Lecture (4)
Classification and Evolution of Information Systems

Introduction

Information systems are made out of components that can be assembled in many different configurations, resulting in a variety of information systems and applications, much as construction materials can be assembled to build different homes types. The size and cost of a home depend on the purpose of the building, the availability of money, and constraints such as ecological and environmental legal requirements. Just as there are many different types of houses, so there are many different types of information systems. It is useful to classify information systems into groups that share similar characteristics. Such a classification may help in identifying systems, analyzing them, planning new systems, planning integration of systems, and making decisions such as the possible outsourcing of systems. This classification can be done in several alternative ways. Information systems are classified by organizational levels, mode of data processing, system objectives, and by the type of support provided.

1. Classification by Organizational Levels

Organizations are made up of components such as divisions, departments, and work units, organized in hierarchical levels. For example, most organizations have functional departments, such as production and accounting, which report to plant management, which report to a division head. The divisions report to the corporate headquarters. Although some organizations have restructured themselves in innovative ways, such as those based on cross-functional teams, today the vast majority of organizations still

have a traditional hierarchical structure. Thus, we can find information systems built for headquarters, for divisions, for the functional departments, for operating units, and even for individual employees. Such systems can stand alone, but usually they are interconnected.

Typical information systems that follow the organizational structure are *functional* (departmental), *enterprise*, and *inter-organizational*. These systems are organized in a hierarchy in which each higher-level system consists of several (even many) systems from the level below it. At a higher level, the enterprise system supports the entire company, and inter-
organizational systems connect different companies.

- **Functional Information Systems**

Functional organizations are hierarchical structures and center on a strong concept of supervisors and subordinates. The controlling authority, often called top management, coordinates with each management level and functional department to keep the organization running smoothly. A functional organization analyzes the strengths and weaknesses of each member, groups them into categories and assigns them to tasks that best utilize their skills. Jobs that perform a similar function are grouped in functional areas. Each functional area contains employees with varied skills that are further grouped based on specialization and put in separate units or departments. Information systems which served these functional departments are called functional information systems.

Evolution of Functional Organizations

Functional organizations work best when a single product or service is involved. The chain of command is linear, so everyone knows his position in the organization. By clustering specialists with similar skills, leadership, tutoring and guidance concentrate on one area. Employees have an obvious path for growth and promotion, either up or lateral.

As a company gets larger, some of the positives of functional organizations become negatives. Since decisions travel through the chain of command, the process becomes bureaucratic, and information and decisions move slowly. Functional grouping can result in a narrowed overall perspective. Because of communication and decision-making issues, the functional organization is slow to adapt to environmental changes

- **Enterprise Information Systems**

While a departmental information system is usually related to a functional area, other information systems serve several departments or the entire enterprise. These information systems together with the departmental applications comprise the **enterprise information system** (EIS). One of the most popular enterprise applications is **enterprise resources planning** (ERP), which enables companies to plan and manage the resources of an entire enterprise. ERP systems present a relatively new model of enterprise computing now days.

- **Inter-organizational Information Systems**

Some information systems connect two or more organizations. They are referred to as inter-organizational information systems (IOS's). IOS's support many inter-organizational operations, of which supply chain management is the best known. An organization's **supply chain** describes the flow of materials, information, money, and services from raw material suppliers through factories and warehouses to the end customers. Note that the supply chain includes both physical flows and information flows. Information flows and digitizable products (e.g., music and software) go through the Internet, whereas physical products are shipped. For example, when you order a computer from *www.dell.com*, your information goes to Dell via the Internet. When your transaction is complete (i.e., your credit card is approved and your order is processed), Dell ships your computer to you. Figure below represents information flows and digitizable products (soft products) with dotted lines and physical products (hard products) as solid lines.
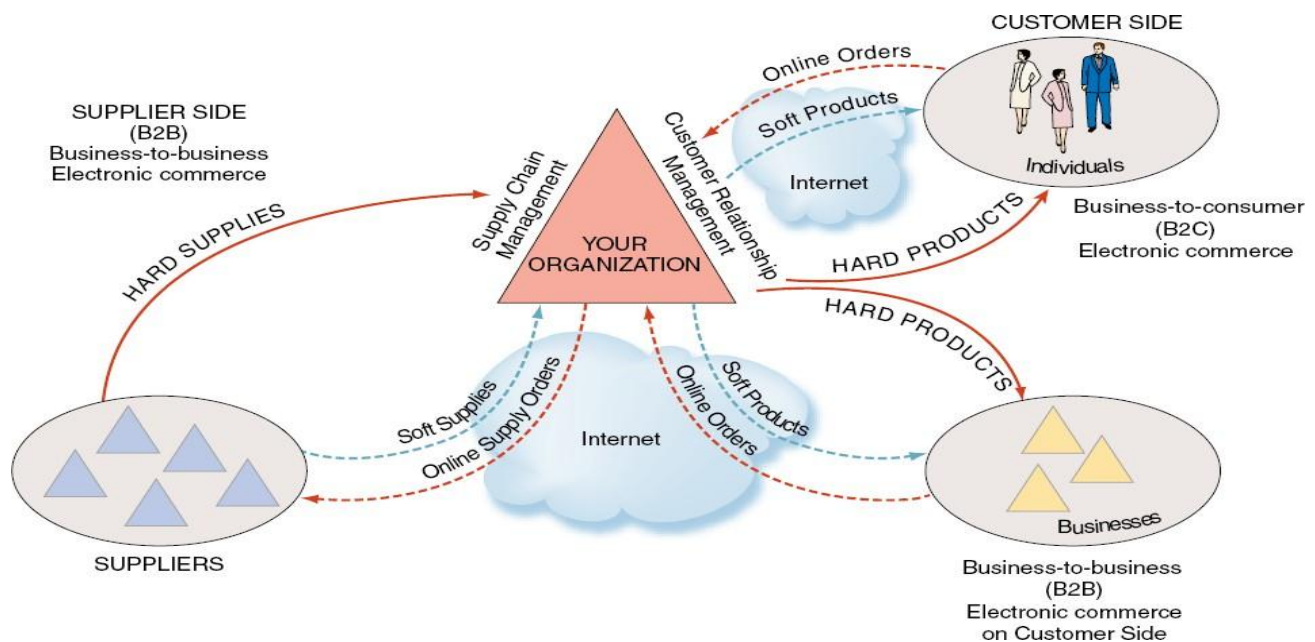

Figure 8: Information flows outside organization in inter-organizational information systems

Another example is the worldwide airline reservation system, which is composed of several systems belonging to different airlines. Thousands of travel agents and hundreds of airlines are connected to it. Those that support international or global operations may be especially complex. Inter- organizational information systems play a major role in e-commerce and other web-based e-government information systems applications.

2. Classification by Mode of Data Processing

- Batch Processing Systems: The transactions are collected as they occur, but processed periodically, say, once a day or week.

- On-line Batch Systems: The transaction information is captured by on-line data-entry devices and logged on the system, but it is processed periodically as in batch processing systems.

- On-line Real-time Systems: The transaction data capture as well as their processing in order to update records (and generate reports) is carried out in real-time as the transaction is taking place.

3. Classification by System Objectives

- Transaction Processing Systems (TPS): Their objective is to process transactions in order to update records and generate reports, i.e., to perform score-keeping functions.

- Process Control System (PCS): These systems are designed to make routine decision that control operational processes.

- Decision Support Systems (DSS): Their objective is to support the managerial decisions. Usually, these systems are based on a model of the

decision-making domain, and utilize techniques from management science, finance or other functional areas of business in order to build such models. These systems are also used often for attention-directing purposes, i.e., for directing the attention of managers to a problematic aspect of operations.

- Expert Systems (ES): These systems incorporate expertise in order to aid managers in diagnosing problems or in problem solving.

- Executive Information System (EIS): These are MIS tailored to the strategic information needs of the top managers.

- Business Information Systems (BIS): As a future managerial end user, it is very important to realize that information systems directly support both operations and management activities in business functions of accounting, finance, human resource management, marketing, and operations management. Such business information systems are needed by all business functions.
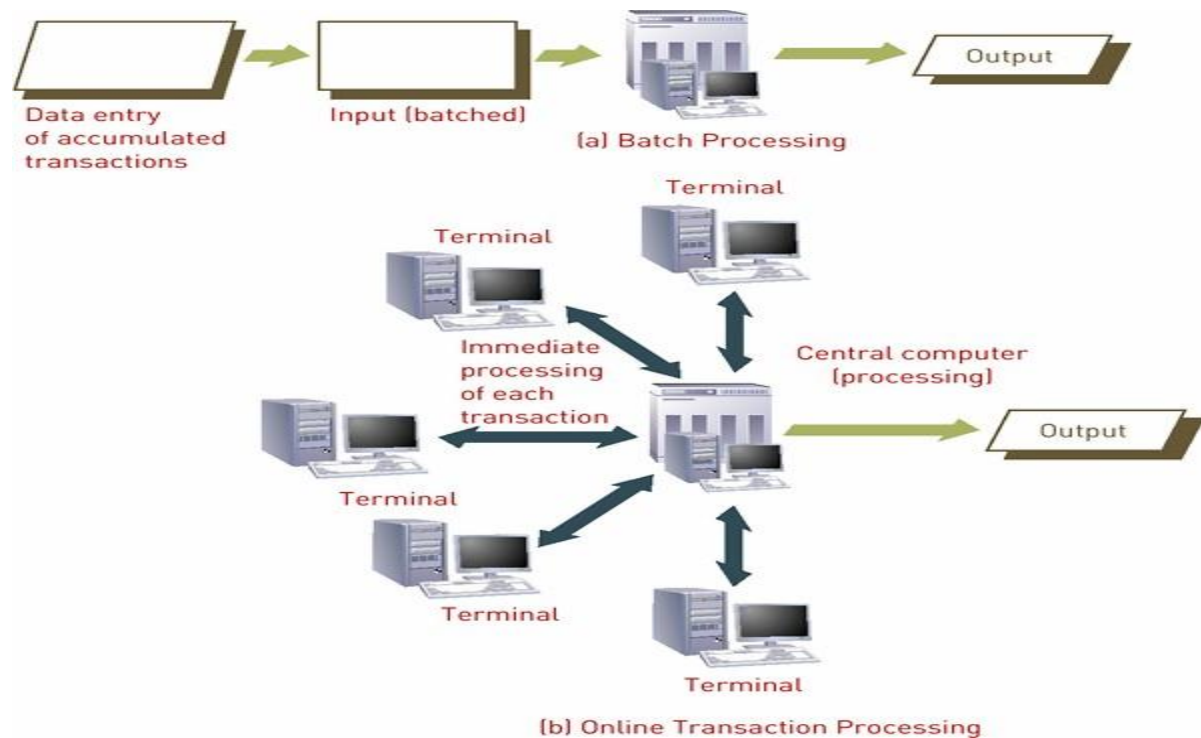

Figure 9: Modes of data processing

4. Classification by the Type of Support Provided

Another way to classify information systems is according to the type of support they provide, regardless of the functional area. For example, an information system can support office workers in almost any functional area. Likewise, managers working from various geographical locations can be supported by a computerized decision-making system.

Clerical workers, who support managers at all levels of the organization, include bookkeepers, secretaries, electronic file clerks, and insurance claim processors. Lower-level managers handle the day-to-day operations of the organization, making routine decisions such as assigning tasks to employees and placing purchase orders. Middle managers make tactical decisions, which deal with activities such as short-term planning, organizing, and control.

Knowledge workers are professional employees such as financial and marketing analysts, engineers, lawyers, and accountants. All knowledge workers are experts in a particular subject area. They create information and knowledge, which they integrate into the business. Knowledge workers act as advisors to middle managers and executives.

Finally, executives make decisions that deal with situations that can significantly change the manner in which business is done. Examples of executive decisions are introducing a new product line, acquiring other businesses, and relocating operations to a foreign country.

Office automation systems (OAS's) typically support the clerical staff, lower and middle managers, and knowledge workers. These employees use OAS to develop documents (word processing and desktop publishing

software), schedule resources (electronic calendars), and communicate
(e-mail, voice mail, videoconferencing, and groupware).

Type of System	Function	Example
Functional area IS	Support the activities within specific functional area.	System for processing payroll
Transaction processing system	Process transaction data from business events.	Wal-Mart checkout point-of-sale terminal
Enterprise resource planning system	Integrate all functional areas of the organization.	Oracle, SAP
Office automation system	Support daily work activities of individuals and groups.	Microsoft Office
Management information system	Produce reports summarized from transaction data, usually in one functional area.	Report on total sales for each customer
Decision support system	Provide access to data and analysis tools.	"What-if" analysis of changes in budget
Expert system	Mimic human expert in a particular area and make a decision.	Credit card approval analysis
Executive information system	Present structured, summarized information about aspects of business important to executives.	Status of production by product
Supply chain management system	Manage flows of products, services, and information among organizations.	Wal-Mart Retail Link system connecting suppliers to Wal-Mart
Electronic commerce system	Enable transactions among organizations and between organizations and customers.	www.dell.com

Table 2: Types of Organizational Information Systems