Objectives:
- To review basic information systems concepts
- To present models of information systems structure and functions
- To examine different types of information systems

Note:
- Some students may already be familiar with many of the concepts in this lecture
- We will cover this material completely, however, so that all students will be equally prepared
- You may find some of the American terminology different and some of the concepts new
What is an information system?

What is information?

What is a system?

Information and data

• **Information**: Message that we receive that is meaningful or useful to us
  - Message can be received by any of the 5 senses: see, hear, touch, smell, taste
  - Currently seeing and hearing are the main ways messages are received in business
  - Research on other forms of message transmission is underway
• Information reduces uncertainty in decision-making situations and thus information has value
• **Data**: A representation of a fact, a number, a word, an image, a picture, or a sound (or a sensation, an odor, or a taste)
• Data for one person may be information for another
  - Example: We have 10 boxes in inventory
    = information for inventory manager
    = data for CEO
Systems

- **System**: A collection of parts, called components, that work together for a purpose
- Two important elements of this definition:
  - System is composed of components
  - System has a purpose
- **Components**:
  - Work together in system
  - We view system as a whole
  - We understand system by examining its components
- **Purpose/objective/goal**:
  - What the system is designed to accomplish
  - Result of the components working together
  - Teleological system (Churchman)

System example

Automobile:
- Components: engine, body, transmission, etc., that make the automobile work
- Purpose: to provide transportation
- Note: driver is a component of the system because the automobile cannot accomplish its purpose without the driver
### Socio-technical system

- **Socio-technical system:** A system that has both human and technical components
- An automobile is a socio-technical system
- Socio-technical systems can only be understood by examining both their technical and human components

### System characteristics

- Systems have inputs and outputs
  - *Input:* goes into system and is used by system to accomplish its purpose
  - *Output:* comes out of system; results from system’s activities

<table>
<thead>
<tr>
<th>Input</th>
<th>System</th>
<th>Output</th>
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- **Automobile:**
  - Input: desired direction and speed of travel
  - Output: actual movement of automobile in a particular direction and at a certain speed
### Information system definition

An *information system (IS)* is a *socio-technical system* the purpose of which is to process *data* and provide *information* to help in the operations, management, and *competitive position* of an organization.

| Components: equipment, instructions, people, procedures, data |
| Purpose: to process data and provide information to help in the organization’s operations, management, and competitive position |
| Input and output: |

Data → Information system → Information
Business operations, management, and competitive position

- Operations: activities that provide the goods and services of the business
  - Related to business’s value chain

- Management: decision making activities at the
  - Operational level (short term – several days to months)
  - Tactical level (intermediate term – several months or years)
  - Strategic level (long term – many years)

Business operations, management, and competitive position

- Competitive position: ability of company to compete with other companies
  - Can give business a competitive advantage over other companies
  - Can have a strategic impact on business

- Information is needed to support business operations, management, and competitive position
Information system functions

- **Function** of an information system: an activity that takes place that helps system accomplish its purpose

- **Input function**: accepts input data from outside system
- **Storage function**: retains input data and other stored data; retrieves stored data when needed; modifies stored data as needed
- **Processing function**: calculates and in other ways manipulates input and stored data
- **Output function**: produces output information (output data) that results from processing for use outside the system

Information system functions model

```
Input data → Input function → Processing function → Output function → Information (output data)

Storage function

Stored data
```
## Information system functions example

**Inventory system:**
(Inventory: Stock of goods in a business)

- **Input function:** accepts input data about changes in inventory (quantity of items sold; quantity of items received)
- **Storage function:** keeps track of stored inventory data (inventory quantities)
- **Processing function:** adjusts inventory quantities for changes in inventory (subtracts quantity sold; adds quantity received)
- **Output function:** produces output information from the system (current quantity on hand for different items)

## Information system components

- **Hardware**
  - Computers
  - Network communications equipment
  - Other physical devices and equipment

- **Software (programs)**
  - System software (operating systems, etc.)
  - Application software (inventory programs, etc.)
Information system components

- Personnel
  - Users
  - System operators
- Procedures
  - Normal operating procedures
  - Error handling procedures
- Stored data
  - Data files
  - Databases

Information system components model
### Information system components example

**Inventory system:**
- **Hardware:**
  - Input devices (keyboard, mouse)
  - Storage devices (magnetic disk, CD)
  - Processing devices (CPU, memory)
  - Output devices (screen, printer)
  - Communications devices (communications channels, communications processors)
- **Software:**
  - Operating systems (computer and network)
  - Communications software
  - Database software
  - Inventory software

### Information system components example

- **Personnel:**
  - Inventory personnel
  - Managers
  - System operators
- **Procedures:**
  - Data entry procedures
  - Output distribution procedures
  - Software operating procedures
  - Backup and recovery procedures
- **Stored data:**
  - Data about each item business stocks (item number, description, cost, price, quantity on hand)
Information system typologies

- Many types of information systems
- Many ways to classify information systems
- Some typologies:
  - Based on scope of system use
  - Based on geographic extent of system
  - Based on purpose of system
  - Based on strategic impact of system

Information system typology: Scope of system use

- *Individual information system*: affects a single user
  - Financial analysis system using spreadsheet software
- *Workgroup information system*: affects a group of users (workgroup, team, department, etc.)
  - Information-sharing system (e.g., Lotus Notes)
- *Organizational (enterprise) information system*: affects multiple groups or a large part of organization
  - Enterprise resource planning (ERP) system
  - Customer relationship management (CRM) system
  - Supply chain management (SCM) system
- *Interorganizational information system*: affects multiple organizations
  - Enterprise information exchange system (e.g., electronic data interchange (EDI) system)
Information system typology: Geographic extent of system

- **Domestic information system**: all components and functions are located in a single country
- **Global information system**: components and/or functions exist in multiple countries; system spans national borders

Reason for distinction: many new issues arise when information systems cross national borders because of differences between countries:
  - Technical differences
  - Political differences
  - Legal differences
  - Economic differences
  - Cultural differences

Information system typology: Purpose of system

- **Transaction processing system (TPS)**
- **Management information system (MIS)**
  (Information reporting system)
  (Management reporting system)
- **Decision support system (DSS)**
- **Executive information system - EIS**
- **Expert system (ES)**
- **Knowledge management system (KMS)**
- **Business intelligence (BI) system**
### Information system typology: Purpose of system

#### Transaction processing system (TPS):
- Keeps records about the state of the organization
- Processes data about business transactions that affect these records
- Produces outputs that
  - Report on transactions that have occurred
  - Report on the state of organization
  - Cause other transactions to occur
- Supports business operations
- Example: Customer order entry system

#### Management information system (MIS):
- Provides information to managers at different levels of an organization to support decision making
- Input data can be
  - Internal (from organizational databases)
  - External (from sources outside business)
- Output information provided in form of
  - Reports
  - Responses to queries
- Levels of management decision making supported
  - Operational
  - Tactical
  - Strategic
- Example: Inventory management system
### Information system typology: Purpose of system

#### Decision support system (DSS):
- Provides results of *analysis* of data to managers at different levels of organization to support decision making
- Input data can come from internal or external sources
- Analysis of data can involve
  - Statistical calculations
  - Mathematical modeling
  - Other techniques
- Output information provided in form of
  - Numerical output (e.g., tables)
  - Graphical output
- Levels of management decision making supported:
  - Tactical
  - Strategic
- Example: Financial modeling system

#### Executive information system (EIS):
- Provides information specifically needed by strategic managers to support decision making
- Input data provided from
  - MIS and DSS reports (with drill down capabilities)
  - Organizational databases
  - External sources
  - Special databases
  - Personal databases
- Output information provided in form of
  - Reports
  - Responses to queries
  - Graphs
- Level of management decision making supported:
  - Strategic
- Example: Sales reporting system with drill down capabilities
Information system typology: Purpose of system

Expert system (ES):
- Provides expert advice to managers at different levels to support decision making
- Advice provided from
  - Knowledge base: rules or other representations of knowledge
  - Inference engine
- Advice provided in form of
  - Responses to queries
- Level of management decision making supported:
  - Operational
  - Tactical
- Example: Credit card application analysis system (American Express)

Knowledge management system (KMS):
- Provides organizational knowledge to managers at different levels to support decision making
  - Knowledge: understanding gained through education, experience, discovery, intuition, and insight; can be
    - Explicit
    - Implicit
  - Organizational knowledge: knowledge of the people who work for the organization.
- Knowledge derived from
  - Stored documents (explicit knowledge)
  - Collaboration among employees (explicit and implicit knowledge)
- Knowledge provided in form of
  - Responses to queries
- Level of management decision making supported:
  - Operational
  - Tactical
  - Strategic
- Example: Engineering knowledge management system (Chrysler)
### Information system typology: Purpose of system

**Business intelligence (BI) system:**
- Uses software tools to capture, organize, and analyze business data in order to improve the business’s performance
- Current and historical data stored in data warehouse
  - Often organized in a multidimensional database (data cube)
- Data analyzed using data mining techniques
  - Looks for patterns, trends, and correlations
  - “Slice and dice” data cube to look at data in different ways to find useful information
- Online analytical processing (OLAP)
  - Use of data mining and other tools in an interactive, real-time environment to provide immediate response to complex queries
- Level of management decision making supported:
  - Operational
  - Tactical
  - Strategic
- Example: Market basket analysis - analysis of sales data to determine what items are purchased together

### Information system typology: Strategic impact of system

- **Non-strategic information system:** does not have a strategic impact on organization
- **Strategic information system:** has a strategic impact on organization
  - Strategic impact creates a competitive advantage for organization through (Porter, others):
    - Cost leadership
    - Differentiation
    - Focus
    - Innovation
    - Growth
    - Business alliances
  - Can support any level of organization (not just strategic level)
  - Can be any type of information system if system can help organization achieve a competitive advantage
<table>
<thead>
<tr>
<th>Electronic commerce systems</th>
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<tbody>
<tr>
<td>• How do the information system concepts discussed here apply to electronic commerce (e-commerce) systems?</td>
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<tr>
<td>• What is the purpose of e-commerce systems?</td>
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<td>• What are the components of e-commerce systems?</td>
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<tr>
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<tr>
<td>• How do e-commerce systems fit in the various typologies of information systems?</td>
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