

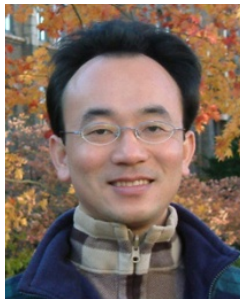
# Hot Issues of Information Management

## Foundations of Business Intelligence: IBM and Big Data (Chap. 6)

1061IM4C07

TLMXB4C (M0842)

Thu 7,8 (14:10-16:00) B702



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2017-11-09



# 課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
1	2017/09/21	Introduction to Case Study for Hot Issues of Information Management
2	2017/09/28	Information Systems in Global Business: UPS (Chap. 1) (pp.53-54)
3	2017/10/05	Global E-Business and Collaboration: P&G (Chap. 2) (pp.84-85)
4	2017/10/12	Information Systems, Organization, and Strategy: Starbucks (Chap. 3) (pp.129-130)
5	2017/10/19	Ethical and Social Issues in Information Systems: Facebook (Chap. 4) (pp.188-190)
6	2017/10/26	IT Infrastructure and Emerging Technologies: Amazon and Cloud Computing (Chap. 5) (pp. 234-236)

# 課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
7	2017/11/02	IT Infrastructure and Emerging Technologies: Amazon and Cloud Computing (Chap. 5) (pp. 234-236)
8	2017/11/09	Foundations of Business Intelligence: IBM and Big Data (Chap. 6) (pp.261-262)
9	2017/11/16	Midterm Report (期中報告)
10	2017/11/23	Midterm Exam Week (期中考試週)
11	2017/11/30	Telecommunications, the Internet, and Wireless Technology: Google, Apple, and Microsoft (Chap. 7) (pp.318-320)
12	2017/12/07	Enterprise Applications: Summit and SAP (Chap. 9) (pp.396-398)

# 課程大綱 (Syllabus)

週次	日期	內容 (Subject/Topics)
13	2017/12/14	E-commerce: Zagat (Chap. 10) (pp.443-445)
14	2017/12/21	Enhancing Decision Making: Zynga (Chap. 12) (pp.512-514)
15	2017/12/28	Building Information Systems: USAA (Chap. 13) (pp.547-548)
16	2018/01/04	Final Report I (期末報告 I)
17	2018/01/11	Final Report II (期末報告 II)
18	2018/01/18	Final Exam Week (期末考試週)

# Management Information Systems: Managing the Digital Firm

**1** Organization, Management, and the  
Networked Enterprise

**2** Information Technology Infrastructure

**3** Key System Applications for the  
Digital Age

**4** Building and Managing Systems

**Chap. 6**  
**Foundations of**  
**Business Intelligence:**  
**IBM and Big Data**

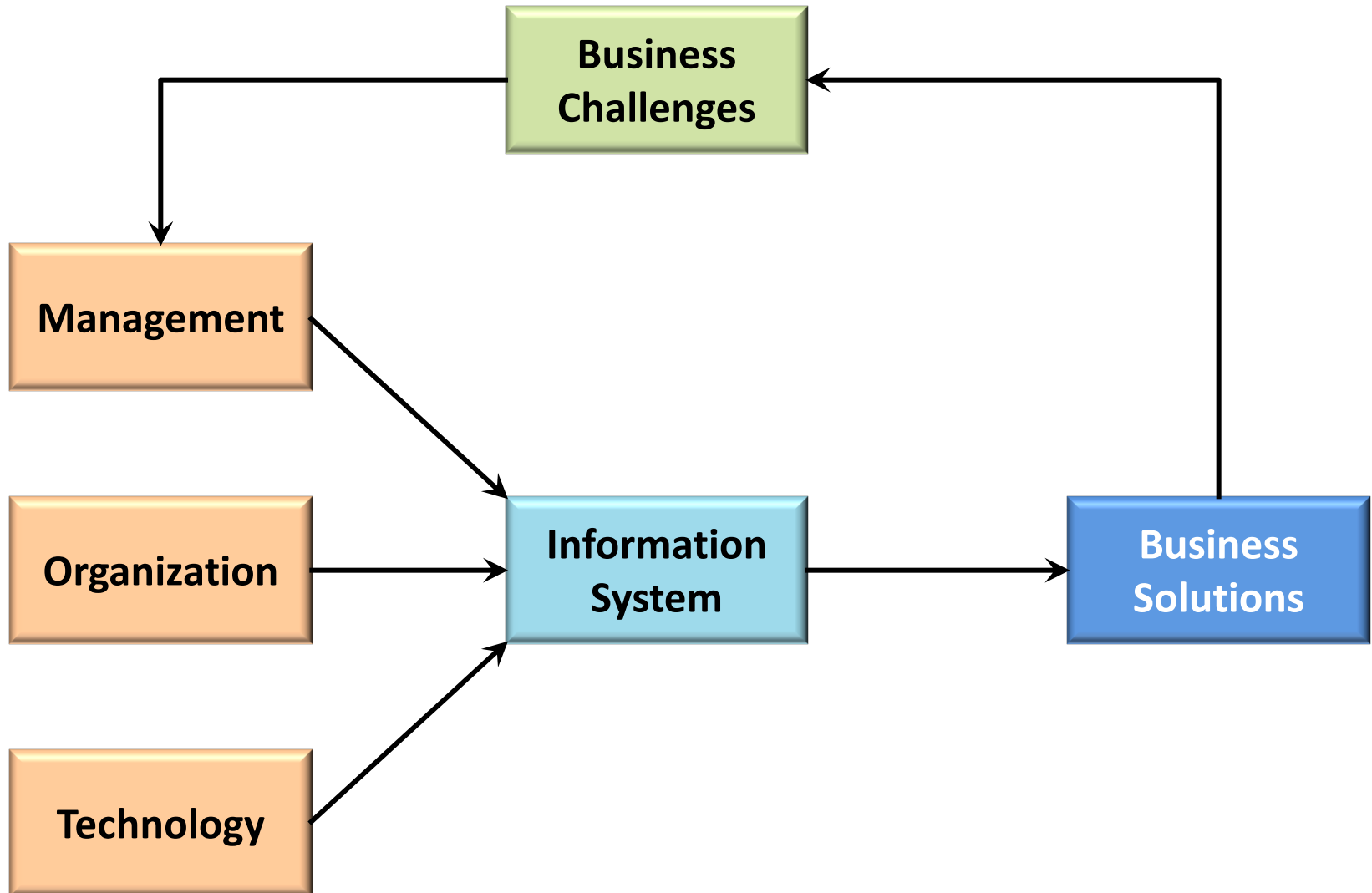
# Case Study:

## IBM and Big Data (Chap. 6) (pp. 261-262)

### Interactive Session: Technology: Big Data, Big Rewards

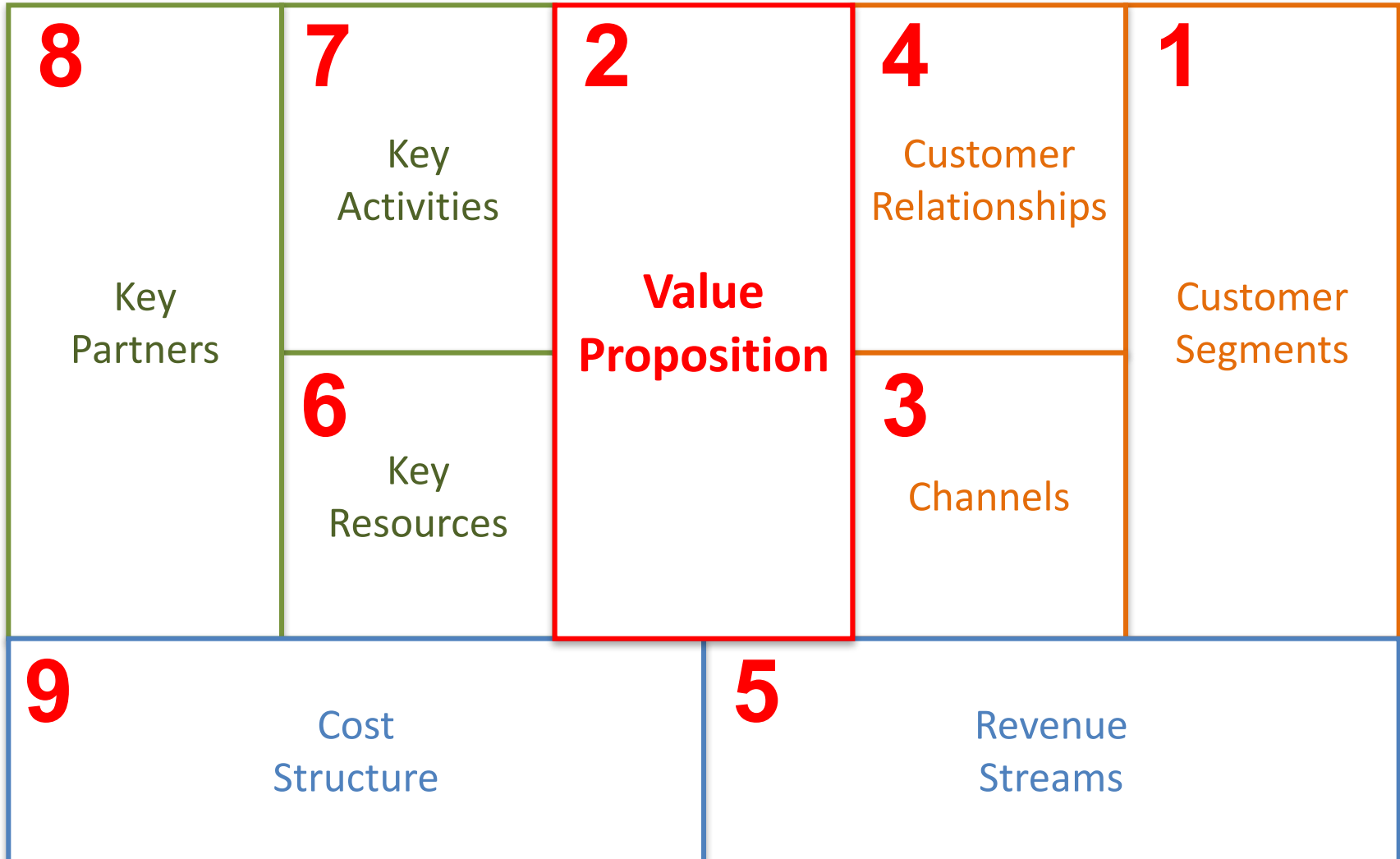
1. Describe the kinds of “big data” collected by the organizations described in this case.
2. List and describe the business intelligence technologies described in this case.
3. Why did the companies described in this case need to maintain and analyze big data? What business benefits did they obtain?
4. Identify three decisions that were improved by using “big data.”
5. What kinds of organizations are most likely to need “big data” management and analytical tools? Why?

# Overview of Fundamental MIS Concepts

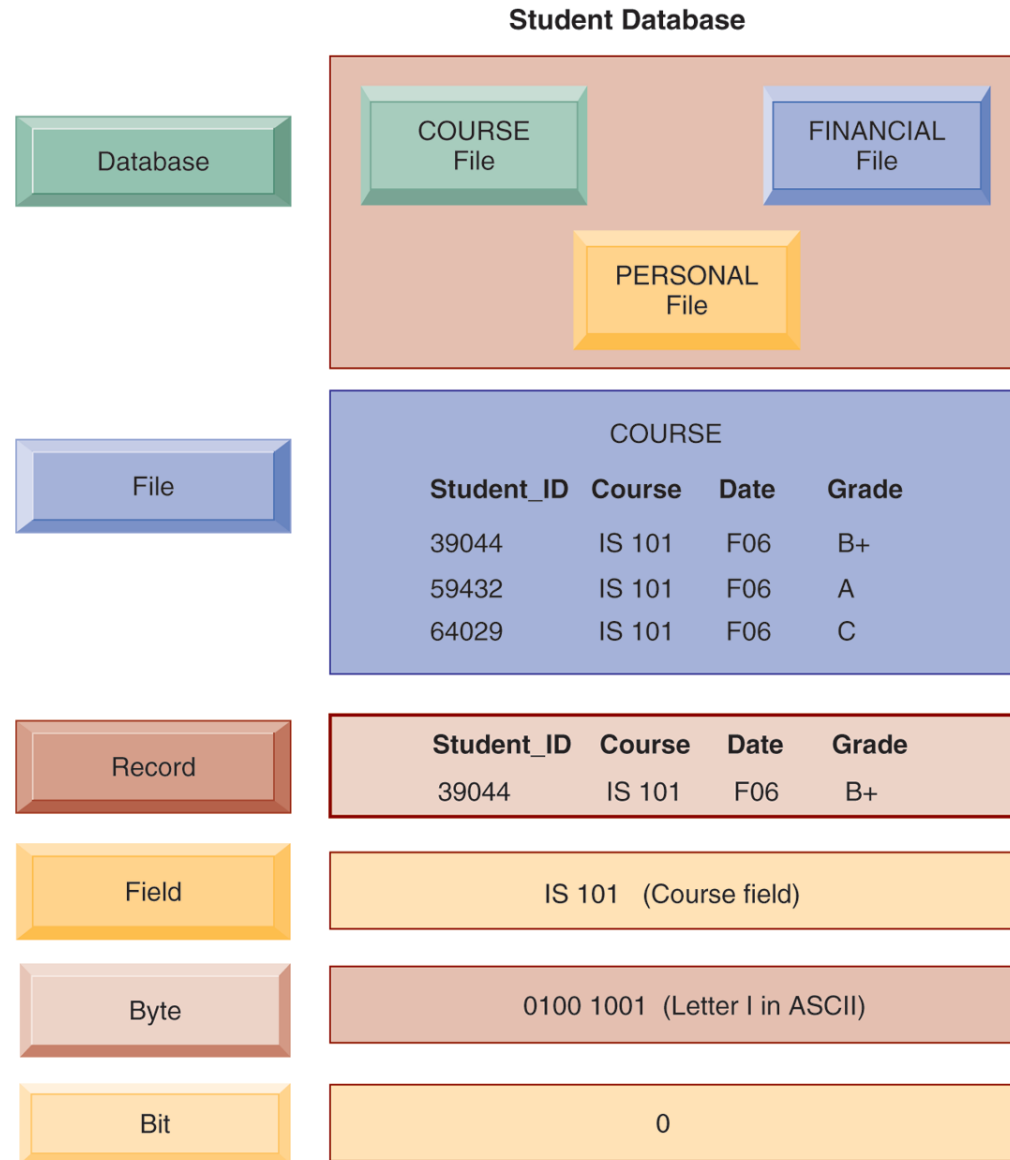




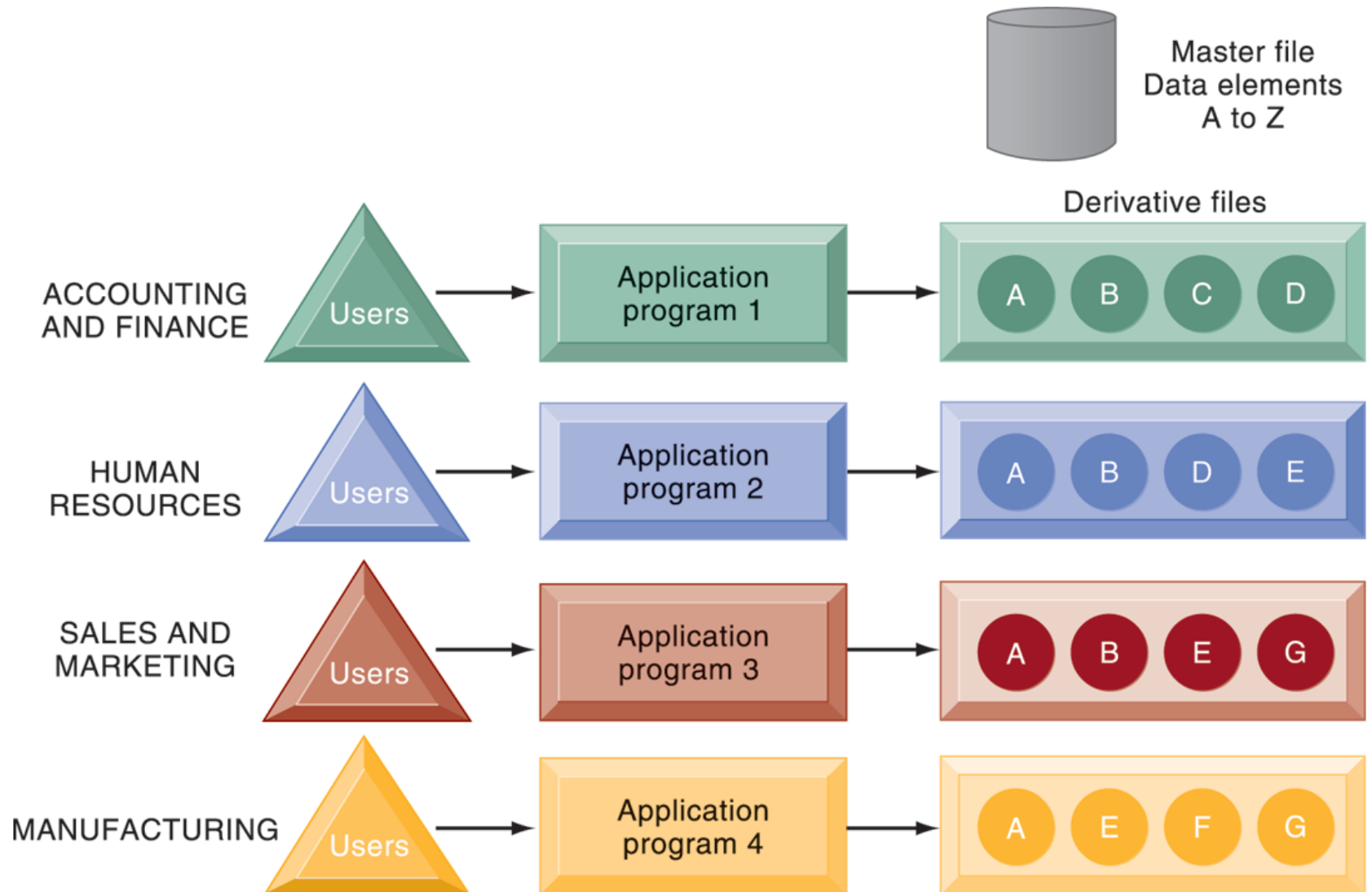
# Business Model



# THE DATA HIERARCHY



# TRADITIONAL FILE PROCESSING



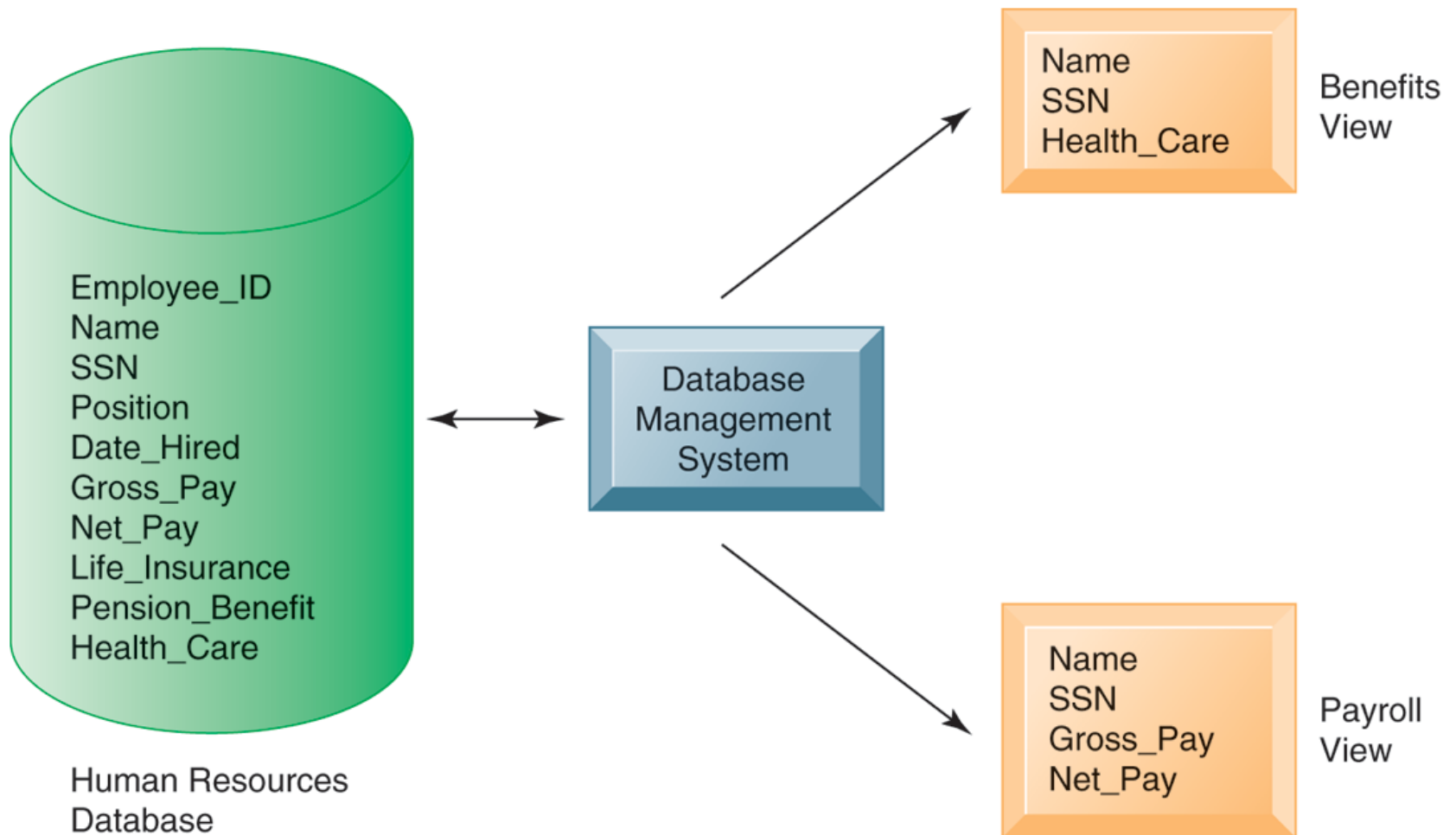
# The Database Approach to Data Management

- Database
  - Serves many applications by centralizing data and controlling redundant data

# The Database Approach to Data Management

- Database management system (DBMS)
  - Interfaces between applications and physical data files
  - Separates logical and physical views of data
  - Solves problems of traditional file environment
    - Controls redundancy
    - Eliminates inconsistency
    - Uncouples programs and data
    - Enables organization to central manage data and data security

# HUMAN RESOURCES DATABASE WITH MULTIPLE VIEWS



# Relational DBMS

- Represent data as two-dimensional tables
- Each table contains data on entity and attributes

# Table: grid of columns and rows

- **Rows (tuples):** Records for different entities
- **Fields (columns):** Represents attribute for entity
- **Key field:** Field used to uniquely identify each record
- **Primary key:** Field in table used for key fields
- **Foreign key:** Primary key used in second table as look-up field to identify records from original table



# RELATIONAL DATABASE TABLES

**SUPPLIER**

Columns (Attributes, Fields)

Supplier_Number	Supplier_Name	Supplier_Street	Supplier_City	Supplier_State	Supplier_Zip
8259	CBM Inc.	74 5 <sup>th</sup> Avenue	Dayton	OH	45220
8261	B. R. Molds	1277 Gandolly Street	Cleveland	OH	49345
8263	Jackson Composites	8233 Micklin Street	Lexington	KY	56723
8444	Bryant Corporation	4315 Mill Drive	Rochester	NY	11344

Rows  
(Records,  
Tuples)

Key Field  
(Primary Key)

**PART**

Part_Number	Part_Name	Unit_Price	Supplier_Number
137	Door latch	22.00	8259
145	Side mirror	12.00	8444
150	Door molding	6.00	8263
152	Door lock	31.00	8259
155	Compressor	54.00	8261
178	Door handle	10.00	8259

Primary Key

Foreign Key

# Operations of a Relational DBMS

- Three basic operations used to develop useful sets of data
  - **SELECT**: Creates subset of data of all records that meet stated criteria
  - **JOIN**: Combines relational tables to provide user with more information than available in individual tables
  - **PROJECT**: Creates subset of columns in table, creating tables with only the information specified

# THE THREE BASIC OPERATIONS OF A RELATIONAL DBMS

PART

Part_Number	Part_Name	Unit_Price	Supplier_Number
137	Door latch	22.00	8259
145	Side mirror	12.00	8444
150	Door molding	6.00	8263
152	Door lock	31.00	8259
155	Compressor	54.00	8261
178	Door handle	10.00	8259

Select Part\_Number = 137 or 150

SUPPLIER

Supplier_Number	Supplier_Name	Supplier_Street	Supplier_City	Supplier_State	Supplier_Zip
8259	CBM Inc.	74 5 <sup>th</sup> Avenue	Dayton	OH	45220
8261	B. R. Molds	1277 Gandolly Street	Cleveland	OH	49345
8263	Jackson Components	8233 Micklin Street	Lexington	KY	56723
8444	Bryant Corporation	4315 Mill Drive	Rochester	NY	11344

Join by Supplier\_Number

Part_Number	Part_Name	Supplier_Number	Supplier_Name
137	Door latch	8259	CBM Inc.
150	Door molding	8263	Jackson Components

Project selected columns

The **select**, **join**, and **project** operations enable data from two different tables to be combined and only selected attributes to be displayed.

# Non-relational databases: “NoSQL”

- More flexible data model
- Data sets stored across distributed machines
- Easier to scale
- Handle large volumes of unstructured and structured data (Web, social media, graphics)

# Databases in the cloud

- Typically, less functionality than on-premises DBs
- Amazon Relational Database Service, Microsoft SQL Azure
- Private clouds

# Designing Databases

- Conceptual (logical) design:
  - abstract model from business perspective
- Physical design:
  - How database is arranged on direct-access storage devices

# Design process identifies and Normalization

- Design process identifies:
  - Relationships among data elements, redundant database elements
  - Most efficient way to group data elements to meet business requirements, needs of application programs
- Normalization
  - Streamlining complex groupings of data to minimize redundant data elements and awkward many-to-many relationships

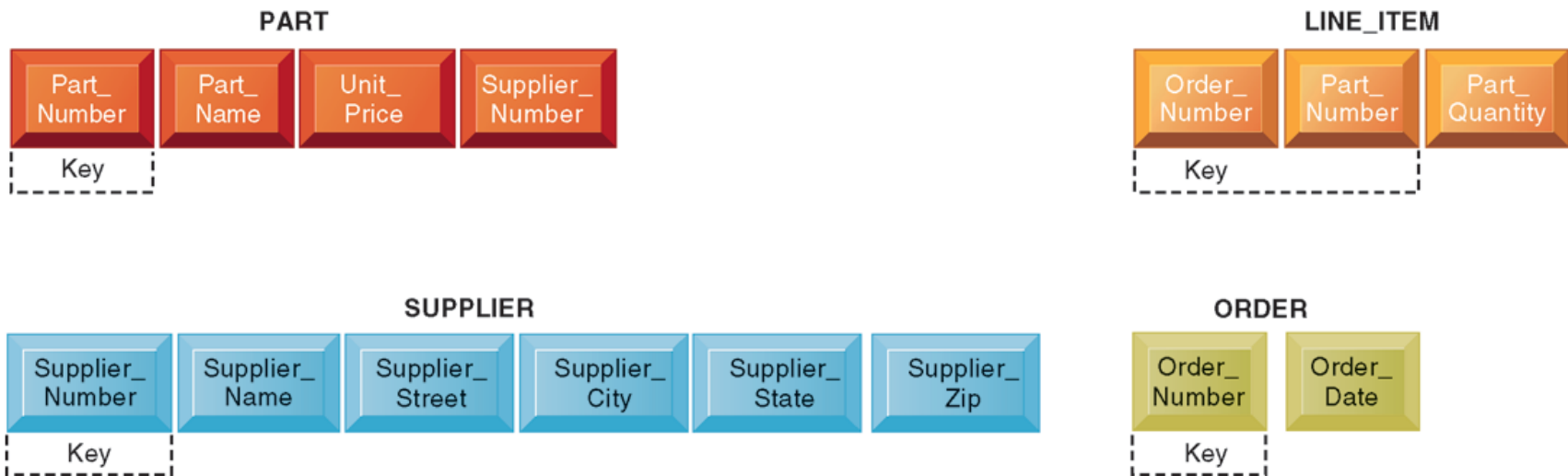
# AN UNNORMALIZED RELATION FOR ORDER

**ORDER (Before Normalization)**

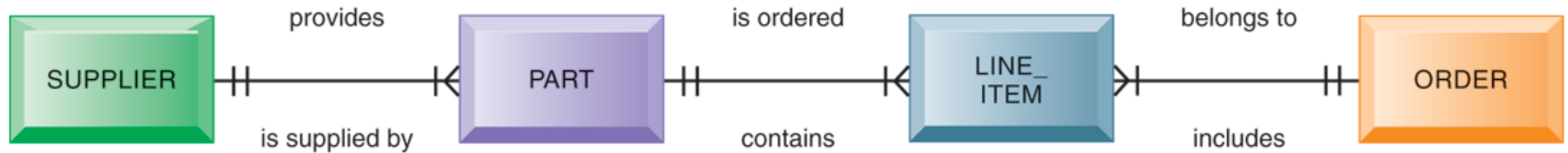
Order_ Number	Order_ Date	Part_ Number	Part_ Name	Unit_ Price	Part_ Quantity	Supplier_ Number	Supplier_ Name	Supplier_ Street	Supplier_ City	Supplier_ State	Supplier_ Zip
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# NORMALIZED TABLES CREATED FROM ORDER



# AN ENTITY-RELATIONSHIP DIAGRAM



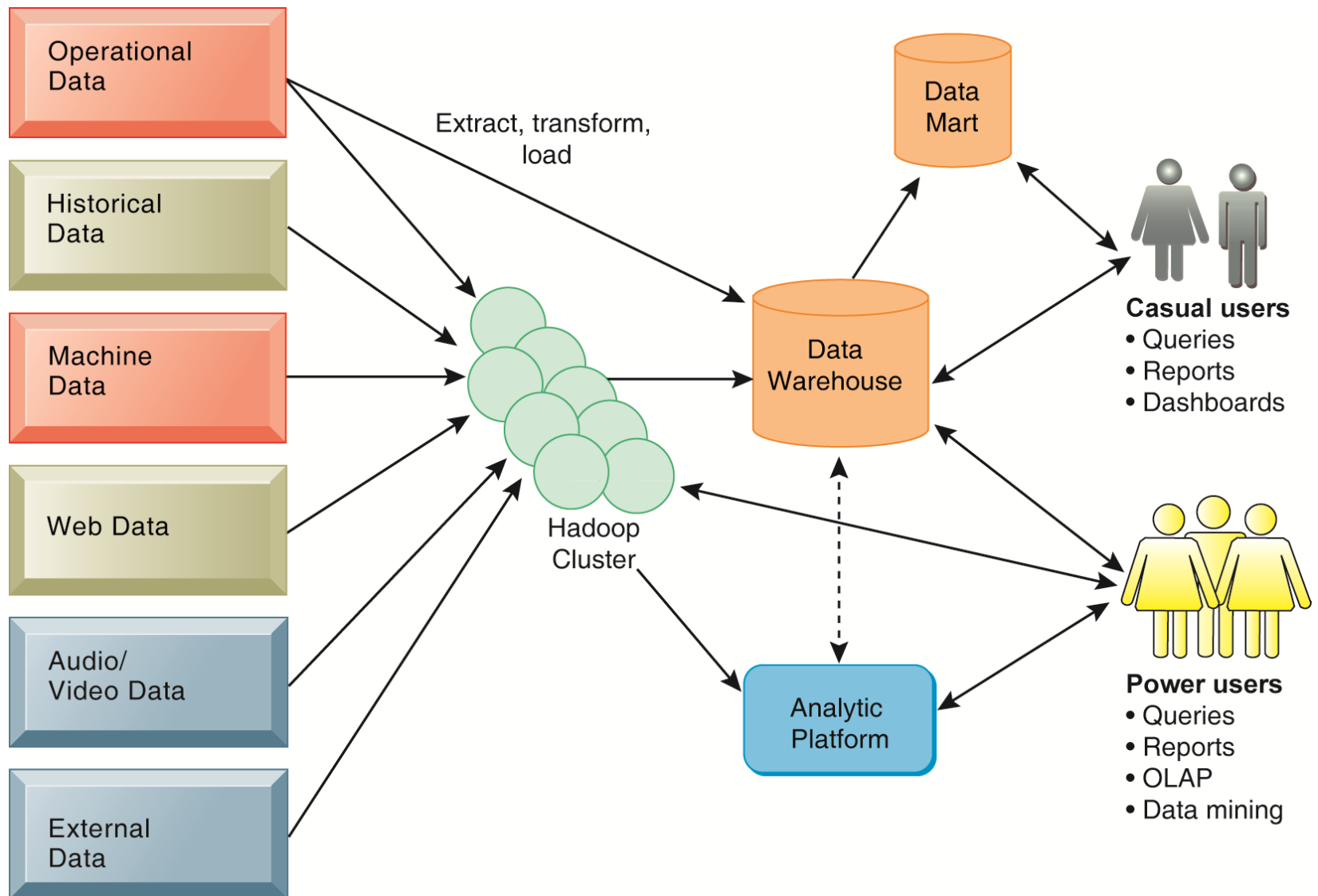
# Using Databases to Improve Business Performance and Decision Making

- **Big data**
  - Massive sets of unstructured/semi-structured data from Web traffic, social media, sensors, and so on
  - Petabytes, exabytes of data
    - Volumes too great for typical DBMS
  - Can reveal more patterns and anomalies

# Using Databases to Improve Business Performance and Decision Making

- **Business intelligence infrastructure**
  - Today includes an array of tools for separate systems, and big data
- **Contemporary tools:**
  - Data warehouses
  - Data marts
  - Hadoop
  - In-memory computing
  - Analytical platforms

# Business Intelligence Infrastructure



# Data Warehouse vs. Data Marts

- **Data warehouse:**
  - Stores current and historical data from many core operational transaction systems
  - Consolidates and standardizes information for use across enterprise, but data cannot be altered
  - Provides analysis and reporting tools
- **Data marts:**
  - Subset of data warehouse
  - Summarized or focused portion of data for use by specific population of users
  - Typically focuses on single subject or line of business

# Hadoop

- Enables distributed parallel processing of big data across inexpensive computers
- Key services
  - **Hadoop Distributed File System (HDFS)**: data storage
  - **MapReduce**: breaks data into clusters for work
  - **Hbase**: NoSQL database
- Used by Facebook, Yahoo, NextBio

# In-memory computing

- Used in **big data analysis**
- Use computers main memory (RAM) for data storage to avoid delays in retrieving data from disk storage
- Can reduce hours/days of processing to seconds
- Requires optimized hardware



# Analytic platforms

- High-speed platforms using both relational and non-relational tools optimized for large datasets
- Examples:
  - IBM Netezza
  - Oracle Exadata

# Analytical tools:

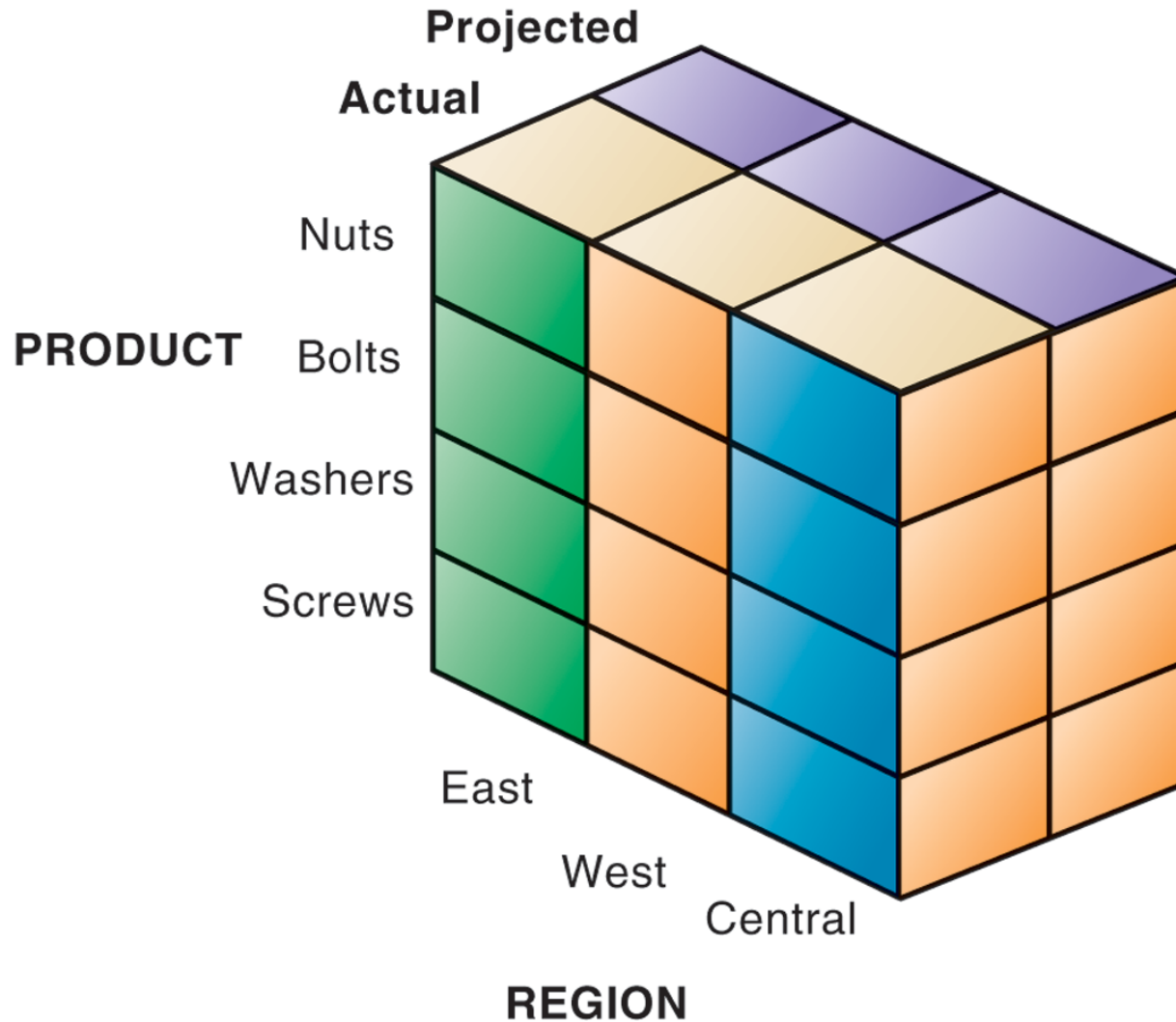
## Relationships, patterns, trends

- **Business Intelligence Analytics and Applications**
- Tools for consolidating, analyzing, and providing access to vast amounts of data to help users make better business decisions
  - **Multidimensional data analysis (OLAP)**
  - **Data mining**
  - **Text mining**
  - **Web mining**

# Online analytical processing (OLAP)

- Supports multidimensional data analysis
  - Viewing data using multiple dimensions
  - Each aspect of information (product, pricing, cost, region, time period) is different dimension
  - Example: How many washers sold in East in June compared with other regions?
- OLAP enables rapid, online answers to ad hoc queries

# MULTIDIMENSIONAL DATA MODEL



# Data mining

- Finds hidden patterns, relationships in datasets
  - Example: customer buying patterns
- Infers rules to predict future behavior
  - Data mining provides insights into data that cannot be discovered through OLAP, by inferring rules from patterns in data.

# Types of Information Obtained from Data Mining

- **Associations:** Occurrences linked to single event
- **Sequences:** Events linked over time
- **Classification:** Recognizes patterns that describe group to which item belongs
- **Clustering:** Similar to classification when no groups have been defined; finds groupings within data
- **Forecasting:** Uses series of existing values to forecast what other values will be

# Text mining

- Extracts key elements from large unstructured data sets
  - Stored e-mails
  - Call center transcripts
  - Legal cases
  - Patent descriptions
  - Service reports, and so on
- Sentiment analysis software
  - Mines e-mails, blogs, social media to detect opinions

# Web mining

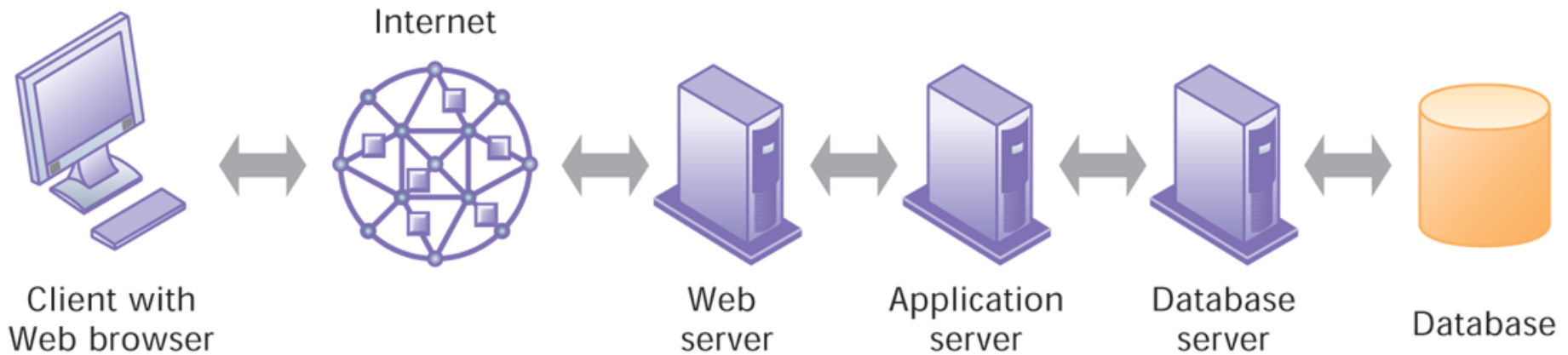
- Discovery and analysis of useful patterns and information from Web
  - Understand customer behavior
  - Evaluate effectiveness of Web site, and so on
- 3 Tasks of Web Mining
  - Web content mining
    - Mines content of Web pages
  - Web structure mining
    - Analyzes links to and from Web page
  - Web usage mining
    - Mines user interaction data recorded by Web server



# Databases and the Web

- Many companies use Web to make some internal databases available to customers or partners
- Typical configuration includes:
  - Web server
  - Application server/middleware/CGI scripts
  - Database server (hosting DBMS)
- Advantages of using Web for database access:
  - Ease of use of browser software
  - Web interface requires few or no changes to database
  - Inexpensive to add Web interface to system

# LINKING INTERNAL DATABASES TO THE WEB



# Managing Data Resources

- **Establishing an information policy**
  - Firm's rules, procedures, roles for sharing, managing, standardizing data
  - Data administration
    - Establishes policies and procedures to manage data
  - Data governance
    - Deals with policies and processes for managing availability, usability, integrity, and security of data, especially regarding government regulations
  - Database administration
    - Creating and maintaining database

# Managing Data Resources

- **Ensuring data quality**

- More than 25% of critical data in Fortune 1000 company databases are inaccurate or incomplete
  - Redundant data
  - Inconsistent data
  - Faulty input
- Before new database in place, need to:
  - Identify and correct faulty data
  - Establish better routines for editing data once database in operation

# Managing Data Resources

- **Data quality audit**

- Structured survey of the accuracy and level of completeness of the data in an information system
  - Survey samples from data files, or
  - Survey end users for perceptions of quality

- **Data cleansing**

- Software to detect and correct data that are incorrect, incomplete, improperly formatted, or redundant
- Enforces consistency among different sets of data from separate information systems

# Data Scientist

## What makes a data scientist?

The big data phenomenon trained a bright spotlight on those who perform deep information analysis and can combine quantitative and statistical modeling expertise with business acumen and a talent for finding hidden patterns. Here's a closer look.

Data scientists rely on analytics, predictive models, statistical analysis and modeling, data mining, sentiment and what-if analysis, and more to do their jobs. Cleansing raw data and building models is detailed work, and the right tools make the process much more efficient.

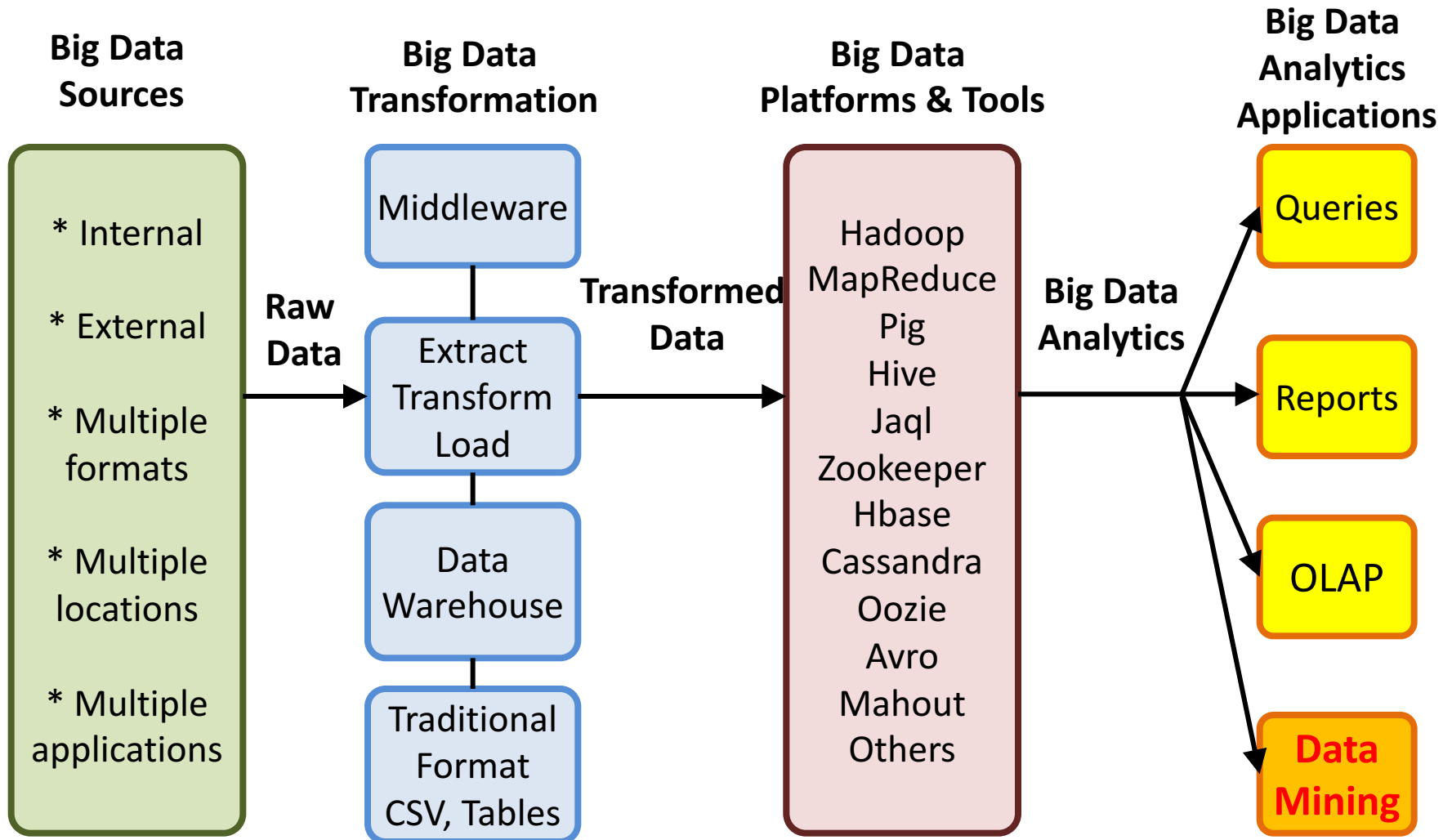
The IBM® BigInsights™ Data Scientist module accelerates data science with advanced analytics to extract valuable insights from Hadoop. Stable machine learning algorithms are optimized for Hadoop. Text analytics extract insight from unstructured data with existing tooling so analytic applications don't have to be developed from scratch. Big R statistical analysis and distributed frames allow data scientists to use the entire Hadoop cluster, not just a limited sample



Good data scientists select and address the business problems that have the most value to the organization. Armed with data and analytical results, they must present their informed conclusions and recommendations to technical and nontechnical stakeholders.

The BigInsights Analyst module lets data scientists use their existing skills to find data across the organization and visualize it without extra coding. IBM BigSheets is a spreadsheet-style data manipulation and visualization tool that gives business users direct access to data through a recognizable interface. IBM-designed Big SQL offers HDFS caching and high availability benefits as well as query optimization—without forcing data scientists to learn a new skill set.

# Architecture of Big Data Analytics



# Architecture of Big Data Analytics

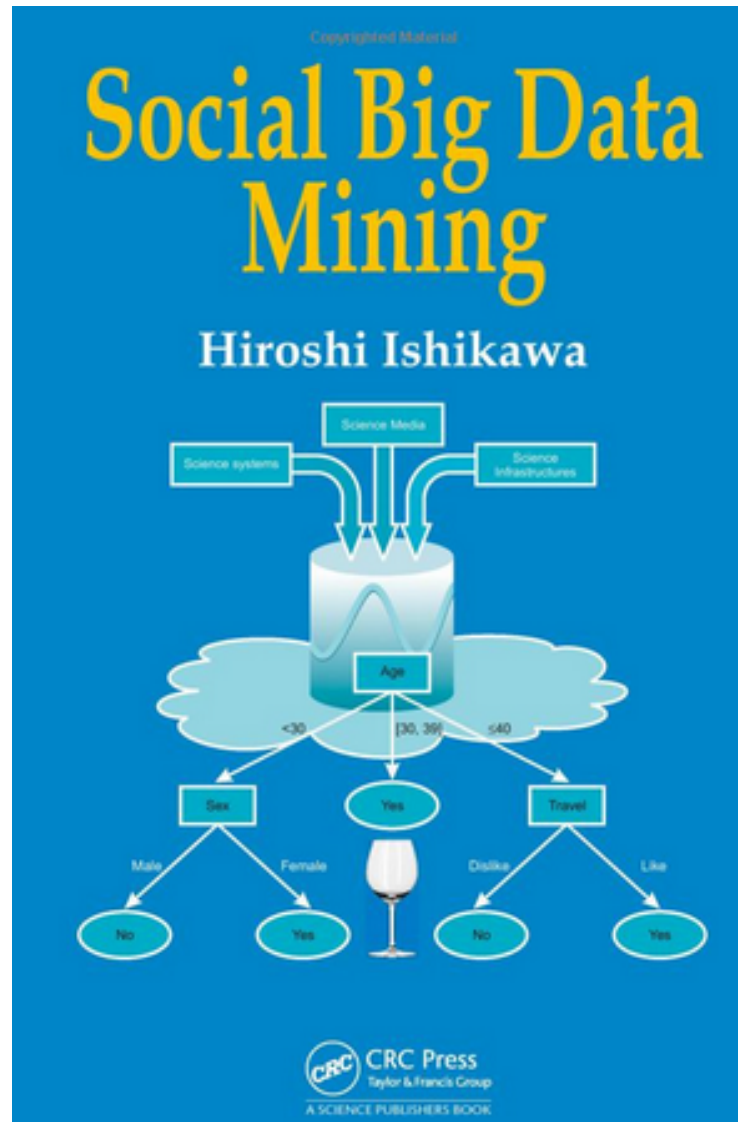


Source: Stephan Kudyba (2014), Big Data, Mining, and Analytics: Components of Strategic Decision Making, Auerbach Publications



# Social Big Data Mining

(Hiroshi Ishikawa, 2015)

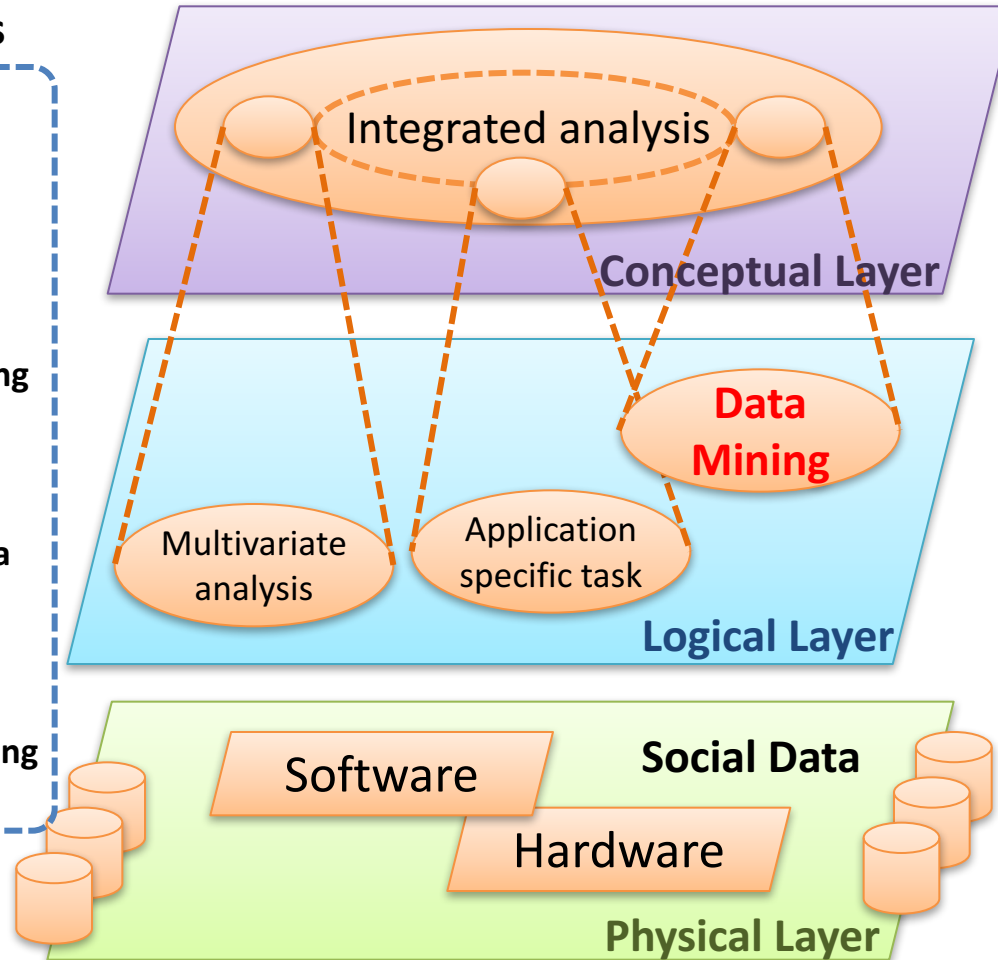


# Architecture for Social Big Data Mining

(Hiroshi Ishikawa, 2015)

## Enabling Technologies

- Integrated analysis model
- Natural Language Processing
- Information Extraction
- Anomaly Detection
- Discovery of relationships among heterogeneous data
- Large-scale visualization
- Parallel distributed processing



## Analysts

- Model Construction
- Explanation by Model
- Construction and confirmation of individual hypothesis
- Description and execution of application-specific task

# Case Study:

## Google, Apple, and Microsoft (Chap. 7) (pp. 318-320)

### Apple, Google, and Microsoft Battle for Your Internet Experience

1. Define and compare the business models and areas of strength of Apple, Google, and Microsoft.
2. Why is mobile computing so important to these three firms? Evaluate the mobile platform offerings of each firm.
3. What is the significance of applications and app stores, and closed vs. open app standards to the success or failure of mobile computing?
4. Which company and business model do you believe will prevail in this epic struggle? Explain your answer.
5. What difference would it make to a business or to an individual consumer if Apple, Google, or Microsoft dominated the Internet experience? Explain your answer.

# 2017/11/16

## Midterm Report (期中報告)

- 請各組組長整理期中報告資料檔案，  
於2017/11/16 (週四) 下午14:00 前，  
完成Email 寄出以下兩個壓縮檔的下載連結，  
給所有組員和老師 (正本to: 老師，副本cc: 所有組員)。
  - 1. 整組各次簡報的 ppt (含整組期中報告目錄 ppt) 壓縮檔
    - (例如：MI4C\_資訊管理專題\_第1組\_期中各次簡報.zip)。
  - 2. 整組各組員的
    - [(1) 個人期中報告.ppt
    - (2) 個人期中書面報告.pdf]
    - 之壓縮檔
    - (例如：MI4C\_資訊管理專題\_第1組\_組員個人期中報告.zip)。

# 資訊管理專題

## (Hot Issues of Information Management)

1. 請同學於資訊管理專題個案討論前  
應詳細研讀個案，並思考個案研究問題。
2. 請同學於上課前複習相關資訊管理相關理論，  
以作為個案分析及擬定管理對策的依據。
3. 請同學於上課前  
先繳交資訊管理專題個案研究問題書面報告。
4. 上課時間地點：  
週四 7,8 (14:10-16:00) B702

# References

- Kenneth C. Laudon & Jane P. Laudon (2014),  
Management Information Systems: Managing the  
Digital Firm, Thirteenth Edition, Pearson.
- Kenneth C. Laudon & Jane P. Laudon 原著，  
游張松 主編，陳文生 翻譯 (2014)，  
資訊管理系統，第13版，滄海