INTRODUCTION TO INFORMATION SYSTEMS & DECISION MAKING

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BUS3500 - Abdou Illia, Fall 2016

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LEARNING GOALS

- Explain basic information systems concepts
- Explain difference b/w data an information
- Identify main components of info. systems
- Describe kinds of information systems.

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Data versus Information

- Data = raw facts that represent the characteristics of an event
  - Example 1:
    - Event: High temperature
    - Data: 100° F
  - Example 2:
    - Event: Sale
    - Data: Sale's date, item number, item description, etc.
- Information = facts within a given context
  - Information results from transforming data by adding context and meaning to make it more useful.
  - The temperature today at noon in Times Square, NYC was 100° F
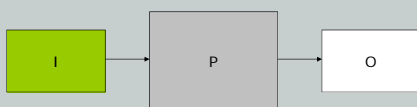
I → P → O

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Functions of an Information System

Figure 1-2

An information system contains information about an organization and its surrounding environment. Three basic activities—input, processing, and output—produce the information organizations need. Feedback is output returned to appropriate people or activities in the organization to evaluate and refine the input. Environmental actors, such as customers, suppliers, competitors, stockholders, and regulatory agencies, interact with the organization and its information systems.

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Data Vs Information

. The output could be a report

Data and Information

Figure 1-1

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The Value of Information

- **Accuracy** (Is information correct? Can we rely on it?)
- **Timeliness** (How current is the information?)
- **Accessibility** (Can the information be accessed when needed?)
- **Engagement** (Is the information capable of affecting a decision?)
- **Application** (Is the information relevant to the current context?)
- **Rarity** (Is the information previously known?)

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Information System?

- Information system: set of interrelated components that work together in order to collect (or retrieve), store, process, and distribute information to support decision-making and control in organizations
- Major components of information systems
  - Hardware (physical parts of a computer or other computing devices)
  - Software (Instructions that tell hardware what to do)
  - Databases (Software that enables storage/retrieval of data)
  - Networks (Computing devices that communicate with each other)
  - People (individuals and organizational units)

  Information Technologies

- Information technology (IT): Computer-based tool that people use to work with information and support the information and information-processing needs of an organization

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ROLES AND RESPONSIBILITIES IN IT

- Beside being computer-based tool, IT is also a business function
  - A relatively new functional area, having only been around formally for around 40 years

- Recent IT strategic positions include:
  - Chief Information Officer (CIO)
  - Chief Technology Officer (CTO)
  - Chief Security Officer (CSO)
  - Chief Privacy Officer (CPO)
  - Chief Knowledge Officer (CKO)

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ROLES AND RESPONSIBILITIES IN IT

- **Chief Information Officer (CIO)**
  - Oversees all uses of IT
  - Ensures the strategic alignment of IT with business goals and objectives
- **Chief Security Officer (CSO)**
  - Responsible for ensuring the security of IT systems
  - Responsible for developing security policies and strategies
  - Responsible for controlling implementation of security policies and strategies
  - Responsible for information security training
- **Chief Knowledge Officer (CKO)**
  - Responsible for collecting, maintaining, and distributing the organization's knowledge
  - Responsible for supervising the implementation of knowledge systems

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Information Systems in Organizations

- An organization is an administrative and functional structure where people work toward a specific goal.
- Understanding the organizations' IT needs means understanding the administrative and functional structure.
  - Hierarchical
  - Matrix
  - Other

IS & Hierarchical Organizational structure

- . **Information Requirements of Key Decision-Making Groups in a Firm**

Decision Characteristics		Examples of Decisions
Unstructured	Senior Management	Decide entrance or exit from markets; Approve capital budget; Decide long-term goals
Semistructured	Middle Management	Design a marketing plan; Develop a departmental budget; Design a new corporate Web site
Structured	Operational Management Individual Employees and Teams	Determine overtime eligibility; Restock inventory; Offer credit to customers; Determine special offers to customers

Senior managers, middle managers, operational managers, and employees have different types of decisions and information requirements.
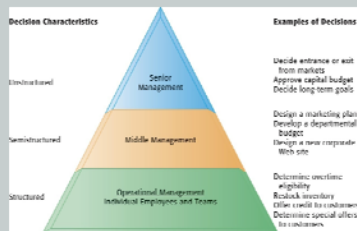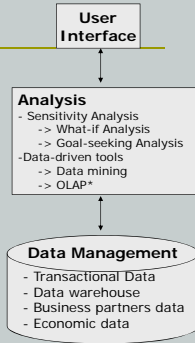
Figure 10-1

Administrative Information Systems

- Transaction Processing Systems (TPS)
  - Basic business system that serves the operational level (analysts) in an organization
- Office Automation Systems (OAS)
  - Systems designed to help office workers in doing their job.
- Decision Support Systems (DSS)
  - Systems designed to support middle managers and business professionals during the decision-making process
- Executive Information Systems (EIS) or Executive Support Systems (ESS)
  - Specialized DSS that help senior level executives make decisions.

DSS structure

User Interface

- Systems designed to help middle managers make decisions
- Major components
  - Data management subsystem
    - Internal and external data sources
  - Analysis subsystem
    - Typically mathematical in nature
  - User interface
    - How the people interact with the DSS
    - Data visualization is the key
      - Text
      - Graphs
      - Charts

Analysis
- Sensitivity Analysis
  -> What-if Analysis
  -> Goal-seeking Analysis
- Data-driven tools
  -> Data mining
  -> OLAP*

Data Management
- Transactional Data
- Data warehouse
- Business partners data
- Economic data

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* OLAP: OnLine Analytical Processing

DSS Analysis Tools

- Simulation is used to examine proposed solutions and their impact
  - Sensitivity analysis
    - Determine how changes in one part of the model influence other parts of the model
  - What-if analysis
    - Manipulate variables to see what would happen in given scenarios
  - Goal-seeking analysis
    - Work backward from desired outcome

What-if Analysis	Change in Interest Rate		
	Loan Amount	*Interest Rate	Monthly Payment
	$10,000	5.00%	$230.29
	$10,000	5.50%	$232.56
	$10,000	6.00%	$234.85
	$10,000	6.50%	$237.14
	$10,000	7.00%	$239.46
	$10,000	7.50%	$241.78
	$10,000	8.00%	$244.12

Determine monthly payment given various interest rates.

Goal-Seeking Analysis	Set Payment Amount		
	Loan Amount	*Interest Rate	Monthly Payment
	$10,000.00	19.190%	$300.00
	$11,000.00	13.894%	$300.00
	$12,000.00	9.243%	$300.00
	$13,000.00	5.106%	$300.00
	$14,000.00	1.388%	$300.00
	$15,000.00	Impossible	$300.00

Works backward from a given monthly payment to determine various loans that would give that payment.

Artificial Intelligence (AI) systems

- Common categories of AI systems:
  1. **Expert system –** computerized advisory programs that imitate the reasoning processes of experts in solving difficult problems
  2. **Neural Network** – attempts to emulate the way the human brain works
     - *Fuzzy logic* – a mathematical method of handling imprecise or subjective information
  3. **Genetic algorithm** – an artificial intelligent system that mimics the evolutionary, survival-of-the-fittest process to generate increasingly better solutions to a problem
  4. **Intelligent agent** – special-purpose knowledge-based information system that accomplishes specific tasks on behalf of its users
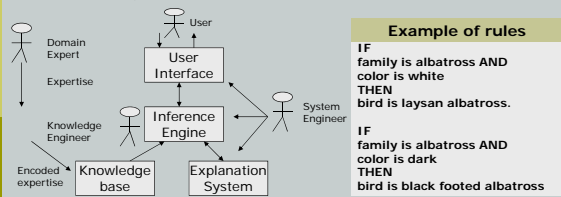
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Expert Systems

- Artificial Intelligence systems that codify *human expertise* in a computer system
  - Main goal is to transfer knowledge from one person to another
  - Wide range of subject areas
    - Medical diagnosis
    - Computer purchasing
  - Knowledge engineer elicits the expertise from the expert and encodes it in the expert system

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Expert Systems Components

- Knowledge base: database of the expertise, often in IF THEN rules.
- Inference engine: derives recommendations from knowledge base and problem-specific data
- User interface: controls the dialog between the user and the system
- Explanation system: Explain the *how* and *why* of recommendations

Domain Expert — Expertise — Knowledge Engineer — Encoded expertise — Knowledge base — User Interface — User — Inference Engine — System Engineer — Explanation System

Example of rules

IF
family is albatross AND
color is white
THEN
bird is laysan albatross.

IF
family is albatross AND
color is dark
THEN
bird is black footed albatross

- Knowledge engineer codify the human expert's expertise into the systems' knowledge base.
- System engineer is the IT professional who develop the user interface, the inference engine, and the explanation system.
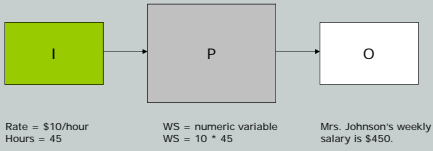
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Summary Questions

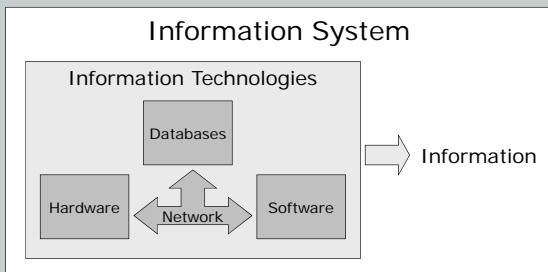|		Notes
1)	Distinguish between Data and Information	3
2)	List/Explain main components of an information system	7
3)	What is the difference between TPS and DSS in terms of their target users?	12
4)	What is the difference between Decision Support Systems (DSS) and Executive Information Systems (EIS) in terms of their target users.	12
6)	What is a Chief Information Officer responsible for?	9
7)	(a) What are the major components in a DSS? (b) What is the function of each?	13
8)	What is an Expert System? What are the main components of an Expert system? What is a knowledge engineer?	17

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Summary Questions (cont.)

I	→	P	→	O

Rate = $10/hour
Hours = 45

WS = numeric variable
WS = 10 * 45

Mrs. Johnson's weekly
salary is $450.

- Given the illustration above, what could be an information?
  a) Rate = $10/hour
  b) Mrs. Johnson's weekly salary is $450
  c) WS = 10 * 45

- The accuracy of an information could be affected by the accuracy of the input data?   T   F
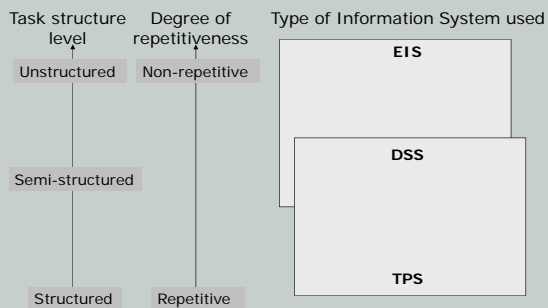
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Information system vs. Information Technology

Information System

Information Technologies

Databases

Hardware ⇔ Network ⇔ Software

⇨ Information

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Organizations and IS

Task structure level	Degree of repetitiveness	Type of Information System used
Unstructured	Non-repetitive	EIS
Semi-structured		DSS
Structured	Repetitive	TPS

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