

# Information Systems for Managers

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## **Part 1 Foundation Concepts**

Chapter 1: Foundations of Information Systems (IS) in Business

Chapter 2: IS in Business and Components of IS

Chapter 3: Competing with Information Technology

## Chapter 1

# Foundation of Information Systems (IS).

### Objectives:

At the end of the chapter you should be able to:

- Identify what is Information Systems (IS).
- Identify system, its resources and its environment.
- Identify with examples of Information Systems (IS).

### Introduction.

The general systems model of the firm provides a good template for analyzing an organization. It highlights the elements that should be present and how they should interact. In the same manner, the model of the eight environmental elements of a firm provides a good way to come to grips with the complexity of how the firm interacts with its environment. An integration of the general systems model and the eight-element environmental model provides the foundation for a concept receiving much current attention—supply chain management. During recent years, the topic of competitive advantage has been the focus of much discussion. Usually, competitive advantage is achieved by managing physical resources, but virtual resources can also play a big role. Michael E. Porter is credited with shedding the most light on the competitive-advantage concept and contributing the ideas of value chains and value systems, which are compatible with taking a systems view of the firm and its environment. The firm's executives can use information to gain strategic, tactical, and operational advantages. A broad view of competitive advantage recognizes the organizations that compete with the firm as well as professionals and staff in other countries that compete with the firm's employees for jobs. Multinational corporations often outsource tasks to other organizations in order to achieve an economic advantage. Firms that do business globally have special needs for information and coordination. A firm's information resources include hardware, software, information specialists, users, facilities, databases, and information. Information has four desirable dimensions: relevancy, accuracy, timeliness, and completeness.

Substantial advantages accrue to corporations that achieve coordination through the use of information resources. Multinational corporations face significant challenges in the form of politically imposed constraints, cultural and communications barriers, technological problems, and lack of support from subsidiary managers.

The task of knowledge management is changing continually. Firms have been using computers since the 1950s, and data formats and storage techniques have changed considerably since then. However, the data in older legacy systems provide valuable insights into business trends and operations. Most legacy systems only stored text and numbers, but today images are also an important part of information systems. Knowledge management recognizes that information represents the firm's knowledge resource. Knowledge management is required to organize, access, and leverage the firm's data and information for decision making.

The firm's executives perform strategic planning for the entire organization, the business area, and the information resources. The chief information officer (also called the chief technology officer) plays a key role in all types of strategic planning. A strategic plan for information resources identifies the objectives that the firm's information systems should meet in the coming years and the information resources that will be necessary to meet those objectives.

#### THE FIRM AND ITS ENVIRONMENT

A firm is a physical system that is managed through the use of a virtual system. The physical system of the firm is an open system in that it interfaces with its environment. A firm takes resources from its environment, transforms the resources into products and services, and returns the transformed resources to the environment.

**THE PHYSICAL RESOURCE FLOW** The firm's physical resources include personnel, material, machines, and money. Personnel are hired by the firm, transformed to higher skill levels through training and experience, and eventually leave the firm. Material enters the firm in the form of raw inputs and is transformed into finished goods, which are then sold to the firm's customers. Machines are purchased, used, and eventually scrapped or traded in on newer machines. Money enters the firm in the form of sales receipts, shareholder investments, and loans and is transformed into payments to suppliers, taxes to the government, and returns to stockholders. While in the firm, the physical resources are used to produce the products and services the firm provides to its customers.

**THE FIRM'S CONTROL MECHANISM** The elements that enable the firm to control its own operations include (1) the performance standards the firm must meet if it is to accomplish its overall objectives (2) the firm's management and (3) an information processor that transforms data into information.

**THE FEEDBACK Loop** The feedback loop is composed of the virtual resources. Data are gathered from the firm and from the environment and entered into the information processor, which transforms it into information. The information is made available to managers, who make decisions to affect necessary changes in the physical system. Management is guided in its decision making by the firm's performance standards. These performance standards can also be used by the information processor to determine when the firm is not performing as planned.

## Information Systems in Business

The general systems model of the firm makes it easy to see the importance of the environment to a firm's success. A firm exists for the purpose of providing products and services that meet environmental needs. Equally important, a firm cannot function without the resources that the environment provides.

The environment varies from firm to firm. A bank has a different environment than does a sporting goods store or a church. However, we can identify eight major elements that exist in the environments of all firms.<sup>1</sup> These environmental elements are organizations and individuals that exist outside the firm and that have a direct or indirect influence on it. These eight elements exist in a larger system called a society. Suppliers, also called vendors, supply the materials, machines, services, people, and information that the firm uses to produce its products and services. These products and services are marketed to the firm's customers. Labor unions are organizations of both skilled and unskilled workers for certain trades and industries. The financial community consists of institutions such as banks and other lending institutions that influence the financial resources that are available to the firm. Stockholders and owners are the persons who invest money in the firm; they are the ultimate owners of the firm. Competitors include all of the organizations that compete with the firm in its marketplace. The government, on the national, state or province, and local levels, provides constraints in the form of laws and regulations and also provides assistance in the form of purchases, information, and funds. The global community is the geographic area where the firm performs its operations. The firm demonstrates its responsibility to the global community by respecting the natural environment, providing products and services that contribute to quality of life, and conducting its operations in an ethical manner.

The firm is connected to its environmental elements by environmental resource flows. Some of the resources flow more frequently than others does. Common flows include information flow from customers, material flow to customers, money flow to stockholders, and raw materials flow from suppliers. Less frequent flows include money flow from the government (such as for research), material flow to suppliers (returned merchandise), and personnel flow to competitors (employees "pirated" by other firms).

Not all resources flow between the firm and all its environmental elements. For example, machines normally do not flow from the firm to stockholders, and money should not flow to competitors. The only resource that connects the firm with all the elements is information, and the firm strives to make the information connection with competitors a one- way flow.

Let us see how we can manage supply chain systems, electronic system and enterprise systems at basic level.

The pathway that facilitates the flow of physical resources from suppliers to then to customers is called the supply chain. The flow of resources through the supply chain must be managed to ensure that it occurs in a timely and efficient manner; this process is called supply chain management. Supply chain management consists of the following activities:



- Forecasting customer demand
- Scheduling production
- Establishing transportation networks
- Ordering replenishment stock from suppliers
- Receiving stock from suppliers
- Managing inventory-raw materials, work-in-process, and finished goods
- Executing production
- Transporting resources to customers
- Tracking the flow of resources from suppliers, through the firm, and to customers

As resources flow through the supply chain they can be tracked electronically, step-by-step. As resources move through the supply chain, actions are recorded in computer terminals located at suppliers' sites, in the firm's receiving area, in the firm's inventory and production areas, in the firms' shipping areas, in the vehicles used by the transporters, and at customers' sites. Data are entered into the terminals either by keyed input, bar-code scanning, or radio frequency ID. As the data are captured, the firm's information system is updated to reflect the current location of the resource being tracked. The ability to track the flow of the resources as it occurs contributes to supply chain management.

#### Supply Chain Management and Enterprise Resource Planning Systems

Supply chain management is only one aspect of enterprise resource planning ( ERP) systems, yet it can play a crucial role in operations. The use of the same ERP system vendor (SAP, Oracle, or some other) by members in the supply chain helps to facilitate the flow of supply chain information. However, the cost of ERP systems can be high, and not every member in a supply chain may wish to purchase ERP software. When one member of a supply chain has substantial power over the other members, such as a large retailer like Wal-Mart has over its suppliers, the more powerful member can apply pressure on the other members to use the same ERP software. In that case, the transfer of data from one member to another is facilitated and all members benefit, but the most powerful member of the supply chain receives the most benefit.

As firms go about meeting the product and service needs of their customers. Firms strive to obtain an advantage over their competitors. They can achieve this advantage by providing products and services at a lower price, providing higher quality products and services, and meeting the special needs of certain market segments.

What is not always obvious is the fact that a firm can also achieve competitive advantage through the use of its virtual resources. In the information systems field, competitive advantage refers to the use of

information to gain leverage in the marketplace. Note that the firm's managers use virtual as well as physical resources in meeting the strategic objectives of the firm.

### **Summary:**

A firm's information resources include hardware, software, information specialists, users, facilities, databases, and information. Information has four desirable dimensions: relevancy, accuracy, timeliness, and completeness. The firm's executives perform strategic planning for the entire organization, the business area, and the information resources. The chief information officer (also called the chief technology officer) plays a key role in all types of strategic planning. A strategic plan for information resources identifies the objectives that the firm's information systems should meet in the coming years and the information resources that will be necessary to meet those objectives. The general systems model of the firm makes it easy to see the importance of the environment to a firm's success. A firm exists for the purpose of providing products and services that meet environmental needs. Equally important, a firm cannot function without the resources that the environment provides.

As resources flow through the supply chain they can be tracked electronically, step-by-step. As resources move through the supply chain, actions are recorded in computer terminals located at suppliers' sites, in the firm's receiving area, in the firm's inventory and production areas, in the firms' shipping areas, in the vehicles used by the transporters, and at customers' sites. Supply chain management is only one aspect of enterprise resource planning (ERP) systems, yet it can play a crucial role in operations. The use of the same ERP system vendor (SAP, Oracle, or some other) by members in the supply chain helps to facilitate the flow of supply chain information. However, the cost of ERP systems can be high, and not every member in a supply chain may wish to purchase ERP software.

### **Keywords:**

Information Systems: collections of all components of hardware, software, database, networks and people.

System: Collections of interrelated components

Supply chain: The pathway that facilitates the flow of physical resources from suppliers to then to customer's electronic systems.

Enterprise Resource Planning (ERP): Firms internal data Management, integrating all internal business processes.

### **Summary Questions.**

1. What do you understand by Information Systems?
2. Explain the Environment in the information systems.
3. Explain the information systems in Business.
4. List some information systems that you are aware of?

## Case- 1:

Roberts Company is a worldwide leader in financial management and employing 50,000 people in 36 countries and territories. It is into brokerage, investment banking, financing, wealth management, advisory, asset management, insurance, lending, and other related products and services to private, institutional, and government clients with assets of \$1.6 trillion.

Over the last five years, that IT infrastructure has played a major role in the company's gains. Like many financial institutions, Roberts Company has had to modernize its technology infrastructure in order to remain competitive. In modernizing its technology, Roberts Company had to make choices regarding its legacy computers and applications. Internet-based applications that gave customers access to their portfolios and tools to work with them were a key to remaining competitive. But these applications did not use mainframe-based software. Roberts Company had initially tried to avoid the costs by copying the data stored in its mainframe installation into Oracle, Sybase, or Microsoft SQL Server databases. In those formats, the data were compatible with server-based applications. However, that technique was not entirely satisfactory. Copying large quantities of data often introduces errors based on disk failures and space issues. The project team prohibited the new platform from requiring changes to program code on the mainframe or hindering its operation in any respect. The team did not want to alter the mainframe in any way because of its track record, its complexity, and the fact that there was likely no one on staff who knew the inner workings of its deep-rooted code.

Case Questions.

1. Why did the firm need to update its IT infrastructure?
2. What is the relationship of information technology to Robert Company's business strategy?

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## **Chapter 2: IS in Business and components of IS**

### **Objectives:**

At the end of the chapter you should be able to:

- Identify the concepts of Information Systems (IS).
- Identify the types of IS.
- Identify with examples of Transaction Processing System (TPS), Management Information Systems (MIS), Decision Support System (DSS), and Executive Support Systems (ESS).
- Identify the process and reports of Transaction Processing System (TPS), Management Information Systems (MIS), Decision Support System (DSS), and Executive Support Systems (ESS).

### **Introduction**

At a micro level, technology makes it possible to create new forms of organizations. Managers design and redesign organizations all the time. The decision you make to open a branch office and give it responsibility for sales in a region is an organization design issue. If you undertake a new project by creating a task force that includes members from around the world and that will work virtually, you have designed a temporary organization. One of the most difficult questions to answer is, "What do managers do?" For the first three or four decades of information technology, IT did little to help managers in their day-to-day tasks, often because IT staff did not understand managers. Few management information systems existed, though many companies claimed to have them. The last decade witnessed the development of groupware, designed to support both the daily tasks of management and coordination, and to provide a repository of organizational intelligence.

Management researchers have emphasized the decision-making nature of management since the 1950s. Certainly, managers are expected to make decisions in many different domains. Important decisions include funding R&D, product development. The decision to introduce a new product. Many managerial decisions revolve around issues of resource allocation. Almost every organization is confronted with limited resources and competing demands for them.

A role that managers often face is as a disturbance handler. Disputes and problems in the organization find their way to a manager who is in a position to resolve them. These disturbances may come from inside the firm, or they may be prompted by problems suppliers or customers. Managers also deal with information in their jobs and function as the spokesperson for the firm. A good manager scans the environment for competitive actions, threats, and opportunities. Today, companies are also dependent on government regulations and actions. Many communications and much purposeful managerial work revolve around information processing. Individuals frequently communicate to obtain new

information. When making a decision, the manager must process information to determine the appropriate course of action to take. Suppliers and customers want information. The securities industry seeks information about company plans and performance.

The technology described next is designed to support people in the organization in the tasks they are expected to perform. This technology lets managers and other workers redesign their tasks. It provides a great deal of flexibility and a number of alternatives for the flow of work, communications, and coordination. Groupware is aimed at what a manager does: It supports members of the organization who have a common task and operate in a shared environment.

Hence there is a need to categorise information systems. A System is a collection of inter related components. An Information System (IS) is an integrated collection of Hardware, Software, Databases, Networks /Communications and People required managing the same. Examples of IS include Enterprise systems, Supply Chain Systems etc.

### **Types of Information Systems**

An organization operates in an ever-increasing competitive and global environment. The successful organization focuses on the efficient execution of its processes, customer service, and speed to market. Enterprise applications provide an organization with a consolidated view of its operations across different functions, levels, and business units. Enterprise applications allow an organization to efficiently exchange information among its functional areas, business units, suppliers, and customers. Every business has manual and automated transaction processing systems (TPSs), which process the detailed data essential to update records about the fundamental business operations of the organization. These include order entry, inventory control, payroll, accounts payable, accounts receivable, and general ledger etc. The input to these systems includes basic business communication such as customer orders, purchase orders, receipts, time cards, invoices, and customer payments. The effect of processing business transactions is that the firm's records are rationalized to reflect the status of the action at the time of the last processed transaction. Automated processes consist databases, telecommunications, people, procedures, software, and hardware devices used to process transactions. The activities include data collection, data edit, data correction, data manipulation, data storage and document production. Today's business systems are built to electronically coordinate all the business functions. The sales function begins the process by carrying out a sales order, electronically inputting the data into the system. The sales system updates daily sales totals and decreases inventory. The accounting system electronically receives the order and runs a credit check. If the credit is not approved, then the business system sends an exception notification to an accounting specialist and the sales person. If credit is approved, then order is transformed to the manufacturing and production system and product assembly begins. When the product is finished, electronic shipping documents are prepared and logistics is notified. When the product is shipped, electronic notifications are sent to Sales, Manufacturing and Production, Accounting, and the customer. The system electronically bills the customer.

From the above information, it is prudent that a business system need to function for top, middle and lower level of management. That is strategic level, managerial level and operational/transactional level.

## Transaction Processing Systems - TPS

For most organizations, TPSs support the routine, day-to-day activities that occur in the normal course of business that help a company add value to its products and services. Depending on the customer, value may mean lower price, better service, higher quality, or uniqueness of product. By adding a significant amount of value to their products and services, firms ensure further organizational success. Because the TPSs often perform activities related to customer contacts – like order processing and invoicing – these information systems play a critical role in providing value to the customer. For example, by capturing and tracking the movement of each package, shippers like Federal Express and United Parcel Service (UPS) are able to provide timely and accurate data on the exact location of a package. Shippers and receivers can access an on-line database and, by providing the air bill number of a package, find the package's current location. If the package has been delivered, they can see who signed for it (especially useful in large firms where packages can become lost in internal distribution systems and mailrooms). Such a system provides the basis for added value through improved customer service.

When computerized transaction processing systems first evolved, only one method of processing was available. All transaction were collected in groups, called batches, and processed together. With batch processing systems, business transactions are accumulated over a period of time and prepared for processing as a single unit or batch. The time period during which transactions are accumulated is whatever length of time is needed to meet the needs of the users of that system. For example, it may be important to process invoices and customer payments for the accounts receivable system daily. On the other hand, the payroll system may receive time cards and process them biweekly to create checks and update employee earnings records as well as to distribute labour costs.

Today's computer technology allows another processing method, called on-line, real-time, or on-line transaction processing (OLTP). As soon as the input is available, a computer program performs the necessary processing and updates the records affected by that reflect the current status. When you make an airline reservation, for instance, the transaction is processed and all databases, such as seat occupancy and accounts receivable, are updated immediately. This type of processing is absolutely essential for businesses that require data quickly and update it often, such as airlines, ticket agencies, and stock investment firms. Many firms have found that OLTP helps them provide faster, more efficient service – one way to add value to their activities in the eyes of the customer. Increasingly, firms are using the Internet to perform many OLTP functions. A third type of transaction processing, called on-line entry with delayed processing is a compromise between batch and on-line processing. With this type of system, transactions are entered into the computer system when they occur, but they are not processed immediately. For example, when you call a toll-free number and order a product, your order is typically entered into the computer when you make the call. However, the order may not be processed until that evening after business hours.

Even though the technology exists to run Transaction Processing Systems applications using on-line processing, it is not done for all applications. For many applications, batch processing is more appropriate and cost-effective. Payroll transactions and billing are typically done via batch processing. Specific goals of the organization define the method of transaction processing best suited for the various applications of the company. Because of the importance of transaction processing organizations expect their TPSs to accomplish a number of specific objectives, including the following:

The primary objective of any TPS is to capture, process, and store transactions and to produce a variety of documents related to routine business activities. These business activities can be directly or indirectly related to selling products and services to customers. Processing orders, purchasing materials, controlling inventory, billing customers, and paying supplier and employees are all business activities that result from customer orders. These activities result in transactions that are processed by the TPS.

One objective of any TPS is error-free data input and processing. Even before the introduction of computer technology, employees visually inspected all documents and reports introduced into or produced by the TPS. Because humans are fallible, the transactions were often inaccurate, resulting in wasted time and effort and requiring resources to correct them. An editing program, for example, should have the ability to determine that an entry that should read "40 hours" is not entered as "400 hours" or "4000 hours" because of a data entry error.

An important component of data integrity is to avoid fraudulent transactions. E-commerce firms face this problem when accepting credit or debit card information over the Internet. How can these firms make sure that the people making the purchases are who they say they are? One approach is to use a digital certificate. A digital certificate is a small computer file that serves as both an Id card and a signature. Some believe that digital certificates, which use complex mathematical codes, are almost fraud proof.

### **Management Information Systems - MIS**

Management information systems (MIS) can often give firms a competitive advantage by providing the right information to the right people in the right format and at the correct time. In many cases, firms and individuals are willing to pay firms for this type of information. The primary purpose of an MIS is to help an organization achieve its goals by providing managers with insight into the regular operations of the organization so that they can control, organize, and plan more effectively and efficiently. One important role of the MIS is to provide the right information to the right person in the right fashion at the right time. In short, an MIS provides managers with information, typically in reports, that support effective decision making and provides feedback on daily operations. Note that business transactions can enter the organization through traditional methods or via the Internet or an extranet connecting customers and suppliers to the firm's transaction processing systems. The use of management information systems spans all levels of management. That is, they provide support to and are used by employees throughout the organization.

Data that enters an MIS originates from both internal and external sources. The most significant internal source of data for an MIS is the organization's various TPSs and ERP systems and related databases. One of the major activities of a TPS is to capture and store the data resulting from ongoing business transactions. With every business transaction, various TPS applications make changes to and update the organization's databases. For example, the billing application helps keep the accounts receivable database up to date so that managers know who owes the company money. These updated databases are a primary internal source of data for the management information system. In firms that have implemented an ERP system, the collection of databases associated with this system is an important source of internal data for the MIS. Other internal data comes from specific functional areas throughout the firm.

External sources of data can include customers, suppliers, competitors, and stockholders, whose data is not already captured by the TPS, as well as other sources, such as the Internet. In addition, many firms have implemented extranets to link them to these entities and allow for the exchange of data and information.

The Management information systems (MIS) uses the data obtained from these sources and processes it into information more usable to managers, primarily in the form of predetermined reports. For example, rather than simply obtaining a chronological list of sales activity over the past week, a national sales manager might obtain her organization's weekly sales data in a format that allows her to see sales activity by region, by local sales representative, by product, and even in comparison with last year's sales.

The output of most management information systems is a collection of reports that are distributed to managers. Data mining allows a company to filter through a vast amount of data stored in databases, data warehouses, and data marts to produce a variety of reports, including scheduled reports, key-indicator reports, demand reports, exception reports, and drill down reports.

Scheduled reports are produced periodically, or on a schedule, such as daily, weekly, or monthly. For example, a production manager could use a weekly summary report that lists total payroll costs to monitor and control labor and job costs. A manufacturing report generated once a day to monitor the production of a new item is another example of a scheduled report. A key-indicator report summarizes the previous day's critical activities and is typically available at the beginning of each workday. These reports can summarize inventory levels, production activity, sales volume, and the like. Key-indicator reports are used by managers and executives to take quick, corrective action on significant aspects of the business. Demand reports are developed to give certain information upon request. In other words, these reports are produced on demand. For example, an executive may want to know the production status of a particular item—a demand report can be generated to give the requested information. Suppliers and customers can also use demand reports. FedEx, for example, provides demand reports on its Web site to allow its customers to track packages from their source to their final destination. On average, the bar code of a typical FedEx package is scanned a mind-boggling 23 times as it travels through the FedEx system. Penske Logistics uses wireless terminals to provide customers with critical delivery information on demand. Other examples of demand reports include reports requested by executives to show the hours worked by a particular employee, total sales to date for a product, and so on. Exception reports are reports that are automatically produced when a situation is unusual or requires management action. For example, a manager might set a parameter that generates a report of all inventory items with fewer than the equivalent of 5 days of sales on hand. This unusual situation requires prompt action to avoid running out of stock on the item. The exception report generated by this parameter would contain only items with fewer than 5 days of sales in inventory. As with key-indicator reports, exception reports are most often used to monitor aspects important to an organization's success. In general, when an exception report is produced, a manager or executive takes action. Drill down reports provides increasingly detailed data about a situation. Through the use of drill down reports, analysts are able to see data at a high level first (similar to a bag of cookies), then at a more detailed level (say, an Oreo), and then a very detailed level (an Oreo double-filling cookie's components).



Management information system reports can help managers develop better plans, make better decisions, and obtain greater control over the operations of the firm. It is important to recognize that various types of reports can overlap.

#### CHARACTERISTICS OF A MANAGEMENT INFORMATION SYSTEM

In general, management information systems perform the following functions:

- Provide reports with fixed and standard formats. For example, scheduled reports for inventory control may contain the same types of information placed in the same locations on the reports. Different managers may use the same report for different purposes.
- Produce hard-copy and soft-copy reports. Some MIS reports are printed on paper and are considered hard-copy reports. Most output soft copy, using visual displays on computer screens. Soft-copy output is typically format in a report like fashion. In other words, a manager might be able to call a MIS report up directly on the computer screen, but the report would sti appear in the standard hard-copy format. Hard copy is still the most o used form of the MIS report.
- Use internal data stored in the computer system. MIS reports use primarily internal sources of data that are contained in computerized databases. Some use external sources of data about competitors, the marketplace, and s The Internet and extranets are frequently used sources for external data.
- Allow end users to develop their own custom reports. Although analysts and programmers may be involved in developing and implementing complex MIS reports that require data from many sources, end users are increasingly developing their own simple programs to query a database and produce basic reports. This capability, however, can result in several end users developing the same or similar reports, which can result in more total time expended and additional storage requirements, compared with having an analyst develop one report for all users.
- Require user requests for reports developed by systems personnel. When information systems personnel develop and implement MIS reports, a formal request to the information systems department may be required. If a manager, for example, wants a production report to be used by several people in his or her department, a formal request for the report is often required. End user-developed reports require much less formality.

Most organizations are structured along functional lines or areas. This functional structure is usually apparent from an organization chart, which typically shows vice presidents under the president. Some of the traditional functional areas are accounting, finance, marketing, personnel, research and development (R&D), legal services, operations/production management, and information systems.

#### FINANCIAL MANAGEMENT INFORMATION SYSTEMS

A financial management information system provides information not only for managers but also for a broader set of people who need to make better decisions on a daily basis. Finding opportunities and quickly identifying problems can mean the difference between a business's success and failure. Specifically, the financial MIS performs the following functions:

- Integrates financial and operational information from multiple sources, including the Internet, into a single MIS.
- Provides easy access to data for both financial and nonfinancial users, often through use of the corporate intranet to access corporate Web pages of financial data and information.

- Makes financial data available on a timely basis to shorten analysis turnaround time.
- Enables analysis of financial data along multiple dimensions—time, geography, product, plant, customer.

In addition to providing information for internal control and management, financial MISs often are required to provide information to outside individuals and groups, including stockholders and federal agencies. Public firms are required to disclose their financial results to stockholders and the public. The federal government also requires financial statements and information systems. As a result of antiterrorism legislation signed into law by President Bush, financial service firms must now implement new information systems designed to make it easier for law enforcement agencies to find and freeze assets owned by suspected terrorists. The legislation also attempts to uncover money laundering.

Depending on the organization and its needs, the financial MIS can include both internal and external systems that assist in acquiring, using, and controlling cash, funds, and other financial resources. These subsystems of the financial MIS have a unique role in adding value to a company's business processes. For example, a real estate development company might use a financial MIS subsystem to help it use and manage funds. Suppose the firm takes \$10,000 deposits on condominiums in a new development. Until construction begins, the company will be able to invest these surplus funds. By using reports produced by the financial MIS, finance staff can analyze investment alternatives. The company might invest in new equipment or purchase global stocks and bonds. The profits generated from the investment can be passed along to customers in different ways. The company can pay stockholders dividends, buy higher quality materials, or sell the condominiums at a lower cost.

Other important financial subsystems include profit/loss and cost accounting, and auditing. Each subsystem interacts with the TPS in a specialized way and has information outputs that assist financial managers in making better decisions. These outputs include profit/loss and cost accounting reports, internal and external auditing reports, and uses and management of funds reports.

Two specialized financial functional systems are profit/loss and cost systems, which organize revenue and cost data for the company. Revenue and expense data for various departments is captured by the TPS and becomes a primary internal source of financial information for the MIS.

Auditing involves analyzing the financial condition of an organization and determining whether financial statements and reports produced by the financial MIS are accurate. Because financial statements, such as income statements and balance sheets etc used by so many people and organizations (investors, bankers, insurance firms, federal and state government agencies, competitors, and customers), sound auditing procedures are important. Auditing can reveal potential fraud, such as credit card fraud. It can also reveal false or misleading information. Internal auditing is performed by individuals within the organization. For example, the finance department of a corporation may use a team of employees to perform an audit.

Another important function of the financial MIS is funds usage and management. Firms that do not manage and use funds effectively often have lower profits or face bankruptcy. To help with the funds usage and management, some banks are backing a new computerized payment system called Straight-Through Processing. "The new system has the potential to clear payments in a day instead

of several days or more. Outputs from the funds usage and management subsystem, when combined with other subsystems of the financial MIS, can locate serious cash flow problems and help the organization increase profits.

Internal uses of funds include additional inventory, new or updated plants and equipment, additional labor, the acquisition of other firms, new computer systems, marketing and advertising, raw materials, land, investments in new products, and research and development. External uses of funds are typically investment related. On occasion, a company might have excess cash from sales that is placed into an external investment. External uses of funds often include bank accounts, stocks, bonds, bills, notes, futures, options, and foreign currency.

#### MANUFACTURING MANAGEMENT INFORMATION SYSTEMS

More than any other functional area, manufacturing has been revolutionized by advances in technology. As a result, many manufacturing operations have been dramatically improved over the last decade. Also, with the emphasis on greater quality and productivity, having an efficient **and** effective manufacturing process is becoming even more critical. The use of computerized systems is emphasized at all levels of manufacturing— from the shop floor to the executive suite. The use of the Internet has also streamlined all aspects of manufacturing.

The objective of the manufacturing MIS is to produce products that meet customer needs—from the raw materials provided by suppliers to finished goods and services delivered to customers—at the lowest possible cost. Cunningham Motor Co., for example, is attempting to manufacture a pricey sports coupe with a 600 horsepower engine that sells for about \$250, 000. Started by Robert Lutz, a former vice president of Chrysler, the company will not put one penny into manufacturing facilities. As raw materials are converted to finished, goods, the manufacturing MIS monitors the process at almost every stage. New bar codes called smart labels could make this process easier. The smart labels, made of chips and tiny radio transmitters, allow materials and products to be monitored through the entire manufacturing process. Procter & Gamble, Gillette, Wal-Mart, and Target have helped to fund research into this new manufacturing MIS. Car manufacturers, which convert raw steel, plastic, and other materials into a finished automobile, also monitor the manufacturing process. Auto manufacturers add thousands of dollars of value to the raw materials they use in assembling a car. If the manufacturing MIS also lets them provide customized paint colors on any of their models, it has further added value (although less tangible) by ensuring a direct customer fit. In doing so, the MIS helps provide the company the edge that can differentiate it from competitors. The success of an organization can depend on the manufacturing function. Some common information subsystems and outputs used in manufacturing are discussed next.

During the early stages of product development, engineering departments are involved in many aspects of design. The size and shape of parts, the way electrical components are attached to equipment, the placement of controls on a product, and the order in which parts are assembled into the finished product are decisions made with the help of design and engineering departments. In some cases, computer-assisted design (CAD) assists this process. CAD can be used to determine how an airplane wing or fuselage will respond to various conditions and stresses while in use. CAD is also used in the automotive industry. The data from design and engineering can also be used to identify problems with existing products and help develop new products. For example, Boeing uses a CAD system to develop a complete digital blueprint of an aircraft before it ever begins its manufacturing

process. As mock-ups are built and tested, the digital blueprint is constantly revised to reflect the most current design. Using such technology helps Boeing reduce its manufacturing costs and the time to design a new aircraft. Lockheed Martin, a defense contractor, used its design and engineering departments to help obtain a \$200 billion contract from the Pentagon to build fighter jets for the military. The Joint Strike Fighter contract, the largest defense contract in history, uses information systems to help design, engineer, and manufacture these sophisticated military jets.

Scheduling production and controlling inventory are critical for any manufacturing company. The overall objective of master production scheduling is to provide detailed plans for both short-term and long-range scheduling of manufacturing facilities. Master production scheduling software packages can include forecasting techniques that attempt to determine current and future demand for products and services. After current demand has been determined and future demand has been estimated, the master production scheduling package can determine the best way to use the manufacturing facility and all its related equipment. The result of the process is a detailed plan that reveals a schedule for every item that will be manufactured.

An important key to the manufacturing process is inventory control. Great strides have been made in developing cost-effective inventory control programs and software packages that allow automatic reordering, forecasting, generation of shop documents and reports, determination of manufacturing costs, analysis of budgeted costs versus actual costs, and the development of master manufacturing schedules, resource requirements, and plans. A furniture company, for example, uses an approach, called "simple, quick, and affordable (SQA)" to keep inventory levels and costs low. Once an order is received, it is broken down into the inventory parts that are needed to successfully complete the order on time. An SQA Web site is used to make sure that the needed inventory is available to complete the order. Procter & Gamble, which produces consumer products that range from Pampers to Pepto-Bismol, uses quick-response inventory control systems to speed products to market. According to a company spokesman, "A key benefit for consumers is that the products are fresher." In another case, Ford Motor Company decided to use UPS Logistics to help the company speed the delivery of parts to factories and finished cars to dealerships.<sup>19</sup> The new inventory control system has reduced by four days the time it typically takes to ship a finished vehicle to a dealership. But more importantly, the new system has also reduced vehicle inventory by about \$1 billion, saving the company \$125 million in annual inventory carrying costs, which dramatically improves Ford's profitability. Many inventory control techniques like Ford's attempt to minimize inventory related costs.

Manufacturing resource planning (MRP II) refers to an integrated, companywide system based on network scheduling that enables people to run their business with a high level of customer service and productivity, while lowering costs and inventories. MRP II is broader in scope than MRP; thus, the latter has been dubbed "little MRP." MRP II places a heavy emphasis on planning. This helps firms ensure that the right product is in the right place at the right time.

Just-in-time (JIT) inventory and manufacturing is an method that maintains inventory at the lowest levels without sacrificing the availability of finished goods. With this approach, inventory and materials are delivered just before they are used in a product. A JIT inventory system would arrange for a car windshield to be delivered to the assembly line only a few moments before it is secured to the automobile, rather than having it sitting around the manufacturing facility while the car's other

components are being assembled. Although JIT has many advantages, it also renders firms more vulnerable to process disruptions.

Managers can use a number of technologies to control and streamline the manufacturing process. For example, computers can be used to directly control manufacturing equipment, using systems called computer-assisted manufacturing (CAM). CAM systems can control drilling machines, assembly lines, and more. Some of them operate quietly, are easy to program, and have self-diagnostic routines to test for difficulties with the computer system or the manufacturing equipment.

Computer-integrated manufacturing (CIM) uses computers to link the components of the production process into an effective system. CIM's goal is bring together production, including order processing, product design, manufacturing, inspection and quality control, and shipping. CIM systems also increase efficiency by coordinating the actions of various production units. In some areas, CIM is used for even broader functions. For example, it can be used to integrate all organizational subsystems, not just the production systems. In automobile manufacturing, design engineers can have their ideas evaluated by financial managers before new components are built to see whether they are economically viable, saving not only time but also money.

FMS is normally implemented using computer systems, robotics, and other automated manufacturing equipment. New product specifications are fed into the computer system, and the computer then makes the necessary changes. Although few firms have a fully implemented FMS, recently use of the overall FMS approach has increased.

With increased pressure from consumers and a general concern for productivity and high quality, today's manufacturing organizations are placing more emphasis on quality control, a process that ensures that the finished product meets the customers' needs. For a continuous process, control charts are used to measure weight, volume, temperature, or similar attributes. Then, upper and lower control chart limits are established. If these limits are exceeded, the manufacturing equipment is inspected for possible defects or potential problems. When the manufacturing operation is not continuous, sampling can allow the producer or consumer to review and accept or reject one or more products. Acceptance sampling is used for items as simple as nuts and bolts or as complex as airplanes. The development of the control chart limits and the specific acceptance sampling plans can be fairly complex. So, quality-control software programs have been used to generate them.

Whether the manufacturing operation is continuous or discrete, the results from quality control are analyzed closely to identify opportunities for improvements. Teams using the total quality management (TQM) or continuous improvement process often analyze this data to increase the quality of the product or eliminate problems in the manufacturing process. The result can be a cost reduction or increase in sales.

Information generated from quality-control programs can help workers locate problems in manufacturing equipment. Quality-control reports can also be used to design better products. With the increased emphasis on quality, workers should continue to rely on the reports and outputs from this important application.

MARKETING MANAGEMENT INFORMATION SYSTEMS

A marketing MIS supports managerial activities in product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting. Marketing functions are increasingly being performed on the Internet. A number of firms are developing Internet marketplaces to advertise and sell products. Customer relationship management (CRM) programs, available from some ERP vendors, help a company manage all aspects of customer encounters. CRM software can help a company collect customer data, contact customers, educate customers on new products, and sell products to customers through an Internet site. Crane Engineering, an industrial equipment distributor in Kimberly, Wisconsin, uses CRM to help manage customer interactions. Subsystems for the marketing MIS include marketing research, product development, promotion and advertising, and product pricing. These subsystems and their outputs help marketing managers and executives increase sales, reduce marketing expenses, and develop plans for future products and services to meet the changing needs of customers.

Surveys, questionnaires, pilot studies, and interviews are popular marketing research tools. The purpose of marketing research is to conduct a formal study of the market and customer preferences. Marketing research can identify prospects (potential future customers) as well as the features that current customers really want in a good or service (such as green ketchup or vanilla-flavored cola). Such attributes as style, color, size, appearance, and general fit can be investigated through marketing research. Pricing, distribution channels, guarantees and warranties, and customer service can also be determined. Once entered into the marketing Management information systems (MIS), data collected from marketing research projects is manipulated to generate reports on key indicators like customer satisfaction and total service calls. Reports generated by the marketing MIS help marketing managers are better informed to help the organization meet its performance goals. The parts division of Hyundai Motor America, for example, uses marketing research and software to predict the demand for car parts. The software from Demand Management helped the company reduce delivery time for key auto parts by 20 percent. Other firms, including Colgate-Palmolive and Unilever, also use sophisticated software and marketing research data to forecast demand for their products. Demand forecasts for products and services are also critical to make sure raw materials and supplies are properly managed.

The Internet is changing the way many firms think about marketing research. Conventional methods of collecting data often cost millions of dollars-For a fraction of these costs, firms can put up Internet information server and launch discussion groups on topics that their customers care about. These information sites must be well designed, or they won't be visited, but a frequently visited site can provide feedback worth a fortune. Firms that are viewed as credible, not just clever, will win enormous advantages. Presence and intelligent interaction, not just advertising, are the keys that will unlock commercial opportunities on-line. Some people, however, consider Internet marketing research to be a nuisance or even harmful. Some firms gather information on customers using cookies, which collect data on people's Internet surfing habits, and sell it to others. Product development involves the conversion of raw materials into finished goods and services and focuses primarily on the physical attributes of the product. Many factors, including plant capacity, labor skills, engineering factors, and materials are important in product development decisions. In many cases, a computer program is used to analyze these various factors and to select the appropriate mix of labor, materials, plant and equipment, and engineering designs. Make-or-buy decisions can also be made with the assistance of computer programs. Faucet maker Moen decided to carry a variety of products with different colors and styles. It concluded that it was not in the business of selling hardware but instead should be selling fashion and jewelry for bathrooms and kitchens.

One of the most important functions of any marketing effort is promotion and advertising. Product success is a direct function of the types of advertising and sales promotion done. Dole Food Company, for example, promoted its products by putting a \$10 electronic incentive on 30 million packages of its Fruit Bowl. The \$10 in electronic currency could be spent at seven participating on-line retailers, including Art.com, Cooking.com, Kbkids.com, and SunglassHut.com. The size of the promotion budget and the allocation of this budget among various campaigns are important factors in planning the campaigns that will be launched—everything from placing ads during the Super Bowl to offering coupons in a grocery store. Television coverage, newspaper ads, promotional brochures and literature, and training programs for salespeople are all components of these campaigns. Because of the time and scheduling savings they offer, computer programs are used to set up the original budget and to monitor expenditures and the overall effectiveness of various promotional campaigns.

Product pricing is another important and complex marketing function. Retail price, wholesale price, and price discounts must be set. A major factor in determining pricing policy is an analysis of the demand curve, which attempts to determine the relationship between price and sales. Most firms try to develop pricing policies that will maximize total sales revenues—usually a function of price elasticity. If the product is very price sensitive, a reduction in price can generate a substantial increase in sales, which can result in higher revenues. A product that is relatively insensitive to price can have its price substantially increased without a large reduction in demand. Computer programs can help determine price elasticity and various pricing policies, such as supply and demand curves for pricing analysis. Typically, a marketing executive has the ability to make alterations in price on the computer system, which analyzes price changes and their impact on total revenues. The rapid feedback now obtainable through computer communications networks enables managers to determine the results of pricing decisions much more quickly than in the past. This ability facilitates more aggressive pricing strategies, which can be quickly adjusted to meet market needs. One critical pricing decision is when to mark down product prices. Using sophisticated software, ShopKo has been able to reduce the number and amount of price cuts, which has helped increase profitability.

Sales analysis is also important to identify products, sales personnel, and customers that contribute to profits and those that do not. Several reports can be generated to help marketing managers make good sales decisions. The sales-by-product report lists all major products and their sales for a period of time, such as a month. This report shows which products are doing well and which ones need improvement or should be discarded altogether. The sales-by-salesperson report lists total sales for each salesperson for each week or month. This report can also be subdivided by product to show which products are being sold by each salesperson. The sales-by-customer report is a tool to use to identify high- and low-volume customers.

#### HUMAN RESOURCE MANAGEMENT INFORMATION SYSTEMS

A human resource MIS, also called the personnel MIS, is concerned with activities related to employees and potential employees of the organization. Because the personnel function relates to all other functional areas in the business, human resource MIS plays a valuable role in ensuring organizational success. Some of the activities performed by this important MIS include workforce analysis and planning; hiring; training; job and task assignment; and many other personnel-related issues. Personnel issues can include offering new hires attractive stock option and incentive programs. One

company, for example, offered engineers a two-year lease on a sporty BMW roadster as a signing bonus. An effective human resource MIS will allow a company to keep personnel costs at a minimum while serving the required business processes needed to achieve corporate goals.

One of the first aspects of any human resource MIS is determining personnel and human needs. The overall purpose of this MIS subsystem is to put the right number and kinds of employees in the right jobs when they are needed. Effective human resource planning requires defining the future number of employees needed and anticipating the future supply of people for these jobs. For firms involved with large projects, such as military contractors and large builders, human resource plans can be generated directly from data on current and future-projects.

If the human resource plan reveals that additional personnel are required, the next logical step is recruiting and selecting personnel. This subsystem performs one of the most important and critical functions of any organization, especially in service organizations, where employees can define the company's success. Firms seeking new employees often use computers to schedule recruiting efforts and trips and to test potential employees' skills. Some software firms, for example, use computerized testing to determine a person's programming skills and abilities. Management information systems can be used to help rank and select potential employees. For every applicant, the results of interviews, tests, and company visits can be analyzed by the system and printed. This report, called a job applicant review profile, can assist corporate recruiting teams in final selection. Some software programs can even analyze this data to help identify job applicants most likely to stay with the company and perform according to corporate standards. Many firms now use the Internet to screen for job applicants. Applicants use a template to load their resume onto the Internet site. HR managers can then access these resumes and identify applicants they are interested in interviewing.

Some jobs, such as programming, equipment repair, and tax preparation, require very specific training. Other jobs may require general training about the organizational culture, orientation, dress standards, and expectations of the organization. Today, many organizations conduct their own training, with the assistance of information systems and technology. Self-paced training can involve computerized tutorials, video programs, and CD-ROM books and materials. Distance learning, where training and classes are conducted over the Internet, is also becoming a viable alternative to more traditional training and learning approaches. This text and supporting material, for example, can be used in a distance-learning environment. When training is complete, employees may be required to take computer-scored tests to reveal their mastery of skills and new material. The results of these tests are usually given to the employee's supervisor in the form of training or skills inventory reports. In some cases, skills inventory reports are used for job placement. For instance, if a particular position in the company needs to be filled, managers might wish to hire internally before they recruit. The skills inventory report would help them evaluate current employees to determine their potential for the position. They can also be part of employee evaluations and determine raises or bonuses. These types of tests, however, must be valid and reliable to avoid mistakes in job placement and bonuses. Technology can also be used to reduce training needs and costs. Buy.com, for example, used Finali and Net Sage to help employees answer customer questions. The Finali and Net Sage products helped Buy.com reduce training and customer service costs by 40 percent.

Scheduling people and jobs can be relatively straightforward or extremely complex. For some small service firms, scheduling and job placements are based on which customers walk through the door. Determining the best schedule for flights and airline pilots, placing military recruits into jobs, and



determining what truck drivers and equipment should be used to transport materials across the country normally require sophisticated computer programs. In most cases, various schedules and job placement reports are generated. Employee schedules are developed for each employee, showing their job assignments over the next week or month. Job placements are often determined based on skills inventory reports, which show which employee might be best suited to a particular job.

The last of the major human resource MIS subsystems involves determining wages, salaries, and benefits, including medical payments, savings plans, and retirement accounts. Wage data, such as industry averages for positions, can be taken from the corporate database and manipulated by the human resource MIS to provide wage information and reports to higher levels of management. These reports, called salary surveys, can be used to compare salaries with budget plans, the cost of salaries versus sales, and the wages required for any one department or office. The reports also help show backup of key positions in the company. Wage and salary administration also entails designing retirement programs for employees. Some firms use computerized retirement programs to help employees gain the most from their retirement accounts and options.

#### OTHER MANAGEMENT INFORMATION SYSTEMS

In addition to finance, manufacturing, marketing, and human resource MISs, some firms have other functional management information systems.

#### ACCOUNTING Management information systems (MIS)

In some cases, accounting works closely with financial management. An accounting MIS performs a number of important activities, providing aggregate information on accounts payable, accounts receivable, payroll, and many other applications. The organization's TPS captures accounting data, which is also used by most other functional information systems. Some smaller firms hire outside accounting firms to assist them with their accounting functions. These outside firms produce reports for the firm using raw accounting data. In addition, many excellent integrated accounting programs, such as QuickBooks, are available for personal computers in small firms. Depending on the needs of the small organization and its personnel's computer experience, using these computerized accounting systems can be a very cost-effective approach to managing information.

#### Geographic Information Systems

Increasingly, managers want to see data presented in graphical form. A **geographic information system (GIS)** is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, that is, data identified according to their locations. A GIS enables users to pair maps or map outlines with tabular data to describe aspects of a particular geographic region. For example, sales managers may want to plot total sales for each county in the states they serve. Using a GIS, they can specify that each county be shaded to indicate the relative amount of sales—no shading or light shading represents no or little sales and deeper shading represents more sales. As seen in the "IS Principles in Action" box, a GIS can be invaluable in helping to eradicate a forest pest, prevent forest damage, and save millions of dollars. Because the GIS works with any data represented in tabular form, graphical capability is finding its way into spreadsheets. For example, Excel and Lotus include a mapping tool that lets you plot spreadsheet data as a demographic map.

Such applications show up frequently in scientific investigations, resource management, and real-estate development planning. Retail, government, and utility organizations are frequent users of GISs. Retail chains, for example, need spatial analysis to determine where potential customers are located and where their competition is.

## AN OVERVIEW OF DECISION SUPPORT SYSTEMS

Decision support systems offer the potential to generate higher profits, lower costs, and better products and services. For example, healthcare organizations use DSSs to track and reduce costs. As with a TPS and an MIS, a DSS should be designed, developed, and used to help an organization achieve its goals and objectives. Decision support systems, although skewed somewhat toward the top levels of management, are used at all levels. To some extent, today's managers at all levels are faced with less structured, non routine problems, but the quantity and magnitude of these decisions increase as a manager rises higher in an organization. Many organizations contain a tangled web of complex rules, procedures, and decisions. DSSs are used to bring more structure to these problems to aid the decision-making process. In addition, because of the inherent flexibility of decision support systems, managers at all levels are able to use DSSs to assist in some relatively routine, programmable decisions in lieu of more formalized management information systems.

Decision support systems have a number of characteristics that allow them to be effective management support tools. Of course, not all DSSs work the same— some are small in scope and offer only some of these characteristics. In general, a decision support system can perform the following functions: For instance, advanced database management systems and data warehouses have allowed decision makers to search for information with a DSS even when some data resides in different databases on different computer systems or networks. Managers can get the information they want, presented in a format that suits their needs. Furthermore, output can be displayed on computer screens or printed, depending on the needs and desires of the problem solvers. Today's decision support systems can produce text, tables, line drawings, pie charts, trend lines, and more. By using their preferred orientation, managers can use a DSS to get a better understanding of a situation and to convey this understanding to others. A manager can get more levels of detail when needed by drilling down through data. For example, a manager can get more detailed information for a project—viewing the overall project cost or drilling down and seeing the cost for each phase, activity, and task. Marketing research surveys, for example, can be analyzed in a variety of ways using programs that are part of a DSS. Many of the analytical programs associated with a DSS are actually stand-alone programs, and the DSS brings them together.

By supporting all types of decision-making approaches, a DSS gives the decision maker a great deal of flexibility in computer support for decision making. For example, what-if analysis, the process of making hypothetical changes to problem data and observing the impact on the results, can be used to control inventory. Given the demand for products, such as automobiles, the computer can determine the necessary parts and components, including engines, transmissions, windows, and so on. With "what-if" analysis, a manager can make changes to problem data (the number of automobiles needed for next month) and immediately see the impact on the parts requirements.

Goal-seeking analysis is the process of determining the problem data required for a given result. For example, a financial manager may be considering an investment with a certain monthly net income, and the manager might have a goal to earn a return of 9 percent on the investment. Goal

seeking allows the manager to determine what monthly net income (problem data) is needed to have a return of 9 percent (problem result). Some spreadsheets can be used to perform goal-seeking analysis.

Simulation is the ability of the DSS to duplicate the features of a real system. In most cases, probability or uncertainties are involved. For example, the mean time between failure and the mean time to repair key components of a manufacturing line can be calculated to determine the impact on the number of products that can be produced each shift. Engineers can use this data to determine which components need to be reengineered to increase the mean time between failures and which components need to have an ample supply of spare parts to reduce the mean time to repair. Drug firms are using simulated trials to reduce the need for human participants and reduce the time and costs of bringing a new drug to market. Drug firms are hoping that this use of simulation will help them identify successful drugs earlier in development.

Developers of decision support systems strive to make them more flexible than management information systems and to give them the potential to assist decision makers in a variety of situations. DSSs can assist with all or most problem-solving phases, decision frequencies, and different degrees of problem structure. DSS approaches can also help at all levels of the decision-making process. In this section we investigate these DSS capabilities.

The objective of most decision support systems is to assist decision makers with the phases of problem solving. As previously discussed, these phases include intelligence, design, choice, implementation, and monitoring. A specific DSS might support only one or a few phases.

Decisions can range on a continuum from one-of-a-kind to repetitive decisions. One-of-a-kind decisions are typically handled by an ad hoc DSS. An ad hoc DSS is concerned with situations or decisions that come up only a few times during the life of the organization; in small businesses, they may happen only once. For example, a company might be faced with a decision on whether to build a new manufacturing facility in another area of the country. Repetitive decisions are addressed by an institutional DSS. An institutional DSS handles situations or decisions that occur more than once, usually several times a year or more. An institutional DSS is used repeatedly and refined over the years. Examples of institutional DSSs include systems that support portfolio and investment decisions and production scheduling. These decisions may require decision support numerous times during the year. Between these two extremes are decisions managers make several times, but not regularly or routinely.

Highly structured problems are straightforward, requiring known facts and relationships. Semistructured or unstructured problems, on the other hand, are more complex. The relationships among the data are not always clear, the data may be in a variety of formats, and the data is often difficult to manipulate or obtain. In addition, the decision maker may not know the information requirements of the decision in advance.

At the core of a DSS are a database and a model base. In addition, a typical DSS contains a dialogue manager, which allows decision makers to easily access and manipulate the DSS and to use common business terms and phrases. Finally, access to the Internet, networks, and other computer-based systems permits the DSS to tie into other powerful systems, including the TPS or

function-specific subsystems. Internet software agents, for example, can be used in creating powerful decision support systems.

The database management system allows managers and decision makers to perform qualitative analysis on the company's vast stores of data in databases, data warehouses, and data marts. A data-driven DSS primarily performs qualitative analysis based on the company's databases. Data-driven DSSs tap into vast stores of information contained in the corporate database, retrieving information on inventory, sales, personnel, production, finance, accounting, and other areas.

A database management system can also connect to external databases to give managers and decision makers even more information and decision support. External databases can include the Internet, libraries, government databases, and more. The combination of internal and external database access can give key decision makers a better understanding of the company and its environment.

### Group Decision Support Systems (GDSS)

The DSS approach has resulted in better decision making for all levels of individual users. However, many DSS approaches and techniques are not suitable for a group decision-making environment. Although not all workers and managers are involved in committee meetings and group decision-making sessions, some tactical and strategic-level managers can spend more than half their decision-making time in a group setting. Such managers need assistance with group decision making. A group decision support system (GDSS), also called group support system and computerized collaborative work system, consists of most of the elements in a DSS, plus GDSS software needed to provide effective support in group decision-making settings.

Group decision support systems are used in most industries. Architects are increasingly using GDSS to help them collaborate with other architects and builders to help them develop the best plans and to compete for contracts. It is often said that two heads are better than one. When it comes to decision making, a GDSS's unique characteristics have the potential to result in better decisions. Developers of these systems try to build on the advantages of individual support systems while realizing that new and additional approaches are needed in a group decision-making environment. For example, some GDSSs can allow the exchange of information and expertise among people without meetings or direct face-to-face interaction.

Many GDSSs allow anonymous input, where the person giving the input is not known to other group members. For example, some organizations use a GDSS to help rank the performance of managers. Anonymous input allows the group decision makers to concentrate on the merits of the input without considering who gave it. In other words, input given by a top-level manager is given the same consideration as input from employees or other members of the group. Some studies have shown that groups using anonymous input can make better decisions and have superior results compared with groups that do not use anonymous input. Anonymous input, however, can result in flaming, where an unknown team member posts insults or even obscenities on the GDSS system. One key characteristic of any GDSS is the ability to suppress or eliminate group behavior that is counterproductive or harmful to effective decision making. In some group settings, dominant individuals can take over the discussion, which can prevent other members of the group from presenting creative alternatives. In other cases, one or two group members can sidetrack or subvert

the group into areas that are nonproductive and do not help solve the problem at hand. Other times, members of a group may assume they have made the right decision without examining alternatives—a phenomenon called groupthink. With traditional group meetings, people must take turns addressing various issues. One person normally talks at a time. With a GDSS, it is possible for every group member to address issues or make comments at the same time by entering them into a PC or workstation. These comments and issues are displayed on every group member's PC or workstation. Parallel communication can speed meeting times and result in better decisions. Most GDSSs can keep detailed records of a meeting automatically. Each comment that is entered into a group member's PC or workstation can be anonymously recorded. In some cases, literally hundreds of comments can be stored for future review and analysis. In addition, most GDSS packages have automatic voting and ranking features. After group members vote, the GDSS records each vote and makes the appropriate rankings.

GDSS software, often called groupware or workgroup software helps with joint work group scheduling, communication, and management. One popular package, Lotus Notes, can capture, store, manipulate, and distribute memos and communications that are developed during group projects. This software allows users to set up electronic bulletin boards, schedule group meetings, and use e-mail in a group setting. NetDocuments Enterprise was a PC Magazine Editor's Choice for providing Web collaboration. The groupware is intended for legal, accounting, and real-estate businesses. A Breakout Session feature allows two people to take a copy of a document to a shared folder or director for joint revision and work. The software also permits digital signatures and the ability to download and work on shared documents on handheld computers. Other GDSS software packages include Collabra Share, OpenMind, and Team Ware. All of these tools can aid in group decision making.

In addition to stand-alone products, GDSS software is increasingly being incorporated into existing software packages. Today, some transaction processing and enterprise resource planning packages include collaboration software. SAP, a popular ERP package discussed has developed mySAP Technology to facilitate collaboration and to allow SAP users to integrate applications from other vendors into the SAP system of programs.

## EXECUTIVE SUPPORT SYSTEMS

Because top-level executives often require specialized support when making strategic decisions, many firms have developed systems to assist executive decision making. This type of system, called an executive support system (ESS), is a specialized DSS that includes all hardware, software, data, procedures, and people used to assist senior-level executives within the organization. In some cases, an ESS, also called an executive information system (EIS), supports the actions of members of the board of directors, who are responsible to stockholders. An ESS can also be used by individuals farther down in the organizational structure. Once targeted at the top-level executive decision makers, ESSs are now marketed to—and used by—employees at other levels in the organization. In the traditional view, ESSs give top executives a means of tracking critical success factors. Today, all levels of the organization share information from the same databases. However, for our discussion, we will assume ESSs remain in the upper management levels, where they indicate important corporate issues, indicate new directions the company may take, and help executives monitor the company's progress.

An ESS is a special type of DSS, and, like a DSS, an ESS is designed to support higher-level decision making in the organization. The two systems are, however, different in important ways. DSSs provide

a variety of modeling and analysis tools to enable users to thoroughly analyze problems—that is, they allow users to answer questions. Following are general characteristics of ESSs:

- Tailored to individual executives. ESSs are typically tailored to individual executives; DSSs are not tailored to particular users. An ESS is an interactive, hands-on tool that allows an executive to focus, filter, and organize data and information.
- Easy to use. A top-level executive's most critical resource can be his or her time. Thus, an ESS must be easy to learn and use and not overly complex.
- Have drill down abilities. An ESS allows executives to drill down into the company to determine how certain data was produced. Drill down allows an executive to get more detailed information if needed.
- Support the need for external data. The data needed to make effective top-level decisions is often external—information from competitors, the federal government, trade associations and journals, consultants, and so on. An effective ESS is able to extract data useful to the decision maker from a wide variety of sources including the Internet and other electronic publishing sources such as LexisNexis.
- Can help with situations that have a high degree of uncertainty. There is a high degree of uncertainty with most executive decisions. Handling these unknown situations using modeling and other ESS procedures helps top-level managers measure the amount of risk in a decision.
- Have a future orientation. Executive decisions are future oriented, meaning that decisions will have a broad impact for years or decades. The information sources to support future-oriented decision making are usually informal—from golf partners to members of social clubs or civic organizations.
- Are linked with value-added business processes. Like other information systems, executive support systems are linked with executive decision making about value-added business processes. For instance, executive support systems can be used by car-rental firms to analyze trends.

The responsibility given to top-level executives and decision makers brings unique problems and pressures to their jobs. The following is a discussion of some of the characteristics of executive decision making that are supported through the ESS approach. As you will note, most of these are related to an organization's overall profitability and direction. An effective ESS should have the capability to support executive decisions with many of these capabilities, such as strategic planning and organizing, crisis management, and more.

One of the key roles of senior executives is to provide a broad vision for the entire organization. This vision includes the organization's major product lines and services, the types of businesses it supports today and in the future, and its overriding goals.

ESSs also support strategic planning. Strategic planning involves determining long-term objectives by analyzing the strengths and weaknesses of the organization, predicting future trends, and projecting the development of new product lines. It also involves planning the acquisition of new equipment, analyzing merger possibilities, and making difficult decisions concerning downsizing and the sale of assets if required by unfavorable economic conditions.

Top-level executives are concerned with organization structure. For example, decisions concerning the creation of new departments or downsizing the labor force are made by

top-level managers. Overall direction for staffing decisions and effective communication with labor unions are also major decision areas for top-level executives. ESSs can be employed to help analyze the impact of staffing decisions, potential pay raises, changes in employee benefits, and new work rules.

### **Summary:**

Even though the technology exists to run TPS applications using on-line processing, it is not done for all applications. For many applications, batch processing is more appropriate and cost-effective. Payroll transactions and billing are typically done via batch processing. An MIS provides managers with information, typically in reports, that support effective decision making and provides feedback on daily operations. Note that business transactions can enter the organization through traditional methods or via the Internet or an extranet connecting customers and suppliers to the firm's transaction processing systems. The MIS uses the data obtained from these sources and processes it into information more usable to managers, primarily in the form of predetermined reports. Decision support systems have a number of characteristics that allow them to be effective management support tools. By supporting all types of decision-making approaches, a DSS gives the decision maker a great deal of flexibility in computer support for decision making. At the core of a DSS are a database and a model base. In addition, a typical DSS contains a dialogue manager, which allows decision makers to easily access and manipulate the DSS and to use common business terms and phrases.

A group decision support system (GDSS), also called group support system and computerized collaborative work system, consists of most of the elements in a DSS, plus GDSS software needed to provide effective support in group decision-making settings. Group decision support systems are used in most industries. GDSS software, often called groupware or workgroup software, helps with joint work group scheduling, communication, and management. One popular package, Lotus Notes, can capture, store, manipulate, and distribute memos and communications that are developed during group projects.

An ESS is a special type of DSS, and, like a DSS, an ESS is designed to support higher-level decision making in the organization. ESSs also support strategic planning. Strategic planning involves determining long-term objectives by analyzing the strengths and weaknesses of the organization, predicting future trends, and projecting the development of new product lines. It also involves planning the acquisition of new equipment, analyzing merger possibilities, and making difficult decisions concerning downsizing and the sale of assets if required by unfavorable economic conditions

### **Key words:**

Information Systems: components of Hardware, Software, Database, Networks and people in an organization.

Transaction Processing System: The operation level system.

Management Information System: The middle level business system

Decision Support System: The top level system used for decision making.

Executive Support System: more personalized systems for Executives.

Group Decision Support System: Decision support systems for collaboration of internal business process.

Drill Down Analysis: Multi Dimensional reports in an organization

## Summary questions.

1. Differentiate between MIS, TPS and DSS.
2. What is common is DSS and ESS?
3. Explain GDSS and its role in business.
4. What are the different types of reports?
5. Explain the role of TPS in Business systems.

**Case:** Shivas is one of the India's leading electronics manufacturers. In India alone, it has 15 sales subsidiaries, 14 manufacturing facilities, five research and development centres, and seven administrative stations. With so many different sources of data, the company found itself with product and customer data that were often inconsistent, duplicate, or incomplete. Different segments of the company used different data. These conditions combined to be a drag on operational efficiency and drained significant amounts of money from the corporation as a whole.

Employees adapted product information to suit the needs of their region. It took considerable time and effort to sift through all the data and create a common set of data for launching products in India, which allowed competitors to infiltrate markets that Shivas did not reach in its first phase of a launch. To solve this problem, Shivas decided to pursue a "single version of the data." Daily activities required the data to pass through legacy systems, fax machines, e-mail, phone calls, and regular mail. With so many people handling the data in such a variety of formats, inefficiencies and inaccuracies were always a risk. Erasing these problems promised to increase Shivas speed of bringing products to market. The market growth overshadowed the costs. Earlier employees in marketing and sales had to request data from numerous repositories. With the new model proposed, a centralized data bank sends the information to all employees who need it at the same time, ensuring uniformity. The recipients of the data include retail partners and e-commerce vendors, who receive complete product information at all stages of a product rollout.

Shivas employees receive data on a more targeted basis. The benefits are more consistent product rollouts and product information. The latter ensures that customers do not become confused while researching their purchases, which could motivate them to abandon Panasonic for a competitor.

Shivas implemented multi data modelling method. It is a multi-step process that includes business process analysis, data assessment, data cleansing, data consolidation and reconciliation, data migration, and development of a master data base. These steps produce a system of records that stores the master file for all of the company's data. The implementation should enforce standards for the formatting and storage of data, such as the number of fields in an address record or the number of digits in a ZIP code.



Time-to-market for a product was reduced from five to six months to one to two months. Shivas improved its efficiency by a factor of 5 and anticipate saving a million rupees a year while increasing sales by 3.5 percent.

### Case Questions.

1. Evaluate Shivas business strategy using the concepts of IS.
2. How did Shivas suffer in their performance and? What technology factors were responsible?
3. How Shivas could overcome the challenges? Explain.

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## Chapter 3 Competing with Information Technology

### Objectives:

At the end of the chapter you should be able to:

- Identify IT and its role in business.
- Identify with examples of IS and IT.

### Introduction.

Harvard professor Michael E. Porter is the person who is most often identified with the topic of competitive advantage. His books and articles have provided guidelines and strategies for firms attempting to gain an advantage over their competitors. Porter believes that a firm achieves competitive advantage by creating a value chain that consists of the primary and support activities that contribute to margin. Margin is the value of the firm's products and services minus their costs, as perceived by the firm's customers. Increased margin is the objective of the value chain.

Firms create value by performing what Porter calls value activities. Value activities are of two types: primary and support. The primary value activities include inbound logistics that obtain raw materials and supplies from suppliers, the firm's operations that transform the raw materials into finished goods, outbound logistics that transport the goods to customers, marketing and sales operations that identify customer needs and obtain orders, and service activities that maintain good customer relationships after the sale. These primary value activities manage the flow of physical resources through the firm.

The support value activities include the firm's infrastructure—the organizational setting that influences all of the primary activities in a general way. In addition, three activities influence the primary activities separately or in some combination—human resources management, technology development, and procurement (or purchasing). Each value activity, whether primary or support, contains three essential ingredients: purchased inputs, human resources, and technology. Also, each activity uses and creates information. For example, information specialists in the information services unit may combine purchased commercial databases, leased computing equipment, and custom-developed programs to produce decision-support information for the firm's executives.

### EXPANDING THE SCOPE OF THE VALUE CHAIN

Expanding the value chain must be alert to additional advantages that can be achieved by linking the firm's value chain to those of other organizations; such linkages result in an inter-organizational system (IOS). The participating firms are called business partners; they work together as a single coordinated unit, creating a synergy that cannot be achieved by working alone.

A firm can link its value chain to those of its suppliers by implementing systems that make input resources available when needed. An example is a just-in-time (JIT) agreement with a supplier to ship raw materials so that they arrive just hours before they are to be used in the production process. JIT helps to minimize storage costs of materials. A firm can also link its value chain with those of its distribution channel members, creating a value system. An example is an airline that allows travel agents as well as individual customers to access airline's computerized reservation system to make flight reservations.

When the buyers of the firm's products are organizations, their value chains can also be linked to those of the firm and its channel members. For example, a pharmaceutical manufacturer can attach retailers' price labels to its products prior to shipment, thus saving retailers the expense of doing so. When the buyers are individual consumers, they can use their computers to log onto the firm's Web site to obtain information and make purchases. Because each value activity includes an informational component, managing the firm's information resources is a key step to achieving competitive advantage.

Competitive advantage can be realized in terms of achieving strategic, tactical, and operational advantages. At the highest managerial level- the strategic planning level- information systems can be used to change the direction of the firm to achieve strategic advantage. At the management control (middle) level, managers can specify how the strategic plans will be implemented, creating tactical advantage. At the operational control (lower) level, managers can use information technology in a variety of ways for data capture and information creation that ensures operating efficiencies, achieving operational advantage.

A strategic advantage is one that has a fundamental effect in shaping the firm's operations. Information systems can be used to create a strategic advantage. For example, a firm may decide to convert all of its existing data into a database with standard interfaces (such as a Web browser interface) for possible sharing with business partners and customers. Standardized databases accessible via Web browsers would reflect a strategic shift in corporate position.

This strategy may cause operations to be fundamentally affected in a number of ways. First, existing access may be via proprietary computer software, and the change would cause the firm to consider purchasing standard reporting software from an outside vendor or hiring an outside firm to design and develop the new reporting systems. Also, mobility of report access is affected, because users will no longer require direct access to the firm's computer resources; any connection to the Internet would enable the user to use a Web browser to access reports from virtually anywhere in the world. In a similar vein, potential suppliers and customers anywhere in the world would have potential access to the firm's raw materials and finished goods inventory levels, speeding the firm's buying and selling transactions.

Security cannot be ignored with this example of a strategic change in information systems. Greater dangers come with the greater opportunities for profits associated with Web access to the firm's information. Will a hacker pose as a vendor or customer in order to gain access to the database and damage the firm's information resource? Will a competitor access the information as part of corporate

espionage? The strategic level establishes the firm's direction and destination, but there still needs to be a plan to accomplish a strategy that recognizes the importance of security.

A firm achieves a tactical advantage when it implements a strategy in a better way than its competitors. In our example, customer service may be enhanced by offering customers direct access to information. All firms want satisfied customers, because customer satisfaction results in repeat purchases.

Assume that a previous customer wishes to purchase \$150 worth of computer paper from our firm. The purchase of such office supplies is routine, and the information system notes that the customer has made purchases totalling \$800 during the month and that there is a 5 percent discount of purchase costs over \$1,000 during any month. Previous purchases plus the current purchase total \$950, just below the amount that triggers a discount.

The information system notes that the purchaser is just below the discount-trigger amount; it can help the firm achieve a tactical advantage in several ways. First, the customer with the 5 percent discount has a reason to continue purchasing products from the firm. Second, information system may suggest which products the customer may wish to purchase. The IS not only encouraging customer loyalty, it may also be increasing its profit on the sale. What if the customer routinely purchases paper but not toner cartridges? It would be safe assume that the customer must be purchasing the toner from another supplier. This is an opportunity for the firm to offer its toner at a low price (the 5% discount) and possibly win r.ure toner purchases from the customer.

The discount itself is an inducement to the customer, but it may also benefit the firm economically. By getting the additional \$50 on this order (\$1,000 minus \$950), the firm saves the expense of processing a second order. Remember, the next order from this customer may h the\$1, 000 levels, and the firm would have the expense of processing the second order providing the discount. Providing the discount on this order saves the firm the cost of processing a second order. Even more expenses are saved by the firm because it will make, fill and ship a single shipment, not two.

The strategic decision was to make the firm's information system available to customers for improved customer service. The firm developed a tactical information system that not only increases customer satisfaction, but also improves profitability. An operational advantage is one that deals with everyday transactions and processes. This is where the information system interacts directly with the process.

A Web site that "remembers" customers and their preferences through past transactions would reflect an operational advantage. Browsers often have cookies, small files of information on the user's computer that can store account numbers, passwords, and other information pertinent to the user's transactions. This is a valuable convenience to the customer, and it directly benefits the firm. It is true that customers who use the Web to enter their purchases save the firm from the expense of paying a clerk to enter the data, but that is a minor benefit.

User-entered data are more likely to be accurate. Because the data are not communicated orally to someone else, it cannot be misunderstood during communication. When the information (name,

address, and so on) can be retrieved from an earlier record, the data have an even greater likelihood of accuracy. Also consider the sense of ownership of the user-entered data. If the data are not accurate, the user does not blame the firm. For a variety of operational reasons, Web access to the firm's information systems improves customer relations.

The three levels of competitive advantage work together. Information systems that are impacted by all three levels have the best chance to increase a firm's performance substantially.

### **Competing with IT**

A multinational corporation (MNC) is a firm that operates across products, markets, nations, and cultures. It consists of the parent company and a group of subsidiaries. The subsidiaries are geographically dispersed, and each one may have its own unique goals, policies, and procedures.

You should not limit your thinking of global competitors to other organizations; professionals and staff working in other countries who compete for the same jobs as those in the host country may also be considered competitors. More and more U.S. firms are outsourcing some of their operations to other countries. India has been the leading destination, but China, Ireland, Scotland, Russia, and other countries in Eastern Europe and Southeast Asia are playing increasing roles. China is becoming an especially big player. In fact, some Indian outsourcing firms are, in turn, outsourcing their work to China.

The main reason to outsource is economic. Chinese labor costs are about 25 percent of U.S. labor costs. However, outsourcing does have its disadvantages. One that is especially critical to IT outsourcing is the protection of intellectual property rights (IPR), which are not adequately protected in many countries. One way to address the IPR problem is to acquire a foreign-owned outsourcer. For example, in 2004 IBM bought Daksh eServices, one of India's largest call-center companies. At the time, IBM had more than 9,000 employees in India who developed software systems; purchasing Daksh eServices allowed IBM to acquire the firm so that IPR issues with the outsourcer would be avoided.

Although all firms have a need for information processing and coordination, these needs are especially crucial for the MNC. The MNC is an open system that seeks to minimize uncertainty in its environment. In this context, uncertainty is "the difference between the amount of information required to perform the task and the amount of information already possessed by the organization. Most MNC executives recognize that they can cope with their environmental influences by making good use of information technology. Coordination is key to achieving competitive advantage in the global marketplace. Companies that are unable to gain strategic control of their worldwide operations and manage them in a globally coordinated manner will not succeed in the international economy.

The bad news for MNC executives is that the challenges of coordination are greater for the MNC than for a firm that restricts its activities to its home country. The difficulty arises from the fact that the resources used by the MNC are widely distributed. Dispersed information resources—hardware, software, and personnel—are difficult to manage and may be governed by conflicting business practices. The good news is that improvements in information technology, methodology, and communications

have made global coordination much easier. But even with these improvements, coordination remains a big challenge.

Many of the advantages that accrue to the MNC by virtue of having good information-processing capabilities are based on its ability to coordinate. The advantages of coordination include the following:

- Flexibility in responding to competitors in different countries and markets
- Ability to respond in one country-or in a region of a country-to a change in another country
- Ability to keep abreast of market needs around the world
- Ability to transfer knowledge between units in different countries
- Reduced overall costs of operation
- Increased efficiency and effectiveness in meeting customer needs
- Ability to achieve and maintain diversity in the firm's products and in how products are produced and distributed

All of these advantages are due to reductions in the time and cost of communications made possible through use of the firm's information resources.

The development of any type of information system can be a challenge but when the system spans international boundaries developers must address several unique constraints. The term global information system (GIS) has been coined to describe an information system that consists of networks that cross national boundaries. The following are just some of the constraints that GIS developers must address.

The national governments in the countries where subsidiaries are located can impose a variety of restrictions that make it difficult for the parent firm to include subsidiaries in the network. A common restriction is limited access to high-speed communications. Because the telephone infrastructure is frequently owned and operated by the government, not private firms, this can be a formidable barrier.

Interaction with technology can vary greatly among cultures. GIS interfaces need to be consistent even as different languages are used. As a result, most GIS interfaces rely on graphics and icons for interactions with users and less on commands typed into fields. In addition, the issue of GIS design may be settled by offering multiple formats that yield the same functionality. If a firm decides to establish a GIS, it must be willing to adapt its systems to the varied needs of a global population.

Cultural barriers also influence the design of a GIS. In some societies, technology use is considered a menial task, whereas in others it is seen as a sign of social importance. National governments seek to protect local manufacturers and stimulate foreign investment in local manufacturing by specifying that only equipment produced or assembled in that country is to be used. This requirement can affect the

interoperability of different hardware and software systems. MNCs are often plagued with problems related to the level of technology that exists in subsidiary countries. In some countries, reliable power sources are not available, resulting in frequent power outages. Telecommunications circuits often can only transmit data at slow speeds, and the transmission quality may be poor. Software can also be a problem. Because many countries do not honor software copyrights and condone black-market software, some software vendors refuse to do business in certain countries. The managers of subsidiary offices often are part of the problem. Some are convinced that they can run their subsidiaries without help, and they view headquarters-imposed regulations as unnecessary. Some subsidiary managers are paid based on profitability, and they will drag their feet when they think that corporate solutions will reduce their earnings. Foreign office management may also view the GIS as a "Big Brother" type of surveillance. Middle-level managers may fear being bypassed by the new information links that funnel operational data to the parent. With all of these potential problems, it is a minor miracle that MNCs ever attempt GISs. Although it is impossible to eliminate the problems completely, their effects can be minimized by following a well-thought-out strategy that is incorporated into the strategic plan for information resources.

A firm's information resources consist of: Computer hardware, Computer software, Information specialists, Users, Facilities, Databases, Information. When managers decide to use information to achieve competitive advantage, they must manage these resources in order to achieve the desired results. Information is like any other resource, it requires management. The managers ensure that the necessary raw data are gathered and then processed into usable information. The managers then ensure that the appropriate individuals receive the information in the proper form at the proper time so that it can be used. Finally, the managers discard information that has outlived its usefulness and replace it with information that is current and accurate. All of this activity-acquiring data, processing data into information, using and communicating information in the most effective way, and discarding information at the proper time-is called knowledge management.

As the system developers (users as well as information specialists) define the output that the information processor is to provide, they consider four basic dimensions of information. These desirable dimensions contribute to information value.

**Relevancy:** Information has relevancy when it pertains to the problem at hand. The user should be able to select the data that are needed without wading through a volume of unrelated facts. Only when data are relevant to the decision to be made should it be called "information."

**Accuracy:** ideally, all information should be accurate. However, features that contribute to system accuracy add to the cost of an information system. Because of this, users are often forced to settle for less than 100 percent accuracy. Applications involving money, such as payroll, billing, and accounts receivable, seek 100 percent accuracy. Other applications, such as long-range economic forecasts and statistical reports, often can be just as useful when the data are less than 100 percent accurate.

**Timeliness:** Information should be available for decision making before crisis situation develop or opportunities are lost. Users should be able to obtain information that describes what is happening now,



in addition to what has happened in the past. Information that arrives after a decision has been made is of no value.

**Completeness:** Users should be able to obtain information that presents a complete picture of a particular problem or solution. The term information overload suggests that harm can come from having too much information. Users should be able to specify the amount of detail that is needed. Information is complete when it has the correct amount of aggregation and supports all areas of the decision being made.

It is usually best to let the users specify the dimensions of the information that they need. When necessary, information specialists can help users approach this task in a logical manner.

Early knowledge management focused on the transaction processing systems that processed orders, maintained inventory records, calculated payroll amounts, and performed tasks. As such, information systems were considered to be "low level," because they performed tasks given to the "lower levels" of the organization. Today, organizations recognize that information systems capture the knowledge held in the organization, and organizations must manage that knowledge.

Those managing and controlling information in a modern firm recognize the limitations of past technologies. Earlier information systems and hardware that are incompatible or only partially compatible with current information systems are called legacy systems. Although the data captured by legacy systems produce historical information, that information is still valuable.

Most legacy data can be converted and utilized by new technologies. The text and numbers that often make up legacy files can be imported into modern databases. Data capture may update old data values with new values. For example, obsolete product numbers may be replaced with current numbers. Other steps may be necessary to merge the textual and numerical data into the current database. Firms make a decision about the amount of legacy data to capture based on their expectations of additional profits that could be realized from legacy data. One problem with converting legacy data is that such data may not be available in digital. Some legacy data may only exist on paper printouts. This data can still be captured as images.

The first firms to use computers placed the responsibility for managing the information resources in the hands of a special unit of information professionals. This unit, called information services (IS), is managed by a manager who may have vice-presidential status. The accepted practice today is to establish information services as a major business area and include its top manager in the senior group of executives, such as the executive committee, who make key decisions for the firm. The term CEO, for "chief executive officer," is firmly implanted in business vocabulary to describe the person (president or chairperson of the board) who exerts the most influence on the direction of the firm. First, the term CIO, for "chief information officer," was used; more recently, the term CTO, for "chief technology officer," has emerged. These terms imply the key role that the top information services manager should play. The chief information officer (CIO) or chief technology officer (CTO) is the highest-level manager of

information services. This person contributes managerial skills to solving problems relating not only to the information resources, but also to other areas of the firm's operations.

When a firm organizes its executives into an executive committee, this group invariably assumes a strategic planning responsibility for the entire firm, at a minimum; the executive committee consists of the president and the vice presidents of the firm's business areas. This committee determines the organization's strategic business plan. Once a plan is in place, the executive committee monitors performance throughout the year and takes appropriate action, as needed. In some cases, the plan can be modified to reflect changing situations. Also, the committee can initiate decisions aimed at ensuring that the plan's goals are met. When a firm's executives are fully committed to strategic planning, they see a need for business area to develop its own strategic plan. The business area plans detail how those will support the enterprise as it works toward its strategic objectives.

One approach to business area strategic planning is for each area to establish its plan independent of the others. However, such an approach does not ensure that the areas work together well. During the past few years, the IS unit has probably devoted more attention to strategic planning than have most of the other business areas. The term used to describe this activity strategic planning for information resources (SP I R).

#### Core Content of a Strategic Plan for Information Resources

Different organizations create different strategic plans for information resources, but two core topics should be included in every plan:

- The objectives to be achieved by each category of systems during the time period covered by the plan
- The information resources necessary to meet the objectives

#### **Summary:**

Firms create value by performing what Porter calls value activities. Expanding the value chain must be alert to additional advantages that can be achieved by linking the firm's value chain to those of other organizations; such linkages result in an inter-organizational system (IOS). The participating firms are called business partners; they work together as a single coordinated unit, creating a synergy that cannot be achieved by working alone. A strategic advantage is one that has a fundamental effect in shaping the firm's operations. Information systems can be used to create a strategic advantage. Competitive advantage can be realized in terms of achieving strategic, tactical, and operational advantages. At the highest managerial level- the strategic planning level- information systems can be used to change the direction of the firm to achieve strategic advantage. At the management control (middle) level, managers can specify how the strategic plans will be implemented, creating tactical advantage.

Companies that are unable to gain strategic control of their worldwide operations and manage them in a globally coordinated manner will not succeed in the international economy. The difficulty arises from the fact that the resources used by the MNC are widely distributed. Dispersed information resources—hardware, software, and personnel—are difficult to manage and may be governed by conflicting business practices. The good news is that improvements in information technology, methodology, and communications have made global coordination much easier. But even with these improvements, coordination remains a big challenge.

The development of any type of information system can be a challenge but when the system spans international boundaries developers must address several unique constraints. Earlier information systems and hardware are that are incompatible or only partially compatible with current information are called legacy systems. Although the data captured by legacy systems produce historical information, that information is still valuable.

Most legacy data can be converted and utilized by new technologies. The text and numbers that often make up legacy files can be imported into modern databases. Data capture may that old data values be updated with new values. For example, obsolete product numbers may be replaced with current numbers. Other steps may be necessary to merge the textual and numerical data into the current database. Firms make a decision about the amount of legacy data to capture based on their expectations of additional profits that could be realized legacy data.

### **Keywords:**

**Strategic Advantage:** A strategic advantage is one that has a fundamental effect in shaping the firm's operations.

**Information Systems:** components of Hardware, Software, Database, Networks and people in an organization.

**Knowledge Management:** list of internal and external facts that are explicit and tacit.

### **Summary questions.**

1. Explain Porter's value chain model.
2. Explain the role of IS in Business.
3. What do you understand by Knowledge flow in organization?
4. What is the role of CTO/CIO in organization?

### **CASE**

#### **Information Systems at the hospitals**

Just think: If you are admitted to the hospital with a blood clot in your leg or brain. You are already taking medicines for treating ulcers. The hospital prescribes some medicines to dissolve the clot. You

refuse to take the medicine until someone double-checks the prescription to make sure there will be no adverse interaction with your other medication. In the end, you learn that your fears were right. The medicines given by doctors interact adversely leading to excess blood thinning and bleeding, and you must stop taking the course of medicines until your blood clot has dissolved.

Indian papers mentioned that more than 27,000 Indians are killed each year because of inappropriate prescriptions. A preventable drug error adds more than Rupees 105,800 to the hospital bill of a single patient, and preventable drug errors occurring in hospitals may amount to 5 lakh rupees annually. Many of these errors are the results of human factors: poor handwriting, memory lapses, fatigue, and distractions, compounded by the sheer volume and complexity of available medications. There are more than 10,000 prescription drugs on the market and 300,000 over-the-counter products. Many have vastly different dosage and usage instructions depending on the patient's age, weight, and risk factors.

To prevent these factors from negatively impacting patients, some health care facilities are using information systems to help doctors and nurses make better prescription decisions. A computerized physician order entry system tries to reduce prescription and dosage errors for medications, keep physicians updated on treatment guidelines, and prevent physicians from ordering superfluous tests or drugs that are not part of the standard formularies. Physicians must be willing to incorporate the use of these systems into their workflow. Many doctors resist changing their ways because a system is complex or takes more time to use than the procedures to which they are accustomed.

Several papers report that the use of simple systems that eliminate handwriting mistakes and offer only basic decision support, such as drug allergy and interaction alerts, do not significantly reduce high rates of adverse drug events.

With a uniform architecture in place, communications between doctors and nurses run much more smoothly. The hospital staff members can avoid literally running back and forth to consult each other because the system contains all of the pertinent information. Doctors save time on their rounds by visiting patients with laptops in tow. They can enter orders for drugs and labs, as well as view lab results, without having to return to their offices mid round. Doctors and nurses still must communicate effectively and they must trust the system. If they do not trust the system, they are more likely to ignore the automated prompts. Using decision-support software can be a difficult sell for doctors because they prefer to trust their experience and training. Some doctors resist the idea that they need help remembering procedures and treatments.

The DSS software tries to reduce misdiagnoses by presenting doctors with a comprehensive list of possible conditions. DSS systems also direct doctors to helpful information, such as medical journal articles with the latest research.

### **Case Questions.**

1. What problems are hospitals facing in diagnosing diseases and prescribing medications?
2. How IS can tackle this problem?
3. Do you agree that DSS/IS need to be in place hospitals in all processes? Why or Why not?
4. What problems prevent computer systems from improving the medical industry? How can these Obstacles be removed?

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# **Part II Information Technologies**

**Chapter 4: Telecommunications and Networks**

**Chapter 5: Telecommunications Network Alternatives**

**Chapter 6: Using IT for Strategic Advantage**

## Chapter 4: Telecommunications and Networks

### Objectives:

At the end of the chapter you should be able to:

- Identify the concepts of Telecommunications resources.
- Identify uses and the characteristics of telecommunications.
- Identify with examples of various Some Examples.
- Identify the process and technology of networking.

### Introduction.

Telecommunications enable managers, end-users and workgroups to electronically exchange data and information anywhere in the world with other end-users, customers, suppliers and business partners. Telecommunications is the method and process of sending data and information in any form (text, voice, images and video) from one place to another, using communication links among computer systems and a variety of terminals.

Telecommunications also includes tele-processing, telematics and telephony. Business applications of telecommunications involve the following:

- (i) Enterprise Collaboration: This includes telecommunications to support communication, coordination and collaboration among business managers and workgroups.
- (ii) Electronic Commerce: This supports the buying and selling of products, services and information over the Internet and other computer networks.
- (iii) Internal Business: This uses a variety of computer networks to support a company's own business operations.

Technology trends today are moving towards the following:

- (i) Open Systems: They use common standards for hardware, software, applications and networking. Like the Internet and corporate Intranets and Extranets, open systems create access by end-users and their computer systems.
- (ii) Interoperability: This is how open systems enable different applications to be carried out, using a variety of computer systems, software packages and databases.
- (iii) Digital Network Technologies: Instead of voice-oriented analog transmission systems (i.e. transmitting the electrical signals through the sound waves of the human voice), telecommunication networks are getting converted to digital transmission systems (i.e. transmitting information in the form of discrete pulses).

### Telecommunications Technologies

- (1) Standard Cable: This is a 9-pin standard wire referred to as RS 232C, normally connecting one device to another. Such cabling may suffice when machines are located within the same hall, but not beyond.
- (2) Twisted-Pair Cable: This is ordinary telephone wire of copper, twisted into pairs and most widely used media for telecommunications throughout the world for both voice and data transmission.
- (3) Coaxial Cable: This is sturdy, copper or aluminum wire, with the cable's cover and insulation minimizing interference and distortion of the signals. If and when placed underground on the floors of oceans, they allow high-speed data transmission and high-service metropolitan areas.
- (4) Optical Fibre: This consists of hair-thin filaments of glass fibre, conducting light pulses generated by laser beams. The transmission rate can be 60 times faster than co-axial cable and 3,000 times better than twisted-pair wires. A half-inch diameter optical fibre can carry up to 50,000 channels, compared to about 5,500 channels for a standard coaxial cable. Advantages of optical fibre are - substantial size and weight reduction; increased speed and great carrying capacity; unaffected by electromagnetic radiation and, hence, multiple fibres customized in the same cable; minimum need for repeaters for signal transmission (unlike electric wire media); and extremely low data-error rate. Disadvantages are high cost of installation, difficulty of splicing the cable (to make connections). However, recent technological advancements have facilitated splicing.

#### **Some Examples:**

- (i) Ocean-bed strands of optical fibres have been laid by submarines, connecting Australia with continental Europe. These strands touch Chennai and Mumbai coasts in India, from where mainland cabling has been done.
- (ii) The metropolitan cities of Delhi and Mumbai have been connected by optical fibres, facilitating data and voice transmission.
- (iii) Indian Railways have gone a big way laying optical fibres to connect different Railway headquarters with one another. Substantial transmission capacity has been created to make it possible to lend extra capacity to other user agencies.

#### **Microwave:**

This involves earth-bound microwave systems that transmit high-speed radio signals in a line-of-sight path between relay stations spaced approximately 50 km apart. The antennae are placed on top of high-rise buildings, towers, hills and mountain peaks. Advantages are - simple technology and low cost of maintenance, while the disadvantages are hindrance by hills and high-rise buildings; earth's curvature, operating as an obstacle over long distance since line-of-sight clearance is needed; frequent need for boosting by relay stations, contributing to some loss of data and voice over a long distance.

#### **Some Examples**

- (i) Indian Railways still uses microwave transmission for long-distance networks. The high microwave tower outside TIT Kharagpur (near the station) is a familiar sight.
- (ii) Indian security police, too, uses microwave for much of police data and voice transmission. The tall microwave tower on Mount Abu is another common sight used by the security police.

#### **Geo-Stationary Satellites:**

These are communication satellites launched by several nations and organizations, placed into stationary geosynchronous orbits (where the escape force counterbalances the earth's gravitation pull), approximately 36,000 km above the earth in the equatorial plane. Satellites are powered by solar panels and use microwave radio signals to their telecommunications media. Besides voice and video transmission, communication



satellites are used for high-speed transmission of large volumes of data. Such satellite systems are operated by COMSAT and INTELLSAT (a consortium of over 100 nations), among others.

INSAT-2D has a few extended C-band transponders to support VSATs for providing communications to Indian enterprises under the Remote Area Business Message Network (RABMN). Also functioning in C-band are 87 VSATs for remote rural area communications, with another 41 VSATs in various stages of implementation for RABMN. Besides, another 350 VSATs are to be commissioned through INSAT- 2D by 200 1-02.

**Polar Orbiting Satellites:** These satellites are placed in an orbital plane in circular polar orbits (with a few operational satellites per plane), to provide a saturated cover over the earth surface for global wireless, voice, paging, fax and data services, anywhere, anytime.

### **Some Important Networking Terminologies**

(i) **Modem:** The most common among communication processors, it converts digital signals from a computer into analog frequencies for transmission over ordinary telephone lines. The modem at the other end of the communications line converts the transmitted data back into digital signals at the receiving terminal. This process, known as modulation and demodulation, is referred to as modem and can vary widely in its power and capacity of transmission.

(ii) **Multiplexer:** This is a communications processor, allowing a single channel to carry simultaneous data transmissions from many terminals. Typically, a multiplexer merges transmission of several terminals at one end and a similar unit separates individual transmissions at the receiving end.

(iii) **Switch:** This is a communications processor that connects several telecommunication circuits in a network so that a message can reach its intended destination.

(iv) **Router:** This is a more intelligent communications processor that interconnects networks based on different rules or protocols, so that a message can reach its destination.

(v) **Hub:** This is a part switching (often automatically) among connections.

(vi) **Gateway:** This is a communications processor that interconnects networks using different communications architecture, often spanning long distances globally.

(i) **Access Control:** This function establishes connections between terminals and computers in a network.

(ii) **Transmission Control:** This function permits the systems to send and receive commands, messages, data and programs.

(iii) **Network Management:** This function takes care of communications in a telecommunications network, and decides priorities, routes, waiting period, etc.

(iv) **Error Control:** This function detects and corrects transmission errors arising out of line-noise, power surges, etc.

(v) **Security Management:** This function protects a communications network from unauthorized access.

### **BANDWIDTH**

The communications speed and capacity of telecommunications resources are known as bandwidth, comprising the frequency range of a telecommunications channel. It determines the channel's maximum data transmission rate, where the speed and capacity are measured in Bits per Second (BPS). This is also referred to as the baud rate.

Some illustrations are as follows:

- (1) **Voice Band or Narrowband:** Low-speed analog channels for voice communications from 300 to 9,600 BPS, now going up to 1 million BPS.
- (2) **Medium-band:** For transmission speeds from 9,600 up to 100 Million BPS, this band is used for data communications by micro computers and video terminals.
- (3) **Broadband:** High-speed digital channels for microwave, fibre optics and satellite transmission, allowing transmission rates from 2,56,000 BPS to several billion BPS.
- (4) **Circuit Switching:** For regular telephone service.
- (5) **Message Switching:** For transmitting messages one bloc at a time.
- (6) **Packet Switching:** For subdividing communication messages into fixed groups, called packets, e.g. 128-character long packet in X.25 protocol.
- (7) **Frame Relay:** Same as packet switching, with packets of variable length.
- (8) **Asynchronous Transmission Mode (ATM):** An emerging high-capacity cell-switching technology, breaking voice, video and data into fixed cells of 53 bytes (48 bytes of data, with 5 bytes of control).
- (9) **Modem:** The most common among communication processors, it converts digital signals from a computer into analog frequencies for transmission over ordinary telephone lines. The modem at the other end of the communications line converts the transmitted data back into digital signals at the receiving terminal. This process, known as modulation and demodulation, is referred to as modem and can vary widely in its power and capacity of transmission.
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- (11) **Switch:** This is a communications processor that connects several telecommunication circuits in a network so that a message can reach its intended destination.
- (12) **Router:** This is a more intelligent communications processor that interconnects networks based on different rules or protocols, so that a message can reach its destination.
- (13) **Hub:** This is a part switching (often automatically) among connections.
- (14) **Gateway:** This is a communications processor that interconnects networks using different communications architecture, often spanning long distances globally.

## Summary.

Telecommunications is the method and process of sending data and information in any form (text, voice, images and video) from one place to another, using communication links among computer systems and a variety of terminals. Telecommunications also includes tele-processing, telematics and telephony. Modem: The most common among communication processors, it converts digital signals from a computer into analog frequencies for transmission over ordinary telephone lines. The modem at the other end of the communications line converts the transmitted data back into digital signals at the receiving terminal. This process, known as modulation and demodulation, is referred to as modem and can vary widely in its power and capacity of transmission.

Multiplexer is a communications processor, allowing a single channel to carry simultaneous data transmissions from many terminals. Switch is a communications processor that connects several

telecommunication circuits in a network so that a message can reach its intended destination. Router is a more intelligent communications processor that interconnects networks based on different rules or protocols, so that a message can reach its destination. Hub is a part switching (often automatically) among connections. Gateway is a communications processor that interconnects networks using different communications architecture, often spanning long distances globally.

### **Key words:**

**Broadband:** High-speed digital channels for microwave, fibre optics and satellite transmission, allowing transmission rates from 2,56,000 BPS to several billion BPS.

**Circuit Switching:** For regular telephone service.

**Message Switching:** For transmitting messages one bloc at a time.

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**Frame Relay:** Same as packet switching, with packets of variable length.

**Modem:** The most common among communication processors, it converts digital signals from a computer into analog frequencies for transmission over ordinary telephone lines.

**Multiplexer:** This is a communications processor, allowing a single channel to carry simultaneous data transmissions from many terminals.

**Switch:** This is a communications processor that connects several telecommunication circuits in a network so that a message can reach its intended destination.

**Router:** This is a more intelligent communications processor that interconnects networks based on different rules or protocols, so that a message can reach its destination.

**Hub:** This is a part switching (often automatically) among connections.

### **Summary Questions.**

1. Explain the various transmission media.
2. Differentiate between router and gateway.
3. Why do we need switching? What are the techniques available?
4. Define Asynchronous transfer mode.

### **Critical Thinking Case Questions.**

1. Visit an Internet Service Provider. Discuss with him the list of tasks for enabling internetworking. Collect information on 'Wi-fi' systems.

2. List various mobile and internet service providers. Compare their offerings in form of product, service, cost, offerings. What do you say? What is your opinion?
3. In this chapter we discussed that Indian security police, too, uses microwave for much of police data and voice transmission. The tall microwave tower on Mount Abu is another common sight used by the security police. Please visit a nearby police station and try to identify the technologies that are used by the system and people there.

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## Chapter 5 Telecommunications Network Alternatives

### Objectives:

At the end of the chapter you should be able to:

- Identify the basics of telecommunications.
- Identify the process and technology of networking.

### INTRODUCTION

Business today involves a seamless integration and networking of enterprises, where hardware, software and telecommunications eventually lead to a worldwide networking of the Internet or Internet-like networking inside the enterprise (Intranet), or, networking among the enterprise and its business partners (Extranet). Here we cover different principles and practices of networking, ranging from the local to the global, and look at their manifold applications relevant to India.

### BASICS OF NETWORKS

A simple network consists of two or more connected computers. Basic network components include computers, network interfaces, a connection medium, network operating system software, and either a hub or a switch. The networking infrastructure for a large company relies on both public and private infrastructures to support the movement of information across diverse technological platforms. It includes the traditional telephone system, mobile cellular communication, wireless local-area networks, videoconferencing systems, a corporate Web site, intranets, extranets, and an array of local and wide-area networks, including the Internet. This collection of networks evolved from two fundamentally different types of networks: telephone networks and computer networks.

Computer networks are interconnected hardware, software and telecommunication resources that share multiple facilities for their optimal use. The sharing can be as follows:

Hardware: CPU, disk, tape, printer

Software: Packages, products, application programs

Telecommunication: Communication links

Data: Files, databases

From an end-users point of view, networks can be based on either geographical spread, or, structural topology. They can also be client-server systems.

### Types of Networks.

Local Area Networks (LAN) connects computers within a limited physical area such as an office or classroom. It uses coaxial cables or wireless radio systems.

Metropolitan Area Networks (MAN) connects computers within a city.

Wide area Networks connects large geographical society, usually a country. Many companies prefer WAN.

MNCs are often plagued with problems related to the level of technology that exists in subsidiary countries. In some countries, reliable power sources are not available, resulting in frequent power outages. Telecommunications circuits often can only transmit data at slow speeds, and the transmission quality may be poor. Software can also be a problem. Because many countries do not honor software copyrights and condone black-market software, some software vendors refuse to do business in certain countries.

#### (I) Geographical Spread

(a) Local Area Network (LAN) connects computers within a limited physical area, such as an office, a classroom, a building, a manufacturing plant, or a work-site. LAN is usually confined within a spread of 1.5 to 2 km of space, using ordinary telephone wiring or coaxial cable or wireless radio system.

#### Some Examples

(i) Bharat Heavy Electricals Ltd (BHEL) , Hardware, was one of the first manufacturing units in India to have used LAN among its heads of different divisions for purposes of information sharing on production, financial accounting, marketing, etc.

(ii) NTPC, Corporate office at Delhi is located at the SCOPE building where all the Members of its Board and other important functionaries are mutually connected by a LAN. This is also one of the first successful LAN installations in India.

(b) Metropolitan Area Network (MAN) connects computers over a large city or metropolitan area, often included in the category of wide area network. These fairly large networks are needed for carrying out day-to-day activities of many business and government organizations and their end-users.

#### Some Examples

(i) National Informatics Centre (NIC), New Delhi, initiated a MAN project in 1982 for the Asiad Games, connecting nine sport stadiums within the city and another two stadiums around it. This highly successful network helped carrying, conveying and sharing information on sports persons, regarding their performances, records achieved (as compared with Commonwealth and Olympic records) and personal details. Virtually, the entire information was available on the fingertips of the sports officials and provided a great help in the Asia administration.

(ii) Neyville Lignite Corporation (NLC), Tamil Nadu, had an early start with a MAN project, where the quarry-site at open-cast mining had a computer; the plant-site for dozers, tractors and shovels had a computer; and the corporate office had a computer - all connected together for efficient production control and optimal equipment utilization.

(c) Wide Area Network (WAN) covers a large geographical area, often a whole country. In order to transmit and receive information among their employees, customers, suppliers and other organizations across cities, regions and countries, many multinational companies use WANs. Three categories of WANs are operational in India: special-purpose (related to a single organization on proprietary basis) or general-purpose (catering to multiple organizations on a service-provider basis) or dual-purpose (serving both special-purpose and

dual-purpose roles) these undergo planning and modification all the time. The following description is only illustrative, needing updating as and when required.

### **Some Examples**

NICNET (National Informatics Centre Network) is the prime government- sector networking and among (ii) ONGCNET (Oil & Natural Gas Corporation Network) is a prime WAN under the ONGC, where the apex computer is at KDM Institute of Petroleum Exploration, Dehra Dun and the satellite computers are at the regional offices at Mumbai, Chennai, Vadodara and Kolkata. These systems are used for offshore and on-land seismic data processing. The ONGC ships and other chartered ships from abroad are used in a grid-like movement on the high seas: to send down small explosions through the water-mass and to receive echoes from the sea-beds. As the ship moves and the echoes diverge as well as emanate from different depth-points, these echoes need to be "integrated" mathematically and reduced to "common depth points" (CDPs). These CDPs are indicative of the seabed structure: comprising geological "fields" or "faults" and their vulnerability or imperviousness. This structure, in turn, gives an idea of the possibility of oil (and natural gas) to have been trapped below impervious "folds". All this is done by routine seismic data processing at the regional computer centers.

ERNET (Education and Research Network) is a major WAN in the education and research area, set up by the Ministry of Information Technology. Initially started with the five TITs and four IIMs - with the National Centre for Software Technology (NCST) at the apex - it now has several hundreds of universities and academic institutions as its members. It has also gateways available to many global educational networks in Europe and USA, with which software packages can be shared and exchanged in the education and research area.

RAILNET (Railway Network) is another major WAN dealing with freight control and wagon monitoring system, under the acronym FOIS (Freight Operation and Information System): planned for the seven Railways headquarters (other than the North East Frontier Railway), a stand-by at Nagpur and an apex centre at the Railway Board, Delhi.

### **Summary**

Computer networks are interconnected hardware, software and telecommunication resources that share multiple facilities for their optimal use. The sharing is done among hardware like CPU, disk, tape, printer, software like Packages, products, application programs, Communication links, files, and databases. From an end-users point of view, networks can be based on either geographical spread, or, structural topology. They can also be client-server systems.

#### **Key words:**

Hardware: CPU, disk, tape, printer

Software: Packages, products, application programs

Telecommunication: Communication links

Data: Files, databases

### **Summary Questions**

1. Explain the importance of network technologies

2. Explain the types of networks.
3. What are the interconnecting media in computer networks?

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1. Bose, Indranil and Raktirn Pal. "Auto-ID: Management Anything Anywhere, Anytime in the Supply Chain." *Communications of the ACM* 48, No.8 (August 2005).
2. Dignan, Larry. "RFID: Hit or Myth?" *Baseline Magazine* (February 2(04).
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## Chapter 6

### Using IT for strategic Advantage

#### Objectives:

At the end of the chapter you should be able to:

- Identify the importance of IT.
- Identify the process and concepts of technology strategy.

#### Introduction.

Implementing a full IT strategy can have advantages to a organization. The time to take the systems apart, the warranties challenges and the cost of keeping further parts on hand and rebuilding the machine, when included in the total cost, indicate it was far less luxurious to standardize on one vendor and buy those PCs than to build them.

The most common strategies for considerate and accepting IT investments include the competitive “cost of doing business” disagreement, followed quickly—and not surprisingly, given the previously stated position—by the attachment of technology to a process. There is nothing wrong with either advance, but neither helps IT managers connect costs to a business result in a concrete way. Information technology becomes a strategic asset when it makes the entire industry adaptive and ready for change by connecting people, process, and information to drive results. How an organization process the results of its technology investments is important, because the continuous improvement of any function requires a clear way to measure performance against goals. The strategic importance of IT, therefore, becomes clearer when executives move away from Industrial Age metrics and toward a more holistic assessment of return on knowledge.



## Importance of IT

In fact, better measurement of the return on IT investments can yield strong overall financial returns. Companies that excel at managing the value of their IT investments outpace their peers in overall financial performance, according to research by The Hackett Group. Essentially, Hackett says, companies that better manage the business value of IT—including governance, portfolio management, and other IT management tactics—have 49 percent higher net profitability than their peer group. In addition, their return on equity and return on assets are higher. Across industries, IT budgets as a percentage of sales hover just below 4 percent. Information technology expenditures are a significant cost for most organizations. But many still struggle to effectively account for their return on IT investments, either in reduced costs or in differentiated value to their customers. One of the biggest problems in justifying IT budgets is the growth of the knowledge economy: Our economics remain rooted in Industrial Age terms. When the only framework is industrial economics, everything looks like a production line.

Information technology adds strategic value when it can change with the business. Because change happens most quickly at the operational edge of the enterprise and not at the bureaucratic center, the ideal IT model pushes out most capabilities to business users by giving them easy ways to customize their information environment and modify processes as their needs and roles evolve. The best solutions also deliver a common platform, so system operation and the data each user has access are consistent and familiar across the experience. This approach leaves IT management the essential task of governing platform policies, security, access control, and overall strategy, without taxing their resources and turning IT into a bottleneck of business change. It means IT drives standardization and leverages economies of scale, rather than simply automating structured processes. A rigid IT infrastructure, on the other hand, locks the business into a fixed set of practices, one that may have been optimized according to a snapshot of business needs taken years before the solution is fully implemented. When business groups or individual users try to change the outdated process, the cost in IT resources is often prohibitive. The result is that the business is slower to respond and, therefore, less able to compete with more nimble players in the market. A platform is also important in the management of complexity. Well-designed platforms minimize the need for users or developers to think about how things work within an environment. They offer a common way to introduce features that may be complex, but because of their relationship to the platform, provide a natural bridge from existing knowledge

On a more strategic use of technology, another company decided to purchase a software application. It assumed it could implement it itself less expensively than it could by engaging an experienced consultant. Seven years later, it was still not installed correctly. The company overestimated the skills of its employees, did not plan effectively, did not assign the correct resources to the appropriate activity and under-funded the project.

Let's define strategic and competitive advantage. A strategic advantage can be thought of as redefining or changing how the game is played. For example, Amazon changed the rules for bookstores. Books can now be purchased online and shipped to your door very quickly and inexpensively. You can read what others think and track what other books were purchased when a specific book was purchased. For example, at the time of this writing, more books are sold over the Internet than are sold in bookstores. This knowledge certainly changed how bookstores function in order to attract and retain customers. Many of the smaller bookstores went out of business, and the larger book stores implemented coffee shops or cafes and invites entertainers to perform at their stores, all in an effort to attract and retain customers.

Take Wal-Mart. It is a great example for creating a competitive advantage through the strategic use of its IT. It was successful in integrating the supply chain and cutting costs down. This savings was used to the

relationships of Wal-Mart customers. It competes effectively on price and quality. The reason is its strategic use IT.

### **Technology for strategic advantage.**

Information systems must be viewed as more than a set of technologies that support efficient business operations, workgroup and enterprise collaboration, or effective business decision making. Information technology can change the way businesses compete. For this reason, you should view information systems strategically - that is, as vital competitive networks, as a means of organizational renewal, and as a necessary investment in technologies that help a company adopt strategies and business processes that enable it to reengineer or reinvent itself in order to survive and succeed in today's dynamic business environment. One of the most popular competitive strategies today is business process reengineering most often simply called reengineering. Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in cost, quality, speed, and service. BPR combines a strategy of promoting business innovation with a strategy of making major improvements to business processes so that a company can become a much stronger and more successful competitor in the marketplace. The potential payback of reengineering is high, but also is its level of risk and disruption to the organizational environment. Information technology plays a major role in reengineering business processes. The speed, information processing capabilities and connectivity of computers and Internet technologies can substantially increase the efficiency of business processes, as well as communication and collaboration among the people responsible for their operation and management.

A key strategic uses of internet technologies is to build a company that develops its business value by making customer value its strategic focus. Customer-focuses companies use Internet, intranet, and extranet e-commerce websites and services to keep track of their customers' preferences; supply products, services, and information anytime, anywhere; and provide services tailored to the individual needs of their customers. Information technology is a key ingredient in reengineering business operations by enabling radical changes to business processes that dramatically improve their efficiency and effectiveness. Internet technologies can play a major role in supporting innovative changes in the design of workflows, job requirements, and organizational structures in a company. A business can use information technology to help it become an agile company. Then it can prosper in rapidly changing markets with broad product ranges and short model lifetimes in which it must process orders in arbitrary lot sizes, and can offer its customers customized products while maintaining high volumes of production. An agile company depends heavily on Internet technologies to help it be responsive to its customers with customized solutions to their needs and cooperate with its customers, suppliers, and other businesses to bring products to market as rapidly and cost-effectively as possible. Forming virtual companies has become an important competitive strategy in today's dynamic global markets. Internet and other information technologies play an important role in providing computing and telecommunication resources to support the communications, coordination, and information flows needed. Managers of a virtual company depend on IT to help them manage a network of people, knowledge, financial, and physical resources provided by many business partners to quickly take advantage of rapidly changing market opportunities. Lasting competitive advantage today can only come from innovative use and management of organizational knowledge by knowledge-creating companies and learning organizations. Internet technologies are widely used in knowledge management systems to support the creation and dissemination of business knowledge and its integration into new products, services, and business processes.

### **Summary**

The most common strategies for considerate and accepting IT investments include the competitive “cost of doing business” disagreement, followed quickly—and not surprisingly, given the previously stated position—by the attachment of technology to a process. Information technology adds strategic value when it can change with the business. Because change happens most quickly at the operational edge of the enterprise and not at the bureaucratic center, the ideal IT model pushes out most capabilities to business users by giving them easy ways to customize their information environment and modify processes as their needs and roles evolve. The best solutions also deliver a common platform, so system operation and the data each user has access are consistent and familiar across the experience. Customer-focuses companies use Internet, intranet, and extranet e-commerce websites and services to keep track of their customers’ preferences; supply products, services, and information anytime, anywhere; and provide services tailored to the individual needs of their customers. Information technology is a key ingredient in reengineering business operations by enabling radical changes to business processes that dramatically improve their efficiency and effectiveness. Internet technologies can play a major role in supporting innovative changes in the design of workflows, job requirements, and organizational structures in a company. A business can use information technology to help it become an agile company. Then it can prosper in rapidly changing markets with broad product ranges and short model lifetimes in which it must process orders in arbitrary lot sizes, and can offer its customers customized products while maintaining high volumes of production.

### **Key Words:**

**Competitive advantage:** It raises the bar in a specific market or industry that could be higher quality, lower cost, speed to market, or improved customer service.

**Technology strategy:** it is defined and implemented as part of the formal business plan, the risk is significantly reduced. The strategy needs to address: Company hardware and software standards, Definition of roles and responsibilities, Vendor performance management criteria, Asset retirement strategy.

**An agile company:** it depends heavily on Internet technologies to help it be responsive to its customers with customized solutions to their needs and cooperate with its customers, suppliers, and other businesses to bring products to market as rapidly and cost-effectively as possible.

**Virtual Company:** In this, Internet and other information technologies play an important role in providing computing and telecommunication resources to support the communications, coordination, and information flows needed.

### **Summary Questions.**

1. How can Internet technologies help a business form strategic alliances with its customers, suppliers, and others?
2. What strategic role can information technology play in business process reengineering?
3. How could a business use the Internet technologies to form a virtual company, or become an agile competitor?

### **Case Example: IT management in Raja Boeing Company.**

With over 150,000 employees, the Raja Boeing India company India company India company is a giant producer of passenger airplanes, business jets, military aircraft, helicopters, flight instruments, and satellites. Until recently it was the India’s number one commercial jet aircraft producer.

It is now in a head-to-head struggle with Rani Airbus for this position. Rani Airbus decided to challenge Raja Boeing India company India Company for the jumbo jet market. Rani Airbus management predicts air travel will expand rapidly, requiring many giant jumbo jets to carry the increased mass of passengers without hiking up operational costs. Raja Boeing India company India company management has a very different vision. It believes that most travelers prefer to fly from their own city nonstop to their destination.

All in all, Raja Boeing India company India company foresees a strong expansion of smaller jet sales rather than of jumbo jet sales. Both companies' business and product development strategies are based on these differing visions. In addition to Rani Airbus competition, Raja Boeing India company India company faced difficult conditions because the market for commercial airplanes has been shrinking due to airline mergers and the downturn in air travel recently. Raja Boeing India designers long ago realized they would save much production time if they reused existing designs rather than designing each aircraft from scratch. However, the process of design customization was manual and took more than 1,000 engineers a year of full-time work to complete. Another problem with manual design was that the staff needed to create life-size mock-ups in plywood and plastic to ensure that everything fit and that the pipes and wires that run through the plane are placed properly and do not interfere with other necessary equipment.

Raja Boeing India company assembled a single parts list that can be used by every division without modification. In addition, management established design-production teams that brought together designers and fabricators from a range of specialties throughout the whole process. Ultimately, the airplane was designed entirely on the computer screen and was initially assembled without expensive mock-ups.

Raja Boeing India company, in the meantime, innovated again and designed plane to fly long distances economically while keeping passengers comfortable and economizing on fuel. About half of each plane will be made from carbon-fibre composite materials, which are lighter than aluminium and can be built in larger sections.. So far it has had little success, with a number of airlines stating that the operating economies and comfort did not match. Raja Boeing India company and its key suppliers are using software that lets designers around the world electronically collaborate in designing components and manufacturing processes.

#### Case Questions:

1. Analyze Boeing and its business strategy using the value chain and competitive forces models.
2. What is the relationship of knowledge management to Boeing's business strategy?

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## **Part III**

### **Business Applications**

Chapter 7: Enterprise Business Systems and ERP: The Business Backbone

Chapter 8: Supply Chain Management: The Business Network

Chapter 9: Electronic Commerce Fundamentals, Systems, Applications & Issues

Chapter 10: Implementing Business Systems

Chapter 11: Developing Business IT Solutions and SDLC

## **Chapter 7**

### **Enterprise Business Systems and ERP: The Business Backbone**

#### **Objectives:**

At the end of this unit, you will understand

- Basics of ERP.
- Advantages of ERP, why it is relevant to any business firm.
- ERP implementations and vendors.
- Example of an ERP system

#### **Introduction**

As you can see in the opening vignette, businesses rely on information systems to integrate their daily transaction activities. The many business activities associated with supply, distribution, sales, marketing, accounting, and taxation can be performed quickly while avoiding waste and mistakes. The goal of this computerization is ultimately to satisfy a business's customers and provide a competitive advantage by reducing costs and improving services.

Transaction processing was one of the first business processes to be computerized, and without information systems, recording and processing business transactions would consume huge amounts of an organization's resources. The transaction processing system (TPS) also provides employees involved in other business processes – the management information system/decision support system (MIS/DSS) and the special-purpose information systems – with data to help them achieve their goals. A transaction processing system serves as the foundation for the other systems. Transaction processing systems perform routine operations such as sales ordering and billing, often performing the same operations daily or weekly. The amount of support for decision making that a TPS directly provides managers and workers is low.

The order entry system captures the basic data needed to process a customer order. Orders may come through the mail or via a telephone ordering system, be gathered by a staff representative, transaction directly from a customer's computer over a wide area network, or be entered directly over the internet by the customer using a data entry form on the firm's Web site.

With an on-line order processing system, such as one used by direct retailers, the status of each inventory item (also called a stock keeping unit, or SKU) on the order is checked to determine whether sufficient

finished product is available. If an order item cannot be filled, a substitute item may be suggested or a back order is created-the order will be filled later, when inventory is replenished. Order processing systems can also suggest related items for order takers to mention to promote add-on sales. Order takers also review customer payment history data from the accounts receivable system to determine whether credit can be extended. Once an order is entered and accepted, it becomes an open order. Typically, a daily soled journal (which included customer information, products ordered, quantity discounts, and prices) is generated.

Electronic data interchange (EDI) can be an important part of the order entry TPS. With EDI, a customer or client organization can place orders directly from its purchasing TPS into the order processing TPS of another organization. Or, the order processing TPS of the supplier firms and the purchasing TPS of the customers could be linked indirectly through a third-party clearinghouse. In any event, this computer-to-computer link allows efficient and effective processing of sales orders and enables an organization to lock in customers and lock out competitors through enhanced customer service. With EDI, orders can be placed anytime of the day or night, and immediate notification of order receipt and processing can be made. Today, more and more firms are using electronic data interchange to make paperless business transactions a reality. A customer relationship management (CRM) system is a collection of people, processes, software, and Internet capabilities that help an enterprise manage customer relationships effectively and systematically. The goal of CRM is to understand and anticipate the needs of current and potential customers to increase customer retention and loyalty while optimizing the way products and services are sold. CRM software automates and integrates the functions of sales, marketing, and service in an organization. The objective is to capture data about every contact a company has with a customer through every channel and store it in the CRM system to enable the company to truly understand customer action. CRM software helps an organization build a database about its customers that describes relationships in sufficient detail so that management, sales-people, customer service providers, and even customers can access information to match customer needs with product plans and offerings, remind customers of service requirements, know what other products a customer had purchased, and any number of things

CRM software is now the number one selling software application in the world, having surpassed enterprise resource planning application in 2001 in terms of total license revenues. The focus of CRM involves much more than installing new software. Moving from a culture of simply selling products to placing the customer first is essential to a successful CRM deployment. Before any software is loaded onto a computer, a company must retrain employees. Who handles customer issues and when must be clearly defined, and computer systems need to be integrated so all pertinent information is available immediately, whether a customer calls a sales representative or customer service representative. Blue Cross Blue Shield of Massachusetts has implemented a CRM software package from pegasystems to help it improve service and sell additional products to existing customers. The CRM system builds a central repository of member-contact histories to ensure that all lines of business and all channels for communication, such as e-mail, fax, phone, and Web site, provide a consistent view of the customer. Blue Cross Blue Shield customers can go on-line and enter address and ID-card changes. The application also lets members retrieve specific information about their policies and benefits, including information on copayment requirements and covered services. The CRM software provides scripting capabilities that let Blue Cross Blue Shield's managers customize service scripts that prompt customer-service agent to offer specific information to a customer when requested.

Flexibility and quick response are hallmarks of business competitiveness. Access to information at the earliest possible time can help businesses serve customers better, raise quality standards, and assess



market conditions. Enterprise resource planning (ERP) is a key factor in instant access. Although some think that ERP systems are only for extremely large firms, this is not the case. Medium sized firms can also benefit from the ERP approach.

### ENTERPRISE RESOURCE PLANNING VENDORS

The key to ERP is real-time monitoring of business functions, which permits timely analysis of key issues such as quality, availability, customer satisfaction performance, and profitability. Financial and planning systems receive “triggered” information from manufacturing and distribution. When something happens on the manufacturing line that affects a business situation—for example, packing material inventory drops to a certain level, which affects the ability to deliver an order to a customer—a message is triggered for the appropriate person in purchasing.

Software Vendor	Name of Software
Oracle	Oracle manufacturing
Sap America	SAP R/3
Baan	Triton
PeopleSoft	PeopleSoft
J.d. Edwards	WorldSoftware and One World
Ross systems	iRenaissance
QAD	MFG/Pro

Successful implementation of a comprehensive ERP system can have a dramatic impact across the entire organization. For a manufacturing organization, the planning process begins with the preparation of a long-term demand forecast. This is prepared weekly for up to 18 months in advance and attempts to predict the amount of each product to be purchased over this time period. As finished products are withdrawn from inventory in response to customer demand, additional new, finished products need to be produced. The ERP production planning module uses the demand forecast and finished product inventory data to determine the week-by-week production schedule. This plan may reveal interesting insights, such as the need to build additional manufacturing capacity, hire additional workers, or develop new suppliers to provide sufficient raw materials. These new requirements can be input to the purchasing system and human resource modules of the ERP system so that managers in those areas can develop future plans. All this data can be fed into the financial module of the ERP system to prepare a profit and loss forecast statement to assess the firm’s future profitability. This profit forecast in turn can be used to help establish new budgeted limits for the upcoming year. ERP systems accommodate the different ways each company runs its business by either providing vastly more functions than one business could ever need or including customization tools that allow firms to fine-tune what should already be a close match. SAP R/3 is the undisputed king of the first approach. R/3 is easily the broadest and most feature-rich ERP system on the market. Thus, rather than compete on size, most competitors focus on customizability. ERP systems have the ability to configure and reconfigure all aspects of the IS environment to support whatever way your company runs its business.

### ADVANTAGES AND DISADVANTAGES OF ERP

Increased global competition, new needs of executives for control over the total cost and product flow through their enterprises, and ever-more –numerous customer interactions are driving the demand for enterprise wide access to real-time information ERP offers integrated software from a single vendor to help

meet those needs. The primary benefits of implementing ERP include elimination of inefficient systems, easing adoption of improved work processes, improving access to data for operational decision making, and technology standardization. ERP vendors have also developed specialized systems for specific applications and market segments. Most ERP vendors have also developed a customer relationship management (CRM) Package for their ERP system. Even with the benefits of ERP, most firms have found it surprisingly difficult to justify implementation of an ERP system based strictly on cost savings.

- Elimination of Costly, Inflexible Legacy Systems

Adoption of an ERP system enables an organization to eliminate dozens or even hundreds of separate systems and replace them with a single integrated set of applications for the entire enterprise. In many cases, these systems are decades old, the original developers are long gone, and the systems are poorly documented. As a result, the systems are extremely difficult to fix when they break, and adapting them to meet new business needs takes too long. They become an anchor around the organization that keeps it from moving ahead and remaining competitive. An ERP system helps match the capabilities of an organization's information systems to its business needs even as these needs evolve.

- Improvement of Work Processes

Competition requires firms to structure their business processes to be as effective and customer-oriented as possible. ERP vendors do considerable research to define the best business processes. They gather requirements of leading firms within the same industry and combine them with research findings from research institutions and consultants. The individual application modules included in the ERP system are then designed to support these best practices, the most efficient and effective ways to complete a business process. Thus, implementation of an ERP system ensures good work processes based on best practices. For example, for managing customer payments, the ERP system's finance module can be configured to reflect the most efficient practices of leading firms in an industry. This increased efficiency ensures that everyday business operations follow the optimal chain of activities, with all users supplied the information and tools they need to complete each step.

- Increase in Access to Data for Operational Decision Making

ERP systems operate via an integrated database and use essentially one set of data to support all business functions. So, decisions on optimal sourcing or cost accounting, for instance, can be run across the enterprise from the start, rather than looking at separate operating units and then trying to coordinate that information manually or reconciling data with another application. The result is an organization that looks seamless, not only to the outside world but also to the decision makers who are deploying resources within the organization.

The data is integrated to provide excellent support for operational decision making and allows firms to provide greater customer service and support, strengthen customer and supplier relationships, and generate new business opportunities. For example, once a salesperson makes a new sale, the business data captured during the sale is distributed to related transactions for the financial sales, distribution, and manufacturing business functions in other departments.

- Upgrade of Technology Infrastructure

An ERP system provides an organization with the opportunity to upgrade and simplify the information technology it employs. In implementing ERP, a company must determine which hardware, operating systems, and databases it wants to use. Centralizing and formalizing these decisions enables the organization to eliminate the hodgepodge of multiple hardware platforms, operating systems, and databases it is currently using—most likely from a variety of vendors. Standardization on fewer technologies and vendors reduces ongoing maintenance and support costs as well as the training load for those who must support the infrastructure. Remy corporation, \$22 million Denver-based professional services firm, needed its front-office applications (those that interact directly with customers) to more easily integrate with its back-office systems. It decided to eliminate its collection of systems from a variety of software manufacturers and move to a PeopleSoft ERP system to avoid potential system integration issues.

- **Difficulty Implementing Change**

In some cases, a company has to make radical changes in how it operates to conform with the work processes (best practices supported by the ERP). These changes can be so drastic to long-time employees that they retire or quit rather than go through the change. This exodus can leave a firm short of experienced workers.

- **Difficulty Integrating with Other Systems**

Most firms have other systems that must be integrated with the ERP. These systems can include financial analysis programs, Internet operations, and other applications. Many firms have experienced difficulties making these other systems operate with their ERP system. Other firms employ additional software to create these links. General Mills uses Tidal Software's Enterprise Scheduler to link the systems used to manage customer orders and its SAP R/3 ERP system. The Enterprise Scheduler converts 205 million orders sent annually via EDI transactions to SAP's format and imports them to R/3. It then routes orders within the company and alerts General Mill's personnel to any problems associated with the orders, such as difficulties in scheduling production or meeting customer desired delivery dates.

- **Risks is Using One Vendor**

The high cost to switch to another vendor's ERP system makes it extremely unlikely that a firm will do so. So, once a company has adopted an ERP system, the vendor knows it has a "captive audience" and has less incentive to listen and respond to customer issues. The high cost to switch also creates a high level of risk—in the event the ERP vendor allows its product to become outdated or goes out of business. Picking an ERP system involves not just choosing the best software product but also choosing the right long-term business partner.

Implementing an ERP system is extremely challenging and requires tremendous amounts of resources, the best IS people, and plenty of management support. Many firms have failed with their initial attempts, causing major business disruptions. Public firms, facing quarterly financial pressures, have become more willing to hold software suppliers publicly responsible for problems tied to the use of their products. The negative impact on the software supplier can be severe. Read the "Ethical and Societal Issues" special-interest box for an example of what can go wrong.

#### **EXAMPLE OF AN ERP SYSTEM**

SAP R/3 has been called one of the most complex packages ever written for use in corporations. However, it is also the most widely used ERP solution in the world. In response to criticisms about its complexity, SAP has worked hard to try to simplify SAP R/3 and to develop streamlined versions of the system. For example, SAP Business One is a reduced set of ERP applications that's designed for use by small and midsize firms. SAP is also developing eleven industry-specific application packages for midsize firms that have more sophisticated transaction needs. Hershey foods made business headlines in 1999 when it had problems in a failed \$112 million attempt to deploy SAP AG's R/3 software and other business applications. But the candy maker was successful with a 2002 upgrade to the Web-enabled version 4.6 of R/3. The second attempt was completed 20 percent under budget and without any of the order processing and product-shipment disruptions that marred the initial attempt. Hershey credited enhancements in the software for reducing costs and simplifying the implementation.

The SAP ERP system was developed from the perspective of a corporation as a whole rather than any specific business department. All data is entered only once in the system, and all SAP programs use the same database with little data redundancy. Each data item is clearly documented in data dictionary. The software is flexible enough to be configured to meet the customer's business requirements. It is based on a three-level client/server architecture consisting of clients, application servers, and database servers. R/3 will run on a wide variety of hardware, from a small Windows NT server up to massively parallel systems.

#### Clients in the SAP System

The R/3 system typically supports hundreds or even thousands of clients. Clients are usually desktop computers with fast processors and at least 32 MB of RAM. Users of the clients request services from the applications servers.

#### Business Application Programming Interfaces (BAPIs)

Business application programming interfaces, or BAPIs, are public interfaces. These interfaces were developed with SAP customers, software development organizations, and standards organizations to enable SAP customers to develop their own applications to interface with SAP. SAP then has the flexibility to change the underlying software, as long as the interface itself is not changed. Thus, new SAP software versions can be introduced without invalidating existing systems. An example of a BAPI is "customer order" to allow checking the status of the customer order.

#### Database server in the SAP System

The database server in the R/3 system holds the data and is accessed and updated constantly. Depending on the hardware selected, the database may be distributed among multiple machines or reside on a single computer. The SAP update process is designed to accommodate hundreds or even thousands of users on a single database server and still provide satisfactory response times.

#### Objects in the SAP System

Like many popular databases, SAP has adopted objects as one of its key implementation concepts. An SAP object is a collection of data and programs. "Purchase order" and "customer" are examples of SAP business objects used in business processes. Attributes contain the details of like object, like name, date of employment, and address of an employee.

## Summary:

Transaction processing was one of the first business processes to be computerized, and without information systems, recording and processing business transactions would consume huge amounts of an organization's resources. The transaction processing system (TPS) also provides employees involved in other business processes – the management information system/decision support system (MIS/DSS) and the special-purpose information systems – with data to help them achieve their goals. The key to ERP is real-time monitoring of business functions, which permits timely analysis of key issues such as quality, availability, customer satisfaction performance, and profitability. Financial and planning systems receive “triggered” information from manufacturing and distribution. When something happens on the manufacturing line that affects a business situation-for example, packing material inventory drops to a certain level, which affects the ability to deliver an order to a customer-a message is triggered for the appropriate person in purchasing.

Increased global competition, new needs of executives for control over the total cost and product flow through their enterprises, and ever-more –numerous customer interactions are driving the demand for enterprise wide access to real-time information ERP offers integrated software from a single vendor to help meet those needs. The primary benefits of implementing ERP include elimination of inefficient systems, easing adoption of improved work processes, improving access to data for operational decision making, and technology standardization. ERP vendors have also developed specialized systems for specific applications and market segments. Most ERP vendors have also developed a customer relationship management (CRM) Package for their ERP system.

### Keywords:

EDI-Electronic Data Interchange: With EDI, a customer or client organization can place orders directly from its purchasing TPS into the order processing TPS of another organization.

CRM - Customer Relationship Management (CRM): It is a collection of people, processes, software, and Internet capabilities that help an enterprise manage customer relationships effectively and systematically.

Enterprise Resource Planning (ERP): an Information System, used for internal business process integration.

### Summary questions:

1. What is an ERP system?
2. Name 3 ERP vendors.
3. Explain ERP system with an example.

### Case:

**Source taken from: Tom Steinert-Threlkeld, “Nestlé Pieces Together Its Global Supply Chain,” Baseline Magazine, January 20, 2006;**

Nestlé is the largest food and beverage company in the world. Headquartered in Vevey, Switzerland, the company has annual revenues in excess of \$70 billion and nearly 250,000 employees at 500 facilities in 200

countries. Best known for its chocolate, coffee (it invented instant coffee), and milk products, Nestlé sells hundreds of thousands of other items, most of which are adapted to fit local markets and cultures. Traditionally, this huge firm allowed each local organization to conduct business as it saw fit, taking into account the local conditions and business cultures. However, Nestlé's management found that allowing these local differences created inefficiencies and extra costs that could prevent the company from competing effectively in electronic commerce. The lack of standard business processes prevented Nestlé from for example, leveraging its worldwide buying power to obtain lower prices for its raw materials.

Even though each factory used the same global suppliers, each negotiated its own deals and prices. Several years ago, Nestlé embarked on a program to standardize and coordinate its information systems, business processes. The company initially installed SAP's R/3 enterprise resource planning (ERP) software to integrate material, distribution, and accounting applications in the United States, Europe, and Canada. Nestlé then extended its enterprise systems strategy to all of its facilities to make them act as a single-minded e-business. Once this project is completed, Nestlé will be able to use sales information from retailers on a global basis to measure the effectiveness of its promotional activities and reduce overstocking and spoilage caused by having products sit around too long on grocery shelves. Achieving global standardization of operational processes has been a complex task. None of Nestlé's products is considered a truly global brand, with perhaps the exception of Nescafé, of which 100 million cups are served around the world each year. But even Nescafé is rebranded, repackaged, and reformulated to create over 200 product versions for different regional preferences.

By April 2000, Brabeck had had enough of a corporate philosophy that allowed for thousands of differently configured supply chains, multiple methods of forecasting demand, and innumerable practices for invoicing customers and collecting payments. The inconsistencies and inefficiencies across the enterprise were chipping away at Nestlé's profits. Brabeck, chief financial officer Mario Corti, and the entire executive board launched a \$2.4 billion initiative to compel its market heads around the world to adopt a single set of business processes and systems for procurement, distribution, and sales management. Every Nestlé facility would format and store data identically, using the same set of information systems.. Putting up billions of dollars to fund a project was risky, but the potential benefits were too important. The savings would be reinvested in innovation, pleasing its largest customers like Wal-Mart and Tesco, and further strengthening Nestlé's position among the other global food suppliers. It would be the first global enterprise to conduct business as though it were operating in a single country. The goal was lofty, and previous attempts at cooperative standards had mixed results. Technology experts from headquarters had emphasized standards and best practices to the 14 countries that deployed SAP in the past. The pleas for a unified corporate culture were largely ignored. On the other hand, market managers in Asia had come together to develop a common system for managing their supply chains using software from SSA Global. The Business Excellence Common Application flourished in Indonesia, Malaysia, the Philippines, and Thailand, and even spread to South Africa. Everything had to be standardized on the new mySAP Internet-based software. Moreover, the deadline had already appeared in a company newsletter, so changing the date could have damaged confidence in the project.

#### Case Questions:

1. What type of global business and systems strategy did Nestlé adopt? Was this strategy appropriate for Nestlé's business model?
2. What management, organization, and technology challenges did Nestlé have to deal with to Standardize its business processes and systems?
3. What strategies did Nestlé management use to deal with these challenges?

**Source: Tom Steinert-Threlkeld, "Nestlé Pieces Together Its Global Supply Chain," Baseline Magazine, January 20, 2006;**

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## **Chapter 8**

### **Supply chain Management (SCM): The Business Network**

#### **Objectives:**

At the end of the chapter you should be able to:

- Identify the concepts of Supply Chain.
- Explain the characteristics of SCM
- Explain the SCM software

#### **Introduction.**

Supply chain management (SCM) systems are used to coordinate the movement of products and services from suppliers to customers (including manufacturer, wholesalers, and retailers). These systems are used to manage demand, warehouses, trade logistics, transportation, and other issues concerning facilities, and movement and transformation of materials on their way to customers.

To check that the supply chain is functioning as good as possible and generating the highest level of customer satisfaction at the lowest cost, all the firms have adopted Supply Chain Management (SCM) processes and associated technology. SCM has three stages of activities: strategic; tactical; and operational. At strategic level, firms check high level strategic decisions concerning the whole firm, like the size and location of manufacturing sites, partnerships with suppliers, products to be contrived and sales markets. Tactical decisions centre on adopting measures that will create cost benefits like using business top practices. Decisions in firms will foresee the effects of how the products move along the supply chain. Operational decisions may comprise schedule variations, purchasing agreements, taking instructions from customers.

IT provides a positioning of initiatives like cycle-time reduction and implementing cross-functional processes. Several well known companies use IT in SCM. There are 3 factors that have impact in this process. They are: satisfaction of customer, reducing inventory and human resource requirement.

#### **Supply Chain Management (SCM)**



Components of SCM include supply chain optimization, and supply chain event management. SCM also comprises warehouse management, radio frequency identification (RFID), and transportation management. Other modules of SCM solutions include functionality for worldwide trade and logistics, demand management, supplier relationship management, and service parts planning. A supply chain is something like several elements that are connected by the movement of products along it. The supply chain always usually starts and finishes with the customer.

The customer initiates the supply chain when ever any product is purchased. In this process he contacts sales. Sales section enters order and date. If the ordered item is to be produced then it will go to production house. All orders will be monitored. Firms have to have the materials for order fulfilment. Once the materials come from suppliers then this will be a cycled process. All materials are verified from suppliers for quality control and goes to the inventory area. The final finished goods will be delivered. To go to the customers the products need to be shipped. When customer receives them then the company sends an invoice that the work is over.

### **Understanding Supply chain management**

Large companies like P&G are constantly searching for ways to reduce supply chain costs and improve efficiency throughout its entire manufacturing and distribution network. Total supply chain costs represent the majority of operating expenses for many businesses and in some industries approach 75 percent of the total operating budget. Reducing supply chain costs may have a major impact on a company's profitability. Supply chain management systems help increase sales by providing more precise control of a firm's ability to have the right product available for customer purchases at the right time.

Smaller companies don't have supply chains as large and complex as those found in larger companies like P&G. Multi-echelon networks have products stored in a variety of locations along their path to distribution. These networks consist of regional distribution centers and a larger number of forward distribution centers. Echelons may be isolated from other echelons, so changes in inventory made by one echelon may have unpredictable consequences on the others. It's unlikely small companies would have this kind of supply chain structure. The multi-echelon inventory optimization software would simply be overkill. Small companies would benefit more from using a Web-based software system for sourcing, work-in-progress tracking, production routing, product-development tracking, problem identification and collaboration, delivery-date projections, and production-related inquiries and reports.

The bullwhip effect occurs when information about the demand for a product gets distorted as it passes from one entity to the next across the supply chain. It can also result from "gaming," as purchasers present manufacturers or suppliers with a false picture of consumer demand. It can be dealt with by reducing uncertainties about demand and supply when all of the supply chains have accurate and up-to-date information.

Supply chain planning systems enable the firm to generate demand forecasts for a product and to develop sourcing and manufacturing plans for that product. They help companies make better operating decisions such as determining how much of a specific product to manufacture in a given time period; establishing inventory levels for raw materials, intermediate products, and finished goods; determining where to store finished goods; and identifying the transportation mode to use for product delivery. One of the most important functions is demand planning, which determines how much product a business needs to make to satisfy all of its customers' demands. These functions are referred to as order planning, advanced scheduling, demand planning, distribution planning, and transportation planning. Supply chain execution

systems manage the flow of products through distribution centers and warehouses to ensure that products are delivered to the right locations in the most efficient manner. They track the physical status of goods, the management of materials, warehouse and transportation operations, and financial information involving all parties. These functions are referred to as order commitments, final production, replenishment, distribution management, and reverse distribution.

Firms use intranets to improve coordination among their internal supply chain processes, and they can use extranets to coordinate supply chain processes shared with their business partners. Using intranets and extranets, all members of the supply chain can instantly communicate with each other, using up-to-date information to adjust purchasing, logistics, manufacturing, packaging, and schedules. A manager can use a Web interface to tap into suppliers' systems to determine whether inventory and production capabilities match demand for the firm's products. Business partners can use Web-based supply chain management tools to collaborate online with suppliers and customers. Sales representatives can access suppliers' production schedules and logistics information to monitor customers' order status. The Internet has introduced new ways of managing warehousing, shipping, and packaging based on access to supply chain information that can give companies an edge in delivering goods and services at a reasonable cost.

In a push-based model, production master schedules are based on forecasts or best guesses of demand for products, and products are "pushed" to customers. In a pull-based model, actual customer orders or purchases trigger events in the supply chain.

In contemporary supply chain management systems, the Internet and Internet technology make it possible to move from sequential supply chains, where information and materials flow sequentially from company to company, to concurrent supply chains, where information flows in many directions simultaneously among members of a supply chain network. Members of the network immediately adjust to changes in schedules or orders.

## **Summary**

Supply Chain Management has three levels of activities that different parts of the company will focus on: strategic; tactical; and operational. At strategic level, company management will be looking to high level strategic decisions concerning the whole organization, such as the size and location of manufacturing sites, partnerships with suppliers, products to be manufactured and sales markets. Tactical decisions focus on adopting measures that will produce cost benefits such as using industry best practices, developing a purchasing strategy with favoured suppliers, working with logistics companies to develop cost effect transportation and developing warehouse strategies to reduce the cost of storing inventory. Decisions at this stage are made each date in firms that affect how the goods move the length of the supply chain. Operational decisions involve creation schedule changes to production, purchasing agreements with suppliers, taking instructions from customers and touching products in the warehouse.

All enterprises participating in supply chain management initiatives accept a specific role to perform. They also share the joint belief that they and all other supply chain participants will be better off because of this collaborative effort. Power within the supply chain is a central issue. There has been a general shift of power from manufacturers to retailers over the last two decade. Retailers sit in a very important position in term of information access for the supply chain. Retailers have risen to the position of prominence through technologies. Barcodes have influenced almost every aspect of Supply Chain Management. The use of barcodes makes business integration processes in supply chain management simpler and more efficient.

Barcodes are an effective identification tool that helps track products and greatly reduce errors. Barcode technology has a range of advantages such as being affordable, easy to handle, and accurate. These advantages make barcodes widely used in supply chain management and accepted across the world.

### **Key words**

**Supply Chain Management:** it comprises warehouse management, radio frequency identification (RFID), and transportation management.

**Purchasing:** The purchasing department receives a list of raw materials and services necessary by the production department to complete the customer's preparation.

**Production:** Based on a manufacture plan, the raw resources are moved inventory to the manufacture area. The finished goods ordered by the customer are contrived using the raw materials purchased from suppliers.

**Transportation:** When the finished product arrives in the warehouse, the shipping section determines the most efficient method to ship the products so that they are delivered on or before the date specified by the customer.

### **Summary questions.**

1. Define Supply Chain Management.
2. What is the role of SCM in Business?
3. Explain the process of SCM.
4. Write notes on SCM.

### **Case:**

#### **Supply Chain in Desi Brands.**

Desi Brands is a specialty retail business based in Delhi, India. As of 2006, the Desi Brands family included 3,500 stores divided among seven retail brands. Most of the brands should be familiar to the average consumer. Since the first Limited store opened in 1983, the business grew dramatically, launching new stores and acquiring other companies for its retail empire. Fortune Magazine named Desi Brands number one in the specialty retail category of its "World's Most Admired Companies" survey for 2008. However, behind the scenes, operations were not always running so smoothly. Specifically, problems with the enterprise's supply chain that year led to a pretty significant catastrophe. A combination of circumstances conspired to create a traffic jam of 400 merchandise trailers at the parking lot of a distribution center that was designed to hold only 150 trailers. The logistics disaster clogged up a main highway. Aside from the public relations nightmare, the incident occurred at the beginning of a sales period. No one had any knowledge of the origin of inventory or where it was going. Matthews admitted that the company never really figured out how this happened. It was clear that the logjam was a symptom of a larger problem. Leading up to 2007, the growth rate of Desi Brands since its inception was very rapid. However, acquisitions, rather than organic growth, were responsible for a large percentage of this growth. Thus, Desi Brand's information technology infrastructure included a mishmash of systems and software from the various retailers that Limited Brands had brought into the fold.

Desi Brands had already begun to contemplate its supply chain needs a year earlier when discount retailers were pushing Limited stores out of their market space. The company reacted to the threat by focusing on

higher-end products, which carried the potential for higher profit margins. In order to get the most out of this strategy, the company needed to increase its speed to market for these products. Improved supply chain technologies that integrate and leverage the supply chain and logistics for the overall benefit of the brand were required. And, so, Desi Brands initiated the process of upgrading its supply chain and eliminating the jumble of legacy systems complicating the infrastructure. The company hoped to reap numerous rewards from the effort, including: increased sales; better flexibility for responding to market trends and customer needs; and freeing up employees to concentrate on sales rather than on tasks related to supply chain and logistics.

Developing this type of supply chain presented a number of challenges. Rashi Limited which supplies global logistics management and leadership for the supply chains used by Desi brands ran into resistance from brand executives when it first tried to integrate the supply chain logistics operations of all the Desi companies. The team launched several cross-functional projects to bolster their credibility. They built regional docking centers on the East and West Coasts to funnel products directly to stores, reducing costs and time to get products to market by as much as 10 days. This helped brand managers make much quicker decisions about which products to reorder. Brand executives embraced the transformation after they saw these results. Desi Brands also faced technical and business process obstacles, as illustrated by its work with INDIA-ERP, one of many supply chain software vendors with which the company worked. INDIA-ERP is a leading vendor of enterprise application integration software and was contracted to develop a global application integration platform. The purpose of the platform was to improve the company's ability to track and manage the flow of information through its worldwide supply chain. After this, Desi Brands was able to unite all of its brands' technology operations under a central entity. Among the company's additional technology goals were a reusable framework to enable the replication of software solutions and an enterprise resource planning (ERP) deployment.

### Case questions.

1. Analyze Desi Brands with respect to enterprise solutions perspective. What problems did it face?
2. How is supply chain management related to the company's business strategy?
3. Describe the supply chain management problems encountered by Desi Brands in this case.

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## **Chapter 9**

### **ELECTRONIC COMMERCE fundamentals , systems, applications and issues**

#### **Objectives:**

**At the end of the chapter you should be able to:**

- **Identify the concepts of E-commerce**
- **Identify the reason for growth for this E-Commerce,**
- **Explain the characteristics and types of E-Commerce.**
- **Explain th ways these are available in market and used indifferent various business applications**
- **Identify the process and technology coverage**

#### **Introduction**

Dot.com firms take many forms. Early e-commerce news profiled start-ups that used Internet technology to compete with the conventional players in an industry. For example, Amazon.com challenged well-established booksellers Waldenbooks and Barnes and Noble. Like Amazon, Tesco (the grocer discussed in the opening vignette) provides an example of business-to-consumer (B2C) e-commerce, in which customer's agreement directly with an organization and avoid any intermediaries. Other types of e-commerce are business-to-business (B2B) e-commerce, in which the participants are firms, and consumer-to-consumer (C2C) e-commerce, which involves consumers selling directly to other consumers. Neoforma.com is a B2B e-commerce company that received more than \$80 million in financing to form an Internet marketplace to take on the \$140 billion hospital supply industry. eBay is an case of a C2C e-commerce site; customers buy and sell objects directly to each other through the site.

Internet technologies are used to enhance their existing operations, such as inventory control and distribution. But whatever model is used, successful execution of e-business requires significant changes to existing business processes and substantial investment in information systems technology.

Over the past few years, we have educated a lot about the practical limitations of e-commerce. It has become painfully clear that before firms can accomplish profits, they must understand their business, their consumers, and the constraints of e-commerce. Although it once seemed so, selling low-priced consumer goods on-line in an effective storefront may not always be a great way to compete. And inventing a new use for cutting-edge technology isn't necessarily enough to promise a successful business. Starting up a dot.com company, taking it public, and selling shares at inflated stock prices before the company has earned a profit doesn't work anymore either—investors have become wary of delicate schemes.

Still, e-commerce is not departed; it is growing and developing, with the hub currently shifted from B2C to B2B. E-commerce is a useful tool for relating to business associates in a virtual supply chain to reduce costs. Noted research firm International Data Corporation (IDC) predicts B2B e-commerce will have a \$5.3 trillion impact on the worldwide economy by 2005. But even B2C e-commerce is experiencing speedy growth.

Businesses and individuals use e-commerce to reduce transaction costs, speed the flow of goods and information, improve the level of customer service, and enable close coordination among manufacturers, suppliers, and customers. E-commerce also enables consumers and firms to gain right of entry to worldwide markets. E-commerce is not limited to use by manufacturing firms; many service firms have also implemented successful e-commerce projects.

Business processes that are strong candidates for conversion to e-commerce are those that are paper based and time consuming and those that can make business more convenient for customers. Thus, it comes as no surprise that the first business processes that firms converted to an e-commerce model were those related to buying and selling. For example, after Cisco Systems, the maker of Internet routers and other telecommunications equipment, put its procurement operation on-line in 1998, the firm reported that it halved cycle times and saved an additional \$170 million in material and labor costs. Similarly, Charles Schwab & Co. slashed transaction costs by as much as 80 percent by shifting brokerage transactions from traditional channels like retail and phone centers to the Internet.

Some firms, such as those in the automotive and aerospace industries, have been conducting e-commerce for decades through the use of electronic data interchange (EDI), which involves application-to-application communications of business data (invoices, purchase orders, etc.) between firms in a standard data format. Many firms have now gone beyond simple EDI-based applications to launch e-commerce initiatives with suppliers, customers, and employees to address business needs in new areas.

Because of the costs involved in buying new technology, the EDI capabilities of most small businesses are non-existent or extremely limited. A few major retailers and manufacturers have enlisted the help of third parties to bring smaller firms into their EDI supply chain. For example, SPS Commerce specializes in hooking up small businesses like American Outdoor Products (25 employees) to big supply chains like Recreational Equipment Incorporated (REI). SPS built an Internet-based application that translates EDI ordering and shipping requirements so that workers can access them through a Web browser on their PC.

## **E-COMMERCE CHALLENGES**

A number of challenges must be overcome for a firm to convert its business processes from the traditional form to e-commerce processes. This section summarizes a few.

The first major challenge is for the firm to describe an effective e-commerce mock-up and strategy. Although a number of dissimilar approaches can be worn, the most winning e-commerce models include three basic components: community, content, and commerce. Message boards and chat rooms are used to build a loyal community of people who are interested in and enthusiastic about the firm and its products and services. Providing useful, accurate, and timely content—such as industry and economic news and stock quotes—is a sound approach to get people to return to your Web site time and again. Commerce involves consumers and businesses paying to purchase physical goods, information, or services that are posted or advertised on-line.

Tesco designed its Web site (<http://www.tesco.com>) with these three components in mind. For community, Tesco offers bulletin boards, presentations, and forums in which users can converse with other people and experts in various topics such as beauty, work and career, pregnancy, and diet and fitness through their iVillage feature. For content, it provides information about topics such as healthy living, you and your child, and personal finance. For commerce, Tesco provides a means for shoppers to order provisions and other items.

A major challenge for firms moving to business-to-consumer e-commerce is the need to change distribution systems and work processes to be able to manage shipments of individual units directly to consumers. Traditional distribution systems send complete cases of a product to a store. The store opens the cases, takes the individual units out, and stacks them on a shelf. Then consumers walk through the aisles and pick up what they need. In business-to-consumer e-commerce, firms need a distribution system that can manage split-case distribution, in which cases of goods are split open on the receiving dock and the individual items are stored on shelves or in bins in the warehouse. The distribution system must also be able to ship and track individual items. The demands of business-to-

consumer e-commerce fulfillment are so great that many on-line vendors outsource the function to firms like FedEx and UPS.

## **THE E-COMMERCE SUPPLY CHAIN**

Supply chain management is composed of three sub-processes: demand planning to expect market demand, supply planning to allot the right amount of enterprise resources to meet demand, and demand fulfillment to fulfill demand quickly and efficiently. The objective of demand planning is to understand customers' buying patterns and develop collective, collaborative long-term, intermediate-term, and short-term forecasts of customer demand. Supply planning includes strategic planning, inventory planning, distribution planning, procurement planning, transportation planning, and supply allocation. The goal of demand fulfillment is to provide fast, accurate, and dependable delivery for customer orders. Demand fulfillment includes order capturing, customer verification, order promising, backlog management, and order fulfillment.

Conversion to e-commerce supply chain management provides businesses an opportunity to achieve operational excellence by increasing revenues, decreasing costs, improving customer satisfaction, and reducing inventory. But to achieve this goal requires integrating all sub-processes that exchange information and move goods between suppliers and customers, including manufacturers, distributors, retailers, and any other enterprise within the unlimited supply chain. By eliminating or reducing time-consuming and labor-intensive steps throughout the order and delivery process, more sales can be completed in the same time period and with increased accuracy.

With increased speed and accuracy of customer order information, firms can reduce the need for inventory—from raw materials, to safety stocks, to finished goods—at all the intermediate manufacturing, storage, and transportation points. Some firms are increasing inventory levels above this minimum to make sure that they can meet changes in forecasted customer needs. Nippon Steel is using supply chain management software from i2 Technologies to cut delivery lead times for products and reduce inventories both for itself and its customers. The initial phase of the consumption provides customers with Web access to ordering, production, and quality data from the firm's steel materials, coil centers, and steel plan divisions.

## **Types of E-Commerce**

### **\* BUSINESS TO BUSINESS (B2B).**

Although the business-to-consumer (B2C) market grabs more of the news headlines, the business-to-business (B2B) market is considerably larger and is growing much more rapidly. Business-to-business e-commerce offers enormous opportunities. It allows manufacturers to buy at a low cost worldwide, and it offers enterprises the chance to sell to a global market right from the start. Moreover, e-commerce offers great promise for developing countries, helping them to enter the prosperous global marketplace, and hence helping reduce the gap between rich and poor countries.

The rapid development of e-commerce presents great challenges to society. Even though e-commerce is creating new job opportunities, it could also cause a loss of employment in traditional job sectors. Many firms may fail in the intense competitive environment of e-commerce and find themselves out of business. Therefore, it is vital that the opportunities and implications of e-commerce be understood.

### **\* BUSINESS TO CONSUMER (B2C)**

Although it is gaining acceptance, e-commerce for consumers is still in its early stages. Many shoppers are not yet convinced that it is worthwhile to connect to the Internet, search for shopping sites, wait for the images to download, try to figure out the ordering process, and then worry about whether their credit card numbers will be stolen by a hacker. But attitudes are changing, and an increasing number of shoppers are beginning to appreciate the importance of e-commerce. For time-strapped households, consumers are asking themselves, Why waste time fighting crowds in shopping

malls when from the comfort of home I can shop on-line anytime and have the goods delivered directly? The shoppers know that many goods and services are cheaper when purchased via the Web. They can also get information about automobiles, cruises, loans, insurance, and homes to cut better deals. More than a new tool for placing orders, the Internet is emerging as a paradise for comparison shoppers. Internet shoppers can, for example, unleash shopping bots or access sites such as Excite or Yahoo to browse the Internet and obtain lists of items, prices, and merchants. By using business-to-consumer e-commerce to sell directly to consumers, producers or providers of consumer services can eliminate the middlemen, or intermediaries, between them and the end consumer. In many cases, this squeezes costs and inefficiencies out of the supply chain and can lead to higher profits and lower prices for consumers.

#### **\* CONSUMER TO CONSUMER (C2C)**

Consumer-to-consumer (C2C) e-commerce involves consumers selling directly to other consumers. Often this exchange is done through Web auction sites like eBay that enabled people to sell over \$9 billion in merchandise in 2001 to other consumers by auctioning them off to the highest bidder. The growth of C2C is responsible for reducing the use of the classified pages of a newspaper to advertise and sell personal items.

The first step in developing a global e-commerce strategy is to determine which global markets make the most sense for selling products or services on-line. One approach is to target regions and countries in which a firm already has on-line customers. Firms can track the country domains from which current users of a site are visiting, and established global firms can look to their overseas offices to help establish the languages and countries to target for their Web sites.

Once a firm decides which global markets it wants to reach with its Web site, it must adapt an existing U.S.-centric site to another language and culture— a process called localization. Localization requires firms to have a deep understanding of the country, its people, and the market, which means either building a physical presence in the country or forming partnerships so that detailed knowledge can be gathered. Firms must take painstaking steps to ensure that e-commerce customers have a local experience even though they're shopping at the Web site of a foreign firm.

Some of the steps involved in localization are the following:

- Recognizing and conforming to the nuances, subtleties, and tastes of local cultures.
- Supporting basic trade laws such as each country's currency, payment preferences, taxes, and tariffs.
  - Ensuring that technological capabilities match local connection speeds.

Tailoring a site to another country is not easy. When Dell Computer launched an e-commerce site to sell PCs to consumers in Japan, it made the fault of surrounding most of the site's content with black borders, a negative sign in Japanese culture. Japanese Web shoppers took one look at the site and fled. Also, support for Asian languages is difficult because Asian alphabets are more complex and not all Web development tools are capable of handling them. As a result, many firms choose to tackle Asian markets last. In addition, great care must be taken to choose icons that are appropriate to a country. For example, the use of mailboxes and shopping carts may not be familiar to global consumers. Users in European countries don't take their mail from large, tubular receptacles, nor do many of them shop in stores large enough for wheeled carts.

One of the most important and most tricky decisions in a company's global Web strategy is whether Web content should be generated and updated centrally or locally. Firms that expand through international partnerships may be tempted to hand control to the new international entities to take the greatest advantage of the proficiency of employees in the new markets. But turning over too much control can lead to a muddle of country-specific sites with no consistency and a speckled corporate message. A mixed model of control may be best. Decisions about corporate identity, brand representation, and the technology used for the Web sites can be made centrally to minimize Web



development and support effort as well as to present a consistent corporate and brand message. But a local authority can decide on content and services best tailored for given markets.

## **E-COMMERCE APPLICATIONS**

Since B2B, B2C, C2C, and global e-commerce use is spreading, it's important to examine some of the most common current uses. E-commerce is being applied to retail and wholesale, manufacturing, marketing, investment and finance, and auctions.

Electronic retailing, sometimes called e-tailing, is the direct sale from business to consumer through electronic storefronts, which are typically designed around the familiar electronic catalog and shopping cart model. Firms such as Office Depot, Wal-Mart, and many others have used the same model to sell wholesale to employees of corporations. There are tens of thousands of electronic retail Web sites—selling literally everything from soup to nuts. In addition, cybermalls are another means to support retail shopping. A cybermall is a site that offers many products at one Internet location—the basic concept of regular shopping mall. An Internet cybermall pulls together multiple buyers and sellers into one virtual place, easily reachable through a Web browser.

Giant retailer Sears, Roebuck and Co. provides an example of how e-commerce is transforming retail selling. Sears gives its shoppers the chance to order on-and pick up items in its stores. To offer that capability, Sears had to implement technology to enable near-real-time inventory checks so customers can determine whether an item is in stock at a given store.

Office Depot and Amazon.com provide yet another example of how e-commerce is transforming retail selling. In September 2002, Amazon.com signed an e-commerce alliance deal with Office Depot to host an office products store on its site. More than 50,000 office products are available for sale on-line.

### **(a) MANUFACTURING**

One approach taken by many manufacturers to raise profitability and get better customer service is to move their supply chain operations onto the Internet. With such an exchange, the business center is not a physical building but a network-based site where business connections occur. This approach has greatly speeded the movement of raw materials and finished products among all members of the business community, thus tumbling the amount of inventory that must be maintained- also led to a much more competitive marketplace and lower prices. Private exchanges are owned and operated by a single firm. The owner uses the exchange to trade exclusively with established business partners. Public exchanges are owned and operated by industry groups. They provide services and a common technology platform to their members and are open, usually for a fee, to any company that wants to use them.

### **(b) MARKETING**

The nature of the Web allows firms to gather much more information about customer behavior and preferences than they could use other marketing approaches. Marketing organizations can measure a large number of activities as customers and potential customers gather information and make their purchase decisions. Analysis of this data is complex because of the Web's interactivity and because each visitor voluntarily provides or refuses to provide personal data such as name, address, e-mail address, telephone number, and demographic data. Internet advertiser's use the data they gather to identify specific portions of their markets and target them with tailored advertising messages. This practice, called market segmentation, divides the pool of potential customers into segments, which are usually defined in terms of demographic characteristics such as age, gender, marital status, income level, and geographic location.

## **© INVESTMENT AND FINANCE**

The Internet has revolutionized the world of investment and finance. Perhaps the changes have been so great because this industry had so many built-in inefficiencies and so much opportunity for improvement.

Before the World Wide Web, if you wanted to invest in stocks, you called your broker and asked what looked promising. He'd tell you about two or three firms and then would try to sell you shares of a stock or perhaps a mutual fund. The sales commission was well over \$ 100 for the stock (depending on the price of the stock and the number of shares purchased) or as much as an 8 percent sales charge on the mutual fund. If you wanted information about the firm before you invested, you would have to wait two or three days for a one-page Standard and Poor's stock report providing summary information and a chart of the stock price for the past two years to arrive in the mail. Once you purchased or sold the stock, it would take two days to get an order confirmation in the mail, detailing what you paid or acknowledged for the stock.

### **(c) On-Line Banking**

On-line banking customers can check balances like savings, checking, and loan accounts; transfer money among accounts; and disburse bills. With on-line banking, one think they can gain a better current knowledge of how much they have in the bank, eradicate the need to write checks in longhand, and reduce how much they spend on envelopes and stamps. All of the nation's major banks and many of the smaller banks enable their customers to pay bills on-line. In 2001, 15 million Americans paid bills on-line, and Americans took out at least 8160 billion in mortgages on-line in 2001, 8 percent of the total market. The number of Americans who pay bills online is expected to reach 46 million by 2005.

### **(d) AUCTIONS**

The Internet has created many new options for C2C, including electronic auctions, where geographically isolated buyers and sellers can come together. A special type of auction called bidding allows a prospective buyer to place only one bid for an item or a service. Priceline.com is the patented Internet bidding system that enables consumers to achieve significant savings by naming their own price for goods and services. Priceline.com takes these consumer offers and then presents them to sellers, who can fill as much of that guaranteed demand as they wish at price points determined by buyers.

Once you have located or built a host server, including the hardware, operating system, and Web server software, you can begin to inspect and install e-commerce software. There are five core tasks that e-commerce software must support: catalog management, product configuration, shopping cart facilities, e-commerce transaction processing, and Web traffic data analysis.

The specific e-commerce software you choose to purchase or install depends on whether you are setting up for B2B or B2C. For example, B2B transactions do not include sales tax calculations, and software to support B2B must incorporate electronic data transfers between business partners, such as purchase orders, shipping notices, and invoices. B2C software, on the other hand, must handle the complication of accounting for sales tax based on the current laws and rules in effect in the various states.

## **ELECTRONIC PAYMENT SYSTEMS**

These are a key component of the e-commerce infrastructure. A digital certificate is an attachment to an e-mail message or data embedded in a Web site that verifies the identity of a sender or Web site. A certificate authority (CA) is a trusted third-party organization or firm that issues digital certificates. The CA is responsible for guaranteeing that the individuals or organizations granted these unique certificates are, in fact, who they claim to be. Digital certificates thus create a trust chain throughout the transaction, verifying boom purchaser and supplier identities.

### **(1) ELECTRONIC CASH**

**Electronic cash** is an amount of money that is computerized, stored, and used as cash for e-commerce transactions. A consumer must open an account with a bank and show some identification to establish identity to obtain electronic cash. Then whenever the consumer wants to withdraw electronic cash to make a purchase, he or she accesses the bank via the Internet and presents proof of identity—typically a digital certificate issued by a certification authority. After the bank verifies the consumer's identity, it

issues the consumer the requested amount of electronic cash and deducts the same amount from the consumer's account.

## **(2) ELECTRONIC WALLETS**

On-line shoppers quickly tire of repeatedly entering their shipment and payment information each time they make a purchase. Electronic wallet holds credit card information, electronic cash, owner identification, and address information. It provides this information at an e-commerce site's checkout counter. When consumers click on items to purchase, they can then click on their electronic wallet to order the item, thus making on-line shopping much faster and easier.

## **(3) SMART, CREDIT, CHARGE, AND DEBIT CARDS**

On-line shoppers use credit and charge cards for the majority of their Internet purchases. A credit card, such as Visa or MasterCard, has a preset spending limit based on the user's credit limit, and each month the user can pay off a portion of the amount owed or the entire credit card balance. Interest is charged on the unpaid amount. A charge card, such as American Express, carries no preset spending limit, and the entire amount charged to the card is due at the end of the billing period. Charge cards do not involve lines of credit and do not gather interest charges.

Debit cards look like credit cards or automated teller machine (ATM) cards, but they operate like cash or a personal check. While a credit card is a way to "buy now, pay later," a debit card is a way to "buy now, pay now." Debit cards allow you to spend only what is in your bank account. It is a quick transaction between the merchant and your personal bank account. When you use a debit card, your money is quickly deducted from your checking or savings account. Credit, charge, and debit cards currently store limited information about you on a magnetic band. This information is read each time the card is swiped to make a purchase. All credit card customers are protected by law from paying any more than \$50 for fraudulent transactions. At Visa, on-line purchases account for the highest amount of purchase fraud—24 cents for every \$100 spent, compared with 6 cents for every \$100 overall. Indeed, the risk of bogus credit card transactions has slowed the growth of e-commerce by exposing merchants to substantial losses and making on-line shoppers nervous. Credit card fraud accounted for \$1.2 billion of total on-line sales of \$65 billion in 2001, with merchants forced to cover most of those losses. Banks charge merchants an average fee of 2.5 percent for on-line transactions compared with 1.5 percent for in-store purchases to offset the costs of credit card fraud.

The smart card is a credit card -sized device with an entrenched microchip to provide electronic memory and processing capability. Smart cards can be used for a variety of purposes, including storing a user's financial facts, health insurance data, credit card numbers, and network identification codes and passwords. They can also store monetary values for spending.

Conventional credit, charge, and debit cards clearly show your account number on the face of the card. The card number, along with a forged signature, is all that a thief needs to purchase items and charge them against your card. A smart card makes credit theft practically impossible because a key to unlock the encrypted information is required, and there is no external number that a thief can recognize and no physical signature a thief can forge.

## **Summary:**

A number of challenges must be overcome for a firm to convert its business processes from the traditional form to e-commerce processes. This section summarizes a few.

The first major challenge is for the firm to define an effective e-commerce model and strategy. Although a number of different approaches can be used, the most successful e-commerce models include three basic components: community, content, and commerce. Message boards and chat rooms are used to build a loyal community of people who are interested in and enthusiastic about the firm and its products and services. Providing useful, accurate, and timely content—such as industry and economic news and

stock quotes—is a sound approach to get people to return to your Web site time and again. Commerce involves consumers and businesses paying to purchase physical goods, information, or services that are posted or advertised on-line. A major challenge for firms moving to business-to-consumer e-commerce is the need to change distribution systems and work processes to be able to manage shipments of individual units directly to consumers. Traditional distribution systems send complete cases of a product to a store. The store opens the cases, takes the individual units out, and stacks them on a shelf. Then consumers walk through the aisles and pick up what they need. In business-to-consumer e-commerce, firms need a distribution system that can manage split-case distribution, in which cases of goods are split open on the receiving dock and the individual items are stored on shelves or in bins in the warehouse. The distribution system must also be able to ship and track individual items. The demands of business-to-consumer e-commerce fulfillment are so great that many on-line vendors outsource the function to firms like FedEx and UPS. There are several types of E-commerce types.

Since B2B, B2C, C2C, and global e-commerce use is spreading, it's important to examine some of the most common current uses. E-commerce is being applied to retail and wholesale, manufacturing, marketing, investment and finance, and auctions. The specific e-commerce software you choose to purchase or install depends on whether you are setting up for B2B or B2C. For example, B2B transactions do not include sales tax calculations, and software to support B2B must incorporate electronic data transfers between business partners, such as purchase orders, shipping notices, and invoices. B2C software, on the other hand, must handle the complication of accounting for sales tax based on the current laws and rules in effect in the various states.

**Keywords:**

Electronic data interchange (EDI): it involves application-to-application communications of business data (invoices, purchase orders, etc.) between firms in a standard data format.

Digital Certificate: A digital certificate is an attachment to an e-mail communication or data entrenched in a Web site that verifies the uniqueness of a sender or Web site.

Electronic Wallet: An electronic wallet holds credit card information, electronic cash, owner identification, and address information. It provides this information at an e-commerce site's checkout counter.

Smart Card: The smart card is a credit card -sized machine with an entrenched chip to provide electronic memory and dispensation capability.

**Summary questions:**

1. What is E-commerce?
2. What are the benefits of E-Commerce?
3. Write notes on E-cash.
4. What are the types of E-commerce? Explain.
5. Explain the applications of E-Commerce.

**Case: E-commerce at eBay.**

eBay.com is an online auction service whose business model is ideally suited to the Web. eBay stores no inventory and ships no products. Instead, it derives its revenue from the movement of information, an ideal task for the Internet. eBay has mass appeal because its fully automated auction service helps buyers and sellers trade high-end articles, such as fine art, automobiles, and jewellery, as well as more mundane and practical items, such as clothing, consumer electronics, and house wares. Users can list their goods under more than 30 main categories and tens of thousands of subcategories.

The success of eBay relies on a unique formula. eBay derives the bulk of its revenue from fees and commissions associated with its trading services. This revenue, however, is only made possible by the hundreds of thousands of people who put time and effort into selling goods on eBay but do not work for the company. Nearly half a million people rely on eBay auctions as their main source of income. The seller pays an insertion fee for listing goods that operates on a sliding scale. A portion of eBay's revenue also comes from direct advertising on the site, as well as end-to-end service providers whose services increase the ease and speed of eBay transactions. The acquisition of PayPal, whose service enables the exchange of money between individuals over the Internet, brings additional transaction-based fee revenue. PayPal charges the recipients of payments a flat fee plus a percentage of the total transaction size and has more than 70 million user accounts. eBay's growth strategy focuses on expansion in geography and scope and on continuing innovation to enhance the variety and appeal of products on its sites. eBay has taken its model to numerous foreign markets and been successful, particularly in England, France, and Germany. It is also working hard to gain a foothold in the Chinese online auction market.

eBay is betting heavily that Internet telephony will become an integral part of the e-commerce experience and accelerate trade on its Web site. The service could potentially generate \$3.5 billion in revenue from markets that eBay traditionally had trouble penetrating, such as real estate, travel, new-car sales, and expensive collectibles. Those markets require more communication among buyers and sellers than eBay currently offers and Skype will provide voice communication services to help. Internet companies such as Google and Microsoft are now offering VoIP services, and VoIP may become a required capability for all major companies that do business online. Even though eBay has taken steps to prohibit the listing of certain items, it may be liable if its members nonetheless manage to use it to sell unlawful goods, such as weapons, drugs, alcohol, adult material, and cigarettes, or if its members defame or libel one another in eBay's Feedback Forum. With online crime becoming more and more sophisticated, the onus is on eBay to provide its users with a secure trade environment. Some users, and former users, believe that the company has not adequately addressed the issue of fraud. The growing scale of eBay makes fraud protection prohibitive. eBay insists that the percentage of listings on its site that are fraudulent is tiny and that the success of the marketplace bears that out.

#### **Case questions:**

1. What is eBay's business model and business strategy? How successful has it been?
2. What are the problems that eBay is currently facing?
3. How is eBay trying to solve these problems?

#### **Source for this case:**

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## **CHAPTER 10.**

### **Implementing Business Systems**

#### **Objectives:**

**At the end of the chapter you should be able to:**

- **Identify the concepts of business systems**
- **Identify the reason developing business systems**
- **Explain th ways these are available in market and used indifferent various business applications**

#### **Introduction**

Every organization needs effective decision making to reach its objectives and goals. In most cases, strategic planning and the overall goals of the organization set the stage for value-added processes and the decision making required to make them work. Often, information systems assist with strategic planning and problem solving. Good decision analysis, for example, contributed about a billion dollars to Eastman Kodak's profits during the 1990s.

In business, one of the highest compliments you can get is to be recognized by your colleagues and peers as a "real problem solver." Problem solving is a critical activity for any business organization. Once a problem has been identified, the problem-solving process begins with decision making. A well-known model developed by Herbert Simon divides the decision-making phase of the problem-solving process into three stages: intelligence, design, and choice. This model was later incorporated by George Huber into an expanded model of the entire problem-solving process.

The first stage in the problem-solving process is the intelligence stage. During this stage, potential problems or opportunities are identified and denned. Information is gathered that relates to the cause and scope of the problem. During the intelligence stage, resource and environmental constraints are investigated. For example, exploring the possibilities of shipping tropical fruit from a farm in Hawaii to stores in Michigan would be done during the intelligence stage. The perishability of the fruit and the maximum price consumers in Michigan are willing to pay for the fruit are problem constraints. Aspects of the problem environment that must be considered in this case include federal and state regulations regarding the shipment of food products.

In the design stage, alternative solutions to the problem are developed. In addition, the feasibility of these alternatives is evaluated. In our tropical fruit example, the alternative methods of shipment, including the transportation times and costs associated with each, would be considered. During this stage the problem solver might determine that shipment by freighter to California and then by truck to Michigan is not feasible because the fruit would spoil.

The last stage of the decision-making phase, the choice stage, requires selecting a course of action. In our tropical fruit example, the Hawaiian farm might select the method of shipping by air to Michigan as its solution. The choice stage would then conclude with selection of the actual air carrier. As we will see later, various factors influence choice; the apparently easy act of choosing is not as simple as it might first appear.

Problem solving includes and goes beyond decision making. It also includes the implementation stage, when the solution is put into effect. For example, if the Hawaiian farmer's decision is to ship the tropical fruit to Michigan as air freight using a specific air freight company, implementation involves informing the farming staff of the new activity, getting the fruit to the airport, and actually shipping the product to Michigan.

The final stage of the problem-solving process is the monitoring stage. In this stage, decision makers evaluate the implementation to determine whether the anticipated results were achieved and to modify the process in light of new information. Monitoring can involve feedback and adjustment. For example, after the first shipment of fruit, the Hawaiian farmer might learn that the flight of the chosen air freight firm routinely makes a stopover in Phoenix, Arizona, where the plane sits on the runway for a number of hours while loading additional cargo. If this unforeseen fluctuation in temperature and humidity adversely affects the fruit, the farmer might have to readjust his solution to include a new air freight firm that does not make such a stopover, or perhaps he would consider a change in fruit packaging.

The primary purpose of an MIS is to help an organization achieve its goals by providing managers with insight into the regular operations of the organization so that they can control, organize, and plan more effectively and efficiently. One important role of the MIS is to provide the right information to the right person in the right fashion at the right time. In short, an MIS provides managers with information, typically in reports, that support effective decision making and provides feedback on daily operations. Note that business transactions can enter the organization through traditional methods or via the Internet or an extranet connecting customers and suppliers to the firm's transaction processing systems. The use of management information systems spans all levels of management. That is, they provide support to and are used by employees throughout the organization.

Most organizations are structured along functional lines or areas. This functional structure is usually apparent from an organization chart, which typically shows vice presidents under the president. Some of the traditional functional areas are accounting, finance, marketing, personnel, research and development (R&D), legal services, operations/production management, and information systems. The MIS can be divided along those functional lines to produce reports tailored to individual functions.

### **types of Functional Business systems**

#### **(1) FINANCIAL MANAGEMENT INFORMATION SYSTEMS**

A financial management information system provides financial information not only for executives but also for a broader set of people who need to make better decisions on a daily basis.



Finding opportunities and quickly identifying problems can mean the difference between a business's success and failure. Specifically, the financial MIS performs the following functions:

- Integrates financial and operational information from multiple sources, including the Internet, into a single MIS.
- Provides easy access to data for both financial and nonfinancial users, often through use of the corporate intranet to access corporate Web pages of financial data and information.
- Makes financial data available on a timely basis to shorten analysis turnaround time.
- Enables analysis of financial data along multiple dimensions—time, geography, product, plant, customer.
  - Analyzes historical and current financial activity.
  - Monitors and controls the use of funds over time.

Depending on the organization and its needs, the financial MIS can include both internal and external systems that assist in acquiring, using, and controlling cash, funds, and other financial resources. These subsystems of the financial MIS have a unique role in adding value to a company's business processes. For example, a real estate development company might use a financial MIS subsystem to help it use and manage funds. Suppose the firm takes \$10,000 deposits on condominiums in a new development. Until construction begins, the company will be able to invest these surplus funds. By using reports produced by the financial MIS, finance staff can analyze investment alternatives. The company might invest in new equipment or purchase global stocks and bonds. The profits generated from the investment can be passed along to customers in different ways. The company can pay stockholders dividends, buy higher quality materials, or sell the condominiums at a lower cost.

## (2) MANUFACTURING MANAGEMENT INFORMATION SYSTEMS

More than any other functional area, manufacturing has been revolutionized by advances in technology. As a result, many manufacturing operations have been dramatically improved over the last decade. Also, with the emphasis on greater quality and productivity, having an efficient and effective manufacturing process is becoming even more critical. The use of computerized systems is emphasized at all levels of manufacturing— from the shop floor to the executive suite. The use of the Internet has also streamlined all aspects of manufacturing.

The subsystems and outputs of the manufacturing MIS monitor and control the flow of materials, products, and services through the organization. The objective of the manufacturing MIS is to produce products that meet customer needs—from the raw materials provided by suppliers to finished goods and services delivered to customers—at the lowest possible cost. Procter & Gamble, Gillette, Wal-Mart, and Target have helped to fund research into this new manufacturing MIS. Car manufacturers, which convert raw steel, plastic, and other materials into a finished automobile, also monitor the manufacturing process. Auto manufacturers add thousands of dollars of value to the raw materials they use in assembling a car. If the manufacturing MIS also lets them provide customized paint colors on any of their models, it has further added value (although less tangible) by ensuring a direct customer fit. In doing so, the MIS helps provide the company the edge that can differentiate it from competitors.

## (3) MARKETING MANAGEMENT INFORMATION SYSTEMS

A marketing information system supports managerial activities in product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting. Marketing functions are increasingly being performed on the Internet. A number of firms are developing Internet marketplaces to advertise and sell products. Customer relationship management (CRM) programs, available from some ERP vendors, help a company manage all aspects of customer encounters. CRM software can help a company collect customer data, contact customers, educate customers on new products, and sell products to customers through an Internet site. Alaska Airlines used a CRM system to notify customers about flight changes after the September 11th tragedy.

Surveys, questionnaires, pilot studies, and interviews are popular marketing research tools. The purpose of marketing research is to conduct a formal study of the market and customer preferences. Marketing research can identify prospects (potential future customers) as well as the features that current customers really want in a good or service (such as green ketchup or vanilla-flavored cola). Such attributes as style, color, size, appearance, and general fit can be investigated through marketing research. Pricing, distribution channels, guarantees and warranties, and customer service can also be determined.

Forecasting demand can be an important result of marketing research and sophisticated software. The Internet is changing the way many firms think about marketing research. Conventional methods of collecting data often cost millions of dollars-For a fraction of these costs, firms can put up Internet information server and launch discussion groups on topics that their customers care about. These information sites must be well designed, or they won't be visited, but a frequently visited site can provide feedback worth a fortune. Firms that are viewed as credible, not just clever, will win enormous advantages. Presence and intelligent interaction, not just advertising, are the keys that will unlock commercial opportunities on-line. Some people, however, consider Internet marketing research to be a nuisance or even harmful. Some firms gather information on customers using cookies, which collect data on people's Internet surfing habits, and sell it to others. To protect customer privacy and keep the valuable marketing research data to themselves, some firms, including General Motors, Ford, and Procter & Gamble, are starting to block Internet ad servers from getting the data.

Product development involves the conversion of raw materials into finished goods and services and focuses primarily on the physical attributes of the product. Many factors, including plant capacity, labor skills, engineering factors, and materials are important in product development decisions. In many cases, a computer program is used to analyze these various factors and to select the appropriate mix of labor, materials, plant and equipment, and engineering designs. Make-or-buy decisions can also be made with the assistance of computer programs. Faucet maker Moen decided to carry a variety of products with different colors and styles. It concluded that it was not in the business of selling hardware but instead should be selling fashion and jewelry for bathrooms and kitchens. Using the Internet and product-development software, the 50 engineers responsible for new product development were able to reduce the time from design to placement on store shelves from 24 months to only 16 months.

One of the most important functions of any marketing effort is promotion and advertising. Product success is a direct function of the types of advertising and sales promotion done.

#### (4) RESOURCE MANAGEMENT INFORMATION SYSTEMS

A human resource MIS, also called the personnel MIS, is concerned with activities related to employees and potential employees of the organization. Because the personnel function relates to all other functional areas in the business, the human resource MIS plays a valuable role in ensuring organizational success. Some of the activities performed by this important MIS include workforce analysis and planning; hiring; training; job and task assignment; and many other personnel-related issues. Personnel issues can include offering new hires attractive stock option and incentive programs. One company, for example, offered new engineers a two-year lease on a sporty BMW roadster as a signing bonus. An effective human resource MIS will allow a company to keep personnel costs at a minimum while serving the required business processes needed to achieve corporate goals.

Human resource subsystems and outputs range from the determination of human resource needs and hiring through retirement and outplacement. Outputs of the human resource MIS include reports such as human resource planning reports, job application review profiles, skills inventory reports, and salary surveys.

#### (5) OTHER MANAGEMENT INFORMATION SYSTEMS

In addition to finance, manufacturing, marketing, and human resource MISs, some firms have other functional management information systems. For example, most successful firms have well-developed accounting function and a supporting accounting MIS. Also, many firms make use of geographic information systems for presenting data in a useful form.

In some cases, accounting works closely with financial management. An accounting MIS performs a number of important activities, providing aggregate information on accounts payable, accounts receivable, payroll, and many other applications. The organization's TPS captures accounting data, which is also used by most other functional information systems.

Some smaller firms hire outside accounting firms to assist them with their accounting functions. These outside firms produce reports for the firm using raw accounting data. In addition, many excellent integrated accounting programs, such as QuickBooks, are available for personal computers in small firms. Depending on the needs of the small organization and its personnel's computer experience, using these computerized accounting systems can be a very cost-effective approach to managing information.

Increasingly, managers want to see data presented in graphical form. A geographic information system (GIS) is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, that is, data identified according to their locations. A GIS enables users to pair maps or map outlines with tabular data to describe aspects of a particular geographic region. For example, sales managers may want to plot total sales for each county in the states they serve. Using a GIS, they can specify that each county be shaded to indicate the relative amount of sales—no shading or light shading represents no or little sales and deeper shading represents more sales. As seen in the "IS Principles in Action" box, a GIS can be invaluable in helping to eradicate a forest pest, prevent forest damage, and save millions of dollars.

Because the GIS works with any data represented in tabular form, graphical capability is finding its way into spreadsheets. For example, Excel and Lotus include a mapping tool that lets you plot spreadsheet data as a demographic map. Such applications show up frequently in scientific investigations, resource management, and real-estate development planning. Retail, government, and utility organizations are frequent users of GISs.

## **Summary:**

Problem solving is a critical activity for any business organization. Once a problem has been identified, the problem-solving process begins with decision making. A well-known model developed by Herbert Simon divides the decision-making phase of the problem-solving process into three stages: intelligence, design, and choice. Most organizations are structured along functional lines or areas. This functional structure is usually apparent from an organization chart, which typically shows vice presidents under the president. Some of the traditional functional areas are accounting, finance, marketing, personnel, research and development (R&D), legal services, operations/production management, and information systems. A financial management information system provides financial information not only for executives but also for a broader set of people who need to make better decisions on a daily basis. A marketing information system supports managerial activities in product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting. Marketing functions are increasingly being performed on the Internet.

A human resource MIS, also called the personnel MIS, is concerned with activities related to employees and potential employees of the organization. A geographic information system (GIS) is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, that is, data identified according to their locations. A GIS enables users to pair maps or map outlines with tabular data to describe aspects of a particular geographic region. Every organization needs effective decision making to reach its objectives and goals. In most cases, strategic planning and the overall goals of the organization set the stage for value-added processes and the decision making required to make them work. Often, information systems assist with strategic planning and problem solving.

## **Keywords:**

Simons model phases: the three stages are intelligence, design, and choice.

Financial management information system: it provides financial information not only for executives but also for a broader set of people who need to make better decisions on a daily basis.

Marketing information system: it supports managerial activities in product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting.

Human resource information system: it is concerned with activities related to employees and potential employees of the organization.

Geographic information system (GIS): it is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information,

### **Summary Questions:**

1. Explain the concept of Business Systems.
2. What the role is of IS in marketing and Finance?
3. Write notes on HRIS.

### **Case:**

#### **An Information System for a Government Army**

The Soldiers' pay could be adjusted frequently depending on where they were serving and what level of danger they were facing at a particular time, in a country. The Army did not deny that its payroll systems were flawed. It conducted an audit in the fall of 2000 that showed payment irregularities for 14 percent of the 24,000 soldiers that had been wounded in wars or evacuated for medical reasons. Some had not received enough pay, some received too much, and in some cases there was simply an indication that more evidence was required to see if there was a problem. The Government said that only some of the soldiers who were overpaid received notification; others simply stopped getting money. It reported that at the time of the audit, the Army had logged \$1.5 million on over-payments to 1,300 soldiers wounded or wars.

It also found that non-injured soldiers were regularly receiving inaccurate pay-checks, the result of reaching different stages of their deployments and redeployments. It un-covered payroll and personnel system problems throughout the Army's operations, but it paid particular attention to those affecting the Reserves. Salaries, bonuses, and benefits for 200,000 reservists originated from this custom-built payroll application. But the payroll management system needed information from the personnel system, known as the Regional Level Application Software system, and the two systems were not well integrated. Reservists normally received payment for performing weekend drills and for their two weeks of active duty per year. However, when a few hundred thousand of them were called up to active duty, the adjustments in their pay often necessitated manual updates to the system, which increased the chance of errors. The Web-based Regional Level Application Software system tracked when reservists participated in their drills, which skills they learned, and where and how long they were called up for combat duty. The payroll system relied on the personnel system's data, including soldier deployment and marital status, to process pay transactions. The integration of the two systems improved over the years, but never really reached an acceptable level.

Making changes was complicated by the age of the system, the number of patches that already had been applied, and a lack of documentation. The system contained millions of lines of programming code, and without proper documentation, changing any of them to perform a fix had the potential to damage the system elsewhere.

The software lacked even the flexibility to follow changes in state tax rates, which had to be programmed manually at a cost of 12 to 18 months. The lag time for such updates often forced soldiers to file corrected tax returns.

### Case Questions:

1. Based on the above facts, can you suggest in improving the IS?
2. Do you really think that a better IS in army for pay roll process would be feasible?

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## **CHAPTER 11.**

### **Developing Business IT Solutions and SDLC**

#### **Objectives:**

**At the end of the chapter you should be able to:**

- **Identify the concepts of system development**
- **Identify the reason developing business systems**
- **Explain the characteristics and steps in SDLC.**

#### Introduction

When an organization needs to accomplish a new task or change a work process, how does it do it? It develops a new system or modifies an existing one. Systems development is the activity of creating or modifying existing business systems. As seen in the opening vignette, the bankruptcy of a partner can even launch a systems development project.

The result of systems development can mean the success or failure of an entire organization. Successful systems development has resulted in huge increases in revenues and profits. Firms that don't innovate with new systems development initiatives or fail to successfully complete a systems development effort can lose millions.

#### **AN OVERVIEW OF SYSTEMS DEVELOPMENT**

In today's businesses, managers and employees in all functional areas work together and use business information systems.

#### **PARTICIPANTS IN SYSTEMS DEVELOPMENT**

A project is a planned collection of activities that achieves a goal, such as constructing a new manufacturing plant or developing a new decision-support system. All projects have a defined starting point and ending point, normally expressed as dates such as August 4<sup>th</sup> and November 11<sup>th</sup>. Most have a budget, such as \$ 150,000. A project manager is the individual responsible for coordinating all people and resources needed to complete a project on time. In systems development, the project manager can be an information systems person inside the organization or an external consultant hired to complete the project. Project managers need technical, business, and people skills. In addition to completing the project on time and within the specified budget, the project manager is usually responsible for controlling project quality, training, communications, risks, and the acquisition of any necessary equipment, including office supplies and sophisticated computer systems.

The IS competence of managers can have a big impact on the systems development effort. A study of the IS competence of business managers revealed that those managers with more knowledge and skill in computer technology were more willing to form partnerships with IS people and to lead and participate in systems development projects. Users who do not agree with a systems development project, however, can be hostile to the project and may even try to disrupt it. Depending on the nature of the systems project,

the development team might include systems analysts and programmers, among others. A systems analyst is including a professional who specializes in analyzing and designing business systems. The other support personnel on the development team are mostly technical specialists, including databases and telecommunications experts, hardware engineers, and supplier representatives. One or more of these roles may be outsourced to outside experts or consultants.

### **INITIATING SYSTEMS DEVELOPMENT**

Systems development begins when an individual or group capable of initiating organizational change perceives a need for a new or modified system. Such individuals have a stake in the development of the system. Executives at Delta Airlines, for example, initiated a systems development project when they decided to expand the company's Web site. The new Web site allows employees to log on to the site to give them deeply discounted flight and travel opportunities fleet Boston Financial Corporation initiated a systems development effort to introduce a new customer relationship management (CRM) system to hundreds of its banks.

Mergers and acquisitions can trigger many systems development projects. Because the information systems for firms are usually different, a large systems development effort is typically required to unify systems. Even with similar information systems, the procedures, culture, training, and management of the information systems are typically different, requiring a realignment of the IS departments. When chicken processor Tyson acquired IBP, a meat-packing conglomerate, a massive systems development project was initiated to integrate the information systems of the two firms. The multimillion-dollar project had some IS personnel working 80-hour weeks to integrate the two information systems.

### **INFORMATION SYSTEMS PLANNING**

Since an organization's strategic plan contains both organizational milestones and broad outline of steps required to reach them, the strategic plan affects the type of system an organization needs. For example, a strategic plan may identify a doubling of sales revenue within five years, a 20 percent reduction of administrative expenses over three years, acquisition of at least two competing firms within a year, or market leadership in a give product category as organizational goals. Organizational commitments to policies such as continuous improvement are also reflected in the strategic plan. Such goals and commitments set broad outlines of system performance.

Often, a section of the strategic plan lists guidelines for meeting specific goals that relate to units or departments. Examples of these guidelines might be improving customer service for luxury car buyers, expanding international distribution by purchasing existing distributors, and using a specific amount of money to buy back company stock. The strategic plan also provides general direction to the functional areas within an organization, including marketing, production, finance, accounting, and human resources. For the IS department, these directions are encompassed in the information systems plan.

The Marriott hotel chain, for example, invites it's chide information officer to board meetings and other top-level management meetings. Proper IS planning ensures that specific systems development objectives support organizational goals. See the "IS Principles in Action" box to learn how British Telecommunications was able to plan and implement a new Internet Billing system.

One of the primary benefits of IS planning and alignment of goals is a long-range view of information technology's use in the organization. Specific systems development initiatives may spring from the IS Plan,



but the IS plan should guide development of the IS infrastructure over time. Another benefit of IS planning is that it ensures better use of IS resources-including funds, personnel, and time for scheduling specific projects.

### **ESTABLISHING OBJECTIVES FOR SYSTEMS DEVELOPMENT**

The overall objective of system development is to achieve business goals, not technical goals, by delivering the right information to the right person, in the right format, at the right time. The impact a particular system has on an organization's ability to meet its goals determines the true value of that system to the organization. Although all systems should support business goals, some systems are more pivotal in continued operations and goal attainment than others. These systems are called mission-critical systems. An order-processing system, for example, is usually considered mission critical. Without it, few organizations could continue daily activities, and they clearly would not meet set goals.

System performance is usually determined by such factors as the following:

- The quality or usefulness of the output. Is the system generating the right information for a value-added business process or by a goal-oriented decision marker?
- The accuracy of the output. Is the output accurate and does it reflect the true situation? As a result of the accounting scandals of 2002, where some firms overstated revenues or understated expenses, accuracy is becoming more important and top corporate officers are being held responsible for the accuracy of all corporate reports.
- The quality or usefulness of the format of the output. Is the output generated in a format that is usable and easily understood? For example, objectives often concern the legibility of screen displays, the appearance of documents, and the adherence to certain naming conventions.
- The speed at which output is generated. Is the system generating output in time to meet organizational goals and operational objectives? Objectives such as customer response time, the time to determine product availability, and through put time are examples.

### **SYSTEMS DEVELOPMENT AND E-COMMERCE**

Building a static Web site to display simple text and graphics is fairly straight forward. However, implementing a dynamic core business application that runs over the Web is much more complicated. Such applications must meet special business needs. They must be able to scale up to support highly variable transactions from potentially thousands of users. Ideally, they can scale up instantly when needed. They must be reliable and fault tolerant, providing continuous availability while processing all transactions accurately. They must also integrate with existing infrastructure, including customer and order databases, existing applications, and enterprise resource planning systems. Development and maintenance must be quick and easy, as business needs may require changing applications on the fly.

Many tools are available for building and running Web applications. The best tools provide components to support applications on an enterprise scale while speeding development. Several vendors provide what is known as an application server to provide remote access to databases via a corporate intranet, including Net Dynamics, Silver steam, Web Logic, Novara Software, Netscape Communication, Microsoft, and IBM. Thomson Financial Services used an application server to build tow applications-one tracks job candidates and the second monitors consultants' work hours.

## SYSTEMS DEVELOPMENT LIFE CYCLES

The systems development process is also called a systems development life cycle (SDLC) because the activities associated with it are ongoing. As each system is being built, the project has timelines and deadlines, until at last the system is installed and accepted.

There are four common systems development life cycles exist: traditional, prototyping, rapid application development (RAD), and end-user development. In addition, firms can outsource the systems development process. With some firms these approaches are formalized and documented so that system developers have a well-defined process to follow; in other firms, less formalized approaches are used.

Traditional systems development efforts can range from a small project, such as purchasing an inexpensive computer program, to a major undertaking. The steps of traditional systems development may vary from one company to the next, but most approaches have five common phase: investigation, analysis design, implementation, and maintenance and review.

In the systems investigation phase, potential problems and opportunities are identified and considered in light of the goals of the business. System investigation attempts to answer the question "What is the problem, and is it worth solving?" The primary result of this phase is a defined information system project for which business problems or opportunity statements have been created, to which some organizational resources have been committed and for which systems analysis is recommended. Systems analysis attempts to answer the question "what must the information system do to solve the problem?" This phase involves the study of existing systems and work processes to identify strengths, weaknesses, and opportunities for improvement. The major outcome of systems analysis is a list of requirements and priorities. Systems design seeks to answer the question "How will the information system do what it must do to obtain the problem solution?" The primary result of this phase is a design that either describes the new system or describes how existing systems will be modified. The system design details system outputs, inputs, and user interfaces; specifies hardware, software, databases, telecommunications, personnel, and procedure components; and shows how these components are related. Systems implementation involves creating or acquiring the various system components detailed into operation. An important task during this phases it to train the users. Systems implementation results in an installed, operational information systems maintenance and review are to ensure the system operates and to modify the system so that it continues to meet changing business needs.

Use of the traditional SDLC also creates much documentation, such as entity-relationship diagrams. This documentation, if kept current, can be useful when it is time to modify the system. The traditional SDLC also ensures that every system requirement can be related to a business need. In addition, resulting products can be reviewed to verify that they satisfy the system requirements and conform to organizational standards.

A number of firms use a standard SDLC. The consulting company Reecho, for example, uses an SDLC that includes information collection, user requirements, detailed system analysis, design, programming, testing implementation, and maintenance. Paragon Development Systems uses an SDLC that includes planning, procurement, deployment, management, support, and retirement.

Quite often, users get a system that does not meet their real needs because its development was based on the development team's understanding of the needs. The traditional approach is also inflexible.

Changes in user requirements cannot be accommodated during development. In spite of its limitations, however, the traditional SDLC is still used for large, complex systems that affect entire businesses, such as TPS and MIS systems. It is also frequently employed on government projects because of the strengths mentioned previously.

## **PROTOTYPING**

**Prototyping** takes an iterative approach to the systems development process. Requirements and alternative solutions to the problem are identified and analyzed, new solutions are designed, and a portion of the system is implemented. Users are then encouraged to try the prototype and provide feedback. Prototyping begins with the creation of a preliminary model of a major subsystem or a scaled-down version of the entire system. For example, a prototype might be developed to show sample report formats and input screens. Once developed and refined, the prototypical reports formats and input screens are used as models for the actual system, which may be developed using an end-user programming language such as Visual Basic. The first preliminary model is refined to form the second- and third-generation models, and so on until the complete system is developed. A number of tools can be used to help implement prototyping. One expert, for example, recommends using virtual reality to help users visualize the completed system for manufacturing firms. This approach can reduce the risks of developing prototypes that don't meet user expectations.

### **Types of Prototypes**

Prototypes can be classified as operational or nonoperational. An operational prototype is a prototype that works—accesses real data files, edits input data, makes necessary computations and comparisons, and produces real output. Fully developed financial reports are examples. The operational prototype may access real files but perhaps does no editing of input. A nonoperational prototype is a mock-up, or model. It typically includes output and input specifications and formats. The outputs include printed reports to managers and the screen layout of reports displayed on personal computers or terminals. The inputs reveal how data is captured, what commands users must enter, and how the system accesses other data files. The primary advantage of a nonoperational prototype is that it can be developed much faster than an operational prototype. Nonoperational prototypes can be discarded, and a fully operational system can be built based on what was learned from the prototypes.

## **RAPID APPLICATION DEVELOPMENT, AGOLE DEVELOPMENT, AND JOINT APPLICATION DEVELOPMENT**

**Rapid application development (RAD)** employs tools and methods designed to speed application development. For example, PowerBuilder, a RAD tool from Sybase's Power soft subsidiary, is popular with the federal government. In addition, such database vendors as Computer Associates International, IBM, and Oracle market fourth-generation languages and other products targeting the RAD market. RAD reduces paper-based documentation, automatically generates program source code, and facilitates user participation in design and development activities. With RAD, entire systems are developed in less than six months. The ultimate goal is to accelerate the process so that application can go into production much sooner than when using other approaches. Prudential Real Estate, for example, used a RAD systems development methodology to reduce the time for it to update its password-protected Internet site. Using RAD, the Internet site is now updated four times a year.

RAD makes adapting to changing system requirements easier. Often called agile or extreme programming (EP), these approaches allow the systems to change as they are being developed. Agile development often requires frequent face-to-face meeting with the system developers and users. Some predict that agile programming will eventually be used by most IT departments. While the development process can be fluid and flexible, it can become complex and time consuming with larger projects. As a result, agile development is most appropriate for smaller projects.

Systems development initiatives arise from a wide variety of individuals and organizational areas, including users. The proliferation of general-purpose information technology and the flexibility of many packaged software programs have allowed non-IS employees to independently develop information systems that meet their needs. Such employees have believed that, by bypassing the formal requisitioning of resources from the IS department, they can develop systems more quickly. In addition, these individuals often believe that they have better insight into their own needs and can develop systems better suited for their purposes.

End-user-developed systems range from the very small (e.g., a software routine to merge for letters) to those of significant organizational value (such as customer contact databases for the Web). Like all projects, some end-user-developed systems fail, and others are successful. Initially, IS professionals discounted the value of these projects. As the number and magnitude of these projects increased, however, IS professionals began to realize that for the good of the entire organization, their involvement with these projects needed to increase.

### **THE CAPABILITY MATURITY MODEL (CMM)**

The Capability Maturity Model (CMM) is one way to measure this experience. It is based on research done at Carnegie Mellon University and work by the Software Engineering Institute (SEI). CMM is a measure of the maturity of the software development process in an organization. CMM grades an organization's systems development maturity using five levels from initial to optimizing. A brief description of each level follows.

1. Initial. This level is typical of organizations inexperienced with software and systems development. This level often has an ad hoc or even a chaotic development process.
2. Repeatable. The second level tracks development costs, schedules, and functionality. The discipline to repeat previous systems development success is in place.
3. Defined. With the third level, organizations use documented and defined procedures. All projects done by the organization use these standardized approaches to develop software and systems. Programming standards are often used at this level.
4. Managed. At this level, organizations use detailed measures of the systems development process to help manage the process and improve software and systems quality.
5. Optimized. This is the highest level of experience and maturity. Continuous improvement is used to strengthen all aspects of the systems development process. Organizations at this level often initiate innovative projects. The goal is to optimize all aspects of the systems development effort.

The CMM model has been popular in the U.S. and around the world, and SEI certifies organizations as being at one of the five levels. Any organization can seek certification, and many computer consulting firms attempt to be certified at the highest level (optimization). Wipro GE Medical, for example, received Level 5

certification. The company develops advance medical software for computerized tomography (CT) scanners, magnetic resonance imaging (MRI) devices, and other medical equipment.

## **SYSTEMS INVESTIGATION**

### **INITIATING SYSTEMS INVESTIGATION**

Because systems development requests can require considerable time and effort to implement, many organizations have adopted a formal procedure for initiating systems development, beginning with systems investigation. The systems request form is a document that is filled out by someone who wants the IS department to initiate systems investigation. This form typically includes the following information:

- Problems in or opportunities for the system
- Objectives of systems investigation
- Overview of the proposed system
- Expected costs and benefits of the proposed system

The information in the systems request form helps to rationalize and prioritize the activities of the IS department. Based on the overall IS plan, the organization's needs and goals, and the estimated value and priority of the proposed projects, managers make decisions regarding the initiation of each systems investigation for such projects.

Once a decision has been made to initiate systems investigation, the first step is to determine what members of the development team should participate in the investigation phase of the project. Members of the development team change from phase to phase.

Ideally, functional managers are heavily involved during the investigation phase. Other members could include users or stakeholders outside management, such as an employee who helped initiate systems development. The technical and financial expertise of others participating in the investigation would help the team determine whether the problem is worth solving.

### **FEASIBILITY ANALYSIS**

There are 3 types of feasibility: technical, economic, legal, operational, and schedule feasibility. Technical feasibility is concerned with whether the hardware, software, and other system components can be acquired or developed to solve the problem. Quicken Loans, Inc., for example, is investigating the technical feasibility of using electronic signatures for its business-to-customer transactions. According to a company representative, "We are trying to make applying for mortgages as easy as applying for a credit card."

Economic feasibility determines whether the project makes financial sense and whether predicted benefits offset the cost and time needed to obtain them. Legal feasibility determines whether laws or regulations may prevent or limit a systems development project. For example, an Internet site that allowed users to share music without paying musicians or music producers was sued. Legal feasibility involves an analysis of existing and future laws to determine the likelihood of legal action against the systems development project and the possible consequences.

Operational feasibility is a measure of whether the project can be put into action or operation. It can include logistical and motivational (acceptance of change) considerations. Motivational considerations are very important because new systems affect people and data flows and may have unintended consequences. As a result, power and politics may come into play, and some people may resist the new system. Because of deadly hospital errors, a health care consortium called the Leapfrog Group is looking into the operational feasibility of developing a new computerized physician-order entry system. The new system would require that all prescriptions and every order a doctor gives to staff be

entered into the computer. The computer then checks for drug allergies and interactions between drugs. If operationally feasible, the new system could save lives and lawsuits.

Schedule feasibility determines whether the project can be completed in a reasonable amount of time—a process that involves balancing the time and resource requirements of the project with other projects.

Net present value is the preferred approach for ranking competing projects and for determining economic feasibility. The net present value represents the net amount by which project savings exceed project expenses, after allowing for the cost of capital and the passage of time. The cost of capital is the average cost of funds used to finance the operations of the business. It represents the minimum desired rate of return on an investment; thus, it is also called the hurdle rate. Net present value takes into account that a dollar returned at a later date is not worth as much as one received today, since the dollar in hand can be invested to earn profits or interest in the interim. Spreadsheet programs, such as Excel, have built-in functions to compute the net present value and internal rate of return.

Activity modelling is often accomplished through the use of data-flow diagrams. A data-flow diagram (DFD) models objects, associations, and activities by describing how data can flow between and around various objects. DFDs work on the premise that for every activity there is some communication, transference, or flow that can be described as a data element. DFDs describe what activities are occurring to fulfil a business relationship or accomplish a business task, not how these activities are to be performed. That is, DFDs show the logical sequence of associations and activities, not the physical processes. A system modelled with a DFD could operate manually or could be computer based; if computer based, the system could operate with a variety of technologies.

DFDs are easy to develop and easily understood by nontechnical people. Data-flow diagrams use four primary symbols.

- Dataflow. The data-flow line includes arrows that show the direction of data element movement.

Process symbol. The process symbol reveals a function that is performed. Computing gross pay, entering a sales order, delivering merchandise, and printing a report are examples of functions that can be represented with a process symbol.

- Entity symbol. The entity symbol shows either the source or destination of the data element. An entity can be, for example, a customer who initiates a sales order, an employee who receives a pay check, or a manager who gets a financial report.
- Data store. A data store reveals a storage location for data. A data store is any computerized or manual data storage location, including magnetic tape, disks, a filing cabinet, or a desk. Comparing entity-relationship diagrams with data-flow diagrams provides insight into the concept of top-down design.

Application flowcharts show the relationships among applications or systems. Assume that a small business has collected data about its order processing, inventory control, invoicing, and marketing analysis applications. Management is jinking of modifying the inventory control application. The raw facts collected, however, do not help in determining how the applications are related to each other and the databases required for each. These relationships are established through data analysis with an application flowchart . Using this tool for data analysis makes clear the relationships among the order processing, inventory control, invoicing, and marketing analysis applications.

The inventory control application provides data to the invoicing application. Any changes made to any one of these applications must take into account the other applications, which may provide data to or receive data from the others.

A grid chart is a table that shows relationships among various aspects of a systems development effort. For example, a grid chart can be used to reveal the databases used by the various applications.

The inventory database is used by the order processing, inventory control, and marketing analysis applications. The supplier database is used by the inventory control application, and the accounts receivable database is used by the invoicing application. This grid chart shows which applications use common databases and reveals that, for example, any changes to the inventory control application must investigate the inventory and supplier databases.

The overall purpose of requirements analysis is to determine user, stakeholder, and organizational needs. For an accounts payable application, the stakeholders could include suppliers and members of the purchasing department.

### **The IS Plan**

As we have seen, the IS plan translates strategic and organizational goals into systems development initiatives. The IS planning process often generates strategic planning documents that can be used to define system requirements. Working from these documents ensures that requirements analysis will address the goals set by top-level managers and decision makers. There are unique benefits to applying the IS plan to define systems requirements. Because the IS plan takes a long-range approach to using information technology within the organization, the requirements for a system analyzed in terms of the IS plan are more likely to be compatible with future systems development initiatives.

Developing formats for printed reports and screens to capture data and display information are some of the common tasks associated with developing systems. Manual or computerized screen and report layout facilities are used\* to capture both output and input requirements.

Screen layout is a technique that allows a designer to quickly and efficiently design the features, layout, and format of a display screen. In general, users who interact with the screen frequently can be presented with more data and less descriptive information; infrequent users should have more descriptive information presented to explain the data that they are viewing.

Report layout allows designers to diagram and format printed reports. Reports can contain data, graphs, or both. Graphic presentations allow managers and executives to quickly view trends and take appropriate action, if necessary.

Screen layout diagrams can document the screens users desire for the new or modified application. Report layout charts reveal the format and content of various reports that the application will prepare. Other diagrams and charts can be developed to reveal the relationship between the application and outputs from the application. A number of tools can be used to document requirements analysis.

### **Summary:**

The result of systems development can mean the success or failure of an entire organization. Successful systems development has resulted in huge increases in revenues and profits. Firms that don't innovate with new systems development initiatives or fail to successfully complete a systems development effort can lose millions. The term information systems planning refer to the translation of strategic and organizational goals into systems development initiatives. The overall objective of system development is to achieve business goals, not technical goals, by delivering the right information to the right person, in the right format, at the right time. The impact a particular system has on an organization's ability to meet its goals determines the true value of that system to the organization. Although all systems should support business goals, some systems are more pivotal in continued operations and goal attainment than others. These systems are called mission-critical systems.

Four common systems development life cycles exist: traditional, prototyping, rapid application development (RAD), and end-user development. In addition, firms can outsource the systems development process. With some firms these approaches are formalized and documented so that system developers

have a well-defined process to follow; in other firms, less formalized approaches are used. Prototyping takes an iterative approach to the systems development process. During each iteration, requirements and alternative solutions to the problem are identified and analyzed, new solutions are designed, and a portion of the system is implemented. Technical feasibility is concerned with whether the hardware, software, and other system components can be acquired or developed to solve the problem. A data-flow diagram (DFD) models objects, associations, and activities by describing how data can flow between and around various objects. A grid chart is a table that shows relationships among various aspects of a systems development effort. For example, a grid chart can be used to reveal the databases used by the various applications. The overall purpose of requirements analysis is to determine user, stakeholder, and organizational needs. For an accounts payable application, the stakeholders could include suppliers and members of the purchasing department.

## Key Words

**Information systems planning:** it refers to the translation of strategic and organizational goals into systems development initiatives.

**Prototyping:** it takes an iterative approach to the systems development process. During each iteration, requirements and alternative solutions to the problem are identified and analyzed, new solutions are designed, and a portion of the system is implemented.

**Technical feasibility:** it is concerned with whether the hardware, software, and other system components can be acquired or developed to solve the problem.

**A data-flow diagram (DFD):** it models objects, associations, and activities by describing how data can flow between and around various objects.

**A grid chart:** it is a table that shows relationships among various aspects of a systems development effort. For example, a grid chart can be used to reveal the databases used by the various applications.

## Summary Questions.

1. Explain System Development Life Cycle.
2. What is feasibility? Explain.
3. Explain the IS plan.

### Case Analysing the Government Medical Systems.

The greater Noida sector provides medical coverage for over 260,000 of its residents through its Gr Noida Medical Aid program. Healthcare providers, including doctors, hospitals, clinics, and nursing homes, submit claims to Gr Noida Medical Aid in order to be paid for the services they provide to Gr Noida Medical Aid patients. As the 1990s drew to a close, Greater Noida, like many other states, began planning for a complete overhaul of its Gr Noida Medical Aid claims processing systems to comply with the rules. Health Insurance Portability and Accountability Act of 1996 (HIPAA). HIPAA was enacted to standardize the management of patient health and records, and, most notably, the protection of patient privacy.

The Gr Noida Medical Aid program was becoming increasingly complex with new services added, each with codes and sub-codes assigned to them. As a result, payments to providers were broken down into smaller and more numerous pieces. The state also wanted to offer providers access to patient eligibility and claim



status data online in the hopes of reducing the volume of calls. At the time, Greater Noida was processing over 100,000 Gr Noida Medical Aid claims per week on a mainframe that dated back to the 1970s. The state's IT department decided that a completely new system would be more cost-effective and easier to maintain than an upgrade of the old system. This approach contrasted with what some other states had done. The IT staff also rejected an option to outsource claims processing systems to a service provider such as Electronic Data Systems (EDS). Shortly after its rollout, the new system was rejecting claims much more frequently than the old system had. Most of the rejected claims were being held up as suspended, a designation usually applied to claim forms that contained errors. The suspended file grew quickly, causing millions of dollars in claims to be held back. Within two months, 300,000 claims were frozen. The claims system software was error-prone, even issuing checks to doctors for their total charges for a procedure instead of the amounts that were actually covered by Gr Noida Medical Aid. Overpayments eventually recovered by Maine Gr Noida Medical Aid totalled \$9 million. Providers were having difficulty filling out the new claim forms correctly, which was not a big surprise. The team had difficulty getting consulting time with the Medicaid experts on staff at the Bureau of Medical Services.

### **Case Questions:**

1. How important are information systems for Greater Noida's Department of Health and Human Services?
2. Analyze the impact of its faulty Medicaid claims processing system.

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# **Part IV Management Challenges**

**Chapter 12: Security and Ethical Challenges**

**Chapter 13: Security Management of IT**

**Chapter 14: Enterprise and Global Management of IT**

## Chapter 12

### Security and Ethical Challenges

#### Objectives:

At the end of this unit, you will understand

- Information Security
- Security Terms.
- Common Threats

#### Introduction

Many people do not want to discuss or even think about technology-related ethical and social issues, at least not until a large scandal takes place data compromise that happened several years ago. However, the use of new technology always presents these kinds of problems. Throughout this chapter and the rest of the text, it is imperative that you discuss these issues so that students can see both the positive and negative sides of technology. It's important for students to understand that almost every technology improvement opens the door to potential misuse and abuse. The introduction of IT has a great effect, raising new ethical, social, and political issues. It must be dealt with on the individual, social, and political levels. There is a relation between Ethical, social, and political issues. Social issues rise from ethical issues as societies extend expectations in persons about the correct course of action. Political issues come from social argument and are mainly disturbed with using laws that lay down behavior to create situations in which persons behave properly. Computer power, storage, and networking capabilities including the Internet reach all individuals and organizations and magnify their impacts. The effortless and obscurity in order can be communicated, hackneyed, and manipulated in online environments are demanding traditional policy of right and wrong performance.

#### Some Security Terms

The key element of ethical actions is Responsibility. It means that the potential costs, duties, and obligations for the decisions are accepted.

Accountability is a mark of systems and its social institutions. Methods and rules are in place to check the responsible, actionable entities.

Liability is a component of political systems such that a body of laws is in place. It actually permits people to recover the damages through other actors, systems, or organizations.

Privacy is very important and is related to individual's claim to be left alone, free from observation or meddling from other persons or organizations, including the condition. Claims of solitude are also involved at the office.

IT systems including Internet technologies, pose as a challenge as traditional regimens for caring individual privacy and intellectual goods. Data storage and data analysis technology enables companies to easily gather personal data about individuals from many different sources and analyze these data to create detailed electronic profiles about individuals and their behaviors.

Intellectual property has some legal traditions as per the protections:

- Trade secrets
- Copyright
- Patent law

Traditional copyright laws are not useful to safe guard against software piracy. This is because digital material is copied so easily. IT and internet also makes intellectual property even more difficult as digital material can be copied easily and transmitted to many different locations simultaneously in the internet.

Courts are cautious of holding software authors answerable for volume like software. In general, it is very difficult (if not impossible) to hold software producers accountable for their software products when those goods are considered like books are, in spite of of the physical or economic damage that consequences. However, as one becomes more dependent then chances are excellent that liability law will expand its reach to comprise software when the software merely provides an in sequence service.

If a system fails, it is foreseeable that the producers of the software-based services could potentially be held liable for economic injuries. This could even extend to systems that have been managed poorly and implemented unsuccessfully. They, too, have the potential to impact the company's bottom line and subject producers of software-based services to liability. While the general rule is that they cannot be held liable for matters beyond their knowledge or control, this defense may not be available in some software guideline compliance programs. Thus, producers of software-based services need to be aware of and involved in the software compliance program. In addition, software vendors may face liability if they fail to advise licensees of latent problems in their software.

Software compliance is also an issue to be considered in due diligence conducted by any company involved, directly or indirectly, in investing or making loans to businesses with computer systems. Financial advisors, in particular, may be held liable even if they are unaware that a company is not in compliance when making financial recommendations. In connection with mergers or acquisitions of companies using date-sensitive software (as almost all are), software compliance is also a factor in due diligence. Basically, software compliance raises technical, contractual, and managerial issues. For a complete solution, the strategies for responding to them must be handled on a coordinated basis.

Google's proposed electronic medical record system would allow consumers to enter their basic medical data into an online repository and invite doctors to send relevant information to Google electronically. One feature of the system will include a 'health profile' for medications, conditions, and allergies, reminder messages for prescription refills or doctor visits, directories for nearby doctors, and personalized health advice. The application will also be able to accept

information from many different recordkeeping technologies currently in use by hospitals and other institutions. The intent of the system is to make patients' records easily accessible, especially in emergencies, and more complete and to streamline recordkeeping.

Electronic recordkeeping promises to reduce costs associated with maintaining health data. However, the upfront costs of implementation are daunting, especially to doctors who maintain their own practices. Managers would have to ensure data was not used for profiling patients or use the data to deny medical procedures. Managers would also have to ensure data was not misused for purposes other than what is intended.

The new system promises to make data more organized and easier to retrieve. Organizations must ensure that data is not used for profiling and not used in the data analysis technology called nonobvious relationship awareness. Government, private, and non-profit organizations must pass new laws, similar to the HIPAA law, that provides adequate protection of consumer health data. That would help reassure patients and make them more likely to use the system.

New systems must be able to mesh with other versions of medical record-keeping applications. The software must be created around universal standards making implementation easier and more efficient. Above all else, technology must be created to prevent security breaches. Systems must be available one-hundred percent of the time, especially to obtain medical information for emergency patients.

### **Common Threats**

The most common threats against contemporary information systems include: technical, organizational, and environmental factors compounded by poor management decisions.

- Technical: unauthorized access, introducing errors
- Communications: tapping, sniffing, message alternation, theft and fraud, radiation
- Corporate servers: hacking, viruses and worms, theft and fraud, vandalism, denial of service attacks
- Corporate systems: theft of data, copying data, alteration of data, hardware failure, and software failure. Power failures, floods, fires, or other natural disasters can also disrupt computer systems.
- Poor management decisions: poor safeguard design to protect valuable data from being lost, destroyed, or fall into the wrong hands.

Malware (for malicious software) is any program or file that is harmful to a computer user. Thus, malware includes computer viruses, worms, Trojan horses, and also spyware programs that gather information about a computer user without permission.

- Virus: a program or programming code that replicates itself by being copied or initiating its copying to another program, computer boot sector or document.
- Worm: a self-replicating virus that does not alter files but resides in active memory and duplicates itself without human intervention.
- Trojan horse. a program in which malicious or harmful code is contained inside apparently harmless programming or data. A Trojan horse is not itself a virus because it

does not replicate but is often a way for viruses or other malicious code to be introduced into a computer system.

A hacker is an individual who gains unauthorized access to a computer system by finding weaknesses in security protections used by Web sites and computer systems. Hackers not only threaten the security of computer systems, but they also steal goods and information, as well as damage systems and commit cyber-vandalism. They may intentionally disrupt, deface, or even destroy a Web site or corporate information system.

The Department of Justice defines computer crime as “any violations of criminal law that involve knowledge of computer technology for their perpetration, investigation, or prosecution.” Computer crime is defined as the commission of illegal acts through the use of a computer or against a computer system.

Identity theft is a crime in which an imposter obtains key pieces of personal information, such as social security identification number, driver’s license number, or credit card numbers, to impersonate someone else. The information may be used to obtain credit, merchandise, or services in the name of the victim or to provide the thief with false credentials.

It is a big problem today as the Internet has made it easy for identity thieves to use stolen information because goods can be purchased online without any personal interaction. Credit card files are a major target of Web site hackers. Moreover, e-commerce sites are wonderful sources of customer personal information that criminals can use to establish a new identity and credit for their own purposes.

Phishing involves setting up fake Web sites or sending e-mail messages that look like those of legitimate businesses to ask users for confidential personal data. The e-mail instructs recipients to update or confirm records by providing social security numbers, bank and credit card information, and other confidential data either by responding to the e-mail message or by entering the information at a bogus Web site. New phishing techniques such as evil twins and pharming are very hard to detect.

Many employees forget their passwords to access computer systems or allow other coworkers to use them, which compromises the system. Malicious intruders seeking system access sometimes trick employees into revealing their passwords by pretending to be legitimate members of the company in need of information (social engineering). Employees can introduce errors by entering faulty data or by not following proper instructions for processing data and using computer equipment. Information specialists can also create software errors as they design and develop new software or maintain existing programs.

Legal actions requiring electronic evidence and computer forensics also require firms to pay more attention to security and electronic records management. Computer forensics is the scientific collection; examination, authentication, preservation, and analysis of data held on or retrieved from computer storage media in such a way that the information can be used as evidence in the court of law. It deals with the following problems:

- Recovering data from computers while preserving evidential integrity
- Securely storing and handling recovered electronic data

- Finding significant information in a large volume of electronic data
- Presenting the information to a court of law

Controls can be adjusted or added to focus on the areas of greatest risk. An organization does not want to over-control areas where risk is low and under-control areas where risk is high.

Security risk analysis involves determining what you need to protect, what you need to protect it from, and how to protect it. It is the process of examining all of the firm's risks, and ranking those risks by level of severity. This process involves making cost-effective decisions on what you want to protect. The old security adage says that you should not spend more to protect something than it is actually worth. A full treatment of risk analysis is outside the scope of this section; however, there are two elements of a risk analysis that should be briefly covered for the students: (1) identifying the assets and (2) identifying the threats. For each asset, the basic goals of security are availability, confidentiality, and integrity. Each threat should be examined with an eye to how the threat could affect these areas. One step in a risk analysis is to identify all the things that need to be protected. Some things are obvious, like all the various pieces of hardware, but some are overlooked, such as the people who actually use the systems. The essential point is to list all things that could be affected by a security problem.

A security policy consists of statements ranking information risks, identifying acceptable security goals, and identifying the mechanisms for achieving these goals. The security policy drives policies determining acceptable use of the firm's information resources and which members of the company have access to its information assets.

Comprehensive and systematic MIS auditing organizations determine the effectiveness of security and controls for their information systems. An MIS audit identifies all of the controls that govern individual information systems and assesses their effectiveness. Control weaknesses and their probability of occurrence will be noted. The results of the audit can be used as guidelines for strengthening controls, if required.

A firewall is a combination of hardware and software that controls the flow of incoming and outgoing network traffic. Firewalls prevent unauthorized users from accessing internal networks. They protect internal systems by monitoring packets for the wrong source or destination, or by offering a proxy server with no access to the internal documents and systems, or by restricting the types of messages that get through, for example, e-mail. Further, many authentication controls have been added for Web pages as part of firewalls.

Intrusion detection systems monitor the most vulnerable points or "hot spots" in a network to detect and deter unauthorized intruders. These systems often also monitor events as they happen to look for security attacks in progress. Sometimes they can be programmed to shut down a particularly sensitive part of a network if it receives unauthorized traffic.

Antivirus software is designed to check computer systems and drives for the presence of computer viruses and worms and often eliminates the malicious software, whereas antispyware software combats intrusive and harmful spyware programs. Often the software can eliminate the virus from the infected area. To be effective, antivirus software must be continually updated.



Encryption, the coding and scrambling of messages, is a widely used technology for securing electronic transmissions over the Internet and over Wi-Fi networks. Encryption offers protection by keeping messages or packets hidden from the view of unauthorized readers. Encryption is crucial for ensuring the success of electronic commerce between the organization and its customers and between the organization and its vendors.

Digital certificates combined with public key encryption provide further protection of electronic transactions by authenticating a user's identity. Digital certificates are data fields used to establish the identity of the sender and to provide the receiver with the means to encode a reply. These use a trusted third party known as a certificate authority to validate a user's identity. Both digital signatures and digital certificates play a role in authentication. Authentication refers to the ability of each party to know that the other parties are who they claim to be.

High-availability computing, though also designed to maximize application and system availability, helps firms recover quickly from a crash. Fault tolerance promises continuous availability and the elimination of recovery time altogether. High-availability computing environments are a minimum requirement for firms with heavy electronic commerce processing requirements or for firms that depend on digital networks for their internal operations.

Disaster recovery planning devises plans for the restoration of computing and communications services after they have been disrupted by an event such as an earthquake, flood, or terrorist attack. Disaster recovery plans focus primarily on the technical issues involved in keeping systems up and running, such as which files to back up and the maintenance of backup computer systems or disaster recovery services.

Business continuity preparation focuses on how the corporation can reinstate business operations after a disaster comes. The business continuity plan identifies dangerous business processes and determines achievement plans for management mission-critical functions if systems go down.

Software metrics are objective assessments of the system in the form of quantified measurements. Metrics allow an information systems department and end users to jointly measure the performance of a system and identify problems as they occur. Metrics must be carefully designed, formal, objective, and used consistently.

## **Summary.**

Many people do not want to discuss or even think about technology-related ethical and social issues, at least not until a large scandal takes place data compromise that happened several years ago. However, the use of new technology always presents these kinds of problems. Throughout this chapter and the rest of the text, it is imperative that you discuss these issues so that students can see both the positive and negative sides of technology. It's important for students to understand that almost every technology improvement opens the door to potential misuse and abuse. The introduction of IT has a

great effect, raising new ethical, social, and political issues. It must be dealt with on the individual, social, and political levels. There is a relation between Ethical, social, and political issues. Social issues rise from ethical issues as societies extend expectations in persons about the correct course of action. Political issues come from social argument and are mainly disturbed with using laws that lay down behavior to create situations in which persons behave properly. The security policy drives policies determining acceptable use of the firm's information resources and which members of the company have access to its information assets. Digital certificates combined with public key encryption provide further protection of electronic transactions by authenticating a user's identity. Digital certificates are data fields used to establish the identity of the sender and to provide the receiver with the means to encode a reply. These use a trusted third party known as a certificate authority to validate a user's identity. Both digital signatures and digital certificates play a role in authentication. Authentication refers to the ability of each party to know that the other parties are who they claim to be.

### **Keywords:**

The key element of ethical actions is Responsibility. It means that the potential costs, duties, and obligations for the decisions are accepted.

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Privacy is very important and is related to individual's claim to be left alone, free from observation or meddling from other persons or organizations, including the condition. Claims of solitude are also involved at the office.

Software metrics: they are objective assessments of the system in the form of quantified measurements.

A firewall: it is a combination of hardware and software that controls the flow of incoming and outgoing network traffic

### **Summary Questions:**

1. Explain the information systems' threats.
2. Explain the role of security risk policies.
3. Do you think that security is essential term in IS building?

### **Case:**

The Department of Investigation is responsible for dispensing benefits such as healthcare, burial, disability compensation, and pensions to Indian military veterans and their families. It serves roughly 63 million people who are eligible for benefits. In 2008 it was revealed that a laptop and disks containing the personal electronic files of 26.5 million military veterans had been stolen from the home of a long time Veterans' employee. The employee, a data analyst, brought the materials home in order to work on a project from his residence. At that time it was believed that the analyst had done this without authorization. The data stolen included names, UID numbers, and birth dates of veterans who were

discharged from the military starting in 1971. Also involved were files of veterans who were discharged earlier and later filed claims with the department.

The stolen data were not related to health records or financial information, but they were not encrypted. The department announced that it could find no evidence suggesting that the stolen data had been used illegally. The department went on to assert that the perpetrators of the burglary might not even know what they possessed or how to use it. The department set up a call center and a Web site to field queries from veterans. In the first few days after the theft was announced, the department received over 100,000 calls to its toll-free information line.

The theft of data occurred at a time when the nation's confidence in the security of personal data was at an all-time low. At Infycards, a payment processor that handles transactions for major credit card companies, a hacking incident compromised the credit card accounts of 40 million consumers. In the wake of these and other scandals, a number of states enacted laws to compel organizations that process private data to inform consumers when their data have been compromised.

With 26.5 million records exposed, the department breach was the second largest such case after Infycards and the largest unauthorized disclosure of social security identification data. Such data are particularly useful to anyone intent on identity theft because they are used for accessing credit reports, bank accounts, and credit card accounts.

The leadership of the department was more seriously called into question for the way it initially responded to the data theft. The department did not report the incident to law enforcement until two weeks after it found out about it. Officials from the Justice Department and the Investigation department felt that the delay may have inhibited their ability to perform a thorough investigation and solve the case. The department did not initially offer a statement explaining why it waited before informing law enforcement or the public.

#### Case Questions.

1. List and describe the security weaknesses at the Department.
2. What management, organization, and technology factors contributed to these weaknesses?

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## Chapter 13: Security Management of IT

### Objectives:

At the end of this unit, you will understand

- Security concerns in business
- Security and threats in business.
- Security management

### Introduction

It is a big problem today as the Internet has made it easy for identity thieves to use stolen information because goods can be purchased online without any personal interaction. Credit card files are a major target of Web site hackers. Moreover, e-commerce sites are wonderful sources of customer personal information that criminals can use to establish a new identity and credit for their own purposes.

Phishing involves setting up fake Web sites or sending e-mail messages that look like those of legitimate businesses to ask users for confidential personal data. The e-mail instructs recipients to update or confirm records by providing social security numbers, bank and credit card information, and other confidential data either by responding to the e-mail message or by entering the information at a bogus Web site. New phishing techniques such as evil twins and pharming are very hard to detect.

Many employees forget their passwords to access computer systems or allow other coworkers to use them, which compromises the system. Malicious intruders seeking system access sometimes

trick employees into revealing their passwords by pretending to be legitimate members of the company in need of information (social engineering). Employees can introduce errors by entering faulty data or by not following proper instructions for processing data and using computer equipment. Information specialists can also create software errors as they design and develop new software or maintain existing programs.

Legal actions requiring electronic evidence and computer forensics also require firms to pay more attention to security and electronic records management. Computer forensics is the scientific collection; examination, authentication, preservation, and analysis of data held on or retrieved from computer storage media in such a way that the information can be used as evidence in the court of law.

## Security Concerns

The use of information technology in e-business has major impacts on society, and thus raises serious ethical issues in the areas such as crime, privacy, individuality, employment, health. As a business end user, one has a responsibility to promote ethical uses of information technology in the workplace. These responsibilities include properly performing your role as a vital human resource in the e-business systems you help develop and use in your organizations. Business ethics is concerned with the numerous ethical questions that managers must confront as part of their daily business decision-making. Managers use several important alternatives when confronted with making ethical decisions on business issues.

Computer crime is a great challenger to society by the criminal or irresponsible actions of computer individuals. These people take advantage of the widespread use and vulnerability of computers and the Internet and other networks. It thus presents a major challenge to the ethical use of information technologies. E-computer crime poses serious threats. It gives some threat to the integrity, safety, and survival of most e-business systems. It makes effective security methods a top priority. Digitised versions can easily be captured. Computer systems are made available for people to access or download at Internet websites. This is readily disseminated by e-mail as file attachments.

As with any revolutionary change, a host of issues must be dealt with to ensure that e-commerce transactions are safe and consumers are protected. Many represent significant threats to its continued growth. The following sections review a number of these threats and present practical ideas on how to curtail their impact. As mentioned previously, organizations use identification technologies to confirm the identity of a user requesting access to information or assets. Just as shoppers are concerned with the legitimacy of sites, e-businesses are concerned with the legitimacy of their customers. Biometric technology, which digitally encodes physical attributes of a person's voice, eye, face, or hand and associates them with biological attributes stored in a file, are commonly used in organizations such as the FBI to allow clearance into a building, for instance. Currently, using the technology to secure on-line transactions is rare for both cost and privacy reasons. It can be expensive to outfit every customer with a biometric scanner, and it is difficult to convince consumers to supply something as personal and distinguishing as a fingerprint. Lawsuits over intellectual property (music, books, inventions, paintings, and other special items secluded by patents, copyrights, or trademarks) have created a virtual e-commerce war zone. From music files to patented on-line coupon schemes, hardly a day goes by without some new suit being filed. Every year, American businesses lose billions of dollars from the importation and sale of counterfeit goods and the infringement of copyrights, trademarks, and patents. The entertainment and travel industries have their futures riding on the outcomes of these logical property battles. As more people use the Internet for e-commerce, they need to know that the merchant with whom they're dealing is legitimate. The Better Business Bureau's Online Reliability seal helps distinguishes trustworthy firms among the thousands of businesses on-line, allowing consumers to easily identify them. On-line swindlers include everyone from whiz-kid vandals to the equivalent of the old boiler-room brokers who hawk bogus offshore tax shelters.

The good news is that you can enjoy the advantages of e-commerce and still keep yourself largely protected. Following are descriptions of the most common scams and some advice to help protect you. On-line auctions brought in about \$ 1 billion in sales in a recent year, and they represent the number-one Internet fraud, according to the National Consumers League. The majority of that fraud comes from so-called person-to-person auctions, which account for roughly half the auction sites. On these sites, it is up to the buyer and seller to resolve details of payment and delivery; the auction sites offer no guarantees. Sticking with auction sites like eBay ([www.ebay.com](http://www.ebay.com)) that ensure the delivery and quality of all the items up for bidding can help buyers avoid trouble. E-mail that is sent to a wide range of people and use net groups indiscriminately is called spam. Spam allows peddlers to hawk their products instantly to thousands of people at virtually no cost. And obtaining e-mail addresses to spam is now a snap, thanks to so-called harvester programs that snoop use-net chat groups and collect thousands of e-mail addresses in a single day. Do not respond to spam; responding will only confirm to the spammer that your e-mail address is perfect and active. Instead, simply delete spam as soon as you get it. If the spam is truly offensive or obviously fraudulent, forward the entire message to your Internet service provider, the Federal Trade Commission ([www.ftc.gov](http://www.ftc.gov)), or the National Fraud Information Center ([www.fraud.org](http://www.fraud.org)) and ask that the sender be barred from sending additional messages.

### Major threats.

Some examples of crimes may be the creation of computer viruses or worms. They typically enter a computer system. They enter through borrowed copies of software or through network communications. A virus copies onto the operating systems programs. From there it goes to the hard disk and go to any inserted floppy disks. The Vaccine programs, and virus prevention and detection programs are there, but they do not work for new types of viruses. Virus is a program code that cannot work without being inserted into another program. Worm is a distinct program that can run unaided.

We can protect your privacy in several ways:

- Encryption usages for sending e-mail (both sender and receiver must have encryption software).
- Blocking Anonymous emails to protect your identify.
- when you add comments in newsgroup postings protect remailers.
- Ask Internet service provider not to include your name for selling
- Reject for revealing personal data and interest on online service and websites user profiles.

The impact of IT on employment is a major ethical concern and is directly related to the use of computers to achieve automation of work activities. The use of e-business technologies has created new jobs and increased productivity. However, it has also caused a significant reduction in some types of job opportunities. One of the most explosive ethical issues concerning the quality of working conditions in e-business is computer monitoring. Computers are being used to monitor the productivity and behaviour of employees while they work. Supposedly, computer monitoring is done so employers can collect productivity data about their employees to increase the efficiency and quality of service.

Computer monitoring has been criticized as unethical because:

- It is used to monitor individuals, not just work, and is done continually, thus violating workers' privacy and personal freedom.
- Is considered an invasion of the privacy of employees, because in many cases, they do not know that they are being monitored, or don't know how the information is being used.
- Employee's right of due process may be harmed by the improper use of collected data to make personnel decisions.
- It increases the stress on employees who must work under constant electronic surveillance.
- It has been blamed for causing health problems among monitored workers.

- Blamed for robbing workers of the dignity of their work.

Information technology has eliminated some monotonous or obnoxious tasks in the office and the factory that formerly had to be performed by people. Thus, IT can be said to upgrade the quality of work. Though, many automated operations are also criticized for relegating people to a “do-nothing” standby role. A frequent criticism of e-business systems concerns their negative effect on the individuality of people.

Computer-based systems are criticized as:

- Being impersonal systems that dehumanize and depersonalize activities, since they eliminate the human relationships present in non-computer systems. Humans feel a loss of identity.
- Humans feel a loss of individuality as some systems require a regimentation of the individual, and demanding strict adherence to detailed procedures.

Encryption of data has become an important way to protect data and other computer network resources especially on the Internet, intranets, and extranets. Encryption characteristics include:

- Passwords, messages, files, and other data can be transmitted in scrambled form and unscrambled by computer systems for authorized users only.
- Encryption involves using special mathematical algorithms, or keys, to transform digital data into a scrambled code before they are transmitted, and to decode the data when they are received.
- The most widely used encryption method uses a pair of public and private keys unique to each individual. For example: e-mail could be scrambled and encoded using a unique public key for the recipient that is known to the sender. After the e-mail is transmitted, only the recipient’s secret private key could unscramble the message.
- Encryption programs are sold as separate products or built into other software used for the encryption process.

Another important method for control and security on the Internet and other networks is the use of firewall computers and software. A network fire wall can be a communications processor, typically a router, or a dedicated server, along with fire wall software. Fire wall computers and software characteristics include:

- A fire wall serves as a “gatekeeper” computer system that protects a company’s intranets and other computer networks from intrusion by serving as a filter and safe transfer point for access to and from the Internet and other networks.
- A fire wall computer screens all network traffic for proper passwords and other security codes, and only allows authorized transmissions in and out of the network.
- Fire walls have become an essential component of organizations connecting to the Internet, because of its vulnerability and lack of security.
- Fire walls can deter, but not completely prevent, unauthorized access (hacking) into computer networks. In some cases, a fire wall may allow access only from trusted locations on the Internet to particular computers inside the fire wall. Or it may allow only “safe” information to pass.
- In some cases, it is impossible to distinguish safe use of a particular network service from unsafe use and so all requests must be blocked. The fire wall may then provide substitutes for some network services that perform most of the same functions but are not as vulnerable to penetration.

The Internet is extremely vulnerable to a variety of assaults by criminal hackers, especially denial of service (DOS) attacks. Denial of service assaults via the Internet depend on three layers of networked computer systems, and these are the basic steps e-business companies and other organizations can take to protect their websites from denial of service and other hacking attacks.

- The victim’s website

- The victim's Internet service provider (ISP)
- The sites of "zombie" or slave computers that were commandeered by the cyber criminals.

The vital role of information technologies and systems in society raises serious ethical and societal issues in terms of their impact on employment, individuality, working conditions, privacy, health, and computer crime. Employment issues include the loss of jobs due to computerization and automation of work versus the jobs created to supply and support new information technologies and the business applications they make possible. The impact on working condition involves the issues of computer monitoring of employees and the quality of the working conditions of jobs that make heavy use of information technologies. The effect of IT of individuality addresses the issues of the depersonalization, regimentation, and inflexibility of some computerized business systems. Health issues are raised by heavy use of computer workstations for long periods of time by employees which may cause work-related health disorders. Serious privacy issues are raised by the use of IT to access or collect private information without authorization, as well as for computer profiling, computer matching, computer monitoring, and computer libel and censorship. Computer crime issues surround activities such as hacking, computer viruses and worms, cyber theft, unauthorized use at work, software piracy, and piracy of intellectual property.

Manager, business professionals, and IS specialists can help solve the problems of improper use of IT by assuring their ethical responsibilities for the ergonomic design, beneficial use, and enlightened management of information technologies in our society.

### **Security Management.**

Business and IT activities involve many ethical considerations. Basic principles of technology and business ethics can serve as guidelines for business professionals when dealing with ethical business issues that may arise in the widespread use of information technology in business and society. Examples include theories of corporate social responsibility, which outline the ethical responsibility of management and employees to a company's stockholders, stakeholders, and society, and the four principles of technology ethics. One of the most important responsibilities of the management of a company is to assure the security and quality of its IT-enabled business activities. Security management tools and policies can ensure the accuracy, integrity, and safety of the information systems and resources of a company, and thus minimize errors, fraud, and security losses in their business activities. Examples mentioned in the chapter include the use of encryption of confidential business data, firewalls, e-mail monitoring, antivirus software, security codes, backup files, security monitors, biometric security measures, computer failure controls, fault tolerant systems, disaster recovery measures, information systems controls, and security audits of business systems.

Information technology has made it easier to communicate, work cooperatively, share resources, and make decisions, all electronically. However, IT has also made it possible to engage in ethical as well as unethical practices electronically anywhere in the world. This possibility has resulted in a massive increase in unethical business practices. Ethical crisis in e-business is certainly real in today's e-business, and companies are scrambling to ensure that they are doing all they can to curb on this problem.

### **Summary**

The use of information technology in e-business has major impacts on society, and thus raises serious ethical issues in the areas such as crime, privacy, individuality, employment, health. As a business end user, one has a responsibility to promote ethical uses of information technology in the workplace. These responsibilities include properly performing your role as a vital human resource in the e-business systems



you help develop and use in your organizations. Business ethics is concerned with the numerous ethical questions that managers must confront as part of their daily business decision-making. Managers use several important alternatives when confronted with making ethical decisions on business issues. Computer crime is a growing threat to society by the criminal or irresponsible actions of computer individuals who are taking advantage of the widespread use and vulnerability of computers and the Internet and other networks. It thus presents a major challenge to the ethical use of information technologies. The vital role of information technologies and systems in society raises serious ethical and societal issues in terms of their impact on employment, individuality, working conditions, privacy, health, and computer crime. Employment issues include the loss of jobs due to computerization and automation of work versus the jobs created to supply and support new information technologies and the business applications they make possible. The impact on working condition involves the issues of computer monitoring of employees and the quality of the working conditions of jobs that make heavy use of information technologies. The effect of IT of individuality addresses the issues of the depersonalization, regimentation, and inflexibility of some computerized business systems. Health issues are raised by heavy use of computer workstations for long periods of time by employees which may cause work-related health disorders. Serious privacy issues are raised by the use of IT to access or collect private information without authorization, as well as for computer profiling, computer matching, computer monitoring, and computer libel and censorship.

## **Key words**

**Business ethics:** it is concerned with the numerous ethical questions that managers must confront as part of their daily business decision-making.

**Computer crime:** it is a growing threat to society by the criminal or irresponsible actions of computer individuals who are taking advantage of the widespread use and vulnerability of computers and the Internet and other networks.

**Virus:** it is a program code that cannot work without being inserted into another program.

**Worm:** it is a distinct program that can run unaided.

**Encryption:** it is a means to protect the data that has become an important way to protect data and other computer network resources especially on the Internet, intranets, and extranets.

## **Case:**

### **India-Secure Restores Telecommunications Services in Wake of 26/11 Taj Disaster.**

India-secure was formed in 2007. It is the number one Indian wireless provider. When Taj Hotel in Mumbai collapsed a few hours after the Twin blasts on September 26<sup>th</sup> 2006 its debris crashed into India-secure switching facility. Damage to the building was so great that the switching center completely failed. The collapse sent a massive steel beam slicing through a bundle of fiber-optic cables buried eight feet below ground, destroying high-speed access lines and rupturing water pipes. The basement of the building was filled with more than 10 million gallons of water. Twenty India-secure employees lost their lives at the scene; The circuits that served the financial district were knocked out, including data lines that served the Bombay Stock exchange. The communication disruption was so complete that it threatened a lengthy trading outage completely destroying the exchange's ability to run its trade execution transaction processing systems and damaging our country's economic stability. The Indian administration recognized the severity of the situation and, once emergency response and rescue efforts were given the

support they required, the Government made restoring Taj's telecommunications connections the highest priority. In the days following the attack, perhaps no event came to symbolize India's resilience more than the reopening of the Mumbai bars and hotels. India-secure played a key role in security. Setting their grief aside, India-secure workers returned to site the next day to restore service by means possible. Fiber-optic cables had to be dragged from street level up through the buildings fifth and eighth-floor windows to tie them into the main switching fabric because it was impossible to run the cables through the flooded basement. With the massive effort, the firm was able to reroute traffic around buildings and connect new circuits in just a few days.

India-secure's rival carriers, helped by sharing network capacity and choking off a non-essential traffic to the area when call volume got too high. Bharat Technologies, one of India-secure's main systems providers, rushed a 100,000-line switch to the scene to replace a massive switch that had been destroyed.

As the first workers began filtering the area, India-secure quietly turned on the last piece of the data network for the securities industry. Then it continued restoring service to other customers served by the Taj hotels.

The work India-secure did to restore service following the destruction of the Taj Hotel certainly represents a triumph and provides confidence to all those businesses so dependent on telecommunications. But the disaster also underscores the dependence of key transaction processing systems on modern telecommunications networks and the need for businesses to consider the use of multiple telecommunications carriers in defining their business resumption plans.

#### Case

1. Why was restoring communications to the Taj Hotels such a high priority?
2. What businesses resumption planning lessons do you think firms learned as a result of such disaster?
3. Is there anything India-secure could have done to be better prepared for a disaster?

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## Chapter 14: Enterprise and Global Management of IT

### Objectives

At the end of this unit, you will understand

- IT Management
- Enterprise management using IT

### Introduction

The strategic and operational importance of information technology in business is no longer questions. As the 21<sup>st</sup> century unfolds, many companies throughout the world are intent on transforming themselves into global business powerhouses via major investments in global e-business, e-commerce, and other IT initiatives. Thus, there is a real need for business managers and professionals to understand how to manage this vital organizational function. The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company major advantages over the competitive forces it faces in the global marketplace. This creates strategic information systems, information systems that support or shape the competitive position and strategies of a business enterprise. So a strategic information system can be any kind of information system (TPS, MIS, DSS, etc.) that helps an organization to gain a competitive advantage, reduce a competitive disadvantage and meet other strategic enterprise objectives.

Information technology is an essential component of business success for companies today. But information technology is also a vital business resource that must be properly managed. Managing the information systems and technologies that support the modern business processes of companies today is a major challenge for both business and IT managers and professionals.

### Global IT Management

For some companies, the competition has not been powerful enough yet to drive them towards developing international systems. Other companies lack the global strategy needed for such development, or they have inherited a patchwork of international systems built with outdated technologies and standards. Some companies underestimate the time, expense, and logistical difficulties of making goods and information flow freely across different countries. The difficulties involved in planning a system appropriate to the firm's global strategy, structuring the organization of systems and business units, solving implementation issues, and choosing the right technical platform are simply too much for some companies. Managing the IS function in organizations has become a very complex task. Organizations have moved from the having a centralized structure towards a decentralized structure, back towards more centralization control over the management of the IS resources of a company. Modern computer-based information systems can support either the centralization or decentralization of information systems operations and decision-making within computer-using organizations.

Application development management involves managing activities such as systems analysis and design, prototyping, applications programming, project management, quality assurance, and system maintenance for all major e-business/IT development projects. Managing application development requires managing the activities of teams of systems analysts, software developers, and other IS professionals working on a variety of information systems development projects. In addition, some systems development groups have established development centers, staffed with IS professionals. IS operation management is concerned with the use of hardware, software, network, and personnel resources in the corporate or business unit data centers (computer centers) of an organization. Operational activities that must be managed include computer system operations, network management, production control, and production support. Many operations management activities are being automated by the use of software packages for computer system performance management.

Global IT management does not exist in a vacuum. Global IT management must focus on developing global e-business IT strategies and managing global e-business application portfolios, Internet technologies, and platforms, databases, and systems development projects. Managers must also take into account the cultural, political, and geographic differences that exist when doing business internationally. The applications of information technology developed by global companies depend on their e-business and IT strategies and their expertise and experience in IT. However, their IT applications also depend on a variety of global business drivers, that is, business requirements (business drivers) caused by the nature of the industry and its competitive or environmental forces. Examples include airlines and hotel chains with global customers, that is, customers who travel widely or have global operations. Such companies will need global e-business capabilities for online transaction processing so they can provide fast, convenient service to their customers or face losing them to their competitors. The economies of scale provided by global e-business operations are another business driver that requires the support of global IT applications. The challenge of global IT management is (a) Managing the joint development and implementation of e-business and IT strategies, (b) managing the development of e-business applications and the research and implementation of new information technologies, and (c) managing IT processes, professionals, and subunits within a company's IT organization and IS function.

### Global Enterprise IT Management

Information systems are not being used effectively or efficiently by many organizations. The experiences of successful organization reveal that the basic ingredient of high-quality information system performance is extensive and meaningful management and user involvement in the governance and development of IT applications. Thus, managers may serve on executive IT groups and create IS management functions within their business units.

The international dimensions of managing global information technologies include dealing with cultural, political, and geo-economic challenges posed by various countries; developing appropriate business and IT strategies for the global marketplace; and developing a portfolio of global e-business and e-commerce applications and an Internet-based technology platform to support them. In addition, data access methods have to be developed and systems development projects managed to produce the global e-business applications that are required to compete successfully in the global marketplace.

Many businesses are becoming global companies and moving toward trans-national business strategies in which they integrate the global business activities of their subsidiaries and headquarters. This requires that they develop a global IT platform, that is, an integrated worldwide hardware, software, and Internet-based network architecture. Global companies are increasingly using the Internet and related technologies as a major component of this IT platform to develop and deliver global IT applications that meet their unique global business requirements. Global IT and end user managers must deal with limitations on the availability of hardware and software, restrictions on trans-border data flows, Internet access, and

movement of personal data, and difficulties with developing common data definitions and system requirements.

## **Summary**

The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company major advantages over the competitive forces it faces in the global marketplace. This creates strategic information systems, information systems that support or shape the competitive position and strategies of a business enterprise. Information technology is an essential component of business success for companies today. But information technology is also a vital business resource that must be properly managed. Managing the information systems and technologies that support the modern business processes of companies today is a major challenge for both business and IT managers and professionals. The international dimensions of managing global information technologies include dealing with cultural, political, and geo-economic challenges posed by various countries; developing appropriate business and IT strategies for the global marketplace; and developing a portfolio of global e-business and e-commerce applications and an Internet-based technology platform to support them.

Global companies are increasingly using the Internet and related technologies as a major component of this IT platform to develop and deliver global IT applications that meet their unique global business requirements. Global IT and end user managers must deal with limitations on the availability of hardware and software, restrictions on trans-border data flows, Internet access, and movement of personal data, and difficulties with developing common data definitions and system requirements. Hardware, global software, and telecommunications are the main technical issues. Hardware issues arise because the firm needs to standardize the computer hardware platform when there is so much variation from operating unit to operating unit and country to country. Finding applications that are user friendly in an international environment and that truly enhance productivity is a critical software challenge. Making data flow seamlessly across networks shaped by disparate national standards is a major telecommunications challenge. Companies can use the Internet for international communication by creating global intranets and extranets. Companies can also use the Internet to create virtual private networks.

## **Keywords**

**Global Information Technology Management:** it is the management of information for the joint development and implementation of e-business and IT strategies by business and IT executives.

**Global Information Technology Management:** it is managing information technologies in an e-business enterprise by managing the research and implementation of new information technologies and the development of e-business applications.

**Global Technology Management:** Organizations must be able to manage e-business/IT planning and the IS function within a company.

**Global IS Management:** Managers within organizations are responsible for managing application development, data center operations, and user services.

**Global Operations Management:** it includes the management of activities such as data entry, equipment operations, production control, and production support.

## **Summary Questions**

1. What is the role of IT management in business process?
2. Explain Global IT management.
- 3.

## Case:

### **Bhima-India Implements IT enabled CRM**

Bhima-India is a leading provider of insurance and other financial services to individual and institutional customers. It serves 10 million individual Indian households and 64,000 firms and institutions with 33 million employees and members. Bhima-India is one of the largest Indian insurers, offering life and property/casualty insurance (including home and auto coverage) as well as savings, retirement, and other financial services for groups and individuals. It also has international insurance operations in 13 countries. Bhima-India demutualized and sold about a third of the company to the public in 2000. The business environment for insurance firms has changed dramatically in recent years. Consumers have many more purchasing options thanks to the IRDA roles and RBI rules, which allowed banks to merge with securities and insurance firms. The act enabled insurance firms and financial institutions to sell a broader array of products and, in turn, created a highly competitive environment. Insurance consumers' buying habits have changed – instead of agents pushing products, consumers are now seeking out information, often from both insurance firms and banks that are developing hybrid insurance and securities products.

Insurance firms are aggressively pursuing new business strategies that will help them keep their existing customers and win new customers from new and old competitors. Many of them are turning to customer IT enabled relationship management systems to market their services. Bhima-India, in particular, is concentrating its efforts on implementing a IT enabled CRM system and customer-centric service strategy to help it retain consumers and, in turn, boost sales. This application creates a single master record for each customer by pulling information from over 30 transaction processing systems. The goal is to ensure that every business unit and every Bhima-India employee has a consistent and current view of a customer's data. Doing so enables the sales department to better target customers for cross-selling opportunities. For example, service rep could sell a life-insurance policy to someone who holds a health-insurance policy with the company. Creating a master record for each customer will also help Bhima-India keep records up to date and identify any data accuracy problems. For example, if a customer has a life-insurance policy that states his age is 32, but he later opens a mutual fund and gives his age to the agent as 52, the system will alert the agent of the problem.

Successful implementation of the CRM system inevitably will change the way Bhima-India employees do their jobs. Sales and services representatives, for example, will be expected to deal with all aspects of their customers' financial needs, not just the one or two product lines they've traditionally handled. Bhima-India's management believes that customer service is imperative not only to Bhima-India's ability to grow but also to its ability to survive. Changes in work processes and roles coupled with successful implementation of the CRM system will enable the company to connect with customers in a way that provides intrinsic value and growth for the future.

#### Case Questions.

1. What challenges is Bhima-India facing that is driving it to invest in a CRM system?
2. What benefits does Bhima-India expect to achieve through successful implementation of CRM?
3. Gaining the desired business benefits from the CRM system requires people to change they way

they operate. What sort of changes must be made? What can Bhima-India management do to help ensure that employees are willing to make these changes?

4. Imagine that you are a Bhima-India service agent with 15 years of experience. Make a list of all the pros and cons you can imagine that such an individual would associate with moving to the new way of doing business.

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# Keywords

## Chapter 1

1. Information Systems: collections of all components of hardware, software, database, networks and people.
2. System: Collections of interrelated components
3. Supply chain: The pathway that facilitates the flow of physical resources from suppliers to then to customer's electronic systems.
4. Enterprise Resource Planning (ERP): Firms internal data Management, integrating all internal business processes.

## Chapter 2

1. Information Systems: components of Hardware, Software, Database, Networks and people in an organization.
2. Transaction Processing System: The operation level system.
3. Management Information System: The middle level business system
4. Decision Support System: The top level system used for decision making.
5. Executive Support System: more personalized systems for Executives.
6. Group Decision Support System: Decision support systems for collaboration of internal business process.
7. Drill Down Analysis: Multi Dimensional reports in an organization

## Chapter 3

1. Strategic Advantage: A strategic advantage is one that has a fundamental effect in shaping the firm's operations.
2. Information Systems: components of Hardware, Software, Database, Networks and people in an organization.
3. Knowledge Management: list of internal and external facts that are explicit and tacit.

## Chapter 4

1. Broadband: High-speed digital channels for microwave, fibre optics and satellite transmission, allowing transmission rates from 2,56,000 BPS to several billion BPS.
2. Circuit Switching: For regular telephone service.
3. Message Switching: For transmitting messages one bloc at a time.
4. Packet Switching: For subdividing communication messages into fixed groups, called packets, e.g. 128-character long packet in X.25 protocol.
5. Frame Relay: Same as packet switching, with packets of variable length.
6. Modem: The most common among communication processors, it converts digital signals from a computer into analog frequencies for transmission over ordinary telephone lines.
7. Multiplexer: This is a communications processor, allowing a single channel to carry simultaneous data transmissions from many terminals.
8. Switch: This is a communications processor that connects several telecommunication circuits in a network so that a message can reach its intended destination.

9. Router: This is a more intelligent communications processor that interconnects networks based on different rules or protocols, so that a message can reach its destination.
10. Hub: This is a part switching (often automatically) among connections.

## Chapter 5

1. Hardware: CPU, disk, tape, printer
2. Software: Packages, products, application programs
3. Telecommunication: Communication links
4. Data: Files, databases

## Chapter 6

1. Competitive advantage: It raises the bar in a specific market or industry that could be higher quality, lower cost, speed to market, or improved customer service.
2. Technology strategy: it is defined and implemented as part of the formal business plan, the risk is significantly reduced. The strategy needs to address: Company hardware and software standards, Definition of roles and responsibilities, Vendor performance management criteria, Asset retirement strategy.
3. An agile company: it depends heavily on Internet technologies to help it be responsive to its customers with customized solutions to their needs and cooperate with its customers, suppliers, and other businesses to bring products to market as rapidly and cost-effectively as possible.
4. Virtual Company: In this, Internet and other information technologies play an important role in providing computing and telecommunication resources to support the communications, coordination, and information flows needed.

## Chapter 7

1. EDI-Electronic Data Interchange: With EDI, a customer or client organization can place orders directly from its purchasing TPS into the order processing TPS of another organization.
2. CRM - Customer Relationship Management (CRM): It is a collection of people, processes, software, and Internet capabilities that help an enterprise manage customer relationships effectively and systematically.
3. Enterprise Resource Planning (ERP): an Information System, used for internal business process integration.

## Chapter 8

1. Supply Chain Management: it comprises warehouse management, radio frequency identification (RFID), and transportation management.
2. Purchasing: The purchasing department receives a list of raw materials and services necessary by the production department to complete the customer's preparation.

3. Production: Based on a manufacture plan, the raw resources are moved inventory to the manufacture area. The finished goods ordered by the customer are contrived using the raw materials purchased from suppliers.
4. Transportation: When the finished product arrives in the warehouse, the shipping section determines the most efficient method to ship the products so that they are delivered on or before the date specified by the customer.

## Chapter 9

1. Electronic data interchange (EDI): it involves application-to-application communications of business data (invoices, purchase orders, etc.) between firms in a standard data format.
2. Digital Certificate: A digital certificate is an attachment to an e-mail communication or data entrenched in a Web site that verifies die uniqueness of a sender or Web site.
3. Electronic Wallet: An electronic wallet holds credit card information, electronic cash, owner identification, and address information. It provides this information at an e-commerce site's checkout counter.
4. Smart Card: The smart card is a credit card -sized machine with an entrenched chip to provide electronic memory and dispensation capability.

## Chapter 10

1. Simons model phases: the three stages are intelligence, design, and choice.
2. Financial management information system: it provides financial information not only for executives but also for a broader set of people who need to make better decisions on a daily basis.
3. Marketing information system: it supports managerial activities in product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting.
4. Human resource information system: it is concerned with activities related to employees and potential employees of the organization.
5. Geographic information system (GIS): it is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information,

## Chapter 11

1. Information systems planning: it refers to the translation of strategic and organizational goals into systems development initiatives.
2. Prototyping: it takes an iterative approach to the systems development process. During each iteration, requirements and alternative solutions to the problem are identified and analyzed, new solutions are designed, and a portion of the system is implemented.
3. Technical feasibility: it is concerned with whether the hardware, software, and other system components can be acquired or developed to solve the problem.
4. A data-flow diagram (DFD): it models objects, associations, and activities by describing how data can flow between and around various objects.

5. A grid chart: it is a table that shows relationships among various aspects of a systems development effort. For example, a grid chart can be used to reveal the databases used by the various applications.

#### Chapter 12

1. The key element of ethical actions is Responsibility. It means that the potential costs, duties, and obligations for the decisions are accepted.
2. Accountability is a mark of systems and its social institutions. Methods and rules are in place to check the responsible, actionable entities.
3. Liability is a component of political systems such that a body of laws is in place. It actually permits people to recover the damages through other actors, systems, or organizations.
4. Privacy is very important and is related to individual's claim to be left alone, free from observation or meddling from other persons or organizations, including the condition. Claims of solitude are also involved at the office.
5. Software metrics: they are objective assessments of the system in the form of quantified measurements.
6. A firewall: it is a combination of hardware and software that controls the flow of incoming and outgoing network traffic

#### Chapter 13

1. Business ethics: it is concerned with the numerous ethical questions that managers must confront as part of their daily business decision-making.
2. Computer crime: it is a growing threat to society by the criminal or irresponsible actions of computer individuals who are taking advantage of the widespread use and vulnerability of computers and the Internet and other networks.
3. Virus: it is a program code that cannot work without being inserted into another program.
4. Worm: it is a distinct program that can run unaided.
5. Encryption: it is a means to protect the data that has become an important way to protect data and other computer network resources especially on the Internet, intranets, and extranets.

#### Chapter 14

1. Global Information Technology Management: it is the management of information for the joint development and implementation of e-business and IT strategies by business and IT executives.
2. Global Information Technology Management: it is managing information technologies in an e-business enterprise by managing the research and implementation of new information technologies and the development of e-business applications.
3. Global Technology Management: Organizations must be able to manage e-business/IT planning and the IS function within a company.
4. Global IS Management: Managers within organizations are responsible for managing application development, data center operations, and user services.

5. Global Operations Management: it includes the management of activities such as data entry, equipment operations, production control, and production support.