The Information Systems Revolution

Why Information Systems?

- Four power worldwide changes have altered the environment of business
  - ◆ Emergence of Global Economy
  - ◆ Transformation of Industrial Economies
  - ◆ Transformation of Business Enterprise
  - ◆ Emergence of the Digital Firm

Emergence of Global Economy

- Globalization of the world's industrial economies greatly enhances the value of information to the firm and offers new opportunities to businesses.
- Information systems provide the communication and analytic power that firms need for conducting trade and managing businesses on a global scale.
- Controlling the far-flung global corporation (communicating with distributors and suppliers, operating 7x24 in a different national environments, servicing local and international reporting needs) is a major business challenge that requires powerful information system responses.

Emergence of Global Economy

- Globalization and information technology also bring new threats to domestic business firms: because global communication and management systems, customers now can shop in a worldwide marketplace, obtaining price and quality information reliably, 24 hours a day.
- Competition forces firms to play in open, unprotected worldwide markets. To become effective and profitable participants in international markets, firms need powerful information and communication systems.

Transformation of Industrial Economies

- The knowledge and information revolution began at the turn of the 20th century has gradually accelerated.
- Today, most people no longer work on farms or in factories, but instead are found in sales, education, healthcare, banks, insurance firms and law firms.
- Knowledge and information are becoming the foundation for many new services and products.
- Intensification of knowledge utilization in the production of traditional products has increased well. E.g. automobile industry

Transformation of Industrial Economies

- In a knowledge and information based economy, information technology and systems are importance. Knowledge based products and services of great economic value are based on new information technologies.
- Information and the technology become critical, strategic assets for business firms and their managers. Information systems are needed to optimize the flow of management and knowledge within the organization and to help management maximize the firm's knowledge resources.
- Because the productivity of employees will depend on the quality of the system serving them, management decisions about information technology are critically important to the prosperity and survival of a firm.

Transformation of Business Enterprise

- The traditional business firm was hierarchical, centralized, structured arrangement of specialists that typically relies on fixed set of **Standard Operation Procedures** (SOP) to deliver a mass-produced product or service.
- The new style of business firm is a flattened, decentralized, flexible arrangement of generalists who rely on nearly instant information to deliver mass-customized products and services uniquely suited for specific markets and customers.

Transformation of Business Enterprise

- The traditional management group relied on formal plans, a rigid division of labor, formal rules, and appeals to loyalty to ensure the proper operation of a firm.
- The new manager relies on informal commitments and networks to establish goals, a flexible arrangement of teams and individuals working in task forces, a customer orientation to achieve coordination among employees and appeals to professionalism and knowledge to ensure proper operation of the firm. Information technology makes this style of management possible.

Emergence of the Digital Firm

- Digitally-enabled relationships with customers, suppliers, and employees
- Core business processes accomplished via digital networks
- Digital management of key corporate assets
- Rapid sensing and responding to environmental changes

Four Major Systems Defining the Digital Firm

- Supply Chain Management (SCM) Systems
- Customer Relationship Management (CRM) Systems
- Enterprise Resource Planning (ERP) Systems
- Knowledge Management (KM) Systems

What is an Information System?

- An Information System (IS) is a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision-making and control in an organization.

hardware

people

procedures

software
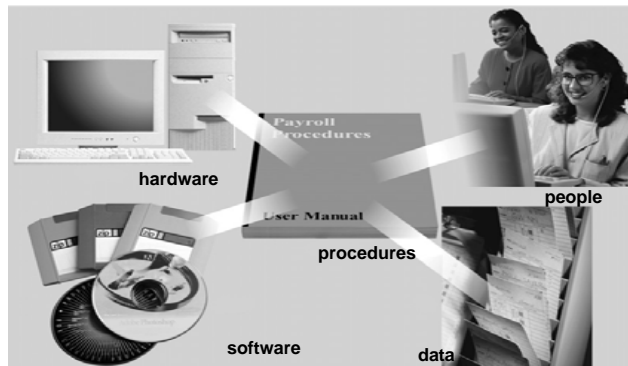
data

Data

- Data is streams of raw facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use.

Information

- Information is data that has been changed into useful and meaningful form to human being.
- The task of changing data into information is called **Processing**.

Activities of an Information System

- An Information System contains information about an organization and its surrounding environment.
- Three basic activities (**Input**, **Processing** and **Output**) produce the information organization need.
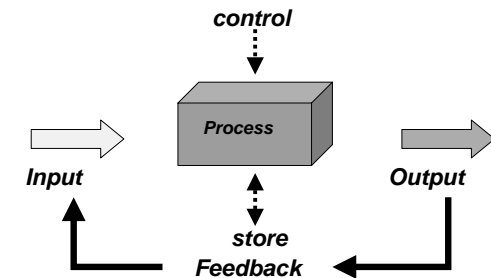
Basic Activities

- **Input** – the capture or collection of raw data from within the organization or from external environment for processing in an Information System.
- **Output** – the distribution of processed information to the people who will use it or to the activities for which it will be used.
- **Processing** – the conversion, manipulation, and analysis of raw input into a form that is more meaningful to human being.
- **Feedback** – output that is returned to the appropriate members of the organization to help them to evaluate or correct input.

## Functions of an Information System
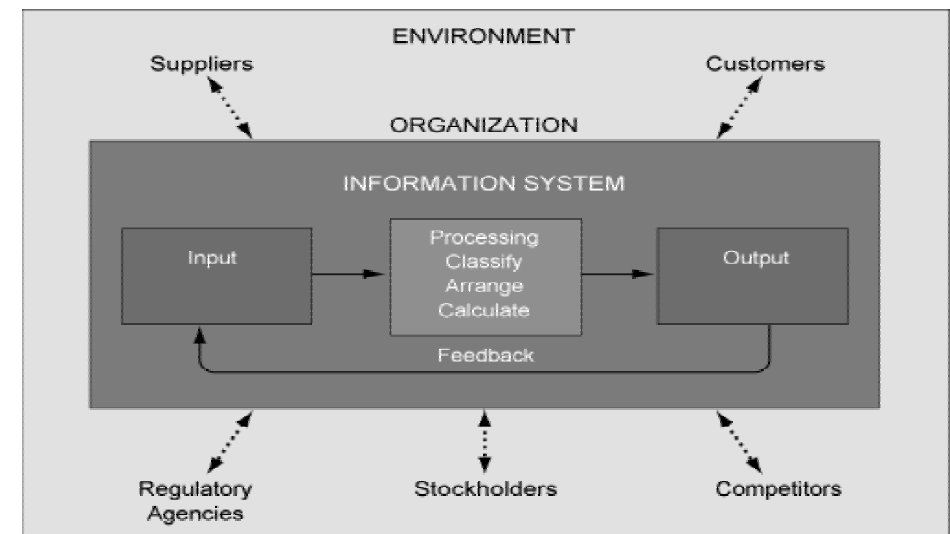
Computer-based Information Systems (CBIS)

- **Computer-based Information Systems** (CBIS) are information systems that rely on computer hardware and software for processing and disseminating information.
- A **Formal System** is a system resting on accepted and fixed definitions of data and procedures, operating with predefined values.
- Informal information systems rely on unstated rules of behavior. There is no agreement on what is information, or on how it will be stored or processed.
- Formal information systems can either be computer-based or manual. Manual systems use paper-and-pencil technology.

Business Perspective on Information Systems

- Form a business perspective, an Information System is an organizational and management solution based on Information Technology, to a challenge posed by the environment.
- **Information Systems Literacy**: Broad-based understanding of Information System that includes behavioral knowledge about organizations and individuals using Information Systems and technical knowledge about computers.
- **Computer Literacy**: Knowledge about Information Technology, focusing on understanding how computer-based technologies work

Business Perspective on Information Systems
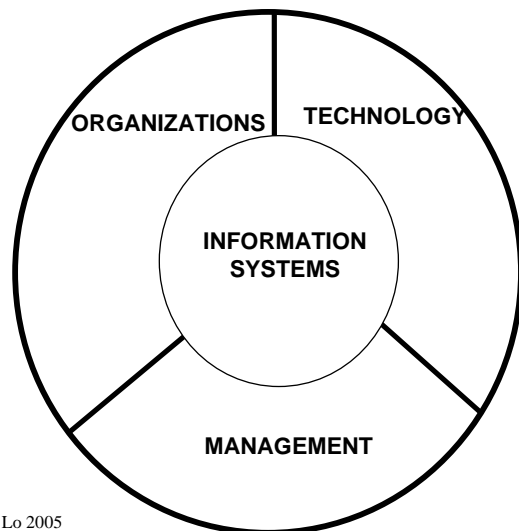
Major Business Functions

- **Sales and Marketing** – Selling the organization's products and services
- **Manufacturing** – Producing products and services
- **Finance** – Managing the organization's financial assets (cash, stocks, bonds, etc.)
- **Accounting** – Maintaining the organization's financial records (receipt, disbursements, paychecks, etc.)
- **Human Resources** – Attracting, developing and maintaining the organization's labor force; maintaining employee records.

Key Elements of Organizations

- Information systems are a part of organizations. The key elements of an organization are:
  - **People**: Managers, knowledge workers, data workers, production or service workers
  - **Structure**: Organization chart, groups of specialists, products, geography
  - **Operating Procedures**: Standard operating procedures (SOP, rules for action)
  - **Politics**: Power to persuade, get things done
  - **Culture**: Customs of behavior

Standard Operating Procedures (SOP)

- Standard Operating Procedures (SOP) are formal rules for accomplishing tasks that have been developed to cope with expected situations.
- These rules guide employees in a variety of procedures, from writing an invoice to responding to complaining customers.
- Most procedures are formal writing and written down, but others are informal work practices.
- Many of a firms SOP's are incorporated into information systems.

People in Organization

- In additional to manager, companies also require
  - **Knowledge Workers**: people such as engineers or architects who design products and services and create new knowledge for the organizations.
  - **Data Workers**: people such as secretaries, bookkeepers or clerks who process the organization's paperwork.
  - **Production and Service Workers**: people such as machinists, assemblers or packers who actually produce the products and services of the organization.

Management

- Managers perceive business challenges in the environment.
- They set the organizational strategy for responding and allocate the human and financial resources to achieve the strategy and coordinate the work.
- They must exercise responsible leadership.
- Management's job is to formulate action plans to solve organizational problems.
- They must also create new products and services and even re-create the organization from time to time. A substantial part of management is creative work driven by new knowledge and information. IT can play a powerful role in redirecting and redesigning the organization.

Management

- Managerial roles and decisions vary at different levels of organization:
- Senior managers make long-range strategic decision making about products and services.
- Middle managers carry out the programs and plans for senior management.
- Operational managers are responsible for monitoring the firm's daily activities.
- All levels of management are expected to be creative, to develop novel solutions to a broad range of problems.
- Each level of management has different information needs and information system requirements.

Technology

- Information Technology is one of many tools available for managers for coping with changes:
  - ◆ Computer Hardware
  - ◆ Computer Software
  - ◆ Storage
  - ◆ Communications Technology
  - ◆ Networks

Technology – Computer Hardware

- Physical equipment used for input, processing and output activities in an Information System.

Rack Servers   Blade Servers

Technology – Computer Software

- The detailed preprogrammed instructions that control and coordinate the hardware components in an Information System.

Technology – Storage

- Physical media for storing data (such as magnetic or optical disk or tape) and the software that managing the organizational data on these physical media.
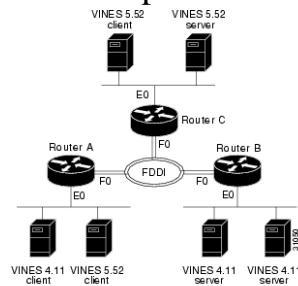
Technology – Communications Technology

- Physical devices and software that links various pieces of hardware and transfers data from one physical location to another
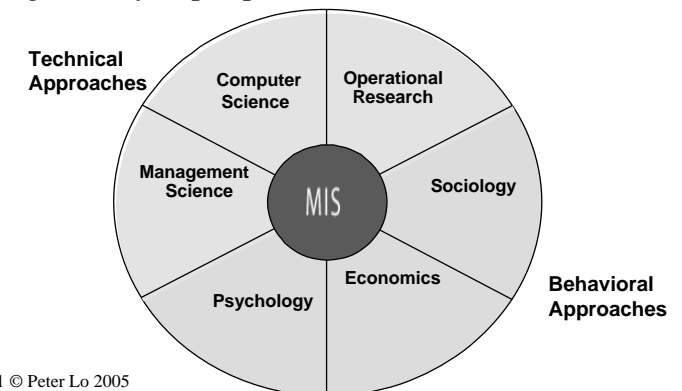
Technology – Networks

- Link computers to share data or resources.

Contemporary Approaches to Information System

- Multiple perspectives on Information System show that the study of Information System is a multidisciplinary field; no single theory or perspective dominates.

Technical Approach

- The technical approach to Information System emphasizes mathematically based, normative models, as well as physical technology and formal capabilities of these systems.
- Computer science is concerned with establishing theories of computability, methods of computation and methods of efficient data storage and access.
- Management science emphasizes the development of models for decision-making and management practices.
- Operational research focuses on mathematical techniques for optimizing selected parameters of organizations such as transportation, inventory control and transaction costs.

Behavioral Approach

- An important part of IS field is concerned with behavioral issues that arise in the development and long-term maintenance of IS.
- Issues such as strategic business integration, design, implementation, utilization, and management cannot be explored usefully with the models used in the technical approach.
  - ◆ Sociologists study
  - ◆ Psychologists study
  - ◆ Economists study

Behavioral Approach

- Sociologists study Information System with an eye towards how groups and organizations shape the development of systems and also how systems affect individuals, groups and organizations.
- Psychologists study Information System with an interest in how formal information is perceived and used by human decision makers.
- Economists study Information System with an interest in what impact systems have control and cost structures within the firm and within markets.

Socio-technical Systems Perspective

- The socio-technical systems perspective helps to avoid a purely technological approach to Information System.
- It is stressed the need to optimize the performance of the system as a whole. Both technical and behavioral components need attention.
- This means that technology employed must be changed and designed in such a way to fit organizational and individual needs. At times, the technology may have to 'de-optimized' to accomplish this fit.
- Organizations and individuals must also be changed through training, learning and planned organizational change in order to allow the technology to operate and prosper.

The New Role of Information System

- The Widening Scope of Information System
- The Network Revolution and the Internet
- New Options for Organizational Design
- e-Commerce and e-Business

The Widening Scope of Information System
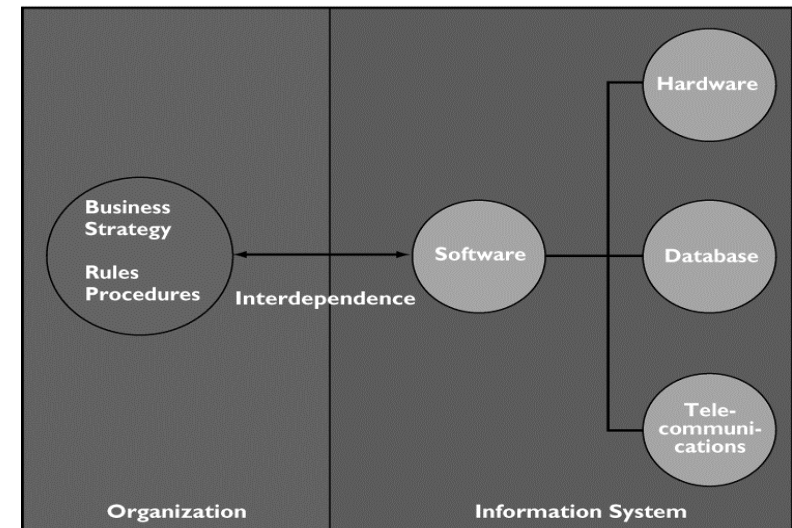
The Widening Scope of Information System

- There is a growing interdependence between business strategy, rules and procedures on one hand – and Information System software, hardware, databases and telecommunications on the other hand.
- What a business would like to do in five years is often dependent on what its system will be able to do.
- Increasing market share, becoming the high-quality or low-cost producer, developing new products, and increasing employee productivity depends more and more on the kinds and quality of information systems in the organization.

The Widening Scope of Information System

- A second change in the relationship of Information System and organizations results from the growing complexity and scope of systems projects and applications.
- Building systems today involves a much larger part of the organization than it did in the past.

1950s	The change from a manual to a computer system was largely technical: the computer system simply automated a clerical procedure
1960s-70s	Later system affects managerial controls and behavior
1980s-90s	Systems influenced institutional core activities concerning products, markets, suppliers, and customers.
2000s	Digital information webs extending beyond the enterprise

The Network Revolution and the Internet

- One reason Information System play such an important role in organization and affect so many people is the soaring power and the decline on cost of computer technology.
- Organization can use powerful communications networks to access different locations around the world and to coordinate activities across time and space. These networks are transforming the shape and the form of business enterprises.

Internet

- The world largest and most widely used network is the Internet. It is an international network of networks that are both commercial and publicly owned.
- The Internet is creating a new "universal" technology platform on which to build all sorts of new products, services, strategies and organizations. It is reshaping the way IS are being used in business and daily life.
- The World Wide Web (WWW) is a system with universally accepted standards for storing retrieving, formatting and displaying information in a networked environment.

What you can Do on the Internet

- **Communicate and Collaborate** – electronic mail; transmit documents and electronic conferences.
- **Access Information** – search for documents, database and library catalogue; read electronic brochures, manuals, books and journals.
- **Participate in Discussions** – discussion groups; voice transmission.
- **Supply Information** – transfer files of text, programs, graphics, animation or videos.
- **Entertainment** – play video games; view video clips; listen music clips; read animated magazines and books.
- **Exchange Business Transactions** – advertise, sell and purchase goods and services.

New Options for Organizational Design

- Flattening Organizations
- Separating Work from Location
- Reorganizing Work-flows
- Increasing Flexibility of Organizations
- Redefining Organizational Boundaries
- The Changing Management Process

Flattening Organizations

- Flatter organizations have fewer levels of management with lower level employees being giving greater decision making authority.
- With Internet, team members can collaborate closely even from distant locations. These also mean that management span of control has been broadened, allowing high-level managers to manage and control more workers spread over greater distance.

Separating Work from Location

- It is possible to organize globally while working locally: Information Technology such as e-mail, the Internet, video conferencing permit tight coordination of geographically disperse workers across time zones and cultures.
- Many employees can work remotely from their homes or cars and companies can reserve space at smaller central offices for meeting clients or other employees.
- Collaborative teamwork across thousands of miles has become a reality.

Separating Work from Location

- Networked Information System allow companies to coordinate as Virtual Corporations (or Virtual Organizations), sometimes called networked organizations.
- While most organizations will not become fully virtual organizations, some of their key business activities may have 'virtual' features such as using networks and the Internet to source products.

Reorganizing Work-flows

- Information System have been progressively replacing manual work procedures with automated work procedures, work flows and work processes.
- Electronic workflows have reduced the cost of operations in many companies by displacing paper and the manual routines that accompany it.
- Improved workflow management has enabled many corporations not only to cut costs significantly but also to improve customer service.
- Redesigned workflows can also facilitate organization efficiency and can enable new organizational structures, products and services.

Increasing Flexibility of Organizations

- Companies can use communications technology to organize in more flexible ways, increasing their ability to respond to changes in the marketplace and to take advantage of new opportunities.
  - ◆ For small companies
  - ◆ For large companies

Increasing Flexibility of Organizations

- For Small Companies:
  - ◆ Desktop machines, Computer-Aided Design (CAD) software and computer controlled machine tools provide the precision, speed and quality of giant manufacturers.
  - ◆ Information immediately accessed by telephone and communication links eliminates the need of research staff and business libraries.
  - ◆ Managers can easily obtain information they need to manage large number of employees in widely scattered locations.

Increasing Flexibility of Organizations

- For Large Companies:
  - ◆ Mass Customization is the use of software and computer networks to finely control production so that products can be easily customized with no added cost for small production runs.
  - ◆ Massive databases of customer purchasing records can be analyzed so that large companies can know their customer's needs and preferences as easily as local merchants.
  - ◆ Information can be easily distributed down the ranks of the organization to empower lower level employees and work groups to solve problems.

Redefining Organizational Boundaries

- **Networked Information System** can enable transactions such as payments and purchase orders to be exchanged electronically among different companies, thereby reducing the cost of obtaining products and services from outside the firm.
- Organizations can share business data, catalogues or mail messages through such systems. These networked Information System can create new efficiencies and new relationships between organization, its customers, and suppliers, redefining their organizational boundaries.
- IS linking its customers, distributors, or suppliers are called **Interorganizational Information System** because they automate the flow of information across organizational boundaries.

The Changing Management Process

- Information Technology is recasting the process of management, providing powerful new capabilities to help managers plan, organize, lead and control.
- **Enterprise Resource Planning** (ERP) system is a business management system that integrates all aspects of the business, including planning, manufacturing, sales and finances so that they can become more closely coordinated by sharing information.
- ERP software models and automates many basic processes such as filling an order or scheduling a shipment with the goal of integrating information across companies and eliminating complex, expensive links between computer systems in different areas of business.

e-Commerce

- An electronic market is an IS that links together many buyers and sellers to exchange information, products, services, and payments.
- These systems function like electronic middlemen, with lowered costs for transactions such as selecting suppliers, stabling prices, ordering goods and paying bills.
- Buyers and sellers can complete purchase and sale transactions digitally regardless of their location.
- Electronic commerce can accelerate ordering, delivery and payment for goods and services while reducing companies' operating and inventory costs.
- The Web is being increasingly used for business-to-business transactions.

e-Business

- Companies are taking advantage of the connectivity and ease of Internet technology and executing all the firm's business processes with Internet technology.
- **Intranet** is an internal network based on Internet technology. Use of these private intranets for organizational communications, collaboration and coordination is prominent.
- **Extranet**: Extension of intranet to authorized external users.