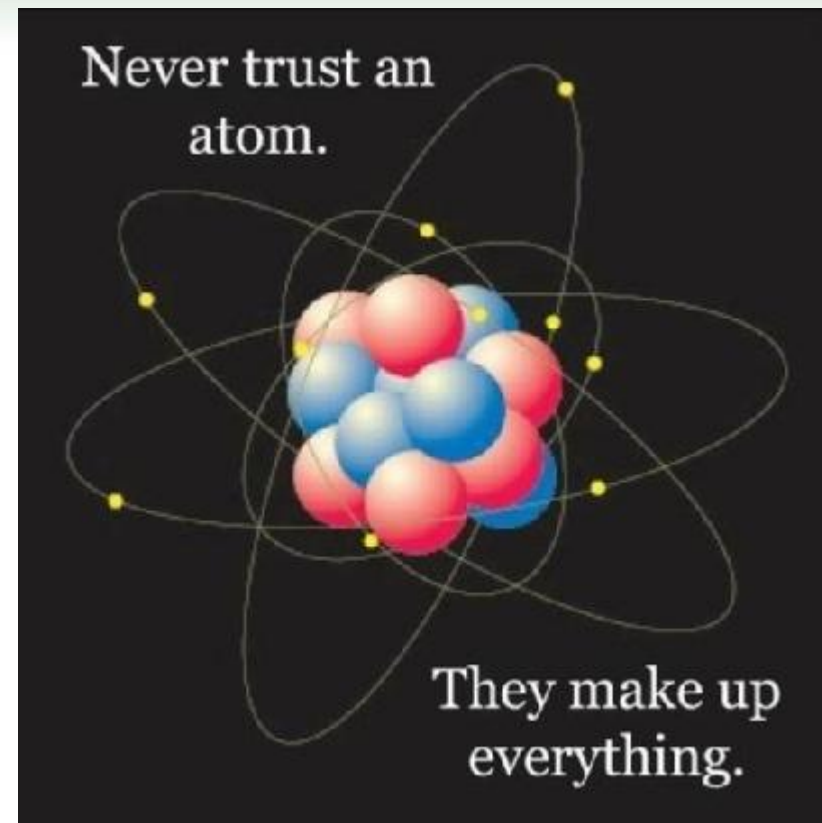
- ◎ Given a customer's characteristics, a data mining model predicts how much the customer will spend on the next catalog order.
 - ◎ Characteristics
 - 40 years old
 - 85K annual income
 - 2 children
 - 3 orders last year
 - Last purchase: 4 months ago
 - Average spending: \$38
 - Last purchase: \$42
 - ◎ Expected next catalog order: \$35-\$45



REFERENCES

- ③ [Big data video](#)

T or F: Data warehouse may include also **metadata** – data about one or more aspects of data in the warehouse (creation time, purpose, method of creation, author, etc)



- ⊙ <http://www.calgaryherald.com/Tips+successful+Kickstarter+campaign/9476984/story.html>
- ⊙ <http://www2.canada.com/calgaryherald/news/business/story.html?id=947f75bc-7fc1-4e13-bdee-fbeea383fb2d&p=3>
- ⊙ Project update form
- ⊙ Preview link
- ⊙ Idea
- ⊙ Idea incentive - Jan Hudec