The chapter introduces six types of information systems. Figure 2.1 and table 2.1 give an overall picture of organizations and how different types of information systems serve them. Figure 2.2 depicts different types of information systems and how they relate to one another (Figure 2.9 as well).

Section 2.2 examines information systems from a functional view of an organization: Sales and marketing systems, manufacturing and production systems, finance and accounting systems, and human resources systems. Read this section carefully to develop an understanding of how information systems serve different functions of an organization.
Reading Notes for Chapter 2 in the textbook - Continued

Read section 2.3 carefully to understand integration of functions and business processes. Figure 2.12 illustrates a cross-functional business process. Pay also attention to customer relationship management and enterprise systems that are current trends in business. Contrast Figure 2.15 and 2.16. Extended enterprises and industrial networks are also recent trends and would not be possible without the support of information technology.

KINDS OF INFORMATION SYSTEMS

- Organizational Hierarchy
- Organizational Levels
- Information Systems
Four General Kinds of IS

- **Operational-level systems**
  - support *operational managers* by monitoring the day-to-day’s elementary activities and transactions of the organization. e.g. TPS.

- **Knowledge-level systems**
  - support *knowledge and data workers* in designing products, distributing information, and coping with paperwork in an organization. e.g. KWS, OAS

- **Management-level systems**
  - support the monitoring, controlling, decision-making, and administrative activities of *middle managers*, e.g. MIS, DSS

- **Strategic-level systems**
  - support long-range planning activities of *senior management*, e.g. ESS
A Framework for IS
(with respect to support provided)

- Executive Support Systems (ESS)
- Management Information Systems (MIS)
- Decision Support Systems (DSS)
- Knowledge Work Systems (KWS)
- Office Automation Systems (OAS)
- Transaction Processing Systems (TPS)

Transaction Processing Systems (TPS)

*Computerized system that performs and records the daily routine transactions necessary to conduct the business; these systems serve the operational level of the organization*

- TYPE: Operational-level
- INPUTS: transactions, events
- PROCESSING: updating
- OUTPUTS: detailed reports
- USERS: operations personnel, supervisors
- DECISION-MAKING: highly structured

**EXAMPLE:** payroll, accounts payable
A Symbolic Representation for a payroll TPS

Typical Applications of TPS

<table>
<thead>
<tr>
<th>Major type</th>
<th>Sales</th>
<th>Manufacturing</th>
<th>Finance</th>
<th>Human</th>
<th>Other types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems</td>
<td></td>
<td>systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major functions of system</td>
<td>Sales management</td>
<td>Scheduling</td>
<td>Budgeting</td>
<td>Personnel record</td>
<td>Admissions</td>
</tr>
<tr>
<td>Market research</td>
<td>Purchasing</td>
<td>General ledger</td>
<td>Benefits</td>
<td>Grade records</td>
<td></td>
</tr>
<tr>
<td>Promotion</td>
<td>Shipping/receiving</td>
<td>Billing</td>
<td>Compensation</td>
<td>Course records</td>
<td></td>
</tr>
<tr>
<td>Pricing</td>
<td>Engineering</td>
<td>Cost accounting</td>
<td>Labor relations</td>
<td>Alumni</td>
<td></td>
</tr>
<tr>
<td>New products</td>
<td>Operations</td>
<td>Training</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major application systems</th>
<th>Sales order</th>
<th>Materials resource</th>
<th>General ledger</th>
<th>Payroll</th>
<th>Registration system</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td></td>
<td></td>
<td>General ledger</td>
<td>Payroll</td>
<td>Registration system</td>
</tr>
<tr>
<td>Major functions</td>
<td></td>
<td></td>
<td>General ledger</td>
<td>Payroll</td>
<td>Registration system</td>
</tr>
<tr>
<td>Application systems</td>
<td></td>
<td></td>
<td>General ledger</td>
<td>Payroll</td>
<td>Registration system</td>
</tr>
<tr>
<td>Pricing system</td>
<td></td>
<td></td>
<td>General ledger</td>
<td>Payroll</td>
<td>Registration system</td>
</tr>
<tr>
<td>Quality control</td>
<td></td>
<td></td>
<td>General ledger</td>
<td>Payroll</td>
<td>Registration system</td>
</tr>
</tbody>
</table>
Office Automation Systems (OAS)

Computer system, such as word processing, electronic mail system, and scheduling system, that is designed to increase the productivity of data workers in the office.

- TYPE: Knowledge-level
- INPUTS: documents, schedules
- PROCESSING: document management, scheduling, communication
- OUTPUTS: documents; schedules
- USERS: clerical workers

EXAMPLE: document imaging system

Knowledge Work Systems (KWS)

Information system that aids knowledge workers in the creation and integration of new knowledge in the organization.

- TYPE: Knowledge-level
- INPUTS: design specifications
- PROCESSING: modelling
- OUTPUTS: designs, graphics
- USERS: technical staff; professionals

EXAMPLE: Engineering workstations
Decision Support Systems (DSS)

Information system at the management level of an organization that combines data and sophisticated analytical models or data analysis tools to support semi-structured and unstructured decision making.

- **TYPE:** Management-level
- **INPUTS:** low volume data
- **PROCESSING:** simulations, analysis
- **OUTPUTS:** decision analysis
- **USERS:** professionals, staff managers
- **DECISION-MAKING:** semi-structured

**EXAMPLE:** sales region analysis

Characteristics of Decision-Support Systems

1. DSS offer users flexibility, adaptability, and a quick response.
2. DSS operate with little or no assistance from professional programmers.
3. DSS provide support for decisions and problems whose solutions cannot be specified in advance.
4. DSS use sophisticated data analysis and modelling tools.
Management Information Systems (MIS)

Information system at the management level of an organization that serves the functions of planning, controlling, and decision making by providing routine summary and exception reports.

- **TYPE:** Management-level
- **INPUTS:** high volume data
- **PROCESSING:** simple models
- **OUTPUTS:** summary reports
- **USERS:** middle managers
- **DECISION-MAKING:** structured to semi-structured

**EXAMPLE:** annual budgeting

Characteristics of Management information Systems

1. MIS support structured decisions at the operational and management control levels. However, they are also useful for planning purposes of senior management staff.
2. MIS are generally reporting and control oriented. They are designed to report on existing operations and therefore to help provide day-to-day control of operations.
3. MIS rely an existing corporate data-and data flows.
4. MIS have little analytical capability.
5. MIS generally aid in decision making using past and present data.
6. MIS are relatively inflexible.
7. MIS have an internal rather than an external orientation.
Executive Support Systems (ESS)

Information system at the strategic level of an organization that address unstructured decision making through advanced graphics and communications.

TYPE: Strategic level
• INPUTS: aggregate data; internal and external
• PROCESSING: interactive
• OUTPUTS: projections
• USERS: senior managers
• DECISION-MAKING: highly unstructured

EXAMPLE: 5 year operating plan

Model of a Typical Executive Support System
Major Types of Information Systems

**ESS**
- Strategic Level Systems
  - System planning
  - Sales trend forecasting
  - Profit planning

**MIS**
- Management Level Systems
  - Sales management
  - Inventory Control
  - Sales region analysis

**DSS**
- Management Level Systems
  - Annual budgeting
  - Cost analysis

**KWS**
- Knowledge Level Systems
  - Engineering workstations

**OAS**
- Knowledge Level Systems
  - Word processing

**TPS**
- Operational Level Systems
  - Machine control
  - Plant scheduling
  - Material movement
  - Cash control

**Relationship between different IS**

TPS is a major producer of information for other systems
Classification of IS by Organizational Structure

- Departmental Information Systems
- Enterprise Information System
- Inter-organizational Systems
  - NYCE
  - SABRE or APOLLO

Classification of IS by Functional Area

- The accounting information system
- The finance information system
- The manufacturing (operations, production) information system
- The marketing information system
- The human resources information system
Sales & Marketing Systems

- Systems that help the firm identify customers for the firm’s products or services, develop products and services to meet customer’s needs, promote products and services, sell the products and services, and provide ongoing customer support.

<table>
<thead>
<tr>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
</tr>
<tr>
<td>Order processing</td>
</tr>
<tr>
<td>Market analysis</td>
</tr>
<tr>
<td>Pricing analysis</td>
</tr>
</tbody>
</table>

Manufacturing and Production Systems

- Systems that deal with the planning, development, and production of products and services and with controlling the flow of production.

<table>
<thead>
<tr>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
</tr>
<tr>
<td>Machine control</td>
</tr>
<tr>
<td>Computer-aided design (CAD)</td>
</tr>
<tr>
<td>Production planning</td>
</tr>
<tr>
<td>Facilities location</td>
</tr>
</tbody>
</table>
Finance and Accounting Systems

- Systems that keep track of the firm’s financial assets and fund flows.

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Organizational Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts receivable</td>
<td>Track money owed the firm</td>
<td>Operational</td>
</tr>
<tr>
<td>Portfolio analysis</td>
<td>Design the firm’s portfolio of investments</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Budgeting</td>
<td>Prepare short-term budgets</td>
<td>Management</td>
</tr>
<tr>
<td>Profit planning</td>
<td>Plan long-term profits</td>
<td>Strategic</td>
</tr>
</tbody>
</table>

Human Resources Systems

- Systems that maintain employee records; Track employee skills, job performance, and training; And support planning for employee compensation and career development.

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Organizational Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training and development</td>
<td>Track employee training, skills, and performance appraisals</td>
<td>Operational</td>
</tr>
<tr>
<td>Career pathing</td>
<td>Design career paths for employees</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Compensation analysis</td>
<td>Monitor the range and distribution of employee wages, salaries, and benefits</td>
<td>Management</td>
</tr>
<tr>
<td>Human resources planning</td>
<td>Plan the long-term labor force needs of the organization</td>
<td>Strategic</td>
</tr>
</tbody>
</table>
Examples of Business Processes

<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Business Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing and production</td>
<td>Assembling the product</td>
</tr>
<tr>
<td></td>
<td>Checking for quality</td>
</tr>
<tr>
<td></td>
<td>Producing bills of materials</td>
</tr>
<tr>
<td>Sales and marketing</td>
<td>Identifying customers</td>
</tr>
<tr>
<td></td>
<td>Making customers aware of the product</td>
</tr>
<tr>
<td>Finance and accounting</td>
<td>Selling the product</td>
</tr>
<tr>
<td></td>
<td>paying creditors</td>
</tr>
<tr>
<td></td>
<td>Creating financial statements</td>
</tr>
<tr>
<td></td>
<td>Managing cash accounts</td>
</tr>
<tr>
<td>Human resources</td>
<td>Hiring employees</td>
</tr>
<tr>
<td></td>
<td>Evaluating employees’ job performance</td>
</tr>
<tr>
<td></td>
<td>Enrolling employees in benefits plans</td>
</tr>
</tbody>
</table>

The Order Fulfillment Process (F 2.12)

- Sales
  - Generate Order
  - Submit Order
- Accounting
  - Check Credit
  - Approve Credit
  - Generate Invoice
- Manufacturing & Production
  - Assemble Product
  - Ship Product
Customer Relationship Management

- **Customer relationship management** Business and technology discipline to coordinate all of the business processes for dealing with customers.

  - Unified view of customers
  - Consistent message to customers
  - End-to-end customer care
  - Long-term customer relationships
  - Identification of best customers

Supply chain management Integration of supplier, distributor, and customer logistics requirements into one cohesive process.

Supply chain Network of facilities for procuring materials, transforming raw materials into finished products,' and distributing finished produce to customers.

- Capacity, inventory level, delivery schedule, payment terms
- Orders, return requests, repair and service requests, payments
HOW INFORMATION SYSTEMS CAN FACILITATE SUPPLY CHAIN MANAGEMENT

Information systems can help participants in the supply chain:
- Decide when and what to produce, store, and move
- Rapidly communicate orders
- Track the status of orders
- Check inventory availability and monitor inventory levels
- Track shipments
- Plan production based on actual customer demand
- Rapidly communicate changes in product design

Enterprise Systems

- Firm wide information systems that integrate key business processes so that information can flow freely between different parts of the firm.
Traditional View of Systems (F. 2.15)

Enterprise Systems (F. 2.16)
Benefits and Challenges of Enterprise Systems

Benefits
- Firm structure and organization: One Organization
- Management: Firm wide Knowledge-based Management Processes
- Technology: Unified Platform

Challenges
- Daunting Implementation
- High Up-front Costs and Future Benefits
- Inflexibility

Extended Enterprises

Extended Enterprises: Networks linking systems of multiple firms in an industry. Also called extended enterprises.

Vertical industrial networks: Networks for integrating the operations of a firm with its suppliers.

Horizontal industrial networks: Networks for linking firms across an entire industry.
Industrial Networks (F. 2.17)

Horizontal industrial network

Firms in a single industry

Firm 1
Firm 2
Firm 3
Firm 4

Firm value chains and enterprise systems

Industrial Networks

Vertical industrial network

Firms in complementary business

Firm 1
Supplier 1
Supplier 2
Supplier 3

Industry value chain