Chapter 2

Information Technologies: Concepts & Management

Learning Objectives

- Describe various information systems and their evolution, and categorize specific systems you observe.
- Describe transaction processing and functional information systems.
- Identify the major support systems, and relate them to managerial functions.
- Discuss information infrastructure and architecture.

Learning Objectives (cont.)

- Compare client/server architecture, enterprisewide computing, and legacy systems, and analyze their interrelationship.
- Describe the major types of Web-based information systems and understand their functionality.
- Describe how information resources are managed.
- Describe the role of the information systems department and its relationship with end-users.

Case: Building an e-Business at Fed Ex

Problem:

- FedEx has kept looking ahead at every stage for opportunities to meet customers' needs for fast, reliable, and affordable overnight deliveries.

Solution:

- In addition to e-Shipping Tools, FedEx is now providing integrated solutions to address the selling & supply chain needs of its customers.

Results:

✔ FedEx's e-business model facilitates better communication and collaboration between the various parties along the supply chains.

✔ It promotes efficiency gains by reducing costs & speeding up the order cycle.

✔ It transforms organizations into high performance e-businesses.

Characteristics of Information Systems

- Several different information systems can exist in one organization.
- A particular information system may be composed of several separate information systems.
- Information systems are connected by means of electronic networks.
- *Interorganizational information* systems involve information flow in two or more organizations.
- An enterprisewide system or interorganizational information system is composed of large & small computers & hardware connected by different types of networks.

Data, Information & Knowledge

One of the primary goals of Information Systems is to economically process data into information or knowledge.

Data items refer to an elementary description of things, events, activities, and transactions that are recorded, classified, and stored, but not organized to convey any specific meaning.

Information is data that have been organized so that they have meaning and value to the recipient.

Knowledge consists of data or information that have been organized and processed to convey *understanding, experience, accumulated learning,* and *expertise.*

Classifications of Information Systems

Information Systems can be classified according to;

- *Organizational Structure*
- *Functional Area*
- *Support Provided*
- *System Architecture*
- *Activity Supported*

Classification by Organizational Structure

- ***Departmental information systems.*** Frequently, an organization uses several application programs in one functional area or department.

- ***Enterprise information systems (EIS).*** While a departmental IS is usually related to a functional area, the collection of all departmental applications when combined with other functions' applications comprises the *enterprisewide information system*.

- ***Interorganizational systems.*** Some information systems connect several organizations.

Classification by Functional Area

The major functional information systems are the following:

- The accounting information system
- The finance information system
- The manufacturing (operations/production) information system
- The marketing information system
- The human resources management information system

Classification by Support Provided

The major types of systems under this classification are:

- Transaction processing system (TPS)
- Management information system (MIS)
- Knowledge management system (KMS)
- Office automation system (OAS)
- Decision support system (DSS)
- Enterprise information system (EIS)
- Group support system (GSS)
- Intelligent support system

Evolution of Support Systems

Early 1950s	Transaction processing system (TPS)
1960s	Management information systems (MISs)
Late 1960s	Office automation system (OAS)
Early 1970s	Decision support system (DSS)

Evolution of Support Systems (cont.)

Early 1980s	Executive information systems
	Enterprise information systems (EISs)
	Group support systems (GSSs)
Mid- 1980s	Expert systems (ES)
	Knowledge management systems (KMS)
1990s	Artificial neural networks (ANNs)

Case: Detecting Bombs with ANN

Problem:

- The Federal Aviation Administration (FAA) use statistical analysis and expert systems to prevent terrorists from sneaking bombs aboard airplanes. Yet, these technologies cannot detect all types of explosives.

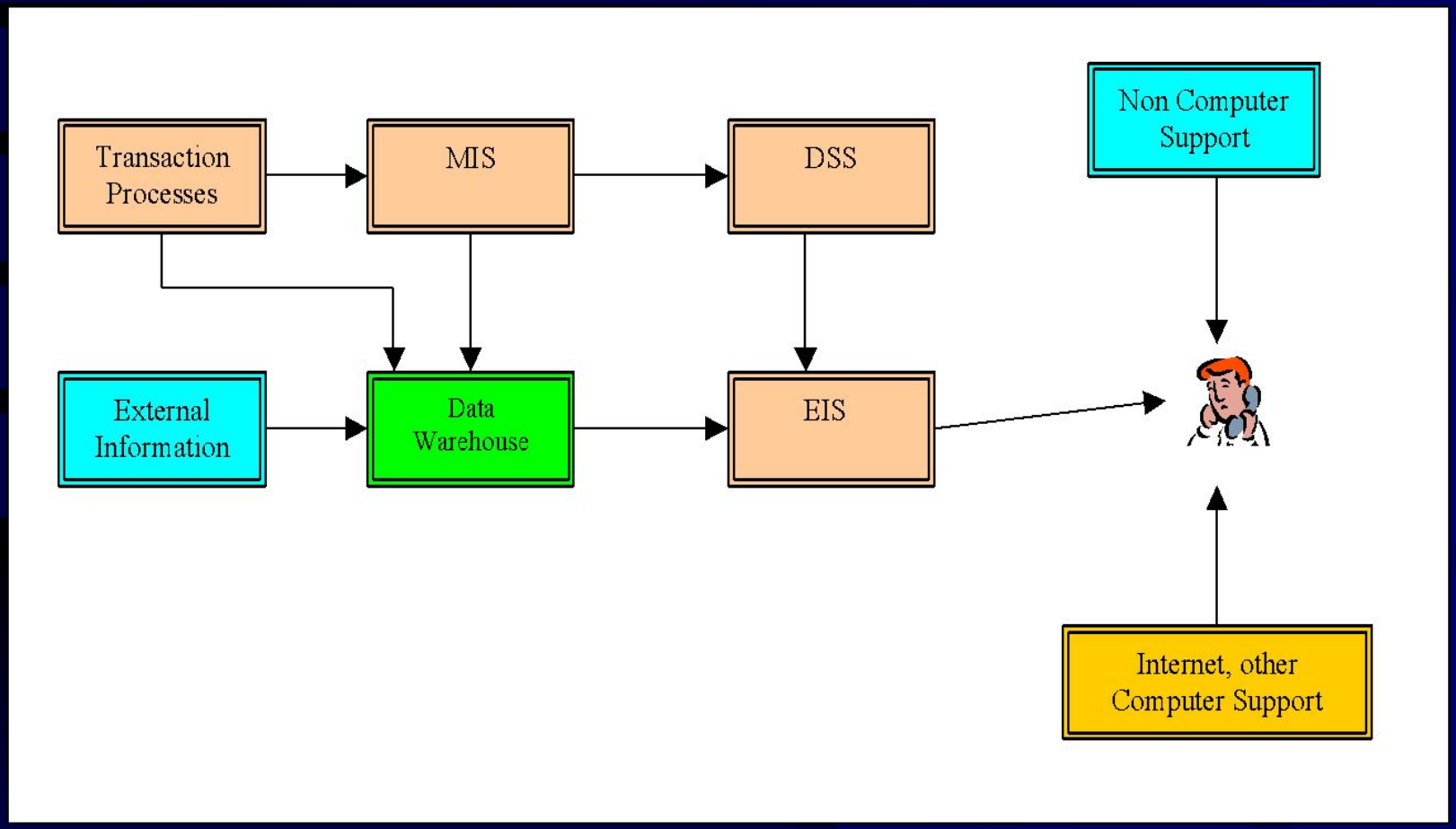
Solution:

- Since 1993, artificial neural networks (ANN) have been added to improve detection effectiveness.
- The ANN is exposed to a set of historical cases and is then able to predict the existence of explosives in new cases.

Results:

- The FAA hopes to detect explosives more successfully and also minimize false alarms.

Interrelated Support Systems



Classification by System Architecture

Information systems can be classified according to three types of architecture:

- **A mainframe-based system.**
- **A standalone personal computer (PC).**
- **A distributed or a networked computing system (several variations exist).**

Transaction Processing

- *Transaction processing systems (TPS)* support the monitoring, collection, storage, processing, and dissemination of the organization's basic business transactions.

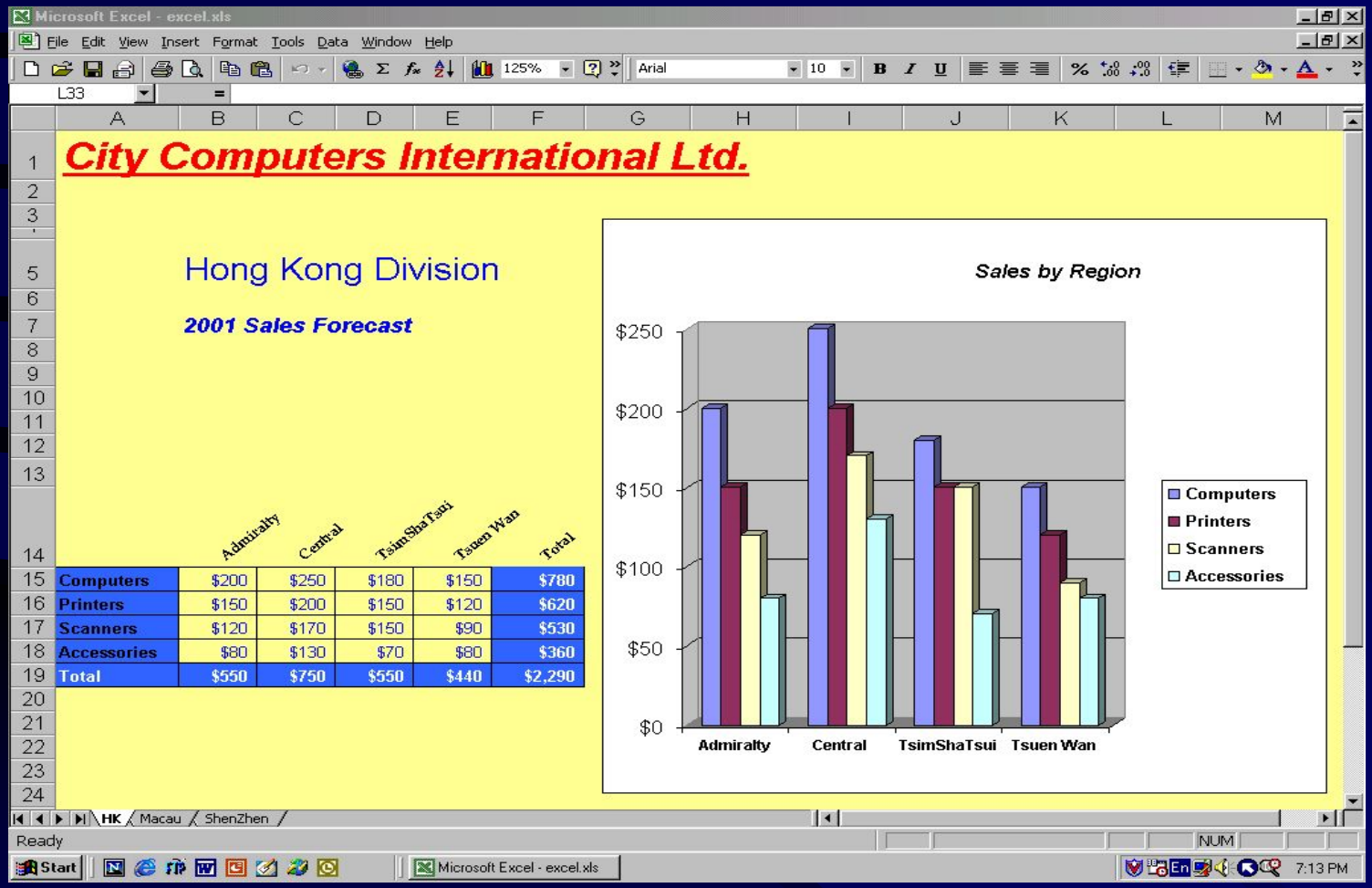
  - ✔ They provide the input data for many applications involving other support systems.
  - ✔ The transaction processing systems are considered critical to the success of any organization.
  - ✔ The TPS collects data continuously, frequently on a daily basis, or even in "real time".

Functional MISs

- *Functional Management Information Systems (MISs)* are put in place to ensure that business strategies come to fruition in an efficient manner.
- Typically a functional MIS provides periodic information about such topics as operational efficiency, effectiveness, and productivity by extracting information from the corporate database and processing it according to the needs of the user.
- MISs can be constructed in whole or in part by end-users.
- MISs are also used for planning, monitoring, and control.

Functional MISs

Sales forecast by region generated by marketing MIS.



	Admiralty	Central	TsimShaTsui	Tsuen Wan	Total
Computers	$200	$250	$180	$150	$780
Printers	$150	$200	$150	$120	$620
Scanners	$120	$170	$150	$90	$530
Accessories	$80	$130	$70	$80	$360
Total	$550	$750	$550	$440	$2,290

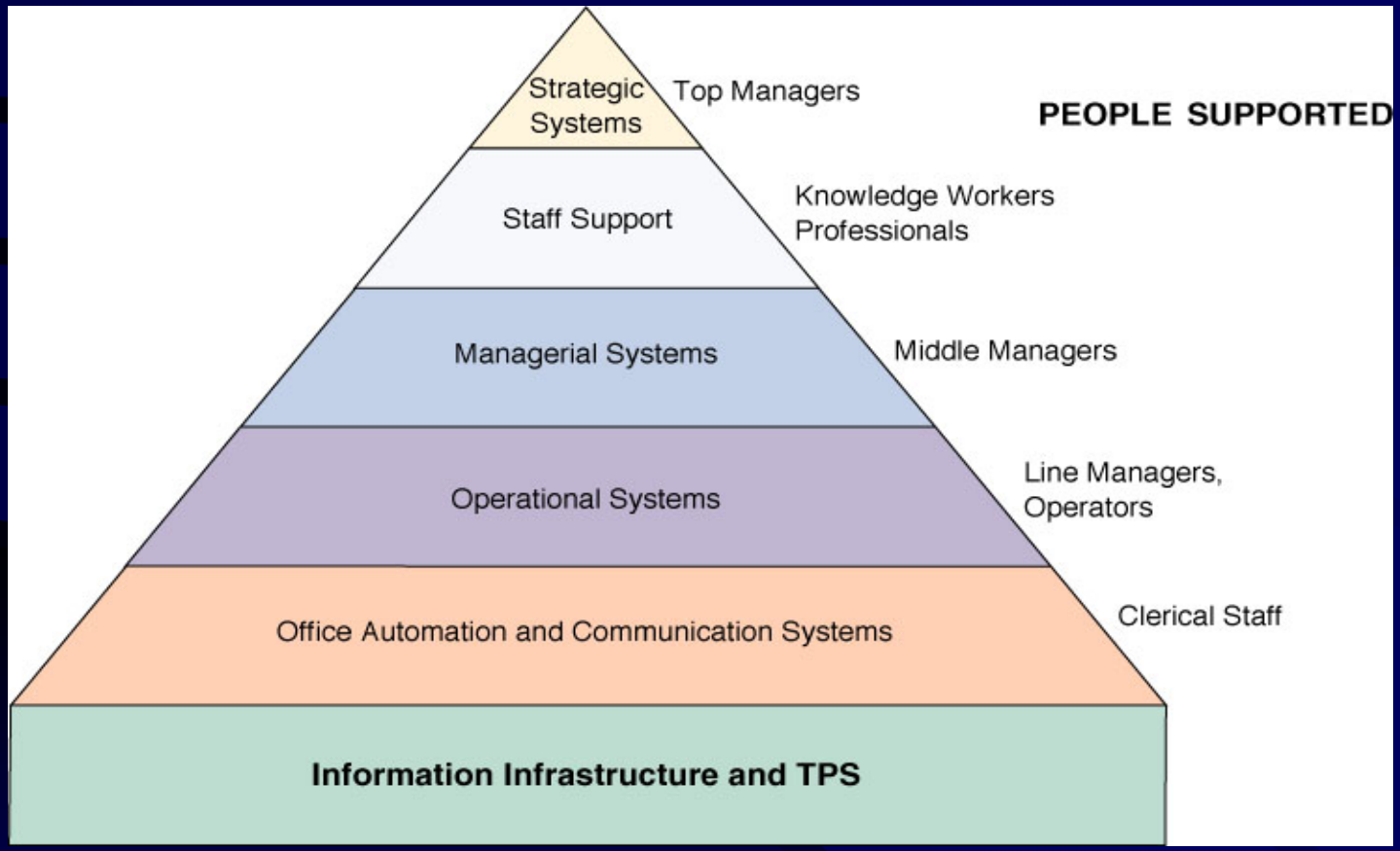
Classification by the Activity Supported

- Another important way to classify information systems is by the nature of the activity they support. Such support can be:
  - ✔ Operational
    - – Day-to-day operations of an organization
  - ✔ Managerial
    - – Middle-management activities such as short-term planning, organizing, and control
  - ✔ Strategic
    - – Decisions that significantly change the manner in which business is being done

New Strategic Systems

- *Electronic commerce* (EC) has become a new way of conducting business in the last decade or so.
  - ✔ In this new model, business transactions take place via telecommunications networks, primarily the Internet.
  - ✔ e-Commerce provides organizations with innovative and strategic advantages, such as;
    - Increased market share
    - Better ability to negotiate with suppliers
    - Better ability to prevent competitors from entering into their territory

Information Systems & People



Information Infrastructure

There are five major components of the infrastructure:

- **Computer hardware**
- **Development software**
- **Networks and communication facilities**
  (including the Internet and intranets)
- **Databases**
- **Information management personnel**

Information Architecture

- *Information architecture* is a high-level map or plan of the information requirements in an organization.
- In preparing information architecture, the designer requires two kinds of information:
  1. The business needs of the organization—that is, its objectives and problems, and the contribution that IT can make.
  2. The information systems that already exist in an organization and how they can be combined among themselves or with future systems to support the organization's information needs.

Types of Information Architecture

- *Mainframe environment.* In the mainframe environment, processing is done by a mainframe computer.
  - ✔ The users work with passive (or “dumb”) terminals, which are used to enter or change data and access information from the mainframe.
- *PC environment.* In the PC configuration, only PCs form the hardware information architecture.
- *Networked (distributed) environment.* Distributed processing divides the processing work between two or more computers.

Case: Flexible IT Architecture at Chase

Problem:

- When Chase Manhattan Bank & Chemical Bank merged in 1996, they faced the obstacle of merging different information systems and creating a new IT architecture.

Solution:

- An innovative 3-layer architecture was constructed using the Internet & intranets.
  - ✔ First layer: global infrastructure
  - ✔ Second layer: distribution networks that route traffic among business units
  - ✔ Third layer: numerous access networks

Results:

- All of this massive networking has one goal: giving customers extensive real-time access to accounts and a view of their assets.

Client/Server Architecture

- A *client/server architecture* divides networked computing units into two major categories; clients and servers.
  - A *client* is a computer such as a PC or a workstation attached to a network, which is used to access shared network resources.
  - A *server* is a machine that is attached to this same network and provides clients with these services.
- The purpose of client/server architecture is to maximize the use of computer resources.
- Client/server architecture gives a company as many access points to data as there are PCs on the network.

Electronic Data Interchange (EDI)

- *Electronic data interchange (EDI)* is the electronic movement of specially formatted standard business documents, such as orders, bills, and confirmations sent between business partners.
- In the past, EDI ran on expensive *value-added networks* (VANs).
  - ✔ These are private, data-only wide area networks used by multiple organization to provide high capacity, security, and economies in the cost of network service.
- The cost of VANS limited EDI to large business partners. However, the situation is changing rapidly with the emergence of *Internet-based EDI*.

Web-based Systems

- *Web-based systems* refer to those applications or services that are resident on a server that is accessible from anywhere via the WWW.
- The *only* client-side software needed to access and execute Web-based applications is a Web browser environment.

Two important features of Web-based functionality;

(1) The generated content/ data is updated in real time.

(2) They are universally accessible via the Web to users (dependent on defined user-access rights).

Web-based Systems (cont.)

- The ***Internet*** is a worldwide system of computer networks--a network of networks in which users at any one computer can, if they have permission, get information from any other computer.
- An ***intranet*** is the use of WWW technologies to create a private network, usually within one enterprise.
  - ✔ A security gateway such as a firewall is used to segregate the intranet from the Internet.
- *An* ***Extranet*** can be viewed as an external extension of the enterprise intranet.

e-Commerce & StoreFronts

- One of the natural outcomes of the Internet and the World Wide Web has been *e-Commerce*.
- Web-based systems are the engines of e-Commerce.
  - ✔ They enable business and inventory transactions to be conducted seamlessly over the Internet 24 hours a day, 7 days a week.
- An *electronic storefront* is the Web-equivalent of a showroom.
  - ✔ This is the Web site where an e-retail business displays its products.

Electronic Markets & Exchanges

- *Electronic markets* are a network of interactions and relationships over which information, products, services, and payments are exchanged.
- *Electronic exchanges* are central Web-based locations where buyers and sellers interact dynamically, with buyer and sellers going back and forth on a price.
  - ✔ *Vertical exchanges* position themselves as the hub for all buying, selling, and related services in a single market category.
  - ✔ *Horizontal exchanges* focus on a specific function or need applicable to many different industries.

Mobile-Commerce

- *Mobile commerce* or *M-commerce* is the buying and selling of goods and services through wireless handheld devices such as cellular telephone and personal digital assistants.
  - Known as "next-generation e-commerce," m-commerce enables users to access the Internet without a place to plug in to.
  - *Wireless Application Protocol (WAP)* is the emerging technology behind m-commerce.
    - ✔ Using *Bluetooth technology*, WAP-enabled smart phones offer fax, e-mail, and phone capabilities all in one.

Managing Information Resources

- The responsibility for the management of information resources is divided between two organizational entities:
  - ✔ The information systems department (ISD) - a corporate entity.
  - ✔ The end-users - who are scattered throughout the organization.
- This division of responsibility raises important questions:
  - ✔ *Which resources are managed by whom?*
  - ✔ *What is the role of the ISD, its structure, and its place in the organization?*
  - ✔ *What are the relationships between the ISD and the end users?*

Which Resources are Managed by Whom?

Major categories of Resources:

- ✔ Hardware
- ✔ Software
- ✔ Databases
- ✔ Networks
- ✔ Procedures
- ✔ Security facilities
- ✔ Physical buildings

- The responsibility for managing these resources depends on many things: the size/ nature of the organization, the amount/ type of IT resources, etc.
- Generally speaking, the ISD is responsible for corporate-level and shared resources, while the end users are responsible for departmental resources.

What is the Role of the ISD?

- The role of the ISD is changing from purely technical to more managerial and strategic.
- As a result, the position of the ISD within the organization tends to be elevated from a unit reporting to a functional department, to a unit reporting to a senior vice president of administration or to the CEO.
- The role of the director of the ISD is changing from a technical manager to a senior executive.
- The ISD can be centralized or decentralized or a combination of the two.
- The ISD must work closely with external organizations such as vendors, business partners, etc.

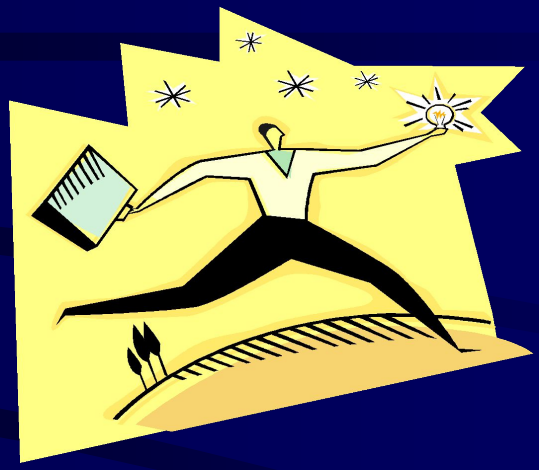
Managing Relationships with End Users

The ISD and the end-user units must be close partners. Some mechanisms that build the required cooperation are:

- ✔ A *Steering committee* that represents all end users and the ISD.
- ✔ *Joint ISD/end-users project teams* for planning, budgeting, application developments, and maintenance.
- ✔ ISD representation on the *top corporate executive committee.*
- ✔ *Service agreements* that define computing responsibilities and provide a framework for services rendered by the ISD to end users.
- ✔ *Technical and administrative support* (including training) for end users.
- ✔ A *conflict resolution unit* established by the ISD to handle end-user complaints quickly and resolve conflicts as soon as possible.

Managerial Issues

- ***The transition to networked computing.*** Converting the IT in organizations to networked computing may be a complicated process.



- ***Legacy systems.*** Whether and when to move from the legacy systems to a client/server enterprisewide architecture is an important issue.

- ***The role of the ISD.*** The role of the ISD can be extremely important, yet top management frequently mistreats it.

Managerial Issues (cont.)

- ***How much infrastructure?***

  Justifying information system applications is not an easy job due to the intangible benefits and rapid changes in technologies.

- ***The role of end users.***

  End users play an important role in IT development and management. The end users know best what their information needs are and to what degree they are fulfilled.

- ***Ethical Issues.***

  IS systems may invade the privacy of the users or create advantages to certain individuals at the expense of others.