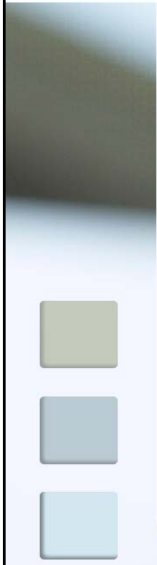


# Chapter 1

## Information Systems

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## Chapter Topics

- 
- An overview of information systems.
  - An introduction to information technology.
  - The concept of “application.”
  - Information systems as products.
  - The business of developing information system products.
  - Information system as the infrastructure of the business.
  - The enterprise of software development.

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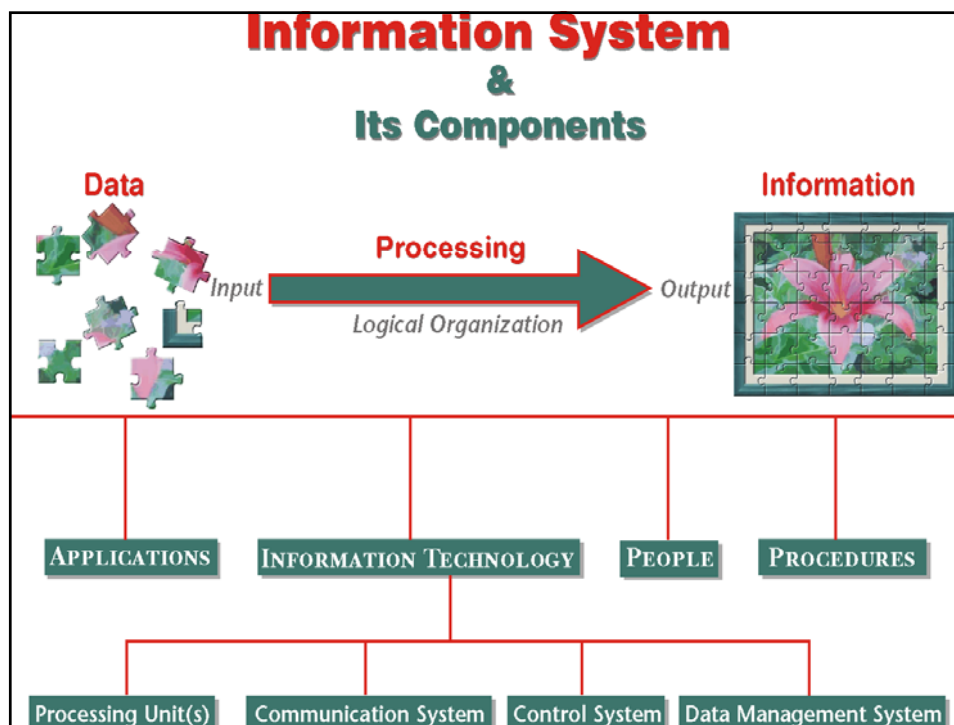
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# Information Systems

- Information systems are systems that process data into information.
- Developing information systems and software applications involves highly **abstract** concepts that have very **concrete** outcomes.

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## Information Systems

- Information systems are **commercial products** that must:
  - satisfy their consumers, and
  - be developed by following a methodology that assures the best possible quality and the best possible use of resources.

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## Information System As Commercial Product

- All commercial products have three basic traits in common:
  - they must satisfy certain requirements or take advantage of opportunities,
  - they are human artifacts and, therefore, must be *built*, and
  - their development must follow a **methodology** that helps to lower costs, raise quality and make success more likely.

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## Data Versus Information

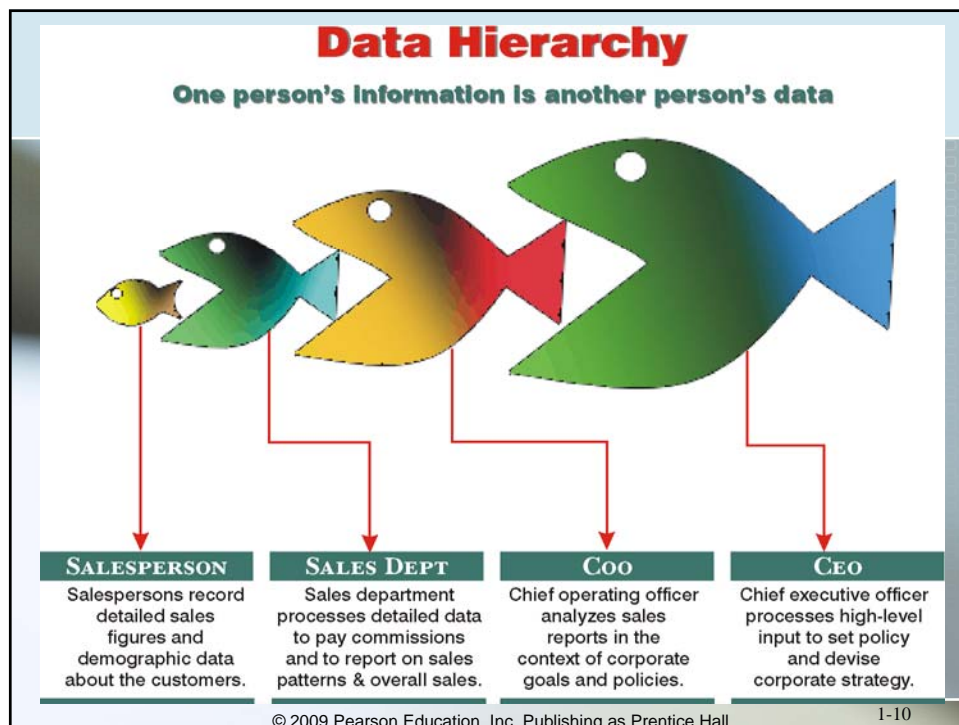
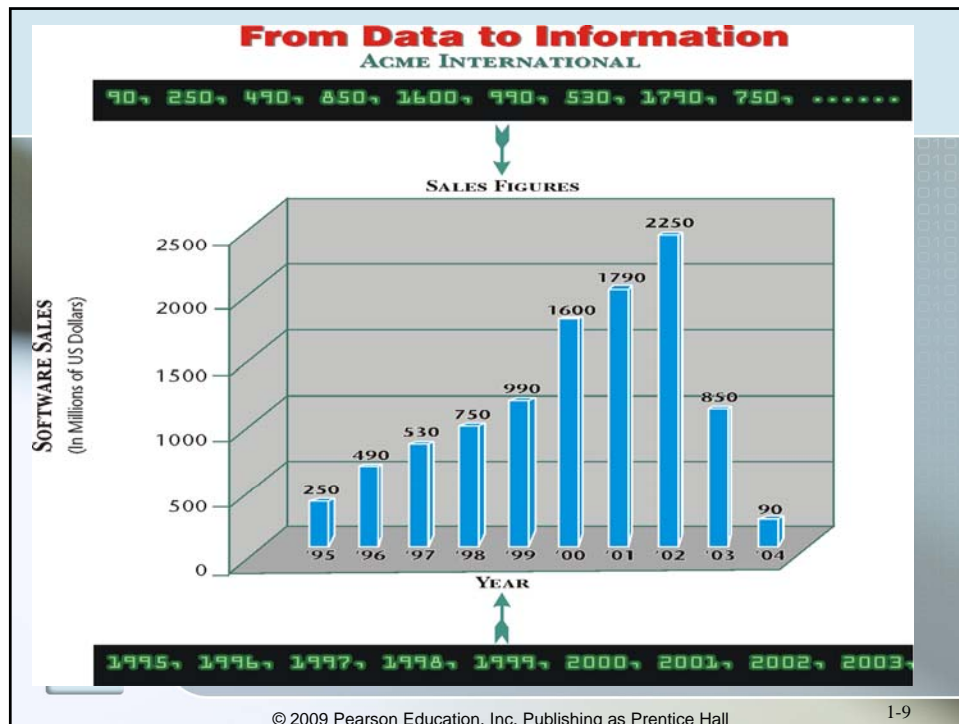
	Data	Information
	Moving images, dialog, music and commentary.	Television Report
	Titles, subtitles, words, paragraphs, quotations and pictures.	Newspaper Report
	The red outline of a circle bisected by a red line.	No Entry!
	A set of musical notes played on a bugle.	Wake-Up Call
	Weight, height, cholesterol, sugar level, age, symptoms, etc.	Patient Profile

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## Purpose of Information

	Information	Purpose
	Bank Statement	?
	Television Report	
	Year-End Corporate Report	
	No Entry Sign	
	Wake-Up Call	
	Patient Profile	

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## Systems and Networks

- A system is a set of interrelated elements organized into an identifiable whole.
- A Network is cooperating sets of relatively independent elements.

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## System Elements

Elements	System
Organs, such as the lungs, that deliver oxygen to the circulatory system.	The Respiratory System
Locomotives, wagons, tunnels, railroads, switches, engineers, conductors, etc.	A Railroad System
Microprocessor(s), printed circuitry, keyboard, monitor, mouse, operating system, storage, etc.	A Computer
Receipts, canceled checks, correspondence, folders, and file cabinets.	A Filing System
Canals, ditches, dams, sprinklers, etc.	An Irrigation System
Trees, vegetation, animals, humans, insects, rivers, etc.	The Amazon Ecosystem

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## The Difference Between Systems and Networks

- Elements within a system *cannot* function the same way if they are taken out of the system.
  - The circulatory system of the human body
- Elements within a network are more or less able to function independently.
  - Workstations connected to the Internet are members of a "network."

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## Information Technology

- Information technology is the know-how, the methods, the tools and the material used to support information systems.

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## Communication System

- The communication system transmits data to the information system and carries information to its users.

## Data Management System

- A data management system is a set of rules, procedures, material and tools that stores, organizes, protects and retrieves data needed by the information system.



## Control System

### ■ The control system

- ❶ directs and facilitates the interactions between the building blocks of the information technology, and
- ❷ provides the information system with the services of information technology.

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## Information Automation

- ### ■ Information automation is the application of information logic to data by a device that executes a program.

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## Information Technology Versus Information Systems

- The task of the information technology is to support information systems.
- The task of information systems is to support human enterprises.

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## Applications and Systems

- Application is a set of programs that performs a specific task.
- Applications must be viewed and developed as integral parts of an information system.

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## Information System As Product

- All software — regardless of purpose — is being transformed into market products.
- As a result, to succeed, software must be conceived as a product, designed as a product and marketed as a product.

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## Business and Information Systems

- Information systems started as tools of business.
- Today, the information systems are becoming less tools and more the backbone of the enterprise.

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## The Business of Information Systems

- The production of software and the management of information has increasingly become a business in its own right.

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## System Software

- System software consists of operating systems, utilities and other basic components of information technologies.

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## Software Components

- Software components are reusable parts that are assembled with other components to create complete systems and applications.



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## Software Contractors

- Software contractors build custom software for enterprises that need very specialized solutions.



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## Infrastructural Information Systems

- Infrastructural information systems are a set of systems and applications that supports the basic functions of an enterprise.

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## Transaction Processing Systems (TPS)

- Transaction processing systems record and process data about the routine activities of an enterprise.

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## Business-to-Business (B2B) Systems

- Business-to-business systems allow businesses to conduct transactions or exchange of information online.

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## Business-to-Consumer (B2C) Systems

- Business-to-customer systems allow consumers to buy products and services directly from businesses online.

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## Business Intelligence (BI) Systems

- A business intelligence system consists of a set of subsystems and applications that allow the management to analyze operational and market data, create models, make forecasts and virtually test business decisions.

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## Artificial Intelligence (AI) and Robotics

- Enable machines to automatically perform tasks that otherwise would require human intelligence,
- Solve complex problems by using non-mathematical algorithms,
- Simulate real or imaginary environments, and
- Provide expert opinion by using available information, heuristic, and inference.

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# The Enterprise of Software Development

Software development must follow the discipline of product development.

- Reproduction
- Testing
- Modeling
- Prototyping
- Installation
- Support

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## Requirements

- Requirements identify the specific objectives that the product must help its users to achieve.
- Requirements are *not* product specifications.

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# Requirements vs. Features of the Product

## Same Requirements, Two Solutions



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## Methodology

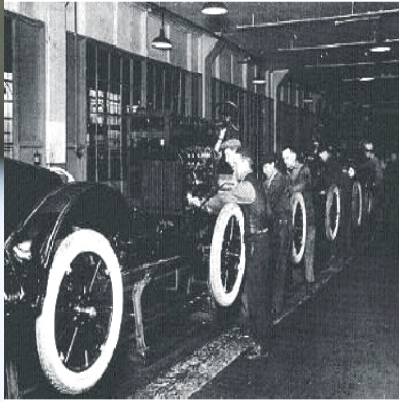
- Development of a product must follow a set of practices, procedures, rules and techniques.

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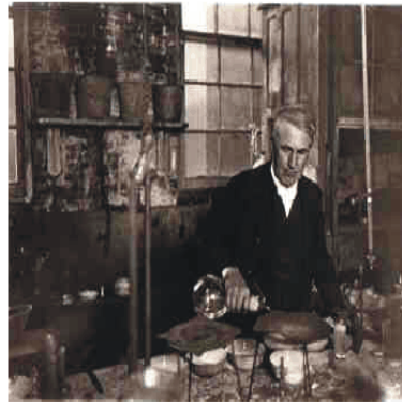
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# Methodology at Work

## Revolutionary Methodologies



Ford Model T Assembly Line  
(1913)



Thomas Edison in His Lab  
(1919)

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## Project Management

- Project management is planning, monitoring and controlling the course of the development process and the resources used by that process.

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## Project Management Principles

- Project management has general principles, practices and guidelines, but must be adapted to:
  - ❶ the goal of the project,
  - ❷ the resources available to a specific project, and
  - ❸ the methodology used to achieve the goal.

## General Principles

- A project has a **goal** and a **lifecycle**.
  - It starts when the decision is made to launch the project (or inception), and ends when the goal is achieved (or completion).
  - Developing an information system is a project.
    - The maintenance of an information system is not.
  - The advertising campaign to launch a product is a project.
    - The marketing department is not.

## Quality Control

- To achieve the maximum possible quality in a product, quality control must be built into the process of its production.

## Quality Of An Information System

- **Correctness.**
  - meets their needs and requirements correctly.
- **Reliability.**
  - its output is predictable within a acceptable range.
- **Availability.**
  - be available to the users when they need it.
- **Security.**
  - secure against unauthorized access.
- **Robustness.**
  - resist mishandling and negligent operation.
- **Efficiency.**
  - carry its tasks with the maximum speed and a minimum amount of resources.
- **Flexibility.**
  - accommodate changes in its environment and in business needs.
- **Maintainability.**
  - the easier it is to repair a system, the higher are the marks for maintainability.
- **Testability.**
  - an information system process data into information based on a set of logical assumptions. If the logic cannot be tested thoroughly, the information that it produces would not be reliable.

## Problem Space and Solution Space

- Problem space is the environment in which the product must operate; solution space contains issues related to the product itself.
- Understanding the problem space is the job of **analysis**, whereas in the solution space we **design** the product.

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## Next: The Object-Oriented Concept

- The real world, as complex as it is, is made of **objects** and their interactions. Clearly, a virtual world can learn greatly from the real world.
- Constructing software from **objects** is the best answer to the challenge of complexity.

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## Next: The Object-Oriented Concept

- Constructing software from **objects** is the best answer to the challenge of complexity.
- Thus, learning how to develop software must start with understanding **objects** — a task that we will undertake in the next chapter.