

# Machakos University - Information System Management

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Title	Information System Management	Code	SIT304
<b>Prerequisites</b>			
Database systems			
<b>Purpose of the course</b>			
To impart an understanding of concepts and fundamentals in information management			
<b>Description</b>			
Information systems: purpose, use, value Properties of data (quality, accuracy, timeliness) Database systems, Analysis of data, forms and sources, Data collection, Data retention, Information backup and recovery			
<b>Course learning outcomes</b>			
At the end of the course, the student should be able to understand, <ul style="list-style-type: none"><li>• Explain the role of data, information, database management systems and data mining in organizations appreciating the advantages of a database approach compared to traditional file processing.</li><li>• Identify and explain the general types of databases: personal, workgroup, department, enterprise.</li><li>• Describe mechanisms for data collection and their implications.</li><li>• Explain basic issues of data retention, including the need for retention, physical storage, security.</li><li>• Explain why data backup is important and how organizations use backup and recovery systems.</li></ul>			
<b>Learning and teaching methodology</b>			
Lectures, directed reading, practical demonstrations of communication services, and hands-on laboratory sessions and projects.			
<b>Assessment</b>			
Assignments, tutorials, tests, practical exercises (40%) and written examinations (60%)			

## BASIC INFORMATION CONCEPTS

Information can be defined as meaningfully interpreted data. If we give you a number 1-212-290-4700, it does not make any sense on its own. It is just a raw data. However if we say Tel: +1-212-290-4700, it starts making sense. It becomes a telephone number. If I gather some more data and record it meaningfully like:

Address: 350 Fifth Avenue, 34th floor

New York, NY 10118-3299 USA

Tel: +1-212-290-4700

Fax: +1-212-736-1300

It becomes a very useful information - the address of New York office of Human Rights Watch, a non-profit, non-governmental human rights organization.

So, from a system analyst's point of view, information is a sequence of symbols that can be construed to a useful message.

An **Information System** is a system that gathers data and disseminates information with the sole purpose of providing information to its users.

The main object of an information system is to provide information to its users. Information systems vary according to the type of users who use the system.

A **Information management system** is an information system that evaluates, analyzes, and processes an organization's data to produce meaningful and useful information based on which the management can take right decisions to ensure future growth of the organization.

### Information Definition

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According to Wikipedia:

"Information can be recorded as signs, or transmitted as signals. Information is any kind of event that affects the state of a dynamic system that can interpret the information.

Conceptually, information is the message (utterance or expression) being conveyed. Therefore, in a general sense, information is "Knowledge communicated or received, concerning a particular fact or circumstance". Information cannot be predicted and resolves uncertainty."

### **Information Vs Data**

Data can be described as unprocessed facts and figures. Plain collected data as raw facts cannot help in decision-making. However, data is the raw material that is organized, structured, and interpreted to create useful information systems.

Data is defined as 'groups of non-random symbols in the form of text, images, voice representing quantities, action and objects'.

Information is interpreted data; created from organized, structured, and processed data in a particular context.

According to Davis and Olson:

"Information is a data that has been processed into a form that is meaningful to recipient and is of real or perceived value in the current or the prospective action or decision of recipient

### **Information, Knowledge, and Business Intelligence**

Professor Ray R. Larson of the School of Information at the University of California, Berkeley, provides an *Information Hierarchy*, which is:

- ☐ Data - The raw material of information
- ☐ Information - Data organized and presented by someone.
- ☐ Knowledge - Information read, heard, or seen, and understood
- ☐ Wisdom - Distilled and integrated knowledge and understanding.

Scott Andrews' explains *Information Continuum s* follows:

- ☐ Data - A Fact or a piece of information, or a series thereof
- ☐ Information - Knowledge discerned from data.
- ☐ Business Intelligence - Information Management pertaining to an organization's policy or decision-making, particularly when tied to strategic or operational objectives

### **Information/Data Collection Techniques**

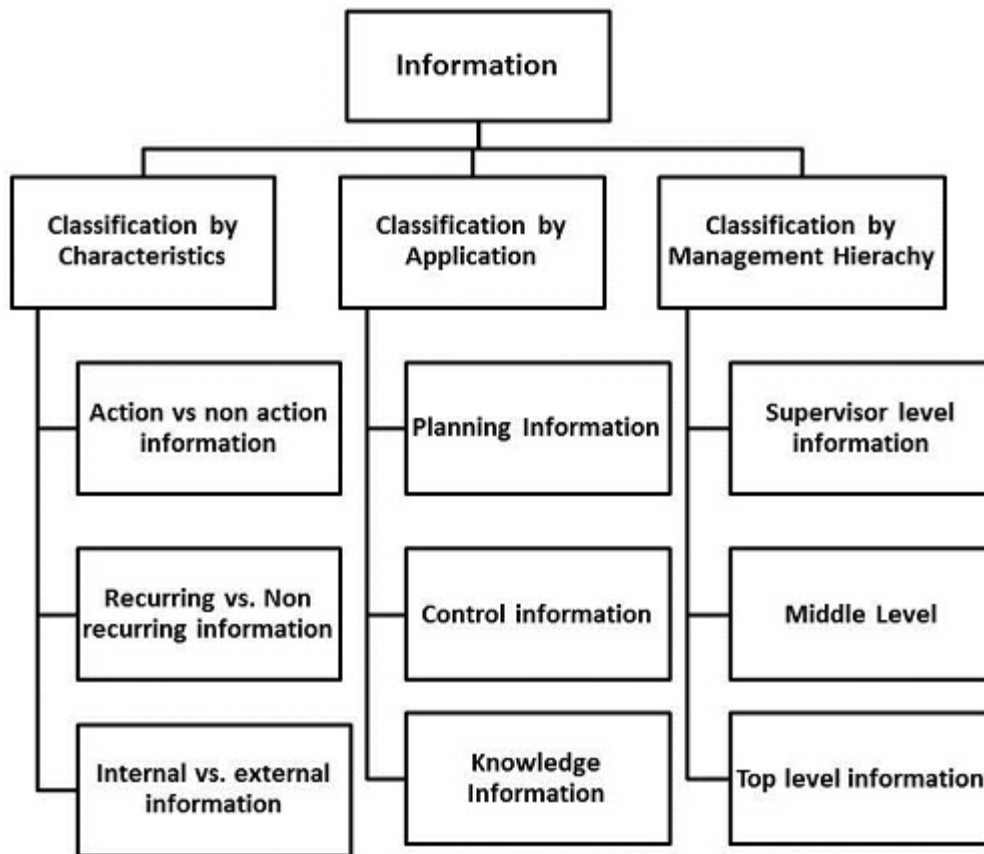
The most popular data collection techniques include:

- Surveys: A questionnaire is prepared to collect the data from the field.

- ☐ Secondary data sources or archival data: Data is collected through old records, magazines, company website, etc.
- ☐ Objective measures or tests: An experimental test is conducted on the subject and the data is collected.
- ☐ Interviews: Data is collected by the system analyst by following a rigid procedure and collecting the answers to a set of pre-conceived questions through personal interviews.

## CLASSIFICATION OF INFORMATION

Information can be classified in a number of ways and in this chapter; you will learn two of the most important ways to classify information.



### Classification by Characteristic

Based on Anthony's classification of Management, information used in business for decision-making is generally categorized into three types:

- **Strategic Information:** Strategic information is concerned with long term policy decisions that defines the objectives of a business and checks how well these objectives are met. For example, acquiring a new plant, a new product, diversification of business etc., comes under strategic information.
- **Tactical Information:** Tactical information is concerned with the information needed for exercising control over business resources, like budgeting, quality control, service level, inventory level, productivity level etc.

- **Operational Information:** Operational information is concerned with plant/business level information and is used to ensure proper conduction of specific operational tasks as planned/intended. Various operator specific, machine specific and shift specific jobs for quality control checks comes under this category.

### **Classification by Application**

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In terms of applications, information can be categorized as:

- **Planning Information:** These are the information needed for establishing standard norms and specifications in an organization. This information is used in strategic, tactical, and operation planning of any activity. Examples of such information are time standards, design standards.
- **Control Information:** This information is needed for establishing control over all business activities through feedback mechanism. This information is used for controlling attainment, nature and utilization of important processes in a system. When such information reflects a deviation from the established standards, the system should induce a decision or an action leading to control.
- **Knowledge Information:** Knowledge is defined as "information about information". Knowledge information is acquired through experience and learning, and collected from archival data and research studies.
- **Organizational Information:** Organizational information deals with an organization's environment, culture in the light of its objectives. Karl Weick's Organizational Information Theory emphasizes that an organization reduces its equivocality or uncertainty by collecting, managing and using these information prudently. This information is used by everybody in the organization; examples of such information are employee and payroll information.
- **Functional/Operational Information:** This is operation specific information. For example, daily schedules in a manufacturing plant that refers to the detailed assignment of jobs to machines or machines to operators. In a service oriented business, it would be the duty roster of various personnel. This information is mostly internal to the organization.

- **Database Information:** Database information construes large quantities of information that has multiple usage and application. Such information is stored, retrieved and managed to create databases. For example, material specification or supplier information is stored for multiple users.



## QUALITY OF INFORMATION

Information is a vital resource for the success of any organization. Future of an organization lies in using and disseminating information wisely. Good quality information placed in right context in right time tells us about opportunities and problems well in advance.

Good quality information: Quality is a value that would vary according to the users and uses of the information.

According to Wang and Strong, following are the dimensions or elements of Information Quality:

- ☐ **Intrinsic:** Accuracy, Objectivity, Believability, and Reputation
- ☐ **Contextual:** Relevancy, Value-Added, Timeliness, Completeness, and Amount of information
- ☐ **Representational:** Interpretability, Format, Coherence, and Compatibility
- ☐ **Accessibility:** Accessibility, Access security

Various authors propose various lists of metrics for assessing the quality of information. Let us generate a list of the most essential characteristic features for information quality:

- ☐ **Reliability** - It should be verifiable and dependable.
- ☐ **Timely** - It must be current and it must reach the users well in time, so that important decisions can be made in time.
- ☐ **Relevant** - It should be current and valid information and it should reduce uncertainties.
- ☐ **Accurate** - It should be free of errors and mistakes, true, and not deceptive.
- ☐ **Sufficient** - It should be adequate in quantity, so that decisions can be made on its basis.
- ☐ **Unambiguous** - It should be expressed in clear terms. In other words, it should be comprehensive.
- ☐ **Complete** - It should meet all the needs in the current context.
- ☐ **Unbiased** - It should be impartial, free from any bias. In other words, it should have integrity.
- ☐ **Explicit** - It should not need any further explanation.

- **Comparable** - It should be of uniform collection, analysis, content, and format.
- **Reproducible** - It could be used by documented methods on the same data set to achieve a consistent result.

## **INFORMATION NEED AND OBJECTIVE**

Information processing beyond doubt is the dominant industry of the present century. Following factors states few common factors that reflect on the needs and objectives of the information processing:

- Increasing impact of information processing for organizational decision making
  - Dependency of services sector including banking, financial organization, health care, entertainment, tourism and travel, education and numerous others on information.
  - Changing employment scene world over, shifting base from manual agricultural to machine-based manufacturing and other industry related jobs.
  - Information revolution and the overall development scenario
  - Growth of IT industry and its strategic importance
  - Strong growth of information services fuelled by increasing competition and reduced product life cycle.
  - Need for sustainable development and quality life.
  - Improvement in communication and transportation brought in by use of information processing.
  - Use of information processing in reduction of energy consumption, reduction in pollution and a better ecological balance in future
  - Use of information processing in land record managements, legal delivery system, educational institutions, natural resource planning, customer relation management and so on.
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In a nutshell:

- ☐ Information is needed to survive in the modern competitive world.
- ☐ Information is needed to create strong information systems and keep these systems up to date.

### **Implications of Information in Business**

Information processing has transformed our society in numerous ways. From a business perspective, there has been a huge shift towards increasingly automated business processes and communication. Access to information and capability of information processing has helped in achieving greater efficiency in accounting and other business processes.

A complete business information system accomplishes the following functionalities:

- ☐ Collection and storage of data
- ☐ Transform these data into business information useful for decision making.
- ☐ Provide controls to safeguard data.
- ☐ Automate and streamline reporting

The following list summarizes the five main uses of information by businesses and other organizations:

- ☐ **Planning** - At the planning stage, information is the most important ingredient in decision making. Information at planning stage includes that of business resources, assets, liabilities, plants and machineries, properties, suppliers, customers, competitors, market and market dynamics, fiscal policy changes of the Government, emerging technologies, etc.
- ☐ **Recording** - Business processing these days involves recording information about each transaction or event. This information is collected, stored, and updated regularly at the operational level.
- ☐ **Controlling** - A business need to set up an information filter, so that only filtered data is presented to the middle and top management. This ensures efficiency at the operational level and effectiveness at the tactical and strategic level.
- ☐ **Measuring** - A business measures its performance metrics by collecting and analyzing sales data, cost of manufacturing, and profit earned.

- **Decision-making** - MIS is primarily concerned with managerial decision-making, theory of organizational behavior, and underlying human behavior in organizational context. Decision-making information includes the socio-economic impact of competition, globalization, democratization, and the effects of all these factors on an organizational structure.

In short, this multi-dimensional information evolves from the following logical foundations:

- Operations research and management science
  - Theory of organizational behavior
  - Computer science:
    - o Data and file structure
    - o Data theory design and implementation
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- o Computer networking
  - o Expert systems and artificial intelligence
  - Information theory

Following factors arising as an outcome of information processing help speed up of business events and achieve greater efficiency:

- Directly and immediate linkage to the system
- Faster communication of an order
- Electronic transfer of funds for faster payment
- Electronically solicited pricing (helps in determining the best price)

### **MIS Need for Information Systems**

Managers make decisions. Decision-making generally takes a four-fold path:

- Understanding the need for decision or the opportunity,
- Preparing alternative course of actions,
- Evaluating all alternative course of actions,
- Deciding the right path for implementation.

**MIS** is an information system that provides information in the form of standardized reports and displays for the managers. MIS is a broad class of information systems designed to provide information needed for effective decision making.

Data and information created from an accounting information system and the reports generated thereon are used to provide accurate, timely and relevant information needed for effective decision making by managers.

Management information systems provide information to support management decision making, with the following goals:

- ☐ Pre-specified and preplanned reporting to managers.
- ☐ Interactive and ad-hoc support for decision making.
- ☐ Critical information for top management.

MIS is of vital importance to any organization, because:

- ☐ It emphasizes on the management decision making, not only processing of data generated by business operations.
- ☐ It emphasizes on the systems framework that should be used for organizing information systems applications.

## Technical foundations of information systems

### Learning outcomes:

Gain knowledge about Technical aspects of information system in organization.

At the end of this chapter, you will be able to:

- Describe computers and information processing.
- Describe information systems software.
- Understands the concept of managing data resources.
- Describe the technology of communication, networks.

### What is a computer system?

Regardless of size, age, function or capability, all computers have the same basic components and operate according to the same basic principles. A computer must handle four basic operations: accept data, store data and instructions, process data and lastly output data. In recent years, almost every computer has also been expected to support data communications. Computers conduct these operations with the same basic equipment.

In general, every computer has these components:

- Central processing unit (CPU) is the most important part of any computer. It manipulates raw data into a more useful form and controls the other parts of the computer systems. Two main unit of CPU is arithmetic logic unit (ALU) that performs the

principles logic and arithmetic operations of the computer and control unit that controls and coordinates the other parts of the computer system.

- Primary storage that stores all or part of the program that is being executed, stores the operating system programs that manage the operation of the computer and holds data that are being used by the program. Internal primary

storage of a computer is often called RAM (Random Access Memory) and can directly access any randomly chosen location in the same amount of time. Besides RAM, ROM (Read Only Memory) is also used to store important or frequently used programs and it comes with manufacturer when a computer is purchased. ROM can be further divided into two subclasses: Programmable read-only memory (PROM) which is used in control devices because it can be reprogrammed once. Erasable programmable read-only memory (EPROM) that can be erased and reprogrammed many times.

- Secondary storage is a relatively long-term, nonvolatile storage of data outside the CPU and primary storage. It can be divided into three different categories:
  1. Magnetic disk which can be divided further into two main type, floppy disks and hard disks. Floppy disk is a removable magnetic disks storage primarily used with PCs. Hard disk is a magnetic tape resembling a thin steel platter with an iron oxide coating and is used in large computer systems and in many PCs.
  2. Optical disk is also called compact disks or laser optical disks. It stores data at densities many times greater than those of magnetic disks. Compact disks read-only memory (CD-ROM) is a read-only optical disks storage used for imaging, reference a database applications with massive amounts of unchanging data and for multimedia. Write once/read many (WROM) or Compact disk-recordable (CD-R) is an optical disk system that allows users to record data only once and data cannot be erased but can be read



indefinitely. Magnetic Tape is an inexpensive, older secondary storage medium in which large volumes of information are stored sequentially by means of magnetized and non-magnetized spots on tape.

- Input and output devices/peripheral devices. Input devices convert data and instructions into electronic form for input into the computer. Examples of input devices are like keyboard, computer mouse, touch screens and etc. Output devices convert electronic data produced by the computer system and display them in a form that people can understand. Examples of output devices are like printer, video display and etc.

## Information Systems Software

Software is a detailed instruction that controls the operation of a computer system. Without software, computer hardware could not perform the tasks we associate with computers. The main functions of software are managing the computer resources of the organization, provide tools for human beings to take advantage of these resources and act as an intermediary between organizations and stored information. Software program is a series of statements or instructions to the computer. A stored program concept means that a program must be stored in the computer's primary storage along with the required data in order to execute, or have its instructions performed by the computer. Software can be divided into two major types:

- System software is a generalized program that manages the resources of the computer. Operating system is the system software that manages and controls computer's activities. An

operating system performs three main functions: allocation and assignment, scheduling and the lastly monitoring.

- Application software is programs written for a specific application to perform functions specific by end users. Application software works through system software, which access to computer hardware.

## Managing data resources

### Problems with traditional file environment

Traditional file environment (flat file organization/data file organization) is a way of collecting and maintaining data in an organization that leads to each functional area or division creating and maintaining its own data files and programs. Traditional file environment will results the following problems:

- Data redundancy and confusion.
- Program-data independence.
- Lack of flexibility.
- Poor security.
- Lack of data sharing and availability.

The above mentioned problems can be solved by using a database.

### Database environment

Database is a collection of data organized to service many application at the same time by storing and managing data so that they appear to be in one location. A database management system (DBMS) is special software to create and maintain a database and enable individual business applications to extract the data they need without having to create separate files or data definitions in their computer programs.

A DBMS has three components:

- A data definition language.
- A data manipulation language.
- A data dictionary.

### Three major types of database models

The earliest DBMS were hierarchical which organizes data in a treelike structure. A record is subdivided into segments that are connected to each other in one-to-many parent-child relationship. The most common hierarchical DBMS is IBM's IMS (Information Management System).

The network data model is a variation of the hierarchical data model. This model is useful for depicting many-to-many relationships.

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Types of database	Processing efficiency	Flexibility	End-user friendliness	Programming complexity
Hierarchical	High	Low	Low	High
Network	Medium-high	Low-medium	Low-moderate	High
Relational	Lower but improving	High	High	Low

Figure: Comparative Summary for Major database models

Relational data model is a type of logical database model that treats data as if they were stored in two-dimensional tables. It can relate data stored in one table to data in another as long as the two tables share a common data element. Object relational data model is a model used mostly for Internet databases. The following table shows the comparison of database alternatives.

### Telecommunications and Networks

#### Components and functions of a telecommunication system

A telecommunication is a collection of compatible hardware and software arranged to communicate information from one location to another. The following are essential components of telecommunication systems:

- Computers to process information.
- Terminals or any input/output devices that send or receive data.
- Communication channels, the links by which data or voice are transmitted between sending and receiving devices in a network. Communication channels use various communication media, such as telephone lines, fiber-optics cables, coaxial cables and wireless transmission.
- Communication processors, such as modems, multiplexers, controllers and front-end processors, which provide support functions for data transmission and reception.
- Communication software, which controls input and output activities and manages other functions of the communication network.

Functions of telecommunication system:

- Establishes the interface between the sender and the receiver.
- Routes messages along the most efficient paths.
- Performs elementary processing of the information to ensure that the right message gets to the right receiver.
- Performs editorial tasks on the data.
- Converts messages from one speed into the speed of a communications line or from one format to another format.
- Controls the flow of information.

Communication Networks

Networks can be classified by their shape (topology) or by their geographic scope and type of services provided. Networks classified by their topology:

- Star network is a network in which all computers and other devices are connected to a central host computer. All communications between networks devices must pass through the host computer.
- Bus network is a topology that links a number of computers by a single circuit with all messages broadcast to the entire network.
- Ring network is a network in which all computers are linked by a closed loop in a manner that passes data in one direction from one computer to another.

Networks classified by their geographic scope:

- Private branch exchanges (PBX) is a central switching system that handles a firm's voice and digital communication.
- Local area networks (LAN) is a telecommunication network that requires its own dedicated channels and that encompasses a limited distance, usually one building or several buildings in close proximity.
- Wide area networks (WAN) is a network that spans a large geographical distance. May consist of a variety of cables, satellite and microwave technology.
- Value-added network (VAN) is a private, multi-path, data-only, third-party managed network that is used by multiple organizations on a subscription basis.

## Summary

Remark:- Technical information about information System concerns about the infrastructure and systems that facilitate the dissemination of information within and outside the organization

Infrastructure involves information about the hardware components, network components of the information system whereas systems include the software application i.e. Application systems, databases and internet services.

## Revision Questions

Name three main components of a computer system.

*Solution:*

*CPU, Storage i.e. primary and secondary storage, input and output peripherals*

Differentiate between Application software and system soft-ware.

Discuss database management system model.

Discuss three telecommunication components and explain two functions of telecommunication system.

Discuss network topology and cite three examples.

**Problem:-** As a Chief Information Officer of a given organization, The organization wish to acquire a Financial Management system, you are tasked to provide a report summary as a specification to aid and fast track procurement process.

## **Redesigning the organization with information systems**

### **Learning outcomes:**

Knowledge on how information systems influence organizational change.

At the end of this chapter you will be able to:

- Demonstrate how building new systems can produce organizational change.
- Explain how the organization can develop information systems that fit its businesses plan.
- Identify the core activities in the systems development process.
- Analyze the organizational change requirements for building successful systems.
- Describe models for determining the business value of information systems.
- Describe the different approaches to systems-building.





## Systems as Planned Organizational Change

The introduction of new information system involves much more than new hard-ware and software. It also includes changes in jobs, skills, management and organi-zation. In the concept of socio-technical, one cannot install new technology without considering the people who must work with it. When we design a new information system, we are redesigning the organization.

One of the most important things to know about building a new information system is that this process is one kind of planned organizational change. Systems builders must understand how a system will affect the organization as whole, focusing par-ticularly on organizational conflict and changes in the locus of decision making. Builders must also consider how the nature of work groups will change under the impact of the new system. Systems can be technical successes but organizational failures because of a failure in the social and political process of building the sys-tems. Analysts and designers are responsible for ensuring that key members of the organization participate in the design process and are permitted to influence the ultimate shape of the system.

## Establishing Organizational Information Requirements

In order to develop an effective information systems plan, the organization must have a clear understanding of both its long- and short-term information require-ments. Two principal methodologies for establishing the essentials information requirements of the organization as a whole are Enterprise Analysis (Business Sys-tems Planning) and critical success factors.

### Enterprise Analysis Enterprise

Analysis (Business Systems Planning) is an analysis of organization-wide informa-tion requirements by looking at the entire organization in terms of organizational units, functions, processes and data elements. It helps to

identify the key entities in the organization's data. This method starts with the notion that the information requirements of a firm or a division can be specified only with a thorough understanding of the entire organization. The central method used in the enterprise analysis approach is to take a large sample of managers and ask them how they use information, where they get the information, what environments are like, what their objectives are, how they make decisions and what their data needs are.

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Stages	Activities
1. Purpose of the Plan	<ul style="list-style-type: none"> <li>• Overview of plan contents</li> <li>• Changes in firm's current situation</li> <li>• Firm's strategic plan</li> <li>• Current business organization</li> <li>• Key business processes</li> <li>• Management strategy</li> </ul>
2. Strategic Business Plan	<ul style="list-style-type: none"> <li>• Current situation</li> <li>• Current business organization</li> <li>• Changing environments</li> <li>• Major goals of business plan</li> </ul>
3. Current Systems	<ul style="list-style-type: none"> <li>• Major systems supporting business functions and processes</li> <li>• Major current capabilities <ul style="list-style-type: none"> <li>▪ Hardware</li> <li>▪ Software</li> <li>▪ Database</li> <li>▪ Telecommunications</li> </ul> </li> <li>• Difficulties meeting business requirements</li> <li>• Anticipated future demands</li> </ul>
4. New development	<ul style="list-style-type: none"> <li>• New system projects <ul style="list-style-type: none"> <li>▪ Project descriptions</li> <li>▪ Business rationale</li> </ul> </li> <li>• New capabilities required <ul style="list-style-type: none"> <li>▪ Hardware</li> <li>▪ Software</li> <li>▪ Database</li> <li>▪ Telecommunication and Internet</li> </ul> </li> </ul>
5. Management Strategy	<ul style="list-style-type: none"> <li>• Acquisition plans</li> <li>• Milestones and timing</li> <li>• Organizational realignment</li> </ul>

Table 1: .Stage of Information System Plan.

The results of this large survey of managers are aggregated into subunits, functions, processes and data metrics. Data elements are organized into

logical application groups and these results will be display out in the form of chart for easier interpretation and decision making based on the survey. The weakness for this method is that it produces an enormous amount of data that is expensive to collect and difficult to analyze. Most of the interviews are conducted with senior or middle managers with little effort to collect information from clerical workers and supervisory man-agers. Moreover, the questions frequently focus not on the critical objectives of management and where information is needed, but rather on what existing information is used. The following table shows the topics that should be included in an information system plan.

### Critical Success Factor (CSF)

Strategic Analysis or Critical Success Factor (CSF) approach argue that the information requirements of an organization are determined by a small number of easily identified operational goals shaped by the industry, the firm, the manager and the broader environment that are believed to assure the success of an organization. An important premise of the strategic analysis approach is that there are a small number of objectives that managers can easily identify and information systems can focus on. The principal method used in CFS analysis is personal interviews- three to four –with a number of top managers to identify their goals and the resulting CSFs. The strength of CSF method is that it produces a smaller data set to analyze than does enterprise analysis and will produce systems that are more custom-tailored to an organization. Another strength of CSF method is that it takes into account the changing environment with which organizations and managers must deal. Un-like enterprise analysis, the CSF method focuses organizational attention on how information should be handled. The primary weakness of this method is that the aggregation process and the analysis of the data are art forms where there is no

particular rigorous way in which individual CSFs can be aggregated into a clear company pattern. Another weakness of this method is that this method is clearly biased toward top managers as their will be the ones being interviewed. Lastly, this method does not necessarily overcome the impact of a changing environment or changed in managers.

### Systems Development and Organizational Change

New information systems can promote various degree of organizational change, enabling organizations to redesign their structure, scope, power relations, workflows, products and services. The following table describes how information technology is being used to transform organizations.

### The Spectrum of Organizational Change

Information technology can promote various degrees of organizational change, ranging from incremental to far-reaching. There are four kinds of structural organizational change that are enabled by information technology:

- Automation involves assisting employees to perform their tasks more efficiently and effectively or in another word, using the computer to speed up the performance of existing tasks.
- Rationalization of procedures is a deeper form of organizational change that streamlines the standard operation procedures, eliminating obvious bottle-necks, so that automation makes operating procedures more efficient.
- Business process reengineering (BPR) is the radical redesign of business processes, combining steps to cut waste and eliminating repetitive, paper-intensive tasks in order to improve cost, quality and service, and to maximize the benefits of information technology. The process of streamlining business procedures so that documents can be moved easily and efficiently is called work-flow management.
- Paradigm shift is a radical re-conceptualization of the nature of the business and the nature of the organization.



Information Technology	Organizational Change
Global networks	International division of labor <ul style="list-style-type: none"> <li>• The operations of a firm are no longer determined by location</li> <li>• The global reach of firms is extended</li> <li>• Costs of global coordination decline</li> <li>• Transaction costs decline</li> </ul>
Enterprise networks	Collaborative work and teamwork <ul style="list-style-type: none"> <li>• The organization of work can now be coordinated across divisional boundaries</li> <li>• A customer and product orientation emerges</li> <li>• Widely dispersed task forces become dominant work group</li> <li>• The costs of management (agency costs) declined</li> <li>• Business processes are changed</li> </ul>
Distributed networks	Empowerment <ul style="list-style-type: none"> <li>• Individuals and work groups now have the information and knowledge to act</li> <li>• Business processes are redesigned, streamlined</li> <li>• Management costs decline</li> <li>• Hierarchical and centralization decline</li> </ul>
Portable networks	Virtual organization <ul style="list-style-type: none"> <li>• Work is no longer tied to geographic location</li> <li>• Knowledge and information can be delivered anywhere they are needed, anytime</li> <li>• Work becomes portable</li> <li>• Organizational costs decline as real estate is less essential for business</li> </ul>

Table 2: Information System and Organizational change summary

The most common forms of organizational change are automation and rationalization. These relatively slow-moving and slow-changing strategies present modest return but little risk. Faster and more comprehensive change like reengineering and paradigm shift carry high rewards but offers a substantial chance of failure. BPR and paradigm shift often fail because extensive organizational change is so difficult to orchestrate.

## System Development Process

System development refers to all the activities that go into producing an information systems solution to an organizational problem or opportunity. System development is a structured kind of problem solving with distinct activities. The core activities in system development will be described briefly in the following table.

Each of the core system development activities entails interaction with the organization.

### Building successful systems

From an organizational and behavior point of view, the major causes of information systems failure are:

- Insufficient or improper user participation in the systems development process.
- Lack of management support.
- Poor management of the implementation process.
- High level of complexity and risk in the systems development projects.

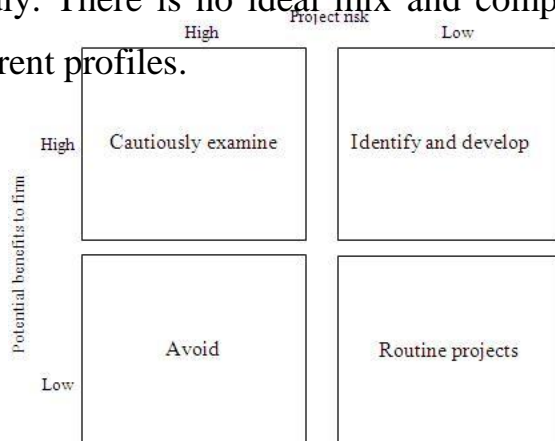


Implementation is the entire process of organizational change surrounding the new information system. Different patterns of the implementation should be analyzed in order to understand system's success or failure. Relationship between participants (system designers and end users) is practically important in the whole process of implementation. Besides that, the support and control from management of the implementation process are an essential part as it acts as the mechanisms for dealing with the level of risks (determined by project size, structure and experience with technology) in each new system.

The business value of information systems can be determined using the following models:

- Capital budgeting like cost/benefit ratio, net present value and return on investments (ROI).
- Portfolio analysis and scoring analysis includes non-financial considerations and can be used to evaluate alternative information systems projects.

Figure below shows a system portfolio where companies should examine their portfolio of projects in terms of potential benefits and likely risks. Certain kinds of projects should be avoided altogether and others developed rapidly. There is no ideal mix and companies in different industries have different profiles.



## Approaches to Systems-Building

Different approaches are being used in building a system. The advantages and disadvantages of these approaches will be as follows:

### Summary

Technical information about information systems concerns about the infrastructure and systems that facilitate the dissemination of information within and outside the organization. Infrastructure involves information about the hardware components, network components of the information system, whereas systems include the software application i.e. application systems, databases and internet services.

### Revision Questions

#### Example .

Differentiate between Enterprise analysis (Business System Planning) and critical success factors.

Solution:

Business System Analysis is an analysis of organization-wide information requirements by looking at the entire organization in terms of organizational units, functions, processes and data elements. Critical Success factors- the information requirements of an organization are determined by a small number of easily identified operational goals shaped by the industry, the firm, the manager and the broader

### EXERCISE

1. Having been recruited as the systems' analyst/designer, advise your employer (current organization) on the issues involved in building a new system and the effects it has on the organization as a whole.
2. Define System development.
3. Discuss the components of Information System plan..

4. Discuss the phases of system development.

**Problem.**

As a ICT manager of a given learning institution, you are requested to advise the institution on the best way forward to carry out an automation project of some of its processes. required provide a brief document on the areas that needs to be considered for successful Information systems implementation.

[References and Additional Reading Materials](#)

- Laudon, K.C. and Laudon J.P. (2010) Management Information System: Managing the Digital firm. 11th Edition, NJ: Pearson Education Inc. ISBN 10, :013609368x.
- Turban, E., McLean, and Wetherbe, J. (2007). Information Technology for Management: ISBN :978-0-470-91680-3.

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**EXERCISE 21.** Having been recruited as the systems' analyst/designer, advise your employer (current organization) on the issues involved in building a new system and the effects it has on the organization as a whole.

**EXERCISE 22.** Define System development.

**EXERCISE 23.** Discuss the components of Information System plan..

**EXERCISE 24.** Discuss the phases of system development.

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## **Information systems security and control**

Learning outcomes: Gain knowledge on how to safeguard and protect information sys-tems within an organization.

After completing this chapter, you will be able to:

- Describe why information systems are so vulnerable to destruction, error, abuse and system quality problems.
- Compare general controls and application controls for information systems.
- Select the factors that must be considered when developing the controls of information systems.
- Describe the most important software quality-assurance techniques.
- Describe the importance of auditing information systems and safeguarding data quality.

## **System Vulnerability and Abuse**

The development, implementation and maintenance of information systems constitute a large and growing part of the cost of doing business, protecting these re-sources is a primarily concern. The increasing reliance on information systems, combined with their connection to the “outside world”

in the form of the Internet, makes security corporate information systems increasingly challenging.

The role of computer controls and security is to protect systems against these and many other mishaps, as well as to help organizations ensure that their information systems operations complies with the law and with expectation of employees and customers for privacy.

The major goals of information security are:

- To reduce the risk of systems and organizations ceasing operations.
- To maintain information confidentiality.
- To ensure the integrity and reliability of data resources.
- To ensure the availability of data resources.
- To ensure compliance with national security laws and privacy policies and laws.

### Why Systems are vulnerable?

The threats to computerized information system can stem from technology, organizational and environmental factors. The threats can be view from two main aspect, risk to hardware and risk to application and data. Risk to hardware involves physical damage to computers, peripheral equipment and communication media. The major causes of such damage are natural disasters, blackouts and brownout and vandal-ism. Natural disasters that pose a risk to information systems (ISs) include fire, floods, earthquakes, tornadoes and lightning, which can destroy hardware, software or both, causing total or partial paralysis of systems or communication lines. Flood water short-circuits and burns delicate components such as microchips. Lightning and voltage surges cause tiny wires to melt and destroy circuitry. Obviously, all data and programs stored in memory chips in a computer are lost when this hap-pens. Water from floods and the heat created when circuits are shorted may also ruin the surface of storage media such as magnetic tapes or disks, thereby destroy-ing data. In addition, wildlife and

human error occasionally destroy communication lines. The easiest way to protect against loss of data caused by natural disasters is to automatically duplicate all data periodically and store duplicate copy in a site many miles away from the office.

Blackouts and brownouts happened when power is disrupted from the computer which results in computers and its peripheral devices cannot functions. The change in power supply can have very damaging effects on computer processes and storage. Blackouts are incidents of a total loss of electrical power, meanwhile in brownouts, the voltage of the power decreases or there are very short interruptions in the flow of power. Power failure may not only disrupt operations but also cause irreparable damage to hardware. Occasional surges in voltage are equally harmful because their impact on equipment is similar to that of lightning. The popular way of handling brownouts is to connect a voltage regulator between computers and the electric network. A voltage regulator boosts or decreases voltage to smooth out drops or surges and guarantees maintenance of voltage within an acceptable tolerance. To ensure against interruptions in power supply, organization use uninterrupted power

supply (UPS) systems which provide an alternative power supply for a short time, as soon as a power net fails. Vandalism occurs when human beings deliberately destroy computer systems. It is difficult to defend computers against vandalism. In the work place, the best measure against vandalism is to allow access only to those who have real need for the system. Sensitive equipment, such as servers, should be locked in a special room. Risk to applications and data are theft of information, data alteration and destruction, computer viruses, programs that support unauthorized access and non-malicious mishaps.

### Concerns for System Builders and Users

The heightened vulnerability of automated data has created special concerns for the builders and users of information systems. These concerns include:

- Disaster. Fault-tolerant computer systems contains extra hardware, software and power supply components that can back a system up and keep it running to prevent system failure. Fault-tolerant technology is used by firms for critical applications with heavy on-line transaction processing requirements. In on-line transaction processing, transactions entered on-line are immediately processed by the computer. Multitudinous changes to databases, reporting or requests for information occurs each instant. Most of the firms will contract their backup facilities with disaster recovery firms.
- Security. Refer to the policies, procedures and technical measures used to prevent unauthorized access, alteration, theft or physical damage to information systems.
- Errors. Computers can also serve as instruments of error, severely disrupting or destroying an organization's record keeping and operations.



In addition to disasters, viruses and security breaches, defective software and data pose a constant threat to information systems, causing untold losses in productivity. Bugs and defects hidden within the codes of software are the major problems faced by most of the firms. Bugs are the segment of program codes, which causes defects or errors. The main source of bugs is the complexity of decision-making code. Zero defects cannot be achieved in large programs because complete testing is not possible. Another reason that systems are unreliable is that computer software is traditionally difficult to be maintained. Maintenance is the most expensive

phase of the systems development process due to organizational changes, which affects information requirements. Besides that, the complexity of the program code and faulty system analysis and design also contributes to the difficulties in maintenance. Another common source to information systems failure is poor data quality (data that are inaccurate, untimely or inconsistent with other sources). Bad data can lead to bad decisions, product recalls and even financial losses.

### Creating a Control Environment

To minimize all the happening of information systems failure, special policies and procedures must be incorporated into the design and implementation of information systems. The combination of manual and automated measures the safeguard information systems and ensure that they perform according to management standards is termed control. Controls are constraints and other measures imposed on a user or a system and can be used to secure systems against the risks or to reduce damage caused to systems, applications and data. Control consists of all the methods, policies and procedures that ensure protection of the organization's assets, accuracy and reliability of its records and operational adherence to management standards. Computer systems are controlled by a combination of general controls and application controls.

### General controls:

General controls are those that control the design, security and use of the computer programs and the security of data files in general throughout the organization. It is a combination of system software and manual procedures and applies to all applications area. General controls include the following:

- Controls over the system implementation process, which audit the systems development process at various points to make sure that it is properly controlled and managed.
- Software control, which controls to ensure the security and reliability of software and also prevents unauthorized access of software programs.

- Physical hardware controls, which controls to ensure the physical security and correct performance of computer hardware.
- Computer operations controls, which are the procedures to ensure that pro-grammed procedures, are consistently and correctly applied to data storage and processing.
- Data security controls, which controls to ensure that data files on either disk or tape are not subject to unauthorized access, change or destruction.
- Administrative disciplines, standards and procedures, which is a formal-ized standards, rules, procedures and disciplines to ensure that the organiza-tion's controls are properly executed and enforced.

The most important administrative controls are segregation of functions where the principle of internal control to divide responsibilities and assign tasks among people so their job functions do not overlap, to minimize the risk of errors and fraudulent manipulation of the organization's assets. Written policies and procedures will es-tablish formal standards for controlling information systems operation. Supervision of personnel involved in control procedures that ensures that the controls for an in-formation system are performing as intended. Weakness in each of these general controls can have a widespread effect on programmed procedures and data through-out the organization. The following table summarizes the effect of weakness in general controls:

## Application Controls

Application controls are specific controls within each separate computer application. They include automated and manual procedures that ensure that only authorized data are completely and accurately processed by that application.

The controls of each application should encompass the whole sequence of processing.

Application controls can be classified as:

- Input controls. The procedures to check data for accuracy and completeness when they enter the system. There are specific input controls for input authorization, data conversion, data editing and error handling. Control total is a type of input control that requires counting transactions or quantity fields prior to processing for comparison and reconciliation after processing. Edit checks includes routines performed to verify input data and correct errors prior to processing. Some important edit techniques are like reasonableness check, format check, existence check and dependency check.
- Processing controls. The routines for establishing that data are complete and accurate during updating. The major processing controls are run control totals, computer matching and programmed edit checks. Run control totals are the procedures for controlling completeness of computer updating by generating control totals that

reconcile total before and after processing. Computer matching is the processing control that matches input data to information held on master files.

- Output controls. Measures that ensure the results of computer processing are accurate, complete and properly distributed. Typical output controls includes the following:
  1. Balancing output totals with input and processing totals.
  2. Reviews of the computer processing logs to determine that all of the correct computer jobs executed properly for processing
  3. Formal procedures and documentation specifying authorized recipients of output reports, checks or other critical documents.

## Summary

Knowledge about information Systems security control and how employee mechanism to curb insecurity, abuse and vulnerability of information system in an organization, the major controls to be implemented are normally grouped under two broad categories that is General Control and Application control.

## Revision questions

1. Discuss two main general control for information system security
2. Explain three benefits to application control mechanism to in-formation system security..
3. Discuss factors that promote vulnerability of computerized in-formation system.
4. Explain the concept of Information systems abuse.

5. As the Chief Information Security officer, you are requested to provide a brief documentation on Information systems security plan for your organization.

### References and Additional Reading Materials

Turban ,E.,McLean, and Wetherbe,J.(2007).Information Technology for Man-agement:ISBN :978-0-470-91680-3.

Transforming Organization in the Digital Economy.New York:John Wiley & Sons.ISBN:0471705225

## **Business Applications in the internet and E-Commerce**

Learning outcomes: Gain knowledge on how to perform business transaction online and the security measure to be put in place.

Objectives After completing this chapter, you will be able to:

- Analyze how Internet technology has changed value propositions and busi-ness models.
- Define electronic commerce and describe how it has changed consumer re-tailing and business-to-business transactions.
- Compare the principal payment systems for electronic commerce.
- Evaluate the role of Internet technology in facilitating management and coor-dination of internal and inter-organizational business processes.
- Assess the challenges posed by electronic business and electronic commerce and management solutions.

### **Electronic Business, Electronic Commerce, and the Emerging Digital Firm**

About 15 years ago, the lines between an organization and its customers, suppliers, and partners were clear. A business wasn't expected to make very much, if any, information available to anyone else outside the corporation. Even the lines sepa-rating divisions within an organization were clear and understood. Production was totally separate from finance, and the human resources department wasn't directly connected to manufacturing. That is no longer the case in today's business world. In order to remain competitive, businesses are expected, if not required, to make most, if not all, information available across all divisions and to the outside world.

### **Internet Technology and the Digital Firm**



The Internet has proved to be the perfect vehicle for the new information infrastructure required by the digital firm because of its open standards and structure. No other methodology or technology has proven to work as well as the Internet for distributing information and bringing people together. It's cheap and relatively easy to use the Internet as the conduit for connecting customers, suppliers, and employees of a firm. Very few products have been created that allow an organization to erase the lines between divisions and disseminate information to anyone and everyone as the Internet.

### [New Business Models and Value Propositions.](#)

New technologies should introduce new methodologies in the digital firm. If the Internet allows a firm to produce and distribute information cheaper, easier, and faster, then people must adapt to that. Information producers must learn and adopt new techniques. New distribution channels should bring a change to the way information is stored and distributed. In many cases, the business model organizations used ten years ago has become outmoded and can actually strangle the firm. Customers and suppliers are learning how to use the new technologies to gather information about the firm's products or services and compare them to the competition. It's easier and faster than ever before. Therefore, any business wishing to stay ahead of the game needs to appreciate that fact and change their processes and methodologies. If they don't, they may not be in business much longer.

### [The Changing Economics of Information:](#)

An example of information richness found in web sites.

Let's say you're getting ready to buy a new car. You've already checked out the prices and information on the various Web sites and have managed to get a pretty good deal because of the information you gathered. But now you need a loan and insurance for the new car. Your bank will give you a

loan with a 7.5 percent interest rate. You think that's a little high. You call your insurance agent and she tells you the going rate is \$1,500 a year. You get a sinking feeling that the excellent discount you were able to wrangle on the car itself will be quickly eaten up by the insurance and loan fees. But wait. You check out the Web sites offering loans and find out you can get 5 percent. You then discover you can get insurance for only \$1,200 a year. Even if you don't use the Web sites you can still take the information to your bank and insurance agent and perhaps get them to renegotiate. Because you were able to gather information from the Internet rather than physically traveling from bank to bank, or insurance company to insurance company, your search costs were much lower. Because of the information you've gathered from the Web, the bank and insurance company no longer have the advantage of information asymmetry. That is, the bank and insurance company thought they had more information about the transaction than you did, therefore they had the upper-hand. But once you gained more information about the transaction than you previously had, you were able to get better rates.

The demise of information asymmetry is a phenomenon that is occurring in many consumer and business transactions and is directly attributable to the Internet. The richness of information that the insurance Web site provided to you, coupled with the information they were able to collect about you, is opening up new opportunities for both businesses and consumers. You get more information than was previously available and the business collects more information than they were previously able to. The reach of the financial Web site offering the loan is far greater than previously possible. Think about that for a minute. If you wanted a loan in the past, usually your only option was to visit the local bank. You were stuck with whatever terms and rates they happened to be offering. Now you can apply for the loan at financial companies all across the country via the Web and select the best

rates and terms. You are no longer limited to the ones in your neighborhood. Conversely, the financial institutions offering loans can now reach out to thousands and millions more potential customers than was ever possible before. The Internet has also allowed businesses and consumers to establish new types of relationships not previously possible.

### Internet Business Models

In the table 10.1 some of the new business models the Internet has enabled digital firms to undertake. Many of these businesses simply would not be possible without the technologies offered by the Internet.

### Electronic Commerce

Electronic Commerce (EC or e-commerce) is defined as the conduct of commerce in goods and services, with the assistance of telecommunications and telecommunications-based tools. "E - Commerce" is often used in a much broader sense, to mean essentially the same as 'electronic business', (EB). This includes for example, buying and selling products with digital cash via Electronic Data Interchange (EDI)". Examples of EB that are not EC include registration and licensing processes, student enrolment, and court administration. "E-Commerce encompasses many areas of which:

1. 'electronic catalogues' refers to means whereby sellers can communicate their offerings to potential buyers;
2. 'electronic data interchange (EDI)' refers to a particular family of standards for expressing the structured data that represent EC transactions; and
3. 'electronic auction's for a particular set of mechanisms for setting prices."

## Categories of Electronic Commerce .

E-commerce is divided into three major categories to make it easier to distinguish between the types of transactions that take place.

- Business-to-consumer (B2C): Most visible.
- Business-to-business (B2B): Greatest dollar amount of transactions.
- Consumer-to-consumer (C2C): Greater geographic reach.

Normally, there are many products and services offered through traditional Web sites. But as we continue to expand the reach of the Internet to wireless devices, businesses are figuring out how to offer more products and more services through new channels dubbed mobile commerce or m-commerce. Not only can you purchase your airline ticket through a traditional Web site but you can instantly find out about flight delays or cancellations through your cell phone or hand-held computer as you travel to the airport. Using your hand-held computer you can purchase and download an electronic book to read while you wait for the airplane to take off.

### **Business to Consumer (B2C)**

It is the model involving businesses and consumers. This is the most common e-commerce segment. In this model, online businesses sell to individual consumers. When B2C started, it had a small share in the market but after 1995 its growth was exponential. The basic concept behind this type is that the online retailers and marketers can sell their products to the online consumer by using crystal clear data which is made available via various online marketing tools. The B2C model sells goods or services to the consumer, generally using online catalog and shopping cart transaction systems. E.g. an online pharmacy giving free medical consultation and selling medicines to patients is following B2C model. Amazon is an

example of one of the first and still one of the most successful B2C e-commerce companies. Services such as subscriptions to information sites or online data backup are also examples of B2C e-commerce.

## **Business to Business (B2B)**

It is the largest form of e-commerce involving business of trillions of dollars. In this form, the buyers and sellers are both business entities and do not involve an individual consumer. It is like the manufacturer supplying goods to the retailer or wholesaler. The volume of B2B transactions is much higher than the volume of B2C transactions. Business-to-business (B2B) describes commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer. Contrasting terms are business-to-consumer (B2C) and business-to-government (B2G).

The primary reason for this is that in a typical supply chain there will be many B2B transactions involving sub-component or raw materials, and only one B2C transaction, specifically sale of the finished product to the end customer. For example, an automobile manufacturer makes several B2B transactions such as buying tires, glass for windscreens, and rubber hoses for its vehicles. The final transaction, a finished vehicle sold to the consumer, is a single (B2C) transaction. Cisco is an example of one of the first B2B catalogs online. Other examples of B2B e-commerce are intranet services and Web meetings.

The term "business-to-business" was originally coined to describe the electronic communications between businesses or enterprises in order to distinguish it from the communications between businesses and consumers (B2C). It eventually came to be used in marketing as well, initially describing only industrial or capital goods marketing. Today it is widely used to describe all products and services used by enterprises. Many professional institutions and the trade publications focus much more on B2C than B2B, although most sales and marketing personnel are in the B2B sector.

## **Consumer to Consumer (C2C)**

It facilitates the online transaction of goods or services between two people. Where consumers can post classified ads or offers to sell their property to other consumers. This is the fastest growing segment of e-commerce courtesy of the advent of social networking. The sites are only intermediaries, just there to match consumers. They do not have to check quality of the products being offered. Though there is no visible Intermediary involved but the parties cannot carry out the transactions without the platform which is provided by the online market maker such as eBay.

## **Other examples of Business models Include**

- **Consumer-to-business (C2B)** is an electronic commerce business model in which consumers (individuals) offer products and services to companies and the companies pay them. This business model is a complete reversal of traditional business model where companies offer goods and services to consumers. This kind of economic relationship is qualified as an inverted business type. The advent of the C2B scheme is due to major changes:
- Connecting a large group of people to a bidirectional network has made this sort of commercial relationship possible. The large traditional media outlets are one direction relationship whereas the internet is bidirectional one.
- **Decreased cost of technology** : Individuals now have access to technologies that were once only available to large companies ( digital printing and acquisition technology, high performance computer, powerful software) Elance is an example of C2B where

the consumer posts a project and businesses answer with bid proposals. Another example of C2B is online loan brokers.

- **Peer to Peer (P2P)** - Though it is an e-commerce model but it is more than that. It is a technology in itself which helps people to directly share computer files and computer resources without having to go through a central web server. To use this, both sides need to install the required software so that they can communicate on the common platform. This type of e-commerce has quite low revenue generation as from the beginning it has been inclined to the free usage due to which it sometimes got entangled in cyber laws.
- **M-Commerce** - It refers to the use of mobile devices for conducting the transactions. The mobile device holders can contact each other and can conduct the business. Even the web design and development companies optimize the websites to be viewed correctly on mobile devices. There are other types of e-commerce business models too like Business to Employee (B2E), electronic commerce uses an intrabusiness network which allows companies to provide products and/or services to their employees.

Typically, companies use B2E networks to automate employee-related corporate processes. Examples of B2E applications include:

- Online insurance policy management
- Corporate announcement dissemination
- Online supply requests
- Special employee offers
- Employee benefits reporting



## Business-to-Business Electronic Commerce: New Efficiencies and Relationships

Before the Internet, transactions between businesses were based on long-term relationships and geographic restrictions. It wasn't practical or cost efficient to search out buyers or suppliers nationwide. Due to new technologies this is made available through electronic data interchanges (EDI) and the Internet. EDI processes allow companies to connect their information systems to each other and make transactions flow seamlessly between the systems. It's faster, cheaper, and less error-prone. It's also cheaper and easier through on-line exchanges for the buyer to find the cheapest prices and the seller to find new customers. Neither buyers nor sellers are restricted to doing business with one or two partners in a particular geographic area.

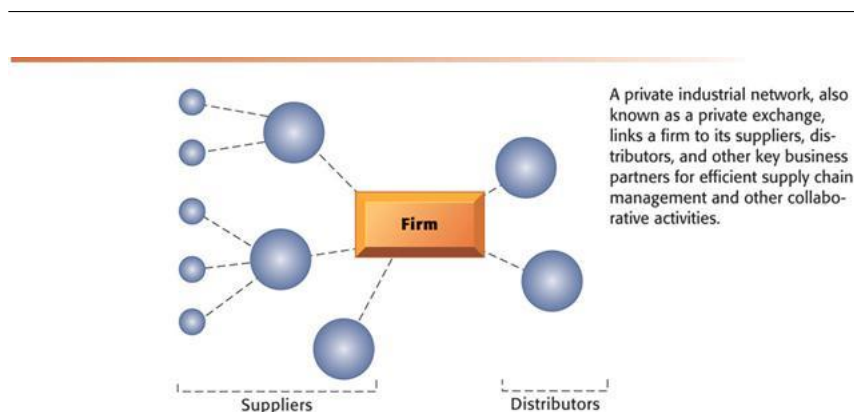


Figure : Relationship between Buyers and sellers

Figure shows the relationships between buyers and sellers in on-line exchanges. Businesses and both buyers and sellers are enjoying tremendous cost savings by using net marketplaces or e-hubs. B2B e-commerce is reducing the buyers' costs by allowing them to shop around for the lowest prices. B2B e-commerce is reducing the sellers' costs by allowing them to automate the purchasing transaction and reach a greater number of potential buyers.

The types of exchanges available for B2B e-commerce include the following:

- Vertical: Specific industries.
- Horizontal: Various functions across all industries.
- Branded: Private exchanges across a broad range of industries. Exchanges also allow businesses to offer a broader range of services to other businesses that simply wasn't possible before the Internet.

### Electronic Commerce Payment Systems.

Various forms of electronic payment systems are taking shape to make Internet-based purchases easier and more secure. Many of us don't want to use credit cards on Internet sites because we don't trust the technology. Or, we simply can't bring ourselves to give someone our credit card information sight unseen. Many banks, credit card companies, and merchants are working very hard to devise new technologies to make it safer and more secure to shop on the Internet by developing systems such as digital credit card payment systems. Digital wallets offer convenience to buyers and sellers by storing information accessible only to those authorized. Sometimes it costs more to process a transaction than the monetary value of the transaction. That's one of the big issues facing some online merchants.

When the credit card was introduced years ago, many people simply refused to believe that products and services could be purchased without cold hard cash. Now they are as ubiquitous as the greenback. In our new electronic world, various on-line payment systems such as electronic cash (e-cash), accumulated balance digital payment systems, digital credit card payment systems, and stored value payment systems are just a few more ways the computer industry and merchants worldwide will continue to make it easier and safer to make purchases online.

As customer-to-customer (C2C) e-commerce continues to grow, a secure, trustworthy, payment system is required. That's where peer-to-peer

payment systems such as PayPal come in. Their Web site explains, "PayPal is the preferred payment service for online auctions, and for online community and group Web sites. PayPal's service, free to consumers, can be used from PCs or Web-enabled mobile phones." A couple more fast-growing payment services offered on the Internet are digital checking and electronic bill presentment and payment systems. The latter is gaining popularity as people become more used to our wired world. Even though most bill payment systems cost extra money, users find it worth it because they don't have to worry about overdue bills and charges.

One of the drawbacks to all these various forms of payment systems is the lack of standardization. As with any emerging technology or service, each company is vying to be the industry leader. But having so many different systems and methodologies leads to confusion by the consumer and extra expense by the merchant. Another problem with micro-payment systems is that the average consumer is reluctant to go through the hassle required to make purchases for miniscule amounts of money. The music industry has tried to set up a system buyers can use to purchase just one song from an album instead of the whole album.

## How Intranets Support Electronic Business

Because the technology has already been created by others, a company can avoid much of the design and development costs by using an intranet. Intranets don't require specialized equipment; just standard desktop clients and servers appropriate to the amount of traffic expected. Any kind of data can be accessible to users without specialized programs. It's a cheap, relatively fast, commonplace technology to increase communications and collaboration within a company. Two benefits of using intranets that stand out are the low start-up costs and the easy-to-use, universal Web browser interface. Small and large businesses can defray lots of the cost of establishing an intranet because they don't have to create the interface programs for the users. The content can be created using simple, off-the-shelf software programs that help the company design, develop, and maintain the site. The company isn't limited to just text, but can include audio and video files that employees can use for training or communicating with distant colleagues and customers.

Intranets are especially useful for allowing geographically separated collaborative teams to work together. As long as you're careful to use firewalls to secure your intranet from outside interference, it is a cheaper, quicker method of sharing data and files between many workers. To be sure, you still need face-to-face interaction, but you can get more work done cheaper this way. A very nice feature of intranets in organizations is their ability to connect different types of computers with different operating systems.

### Intranet Applications for Electronic Business.

All functional areas of an organization can benefit from using intranets to help manage business processes faster, cheaper, and more efficiently. Each

area has its own particular needs and wants that can be met through intranets. Yet, each can benefit from having access to information from the others.



Figure : Functional application areas of intranet within the organization.

### Business Process Integration

An intranet can drastically reduce an organization's supply chain costs and management through improved coordination between various departments. It's possible that the production and shipping departments are located in one building, with the engineering department located across town. The engineers can waste a lot of time traveling back and forth across town or simply fail to coordinate with production altogether. An intranet offers much improved coordination between these departments. We're pretty sure that when Tim Berners-Lee invented the World Wide Web in the early 1990s he never envisioned some of the innovative ways it would be used to connect companies, suppliers, and customers.

### Challenges of E-Commerce and Online Business transaction

More and more people rely on electronic communications for the transmission of sensitive or personal data; e-mail, e-commerce, FTP, and HTML are all examples of technology that have already filtered into the social consciousness as primary ways for disseminating and gathering information and for exchanging goods and services. While this technological shift has made communication faster, easier, and better in

many ways, it has also brought along with it a whole host of difficult problems and social policy issues.

The main problem that comes with electronic communications is the ease with which transmissions can be eavesdropped or impersonated. Paper communications obviously have security problems as well: documents can be stolen, steamed open, have forged signatures or changed contents. However, if someone is trying to catch a specific transmission (or type of communication), it is much easier when dealing with an electronic medium. It is a trivial matter for people to set up programs that systematically scan e-mail for keywords, or that sniff packets in a Telnet session for passwords, whereas randomly steaming open mass quantities of paper mail looking for a certain document is clearly infeasible. Also, since there can be (and often are) multiple copies of any given electronic transmission, it is difficult to know if someone has stolen a copy or somehow altered the original.

Secondly, there is an access control problem. Many electronic transmissions are made in a broadcast manner, as seen with cable or satellite television and wireless phones. People can install devices to intercept these transmissions, and senders usually have no way to either monitor or stop this. In order to prevent unwanted people from making free use of their services, senders must encrypt their outgoing transmissions. To their paying customers, they can give special devices to decrypt the information.

Finally, there is the problem of authentication: electronic communications are im-personal, and can be easily forged by impersonating IP addresses, changing "sender fields" in e-mail, "cloning" cellular phone numbers, and so forth. In order for people to want to - and, indeed, be able to - use electronic communication in the coming years, it is essential that these problems be resolved. Right now, advances in cryp-tography are the best way to address these issues. Data encryption not only provides privacy and access control by rendering communications illegible to unauthorized parties; it can provide effective



authentication as well through the use of digital signatures and timestamps.

The Strategic Challenges of Electronic Commerce According to the site [www.enix.co.uk](http://www.enix.co.uk)<sup>4</sup> the rise of the Internet (electronic commerce), since the advent of the World Wide Web has provided an easy to use communication channel for businesses to contact current and potential customers. The emergence of the Internet as a general communication channel has also given rise to the possibility of widespread electronic commerce. Even though there is still much debate relating to electronic payment for commercial activities, this is clearly an area of growth. These technologies include: Organizational support systems, such as workflow and groupware making businesses more efficient. Customer contact databases - helping capture information about customers and facilitate new methods of marketing. Electronic payment systems for goods and services - these are emerging, although the majority of payments are still based on relatively expensive traditional cheque clearance. Collectively and individually, these areas will contribute to major changes in the way a company conducts its business. Enix have coined the term Workware to describe the combination of these technologies.

The emergence of Electronic Commerce will be underpinned by three key components.

- Marketing (Customer Satisfaction)
- Organization (Process Support)
- Banking (Payment Systems)

### How to safe guard E-Commerce Processes

There are two main forms of cryptography: secret-key (or symmetric) and public-key (or asymmetric).

#### Secret-key cryptography

Secret-key cryptography is the more traditional form, and has been used for all kinds of communications throughout the ages. In this method, one "key" is used to both encrypt and decrypt the data.

## Public-key cryptography

A user makes the public key open and available to anyone (by publishing it on-line or registering it with a public key server), and keeps the private key hidden away where (hopefully) no one can get at it. The private key is mathematically derived from the public key, and thus the two are linked together. In order to send someone a message, the sender encrypts the transmission with the receiver's public key. This can then only be decrypted by the receiver's private key.

## Digital signatures

Public-key also provides a mechanism for authenticating messages that secret-key techniques do not: digital signatures. The sender of a message completes a calculation (performed by a hash function) involving the actual file structure to be transmitted, and his or her private key, and the result of this (the digital signature itself) is appended to the end of the transmission. The receiver can then perform a calculation involving the received message and the sender's public key, and if everything is valid, the sender's identity will have been verified. A benefit of this signature method is that it not only verifies the sender's identity; it also verifies that the original contents of the transmission have not been altered in anyway.

## Protocols for Securing ECommerce Transaction

The security of ECommerce transactions depends both on the network protocols and the payment framework used to perform the transaction.

## Network Transport Security

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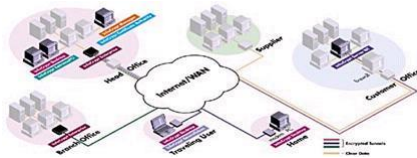


Figure : VPN service

Models such as SET, CAFÉ, DigiCash, First Virtual, and Millicent provide a se-cure payment method. However, the transaction still depends on the privacy and authentication of the data stream. Basic TCP/IP networking protocols do not in-clude encryption and strong authentication. Higher level protocols such as HTTP, FTP, and Telnet do little to provide advanced security measures beyond userid and password authentication. All information sent using these protocols is unencrypted, so the data stream lacks confidentiality

Traditional networking protocols and applications are unable to enforce strong se-curity measures for performing ECommerce transactions securely. This lack of security led to the design and implementation of many new security protocols that strive to reach different security goals. There are some secure transport protocols that provide confidentiality and authentication between systems and applications by using encryption. The following describes some of the more popular secure transport protocols examples.

### Virtual Private Network

Virtual Private Networking technology provides the medium to use the public In-ternet backbone as an appropriate channel for private data communication. With encryption and encapsulation technology, a VPN essentially carves out a private passageway through the Internet. VPNs will allow remote offices, company road warriors, and even business partners or customers to use the Internet, rather than pricey

private lines, to reach company networks. So the companies can save a lot of money.

You can also use VPNs to link remote LANs together or give traveling staffers, work-at-home employees, and business partners a simple way to reach past company firewalls and tap into company resources. Virtual private networks are flexible. They are point-to-multipoint connections, rather than point-to-point links. They can be set up or closed down at the network administrators will, making them ideal for short-term projects.

## Secure Socket Layer (SSL)

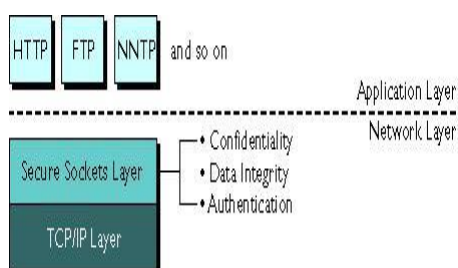
SSL is the Secure Sockets Layer protocol. Version 2.0 originated by Netscape Development Corporation, and version 3.0 was designed with public review and input from industry. SSL (Secure Sockets Layer) is a communication system that ensures privacy when communicating with other SSL-enabled products. Technically speaking, SSL is a protocol that runs above TCP/IP and below HTTP or other top-level protocols. It is symmetric encryption nested within public-key encryption, authenticated through the use of certificates. An SSL connection can only occur between an SSL-enabled client and an SSL-enabled server. In fact, when a server is running in SSL mode, it can only communicate through SSL.

Essentially, SSL is symmetric encryption nested within public-key encryption, authenticated through the use of certificates. An SSL connection can occur only between an SSL-enabled client and an SSL-enabled server. In fact, when a server is running in SSL mode, it can communicate only through SSL.

TCP/IP is Transmission Control Protocol/ Internet Protocol, the basic language of the Internet, and HTTP is Hypertext Transfer Protocol, the basic language of the graphical World Wide Web, a subset of the Internet.

Technically speaking, SSL is a protocol that runs above TCP/IP and below HTTP, NNTP, or other top-level protocols, as shown in the figure below.

How SSL relates to TCP/IP and application protocols.



## Figure SSL as part of TCP/IP

### S-HTTP

S-HTTP was designed by E. Rescorla and A. Schiffman of EIT to secure HTTP connections. S-HTTP provides a wide variety of mechanisms to provide for confidentiality, authentication, and integrity. Separation of policy from mechanism was an explicit goal. The system is not tied to any particular cryptographic system, key infrastructure, or cryptographic format. The Internet draft is fairly clear in its presentation of the protocol, although implementation details are sketchy.

S-HTTP is a superset of HTTP, which allows messages to be encapsulated in various ways. Encapsulations can include encryption, signing, or MAC based authentication. This encapsulation can be recursive, and a message can have several security transformations applied to it. S-HTTP also includes header definitions to provide key transfer, certificate transfer, and similar administrative functions. S-HTTP appears to be extremely flexible in what it will allow the programmer to do. S-HTTP also offers the potential for substantial user involvement in, and oversight of, the authentication & encryption activities.

### Transport Layer Security (TLS)

TLS, more commonly known as SSL, is a popular mechanism for enhancing TCP communications with privacy and authentication. TLS is in wide use with the HTTP protocol, and is also being used for adding security to many other common protocols that run over TCP.

TLS is a protocol under development by the Internet Engineering Task Force (IETF). TLS starts with Netscape's SSL v3.0 and adds features from Microsoft PCT v2.0 to make a standard security protocol. TLS, sometimes called the Secure Transport Layer Protocol (STLP), is still in draft form with the latest revision dated November 1998. The current draft documents describe how to use TLS with HTTP, FTP, Telnet and Terminal Editors.

## Summary

Knowledge about Online business services and how online cash can be protected. E-commerce is a form of online business transaction and has three main categories: Business-to-consumer(B2C),Business-to-business(B2B), Consumer-to-consumer (C2C).there are several security threats posed by Online business transaction, some of the methods to curb these include: cryptography, SSL,TLS, VPN and S-HTTP.

## Revision Questions

### Example

Name and explain three categories of E- commerce.

Solution:

- E-commerce is divided into three major categories to make it easier to distinguish between the types of transactions that take place.
- Business-to-consumer (B2C): Most visible.
- Business-to-business (B2B): Greatest dollar amount of transactions.
- Consumer-to-consumer (C2C): Greater geographic reach.

## EXERCISE

Use your imagination and come up with an idea of how your organization or company can use an intranet or extranet.

## EXERCISE

Select any B2C Web site and describe its richness and reach..

## EXERCISE

Assess the challenges posed by electronic business and electronic commerce and management solutions.

## EXERCISE 38

What are some of the management issues involved with e-commerce, and how would you resolve them?

Problem. Discuss the Management Opportunities and Challenges of using E-commerce.

### References and Additional Reading Materials

- Turban ,E.,McLean, and Wetherbe,J.(2007).Information Technology for Management:ISBN :978-0-470-91680-3.
- Transforming Organization in the Digital Economy.New York:John Wiley & Sons.ISBN:0471705225