Experiencing MIS

Fifth Canadian Edition

Chapter 8

Decision Making and Business Intelligence

Q8-1: Do Managers Make Rational Decisions? (1 of 2)

- **Decision making**, choosing from range of alternatives is essence of management
- Decision making process is much more complicated for **three reasons**:
  1. Concept of rationality is hard to define
  2. Good outcomes may result from irrational processes, bad outcomes can result from good processes
  3. Humans intend to be rational, but there are limits on our cognitive capabilities.

"Bounded rationality" – Herbert Simon

Q8-1: Do Managers Make Rational Decisions? (2 of 2)

- We are not calculators, or economic automatons
- Rather, we settle, sacrifice, choose an alternative "good enough" across a range of criteria
- Chapter focus is on decision making by managers supported by business intelligence systems
  - Data-driven decision making

Management Misinformation Systems (1 of 3)

- Coined by Russell Ackoff, 1960s
- Designers of MIS make erroneous assumptions about **managerial decision making**, thus the systems may not provide good solutions

Management Misinformation Systems (2 of 3)

Three assumptions:

1. Managers will make better decisions if they get the data they need.
   - Ackoff: too many possibilities exist, and better decisions will not necessarily be made even with perfect data. **Uncertainty and complexity.**
2. Poor decisions are made because of lack of information.
   - Ackoff: managers have too much, not too little, information. **Information overload.**

Management Misinformation Systems (3 of 3)

3. Managers know what data they need.
   - Ackoff: They are not sure if their requests are necessary or superfluous, and tent ask for more than needed, further promoting **information overload**.

Information Overload

- Managers face **information overload**
  - Digital universe is doubling in size every two years (IDC)
  - Data is growing at the rate of 40 percent a year
  - Occurs inside and outside of organizations
- The challenge is to **find** the appropriate data and **incorporate** them into their decision-making processes

Figure 8-1
How Big Is an Exabyte?

Kilobyte (KB)	*1000 bytes OR 10^3 bytes* 2 Kilobytes: A typewritten page 100 Kilobytes: A low-resolution photograph
Megabyte (MB)	*1 000 000 bytes OR 10^6 bytes* 1 Megabyte: A small novel OR a 3.5-inch floppy disk 2 Megabytes: A high-resolution photograph 5 Megabytes: The complete works of Shakespeare 10 Megabytes: A minute of high-fidelity sound 100 Megabytes: 1 meter of shelved books 500 Megabytes: A CD-ROM
Gigabyte (GB)	*1 000 000 000 bytes OR 10^9 bytes* 1 Gigabyte: A pickup truck filled with paper 20 Gigabytes: A good collection of the works of Beethoven 100 Gigabytes: A library floor of academic journals
Terabyte (TB)	*1 000 000 000 000 bytes OR 10^{12} bytes* 1 Terabyte: 50 000 trees made into paper and printed 2 Terabytes: An academic research library 10 Terabytes: The printed collection of the U.S. Library of Congress 400 Terabytes: National Climactic Data Center (NOAA) database
Petabyte (PB)	*1 000 000 000 000 000 bytes OR 10^{15} bytes* 1 Petabyte: Three years of EOS data (2001) 2 Petabytes: All U.S. academic research libraries 20 Petabytes: Production of hard-disk drives in 1995 200 Petabytes: All printed material
Exabyte (EB)	*1 000 000 000 000 000 000 bytes OR 10^{18} bytes* 2 Exabytes: Total volume of information generated worldwide [in 1999] 5 Exabytes: All words ever spoken by human beings

Source: www2.sims.berkeley.edu/research/projects/how-much-info/datapowers.html. Used with the permission of Peter Lyman and Hal R. Varian, University of California at Berkeley.

Problems with Data

- Raw data usually **unsuitable** for sophisticated reporting or data mining
  - Dirty data
  - Missing values
  - Inconsistent data, esp. in data collected over time
  - Data not integrated
    - From different sources
    - From incompatible sources
  - Granularity
    - Fine data: data that expresses precise detail (e.g. clickstream data)
    - Course data: highly summarized (Google Analytics)

Q8-2: What Are OLTP and OLAP

- **Online Transaction Processing (OLTP)** system collects data electronically and process the transactions online
  - Can be in real time or batched transactions
- OLTP systems - backbone of all functional, cross-functional, and interorganizational systems in an organization
- OLTP systems support decision making by providing the raw information about transactions and status for an organization

What Are OLAP? (1 of 2)

- While data may be collected in OLTP, the data may not be used to improve decision making
- **Online Analytic Processing (OLAP) systems** focus on making OLTP-collected data useful for decision making
  - OLAP provides the ability to sum, count, average, and perform other simple arithmetic operations on groups of data
  - OLAP report has measures, or facts, and dimensions

Figure 8-3
OLAP Product Family by Store Type

	A	B	C	D	E	F	G
1							
2							
3	Store Sales Net	Store Type					
4	Product Family	Deluxe Supermarket	Gourmet Supermarket	Mid-Size Grocery	Small Grocery	Supermarket	Grand Total
5	Drink	$8 119.05	$2 392.83	$1 409.50	$685.89	$16 751.71	$29 358.98
6	Food	$70 276.11	$20 026.18	$10 392.19	$6 109.72	$138 960.67	$245 764.87
7	Nonconsumable	$18 884.24	$5 064.79	$2 813.73	$1 534.90	$36 189.40	$64 487.05
8	Grand Total	$97 279.40	$27 483.80	$14 615.42	$8 330.51	$191 901.77	$339 610.90

Source: Microsoft Excel

What Is the Data Resource Challenge?

- Though data is collected, it may not be used to improve decision-making
  - Ex. Grocery chain found to use less than 2% of the scanner data it collects
- Companies must see their data as an *asset* – a resource from which benefits can be obtained
- If data is an asset, how is it reported? Who manages it? Who extracts the value out of it?
  - Focus on Business Intelligence

Q8-3: What Are Business Intelligence Systems?

- **Business Intelligence (BI)** system provides information for improving decision making
- Five categories of BI systems:
  - Group decision support systems (GDSS)
  - Reporting systems
  - Data-mining systems
  - Knowledge-management (KM) systems
  - Expert systems

Reporting Systems

- **Integrate** data from multiple sources
- **Process** data by sorting, grouping, summing, averaging, and comparing
- **Format** results into reports
- Improve decision making by providing:
  right information to right user at right time

Data-Mining Systems

- Process data using sophisticated statistical techniques
  - E.g., regression analysis, data tree analysis
- Can find patterns and relationships to *anticipate* events or *predict* future outcomes
  - **Market-basket analysis** is a type of data-mining system, computes correlations of items on past orders to determine ones frequently purchased together

Knowledge-Management Systems

- Create value from intellectual capital
- Collect and share human knowledge
- Supported by the five components of the information system
- Foster innovation
- Improve customer service
- Increase organizational responsiveness
- Reduce costs

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

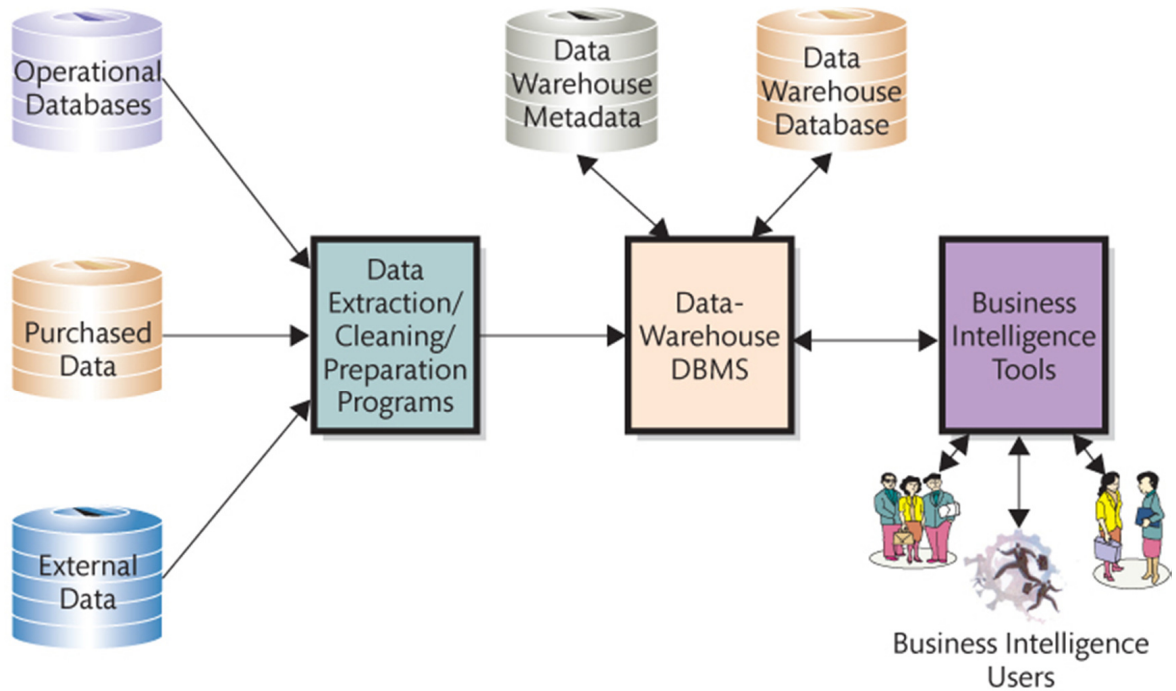
Q8-4: How Do Organizations Use Data Warehouses to Acquire Data?

- Analyses from operational data are not recommended
- Operational data not set up for analysis, but for fast and reliable transaction processing
- Operational data gets *extracted* for BI processing
  - To a database for small companies
  - To a data warehouse for larger companies

Data Warehouse

- **Data warehouse:** Facility for managing an organization's BC data
- Functions:
  - Obtain data
  - Cleanse data
  - Organize and relate data
  - Catalogue data
- Stores **metadata**, or data about data
- Usually a room with a few computers and storage devices

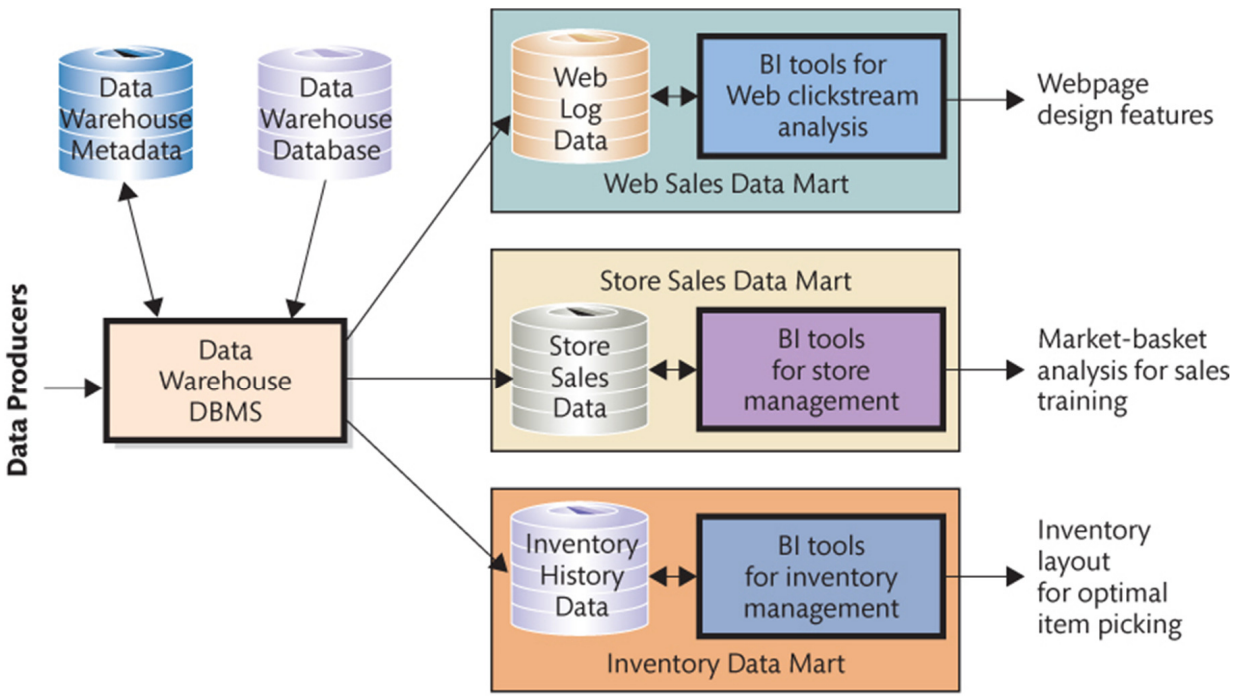
Figure 8-7
Components of a Data Warehouse



Q8-5: What Are the Differences Between Data Warehouses and Data Marts?

- **Data mart:** data collection created to address needs of a:
  specific function, **problem**, **opportunity**
- Companies may have more than one
  - E.g., one for clickstream data, one for market-based analysis, another for inventory
- Smaller than data warehouse
- Users in data mark obtain data from data warehouse, but do not have expertise that data warehouse employees need

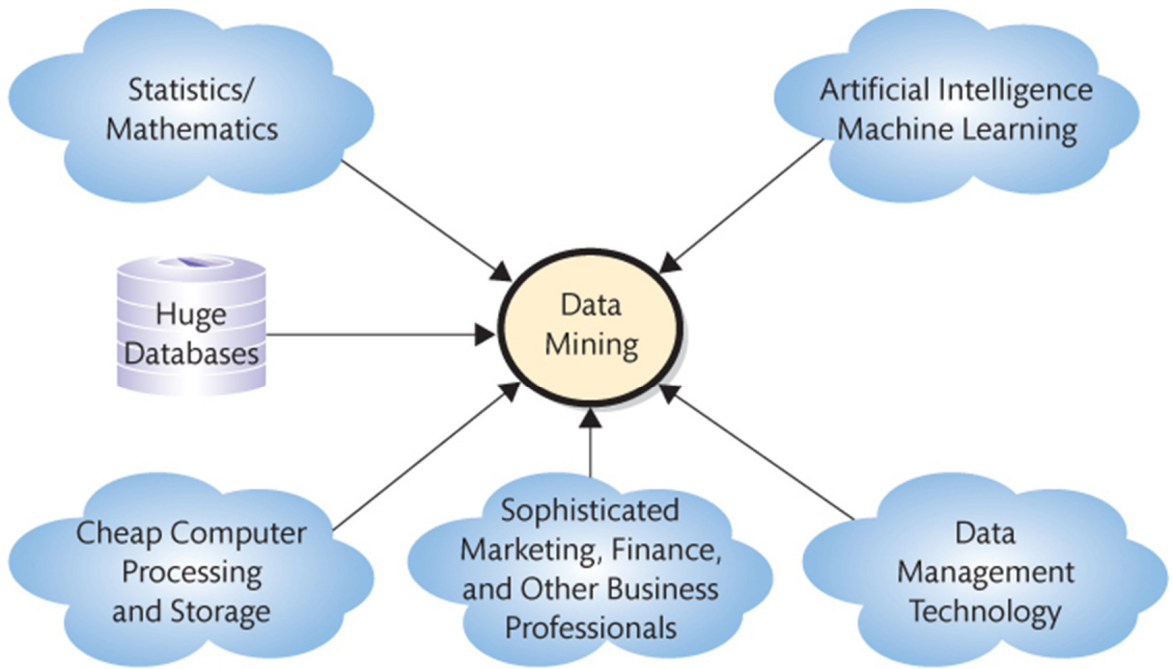
Figure 8-9
Data Mart Examples



Q8-6: What Are Typical Data-Mining Applications?

- **Data Mining:** application of statistical techniques to find patterns and relationships among data and to classify and predict
- convergence of disciplines
  - statistics and mathematics
  - artificial intelligence
  - machine-learning
- Data mining techniques take advantage of developments in data management
- **Unsupervised** and **Supervised** techniques

Figure 8-10
Convergence of Disciplines for Data Mining



Unsupervised Data Mining

- Analysts do not create **model** or **hypothesis** before running the analysis
- Apply data-mining **technique** to the data and observe results
- Hypotheses created **after** analysis as explanation for results
- Example: Cluster analysis
  - identify groups of entities that have similar characteristics

Supervised Data Mining

- Model developed **before** the analysis
- Statistical techniques applied to data to **estimate parameters** of the model
- Examples:
  - Regression analysis
    - measures the impact of a set of variables on another variable
  - Neural networks
    - used to predict values and make classifications, such as “good prospect” or “poor prospect” customers
  - Market-based analysis
    - Determining sales patterns – items that tend to be bought together

Big Data

- Large amounts of varied data from a variety of sources over a period of time could be used to make better decisions
- Controversial
  - Lack of precision in its definition
  - Adds to excessive data collection
  - Expensive
  - Imprecise (overly vague or general)