NEW PERSPECTIVES

Unit 9
Information Systems

Computer Concepts 2016

ENHANCED EDITION

9 Unit Contents

- Section A: Information System Basics
- Section B: Enterprise Applications
- Section C: Systems Analysis
- Section D: Design and Implementation
- Section E: System Security

9 Section A: Information Basics

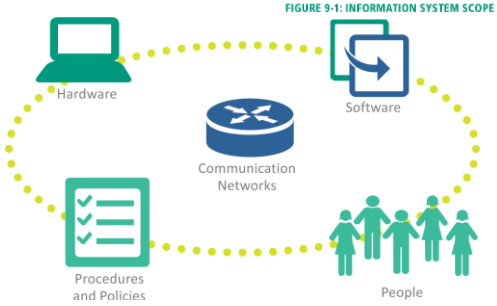
- Enterprise Basics
- Transaction Processing Systems
- Management Information Systems
- Decision Support Systems
- Expert Systems

9 Enterprise Basics

- An **information system** collects, stores, and processes data to provide useful, accurate, and timely information, typically within the context of an organization
- An **organization** is a group of people working together to accomplish a goal
- Any organization that seeks profit by providing goods and services is called a business or an **enterprise**
- An organization's goal or plan is referred to as its **mission;** its **mission statement** describes not only an organization's goals, but also the way in which those goals will be accomplished

9 Enterprise Basics

FIGURE 9-1: INFORMATION SYSTEM SCOPE



9 Enterprise Basics

- **Vertical market** software is designed for a specific industry or enterprise; the software that controls touchscreen order entry at fast food restaurants is an example of software designed for vertical markets
- **Horizontal market** software is designed for common elements of many businesses

9 Enterprise Basics

- An **organizational chart** depicts the hierarchy of employees in an organization
- **Workers** are the people who directly carry out the organization's mission
- **Managers** determine organizational goals and plan how to achieve those goals; managers use the following methods:
  - **Strategic planning** – emphasis on long-range and future goals
  - **Tactical planning** – setting incremental goals that can be achieved in a year or less
  - **Operational planning** – covers activities that make day-to-day operations run smoothly

9 Enterprise Basics

FIGURE 9-5: THE DECISION-MAKING PROCESS

Phase 1: Recognize a problem or a need to make a decision.

Phase 2: Devise and analyze possible solutions to the problem.

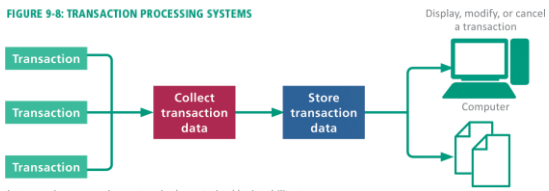
Phase 3: Select an action or a solution.

9 Transaction Processing Systems

- In an information system context, a **transaction** is an exchange between two parties that is recorded and stored in a computer system
- A **transaction processing system** (TPS) provides a way to collect, process, store, display, modify, or cancel transactions
- Transaction processing systems, such as banking, use **online processing**—a real-time method in which each transaction is processed as it is entered; this system software is often referred to as an **OLTP** (online transaction processing) system

9 Transaction Processing Systems

FIGURE 9-8: TRANSACTION PROCESSING SYSTEMS



A transaction processing system is characterized by its ability to:

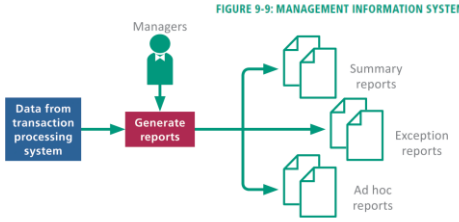
- Collect, display, and modify transactions
- Store transactions
- List transactions

9 Management Information Systems

- The term **management information system** refers to any computer system that processes data and provides information within a business setting
- Managers depend on these reports to make routine business decisions
- A **summary report** combines, groups, or totals data
- An **exception report** contains information that is outside of normal or acceptable ranges

9 Management Information Systems

FIGURE 9-9: MANAGEMENT INFORMATION SYSTEMS



A management information system is characterized by its ability to:

- Produce routine and on-demand reports
- Provide useful information for managerial activities
- Increase managerial efficiency
- Provide information used for structured, routine decisions

9 Decision Support Systems

- A **decision support system** (DSS) helps people make decisions by directly manipulating data, accessing data from external sources, generating statistical projections, and creating data models of various scenarios
- An **executive information system** (EIS) is a type of decision support system designed to provide senior managers with information relevant to strategic management activities

9 Decision Support Systems

- A **decision model** is a numerical representation of a realistic situation, such as a cash-flow model of a business that shows how income adds to cash accounts
- A **decision query** is a question or a set of instructions describing data that must be gathered to make a decision

9 Decision Support Systems

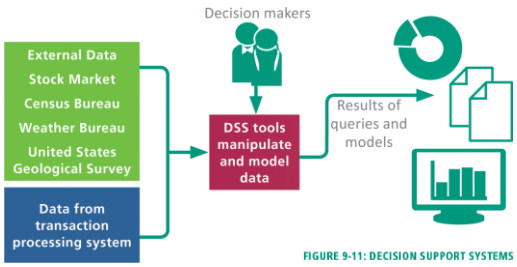


FIGURE 9-11: DECISION SUPPORT SYSTEMS

9 Expert Systems

- An **expert system**, sometimes referred to as a knowledge-based system, is a computer system designed to analyze data and produce a recommendation, diagnosis, or decision based on a set of facts and rules
- The facts and rules are incorporated into a **knowledge base** which is stored in a computer file and can be manipulated by software called an **inference engine**
- The process of designing, entering, and testing the rules in an expert system is referred to as **knowledge engineering**

9 Expert Systems

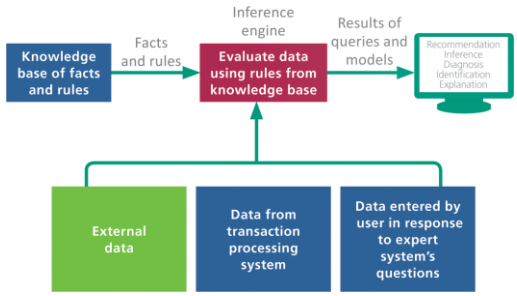
FIGURE 9-12: EXPERT SYSTEMS ARE BASED ON A SET OF FACTS AND RULES

9 Expert Systems

- An **expert system shell** is a software tool containing an inference engine and a user interface that developers use to enter facts and rules for a knowledge base
- These systems are designed to deal with data that is imprecise or problematic; using a technique called **fuzzy logic**, an expert system can deal with this type of data by working with confidence levels

9 Expert Systems

FIGURE 9-13: EXPERT SYSTEMS



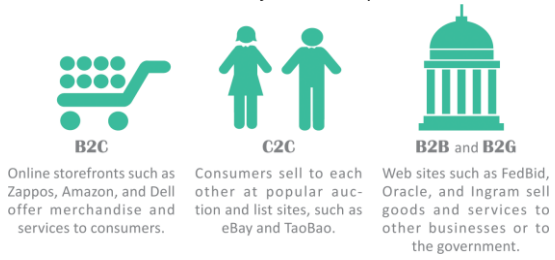
9 Section B: Enterprise Applications

- Ecommerce
- Supply Chain Management
- Customer Relationship Management
- Enterprise Resource Planning

9 Ecommerce

FIGURE 9-14: ECOMMERCE CLASSIFICATIONS

- **Ecommerce** refers to business transactions that are conducted electronically over a computer network



9 Ecommerce

- An **ecommerce application** is the software that handles ecommerce transactions
- Payment processing is based on an online **payment gateway** that authorizes credit and debit cards, PayPal, and Apple Pay transactions

9 Ecommerce

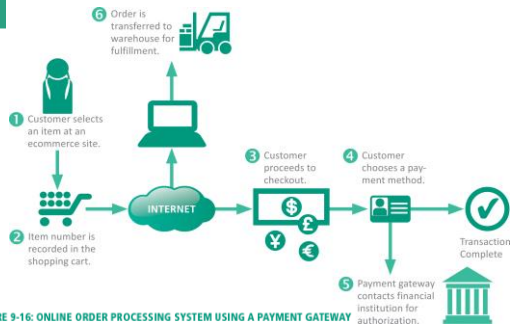


FIGURE 9-16: ONLINE ORDER PROCESSING SYSTEM USING A PAYMENT GATEWAY

9 Supply Chain Management

- A **supply chain** is the sequence of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer
- Supply chains are complex, so businesses use **SCM** (supply chain management) to maximize efficiency and profitability

9 Customer Relationship Management

- The acronym **CRM** stands for customer relationship management
- A major source of data for CRM is produced by **loyalty programs**, or a rewards program, which is a marketing effort that provides customers with incentives for making purchases

9 Customer Relationship Management

FIGURE 9-19: CRM HELPS TURN SHOPPERS INTO REPEAT BUYERS

Enhance the ecommerce site with search, recommendations, and reviews.

Collect customer email addresses from loyalty programs and build profiles in a database.

Target customers in the database with email marketing.

Provide customer service through online chat and easy returns.

Promote products in blogs and social media ads.

Provide analytics for back-office demand forecasting and online metrics, such as the number of visitors, mentions, and likes.

9 Enterprise Resource Planning

- The acronym **ERP** stands for enterprise resource planning; it is a suite of software modules that integrate major business activities; it is sometimes described as "the central nervous system of an enterprise"

FIGURE 9-22: ERP MODULES

9 Enterprise Resource Planning

- An ERP system can provide the following benefits to an enterprise:

1. Improved overall performance by standardizing business processes based on best practices
2. Minimized technology overhead for managers and other workers who interact with a single, centralized, and integrated set of software modules
3. Increased efficiency and productivity from streamlined workflows
4. Improved access to information from a single database

Cont…

9 Enterprise Resource Planning

5. Enhanced customer satisfaction based on efficient sales and distribution
6. Reduced costs and errors when transferring data between systems such as accounting and human resources
7. Increased profitability from the ability to collect analytics for all aspects of business operations
8. Reduced inventory costs resulting from better planning, forecasting, modeling, and tracking

9 Section C: Systems Analysis

- System Development Life Cycle
- Planning Phase
- Analysis Phase
- Documentation Tools

9 System Development Life Cycle

- An information system progresses through several phases as it is developed, used, and retired; these phases encompass as **system development life cycle**, or SDLC

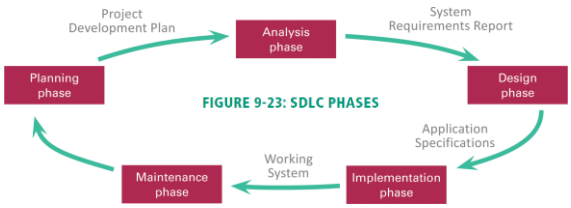


FIGURE 9-23: SDLC PHASES

9 System Development Life Cycle

- **Systems analysis and design** is a discipline that focuses on developing information systems according to the phases of an SDLC
- The scope of systems analysis and design encompasses the people, procedures, computers, communications networks, and software involved with handling information in an organization

9 Planning Phase

- The **planning phase** for an information system project includes:
  - Assembling the project team
  - Justifying the project
  - Choosing a development methodology
  - Developing a project schedule
  - Producing a project development plan

9 Planning Phase

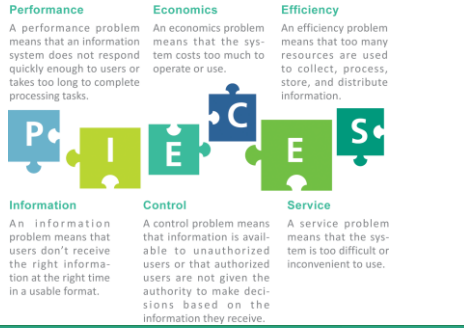
- The goal of these activities is to create a **project development plan;** this planning document includes:
  - A short description of the project including its scope
  - An estimate of the project costs and potential financial benefits
  - A list of project team participants
  - A schedule for the project, including an outline of its phases

9 Planning Phase

- Project team members can identify problems and opportunities using a variety of techniques, such as interviews and data analysis
- The **PIECES framework** helps classify problems in an information system; each letter of *PIECES* stands for a potential problem

9 Planning Phase

FIGURE 9-27: PIECES FRAMEWORK



9 Planning Phase

- There are many standard system development methodologies:
  - **Structured methodology** focuses on the processes that take place within an information system
  - **Information engineering methodology** focuses on the data an information system collects before working out ways to process that data
  - **Object-oriented methodology** treats an information system as a collection of objects that interact to accomplish tasks

9 Planning Phase

- **Project management software** is an effective tool for planning and scheduling
- Industry standard tools for scheduling and project management include:
  - **PERT** (Program Evaluation and Review Technique) – used for analyzing the time needed to complete each project task
  - **WBS** (work breakdown structure) – breaks a complete task into a series of subtasks
  - **Gantt charts** – shows the duration of development tasks as they occur over time

9 Analysis Phase

- The goal of the **analysis phase** is to produce a list of requirements for a new or revised information system; tasks for this phase include:
  - Studying the current system
  - Determining system requirements
  - Writing a requirements report

9 Analysis Phase

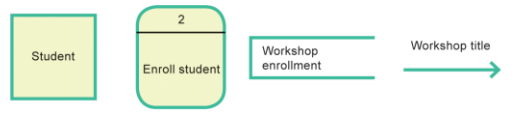
- **System requirements** are the criteria for successfully solving problems identified in an information system
- They also serve as an evaluation checklist at the end of a project, so they are sometimes referred to as **success factors**
- System requirements are incorporated into a document called a **system requirements report** that describes the objectives for the information system

9 Documentation Tools

- The core documentation tool for project teams using structured methodology is the **data flow diagram** (DFD), which graphically illustrates how data moves through an information system
- In DFD terminology:
  - An **external entity** is a person, organization, or device used outside the information system that originates or receives data
  - A **data store** is a medium that holds data
  - A **process** is a routine that changes data by performing a calculation
  - An arrow symbolizes a **data flow** and indicates how data travels

9 Documentation Tools

FIGURE 9-30: DATA FLOW DIAGRAM SYMBOLS



An external entity is represented by a square labeled with a noun.

A process is represented by a rounded rectangle, which is numbered and labeled with a verb phrase.

A data store is represented by an open rectangle labeled with the name of a data file.

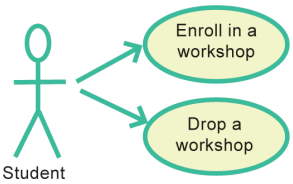
A data flow is represented by an arrow labeled with a description of the data.

9 Documentation Tools

- The current standard for object-oriented documentation is referred to as **UML** (Unified Modeling Language)
- Three of the most frequently used UML tools include use case diagrams, sequence diagrams, and class diagrams
- A **use case diagram** documents the users of an information system and the functions they perform
- In object-oriented jargon, the people who use the system are called **actors**; any task an actor performs is called a **use case**

9 Documentation Tools

FIGURE 9-32: USE CASE DIAGRAM



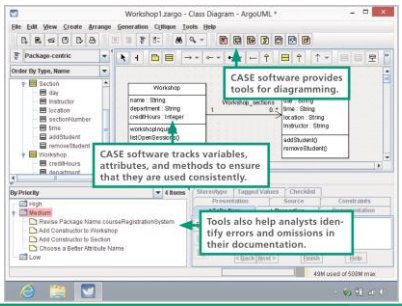
A use case diagram for a workshop registration system depicts two use cases—one in which a student (actor) enrolls in a workshop (use case 1), and one in which the student drops the workshop (use case 2).

9 Documentation Tools

- A **class diagram** provides the name of each object, a list of each object's attributes, a list of methods, and an indication of the associations between objects
- A **sequence diagram** depicts the detailed sequence of interactions that take place for a use case
- A **CASE tool** (computer-aided software engineering tool) is a software application designed for documenting system requirements, diagramming current and proposed information systems, scheduling development tasks, and developing computer programs

9 Documentation Tools

FIGURE 9-35: CASE SOFTWARE



9 Section D: Design and Implementation

- Design Phase
- Evaluation and Selection
- Application Specifications
- Implementation Phase
- Documentation and Training
- Conversion and Cutover
- Maintenance Phase

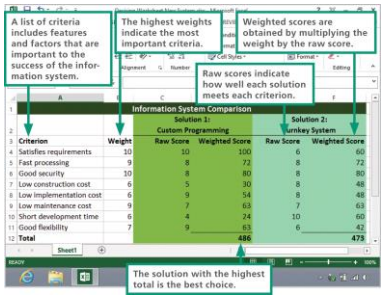
9 Design Phase

- In the **design phase** of the SDLC, the project team must figure out how the new system will fulfill the requirements specified in the system requirements report
- **Activities that take place during the design phase:**
  - Identify potential solutions
  - Evaluate solutions and select the best one
  - Select hardware and software
  - Develop application specifications
  - Obtain approval

9 Evaluation and Selection

- Using a **decision support worksheet**, the project team can assign scores to each criterion, weigh them, and compare totals for all solutions

FIGURE 9-39: EVALUATING SOLUTIONS WITH A DECISION SUPPORT WORKSHEET



9 Application Specifications

- The team's systems analysts will create a set of **application specifications** that describe the way information system's software should interact with users, store data, process data, and format reports
- The goal of the **detailed design phase** is to create very detailed specifications for the complete information system

9 Implementation Phase

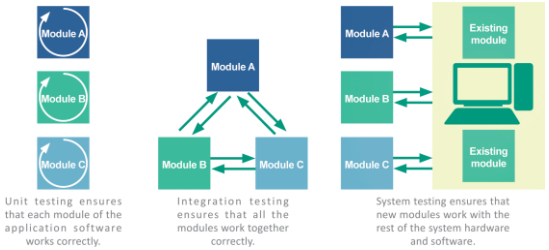
- During the **implementation phase** of the SDLC, the project team supervises the tasks necessary to construct the new information system
- Tasks that take place during this phase include:
  - Purchase or contract for hardware/software
  - Create applications
  - Test applications
  - Finalize documentation
  - Train users
  - Convert data
  - Initiate new system

9 Implementation Phase

- **Software customization** is the process of modifying a commercial application to reflect an organization's needs
- **Application testing** is the process of trying out various sequences of input values and checking the results to verify that the application works as it was designed
  - As each application module is completed, it undergoes **unit testing** to ensure that it operates reliably and correctly
  - When all modules have been completed and tested, **integration testing** is performed to ensure that the modules operate together correctly
  - **System testing** ensures that all the hardware and software components work together

9 Implementation Phase

FIGURE 9-43: APPLICATION TESTING



9 Documentation and Training

- **System documentation** describes a system's features, hardware architecture, and programming
- **User documentation** describes how to interact with the system to accomplish specific tasks
- A **procedure handbook** is a type of user documentation that contains step-by-step instructions for performing tasks

9 Conversion and Cutover

- **System conversion** refers to the process of deactivating an old information system and activating a new one; it is also referred to as a "cutover" or "to go live"
- **Acceptance testing** is designed to verify that the new information system works as required

9 Maintenance Phase

- The **maintenance phase** of the SDLC involves the day-to-day operation of the system, making modifications to improve performance, and correcting problems
- Changes during the maintenance phase can include the following:
  - Updates to the operating system and application software
  - User interface revisions to make the system easier to use
  - Hardware replacements necessary to retire defective equipment or enhance performance
  - Security upgrades
  - Quality-of-service enhancements

9 Maintenance Phase

- The term **quality of service** (QoS) refers to the level of performance a computer system provides
- A **quality-of-service metric** is a technique used for measuring a specific QoS characteristic
- Many organizations establish a **help desk** to handle end-user problems; it is staffed by technical support specialists

9 Maintenance Phase

FIGURE 9-47: QUALITY-OF-SERVICE METRICS

QOS METRIC	DESCRIPTION
Throughput	Amount of data processed in a particular time interval
Accuracy	Number of errors occurring in a particular time interval for a particular function
Downtime	Amount of time a system is not available for processing
Capacity	Available storage space, number of users, number of connections, or number of packets
User levels	Number of users at peak, average, and low times
Response time	Time period between when a user initiates a request for information and when the request is fulfilled

9 Section E: System Security

- Systems at Risk
- Data Centers
- Disaster Recovery Planning
- Data Breaches
- Security Measures

9 Systems at Risk

- The kinds of disasters that put information systems at risk include:
  - Natural disasters
  - Power outages
  - Equipment failures
  - Human errors
  - Software failures
  - Acts of war
  - Sabotage and vandalism

9 Data Centers

- A **data center** is a specialized facility designed to hold and protect computer systems and data
- These centers may be dedicated to information systems for a single company, or they may be a **colocation center** in which several corporations lease space and equipment

9 Data Centers

FIGURE 9-49: DATA CENTER COMPONENTS

9 Data Centers

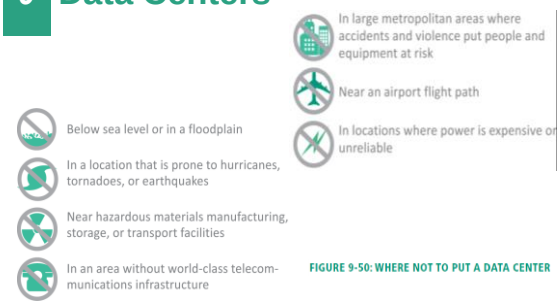


FIGURE 9-50: WHERE NOT TO PUT A DATA CENTER

9 Data Centers

FIGURE 9-51: WORLD'S MOST SECURE DATA CENTERS

Bahnhof Pionen is located 100 feet beneath Stockholm, Sweden, and sometimes called the "James Bond" data center.

Iron Mountain is located 220 feet underground in a limestone cave near Pittsburgh.

Smartbunker runs on wind power and is housed in a former NATO command bunker in the Lincolnshire Wolds, U.K.

InfoBunker is a 65,000-square-foot data center built in a decommissioned Air Force bunker designed to survive a 20-megaton nuclear blast.

9 Disaster Recovery Planning

- A **disaster recovery plan** is a step-by-step description of the methods used to secure data against disaster and a set of guidelines for how an organization will recover lost data and resume operations if and when a disaster occurs
- **Disaster recovery plans should:**
  - Ensure the safety of people on the premises
  - Continue critical business operations
  - Minimize disruptions to operations
  - Minimize immediate damage and prevent additional loss
  - Establish a management chain
  - Facilitate effective recovery tasks coordination

9 Data Breaches

- A **data breach** is an incident in which personal data is viewed, accessed, or retrieved without authorization
- Data breaches can be caused by the following:
  - Malware attacks
  - Employee negligence
  - Insider theft
  - Device theft
  - System glitches

9 Data Breaches

- **Identity theft** is the fraudulent use of someone's personal information to carry out transactions, such as applying for loans, making purchases, collecting tax refunds, or obtaining false identity documents

9 Security Measures

- Measures that protect information systems can be grouped into four categories: **deterrents**, **preventative countermeasures**, **corrective procedures**, and **detection activities**

- **Deterrents** reduce the likelihood of a deliberate attack. Physical deterrents, such as limiting access to critical servers, fall under this category. Common deterrents also include security features such as multi-level authentication, password protection, and biometric identification.
- **Preventive countermeasures** shield vulnerabilities to render an attack unsuccessful or reduce its impact. Firewalls that prevent unauthorized access to a system and encryption that makes stolen data indecipherable are examples of preventive countermeasures.

Cont…

9 Security Measures

- **Corrective procedures** reduce the effect of an attack. Data backups, disaster recovery plans, and the availability of redundant hardware devices all are examples of corrective procedures.
- **Detection activities** recognize attacks and trigger preventive countermeasures or corrective procedures. For example, antivirus software detects viruses entering a system and can be configured to perform corrective procedures such as removing the virus and quarantining infected files. Theft or vandalism can be detected by periodic hardware inventories. The use of monitoring software to track users, file updates, and changes to critical systems can also help detect anomalies that indicate an intrusion or a threat.

9 Security Measures

- To minimize the risk of identify theft customers should be vigilant about the information they divulge, for example:
  - Know when data is being collected
  - Find out how data is being used
  - Find out what data is retained
  - Don't trade your privacy

NEW PERSPECTIVES

Unit 9 Complete

Computer Concepts 2016