R N S INSTITUTE OF TECHNOLOGY

CHANNASANDRA, BANGALORE - 61

INFORMATION SYSTEMS

NOTES FOR 6TH SEMESTER INFORMATION SCIENCE

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CONTENTS:

UNIT 1
FOUNDATION CONCEPTS – 1

INTRODUCTION

What is an Information System?

An **Information System (IS)** can be any organized combination of people, hardware, software, communication networks, and data resources that stores and retrieves, transforms and disseminates information in an organization.

Information Technologies

Information System (IS) and Information Technology (IT) are two distinct concepts. IT refers to the various hardware components necessary for the system to operate. IS could use simple hardware components (such as files, folders) to capture and store its data. We will concentrate on *computer-based IS* and their use of the following Information Technologies:

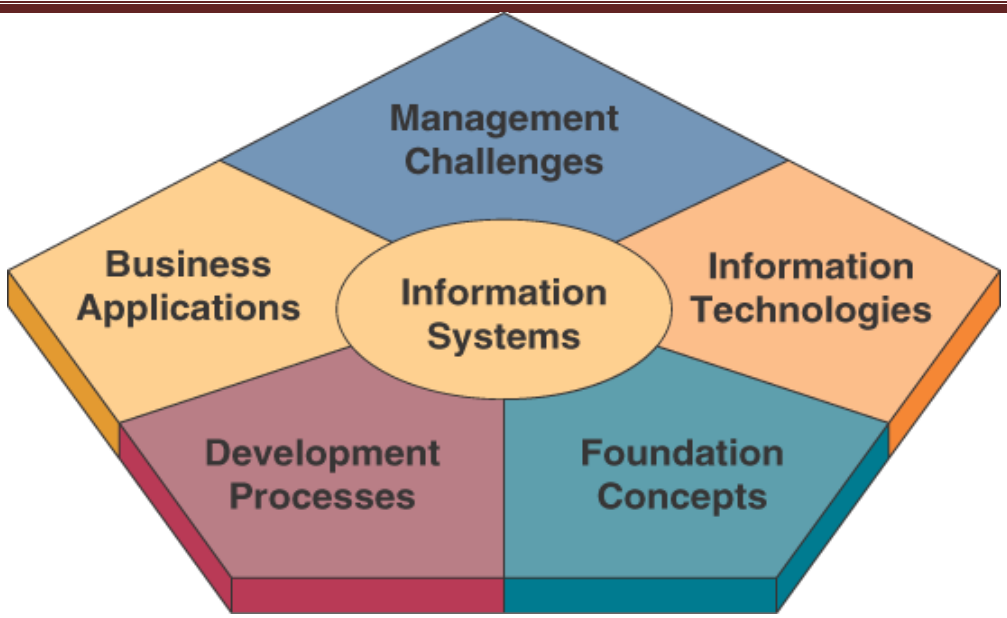
- **Computer hardware technologies,** including microcomputers, midsize servers, and large mainframe systems, and their input, output and storage devices that support them.
- **Computer software technologies,** including operating system software, Web browsers, software productivity suites and software for business applications like customer relationship management and supply chain management.
- **Telecommunication network technologies,** including the telecommunications media, processors, and software needed to provide wire-based and wireless access and support for the Internet and private Internet-based networks such as intranets and extranets.
- **Data resource management technologies,** including DBMS software for the development, access, and maintenance of the databases of an organization.

An IS Framework for Business Professionals

Figure 1.1 illustrates a useful conceptual framework that organizes the knowledge and emphasizes that you should concentrate on five areas of IS knowledge:

- **Foundation Concepts**. Fundamental behavioural, technical, business and managerial concepts about the components and roles of information systems.
- **Information Technologies.** Major concepts, developments and management issues in information technology – that is, hardware, software, networks, data management and many Internet-based technologies.
- **Business Applications.** The major uses of IS for the operations, management and competitive advantage of a business.
- **Development Processes.** How business professionals and information specialists plan, develop and implement IS to meet business opportunities.
- **Management Challenges.** The challenges of effectively and ethically managing information technology at the end user, enterprise and global levels of a business.

FIGURE 1.1 Major areas of IS knowledge needed by business professionals

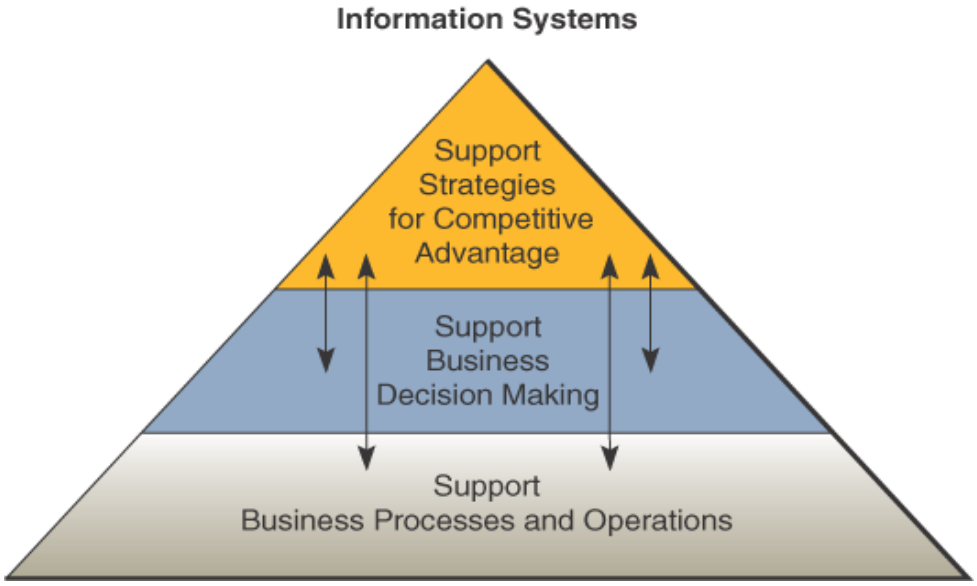


The Fundamental Roles of Information Systems in Business

There are three fundamental reasons for all business applications of information technology. They are found in the three vital roles that information systems can perform for a business enterprise.

- Support of its business processes and operations.
- Support of decision making by its employees and managers.
- Support of its strategies for competitive advantage.

FIGURE 1.2 The 3 major roles of the business applications of IS



Trends in Information Systems

The business applications of IS have expanded significantly over the years. Figure 1.3 summarizes the changes. [Explain year-wise developments by looking at the diagrams in paragraph form, if asked in examination.]

The Major Roles of IS: Examples

- **Support Business Processes.** We regularly encounter IS at many retail stores. They record customer purchases, keep track of inventory, pay employees, evaluate sales trends etc.
- **Support Decision Making.** IS helps store manager and other business professionals make better decisions. For example, decisions on what lines of merchandise need to be added or discontinued, kind of investments they require are made after an analysis provided by computer based IS.
- **Support Competitive Advantage.** Gaining strategic advantage over competitors requires innovative application of information technologies. For example, installing touch-screen kiosks with link to e-commerce website for online shopping might attract new customers and build customer loyalty because of ease of shopping.

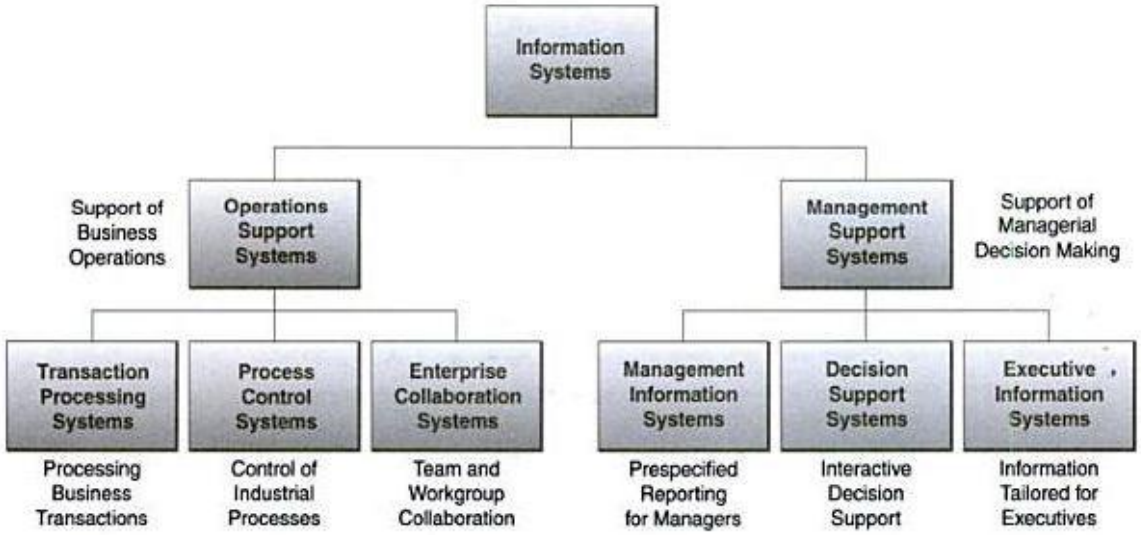
Types of Information Systems

Information systems are categorised to spotlight the major roles each plays in the operations and management of a business.

- **Operations Support Systems.** They produce a variety of information products for internal and external use. The role of a business firm's operations support systems is to efficiently process business transactions, control industrial processes, support enterprise communications and collaboration, and update corporate databases.
  - **transaction processing systems** – they process transactions in two ways namely: (i) *batch processing* – transactions data are accumulated over a period of time and processed periodically. (ii) *real time processing* – data are processed immediately after transaction occurs.
  - **Process control systems –** monitor and control physical processes.
  - **Enterprise collaboration systems** – enhance team and workgroup communications and productivity; include applications that are sometimes called *office automation systems.*
- **Management Support systems.** When information systems focus on providing information and support for effective decision making by managers, they are called management support systems.

- **Management information systems** provide information in the form of reports and displays to managers and many business professionals.
- **Decision support systems** give direct computer support to managers during the decision-making process.
- **Executive information systems** provide critical information from a variety of internal and external sources in easy-to-use displays to executives and managers.

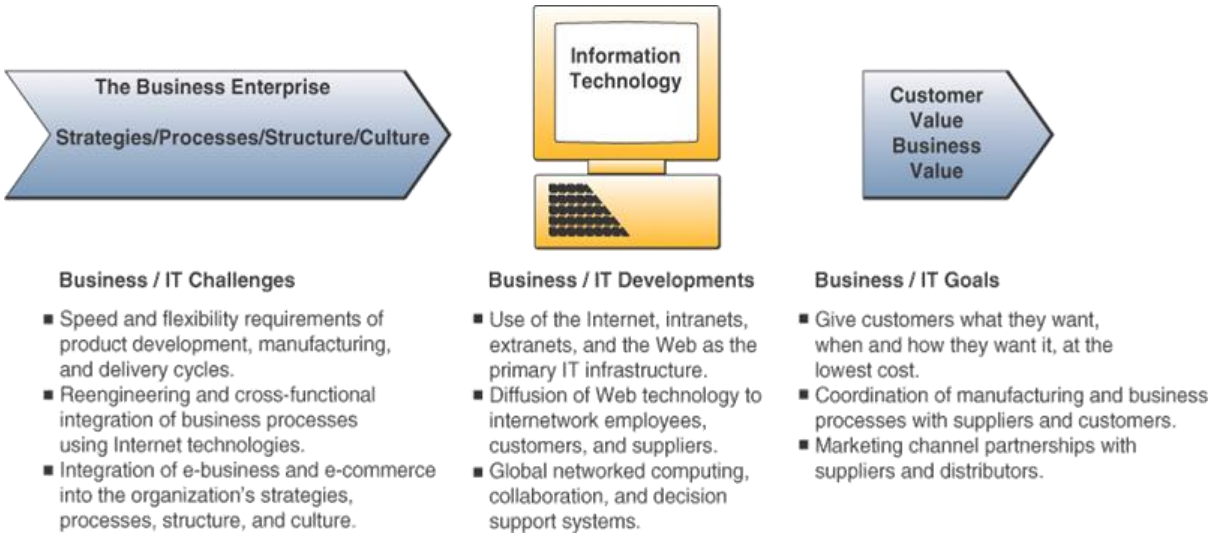
FIGURE 1.5 Operations and management classifications of information systems. Note how this conceptual overview emphasizes the main purposes of information systems that support business operations and managerial decision making.



Managerial Challenges of Information Technology

Figure 1.10 emphasizes that IS and their technologies must be managed to support the business strategies, business processes, and organizational structures and culture of a business enterprise. The goal of many companies today is to maximize their customer and business value by using IT to support their employees in implementing cooperative business processes with customers, suppliers and others.

FIGURE 1.10 examples of the challenges and opportunities that business managers face in managing IS and technologies to meet business goals.



- ✓ **Success and failure with IT –** the success of an IS should not be measured only by its *efficiency* in terms of minimizing costs, time, and the use of information resources. Success should also be measured by the *effectiveness* of IT in supporting an organization's business strategies, enabling its business processes,

enhancing its organisational structures and culture, and increasing the customer and business value of the enterprise.

- ✓ **Developing IS solutions –** most computer-based IS are conceived, designed and implemented using some form of systematic development process.

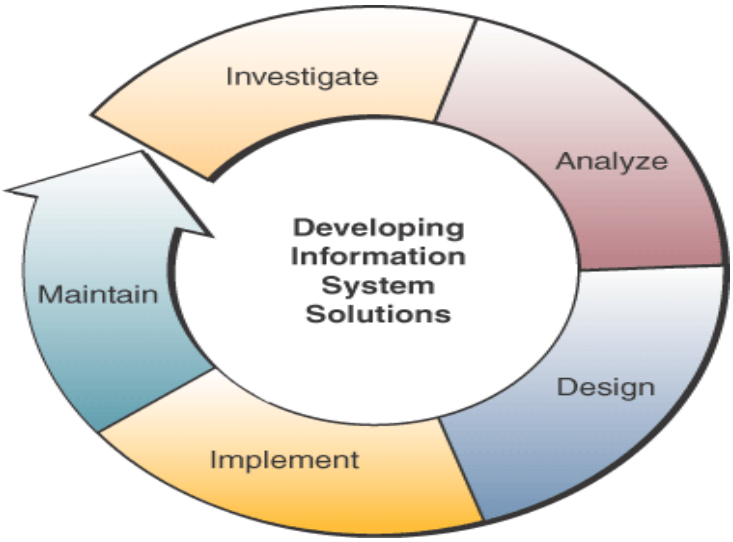
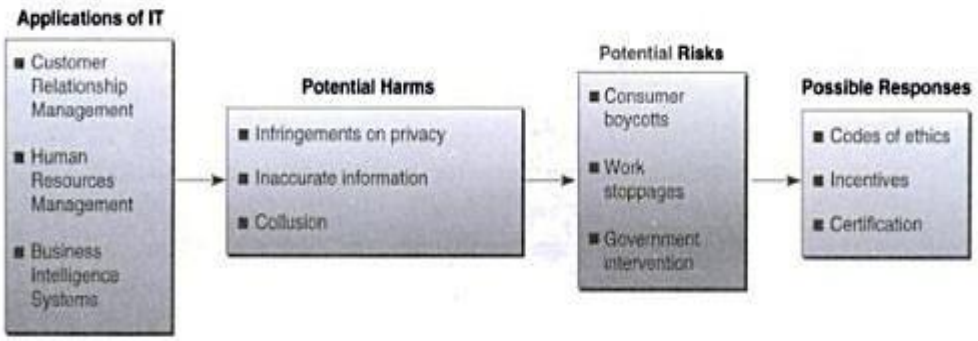


FIGURE 1.11 developing IS solutions to business problems can be implemented and managed as a multistep process or cycle.

In this development process, end users and information specialists *design* IS applications based on the *analysis* of the business requirements of an organisation. Examples of other activities include *investigating* the economic or technical feasibility of a proposed application, acquiring and learning how to use the software required implementing the new system, and making improvements to *maintain* the business value of a system.

- ✓ **Challenges of Ethics and IT -** some of the ethical responsibilities are:
  - ➢ What uses of IT might be considered improper, irresponsible or harmful to other individuals or to society?
  - ➢ What is the proper business use of the internet and an organization's IT resources?
  - ➢ What does it take to be a responsible end user of IT?
  - ➢ How can you protect yourself from computer crime and other risks of IT?

FIGURE 1.12 Examples of some of the ethical challenges that must be faced by business managers who implement major applications of information technology.



- ✓ **Challenges of IT Careers –** both IT and IS has created interesting, challenging and lucrative career opportunities for millions of men and women all over the globe.
  - ➢ Uncertainty about the career path.
  - ➢ Economic downturns have affected all job sectors [in recent years].

- Rising labour costs have led to software outsourcing.
- New jobs pose constant human resource management challenges to all organisations due to frequent shortage of qualified personnel.
- Constantly changing job requirements.

✓ **The IS Function –** it represents:

- A major functional area of business equally as important to business success as the functions of accounting, finance, operations management, marketing and human resources management.
- An important contributor to operational efficiency, employee productivity and morale, and customer service and satisfaction.
- A major source of information and support needed to promote effective decision making by managers and business professionals.
- A vital ingredient in developing competitive products and services that give an organisation a strategic advantage in the global marketplace.
- A dynamic, rewarding and challenging career opportunity for millions of men and women.
- A key component of the resources, infrastructure, and capabilities of today's networked business enterprises.

SYSTEM CONCEPTS: A FOUNDATION

System concepts underlie all business processes and the field of information systems. They help you understand:

- **Technology.** That computer networks are systems of information processing components that use a variety of hardware, software, data management, and telecommunications network technologies.
- **Applications.** That electronic business and commerce applications involve interconnected business information systems.
- **Development.** That developing ways to use information technology in business includes designing the basic components of information systems.
- **Management.** That managing IT emphasizes the quality, strategic business value, and security of an organisation's information systems.

What is a system?

A system is a set of interrelated components, with a clearly defined boundary, working together to achieve a common set of objectives.

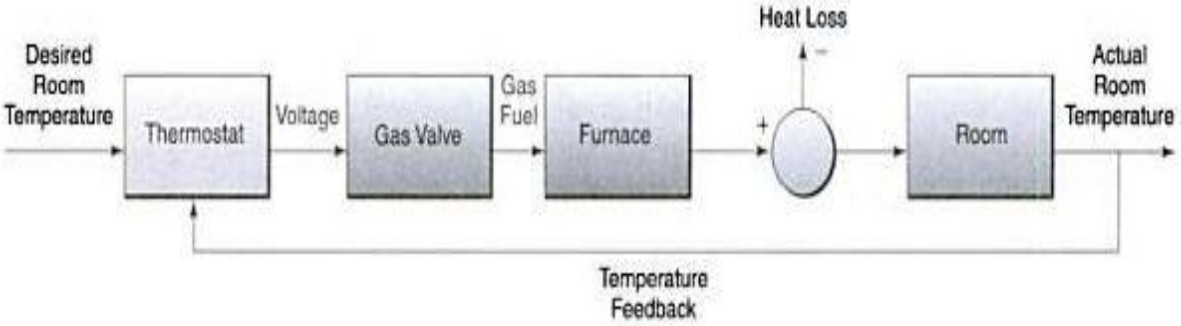
Dynamic system has three basic interacting components or functions:

- **Input** involves capturing and assembling elements that enter the system to be processed
- **Processing** involves transformation processes that convert input into output.
- **Output** involves transferring elements that have been produced by a transformation process to their ultimate destination.

The system concept becomes even more useful by including two additional components: feedback and control. This is called as a *cybernetic* system, that is, self-monitoring and self-regulatory.

- **Feedback** is data about the performance of a system.
- **Control** involves monitoring and evaluating feedback to determine whether a system is moving toward the achievement of its goal.

FIGURE 1.13 A common cybernetic system is a home temperature control system. The thermostat accepts the desired room temperature as input and sends voltage to open the gas valve which fires the furnace. The resulting hot air goes into the room and the thermometer in the thermostat provides feedback to shut the system down when the desired temperature is reached.

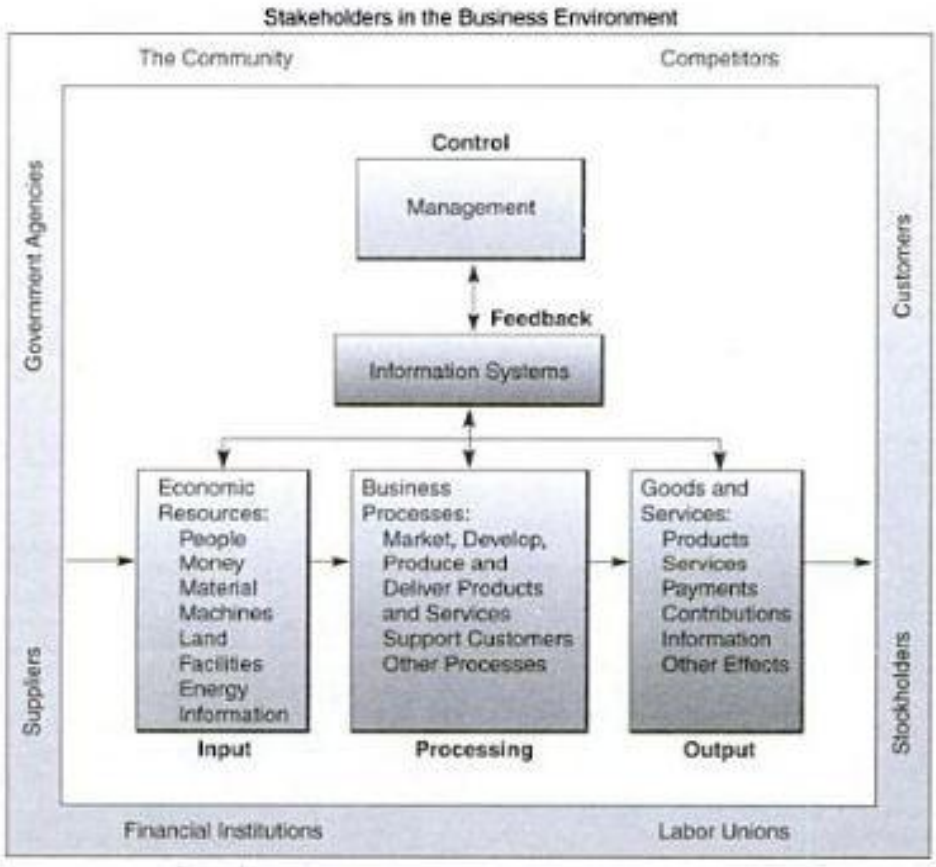


Other system characteristics

A system does not exist in a vacuum; rather, it exists and functions in an *environment* containing other systems. If a system is one of the components of a larger system, it is a *subsystem* and the larger system is its environment. Several systems share same environment. Some of these systems may be connected to one another by means of a shared boundary, or *interface*. Figure 1.14 illustrates the concept of *open system.* Here, the systems exchanges

inputs and outputs with its environment. A system that has the ability to change itself or its environment in order to survive is an *adaptive system.*

FIGURE 1.14
A business is an example of an organizational system where economic resources (input) are transformed by various business processes (processing) into goods and services (output). Information systems provide information (feedback) on the operations of the system to management for the direction and maintenance of the system (control) as it exchanges inputs and outputs with its environment.



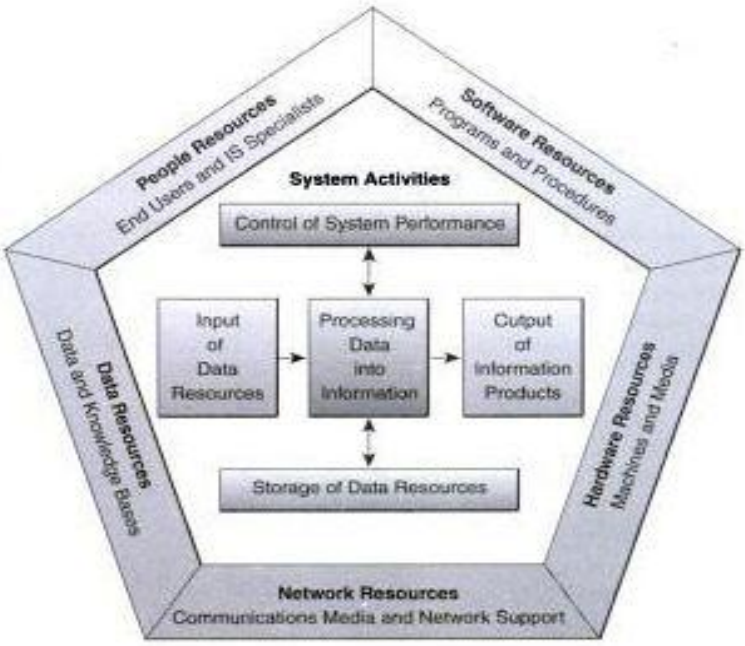
Components of an Information System

Figure 1.15 illustrates an **information system model** that expresses a fundamental conceptual framework for the major components and activities of IS. An IS depends on the resources of people, hardware, software, data, and networks to perform input, processing, output, storage, and control activities that convert data resources into information products.

This **information system model** provides a framework that emphasizes four major concepts that can be applied to all types of IS;

- People, hardware, software, data, and networks are the five basic resources of IS.
- People resources include end users and IS specialists, hardware resources consist of machines and media, software resources include both programs and procedures, data resources can include data and knowledge bases, and network resources include communications media and networks.

FIGURE 1.15
The components of an information system. All information systems use people, hardware, software, data, and network resources to perform input, processing, output, storage, and control activities that transform data resources into information products.



- Data resources are transformed by information processing activities into a variety of information products for end users.
- Information processing consists of the system activities of input, processing, output, storage and control.

Information System Resources

- **People Resources** – people are essential for successful operation of all IS. They include:
  - **End users** (users/clients) are people who use IS. They can be customers, salespersons, engineers, clerks, accountants or managers. They are **knowledge workers** who spend time communicating and collaborating in teams and workgroups and creating, using and distributing information.
  - **IS specialists** are people who develop and operate IS. They include systems analysts, software developers, system operators and other managerial, technical, and clerical IS personnel. They design, monitor and operate large computer systems & network.
- **Hardware Resources –** includes all physical devices and materials used in information processing. Also includes all data **media** [paper, magnetic/optical disks]
  - **Computer Systems,** which consists of CPU containing microprocessors and variety of interconnected peripherals devices. Ex: laptops, desktops, mainframes etc.
  - **Computer peripherals,** devices such as keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for data storage.
- **Software Resources –** includes all sets of information processing instructions called **procedures** and sets of operating instructions called **programs.** Examples are:
  - **System Software,** such as an OS program, which controls and supports the operations of a computer system.
  - **Application Software,** programs that direct processing for a particular use of computers by end users.
  - **Procedures,** operating instructions for people who use an IS.
- **Data resources –** data are the lifeblood of today's organisations and the effective and efficient management of data is considered an integral part of organizational strategy. Data can take many forms like alphanumeric data, text, images, audio, video, human voice etc. The data resources of information systems are typically organised, stored, and accessed by a variety of data resource management technologies into:
  - Databases that hold processed and organised data.
  - Knowledge bases that hold knowledge in a variety of forms such as facts, rules and case examples about successful business practices.

- **Data v/s information** – data means raw facts or observations. Information means data that have been converted into meaningful or useful context for specific end users.

❖ **Network Resources –** this concept emphasizes that communications technologies and networks are a fundamental resource component of all IS. They include:

- **Communications Media.** Examples include twisted-pair wire, co-axial and fibre-optic cables; and microwave, cellular, and satellite wireless technologies.
- **Network Infrastructure.** Examples include communications processors such as modems and internetwork processors and communications control software such as network OS and Internet browser packages.

Information System Activities

Basic activities of IS are:

✓ **Input of Data Resources –** data about business transactions and other events must be captured and prepared for processing by the **input** activity. End users take care of recording and editing of data entries into a computer system. Later it is transferred to machine-readable medium [magnetic disk] until needed for processing. Example: optical scanning of bar-coded tags on merchandise.

✓ **Processing of Data into Information –** data are typically subjected to **processing** activities such as calculating, comparing, sorting, classifying, and summarizing. These activities organize, analyse, and manipulate data, thus converting them into information for end users. The quality of any data stored in an information system must also be maintained by a continual process of correcting and updating activities.

✓ **Output of Information Products –** information in various forms is transmitted to end users and made available to them in the **output** activity. The goal of IS is the production of appropriate **information products** for end users like messages, reports, forms and graphic images, which may be provided by video displays, audio responses, paper products, and multimedia.

✓ **Storage of Data Resources – storage** is the IS activity in which data and information are retained in an organised manner for later use. Stored data are commonly organized into a variety of data elements and databases.

✓ **Control of System Performance –** an IS should produce feedback about its input, processing, output and storage activities. This feedback must be monitored and evaluated to determine if the system is meeting established performance standards.

Recognizing Information Systems

As a business professional, you should be able to identify and recognize the fundamental components of IS in the real world such as:

➢ The people, hardware, software, data and network resources they use.
➢ The types of information products they produce.
➢ The way they perform input, processing, output, storage and control activities.

This kind of understanding will help us to be a better user, developer, and manager of information systems.

UNIT 2
FOUNDATION CONCEPTS – 2

FUNDAMENTALS OF STRATEGIC ADVANTAGE

Strategic IT

IT can change the way businesses compete. So, we should also view IS strategically 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 business environment.

Competitive Strategy Concepts

A strategic IS can be any kind of IS that uses IT to help an organisation gain a competitive advantage, reduce a competitive disadvantage, or meet other strategic enterprise objectives.

Competitive Forces and Strategies

A company can survive and succeed in the long run only if it successfully develops strategies to confront five **competitive forces** that shape the structure of competition in its industry. Any business that wants to survive and succeed must develop and implement strategies to effectively counter

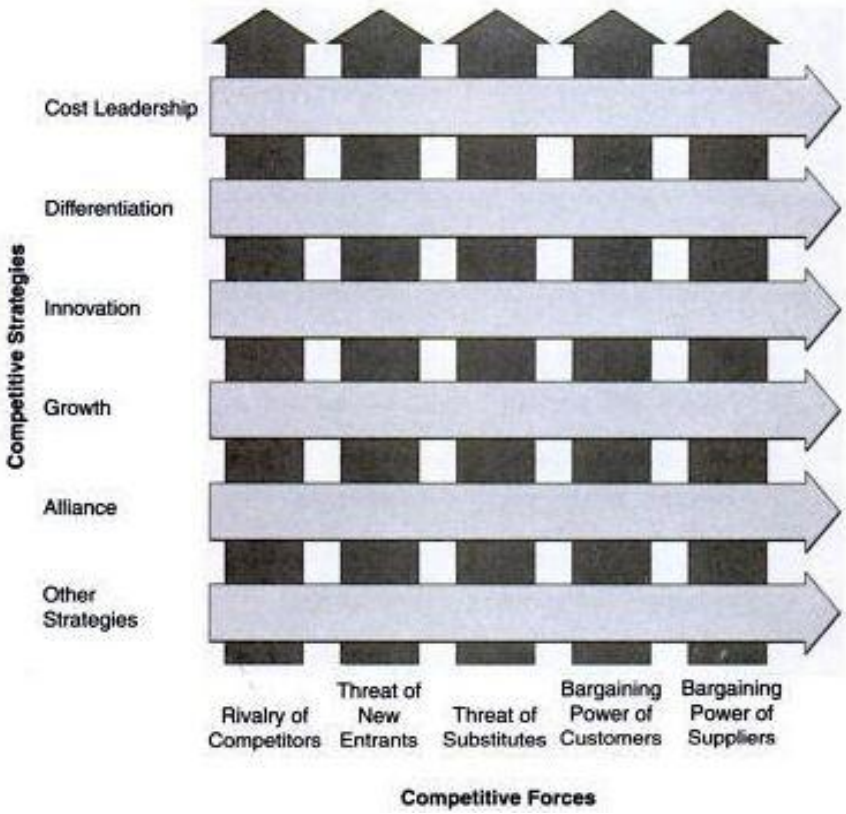
- The rivalry of competitors within its industry
- The threat of new entrants into an industry and its markets
- The threat posed by substitute products which might capture market share
- The bargaining power of customers
- The bargaining power of suppliers

The Competitive Advantage of IT

Figure 2.1 illustrates that businesses can counter the threats of competitive forces that they face by implementing five basic **competitive strategies**

- **Cost Leadership Strategy.** Becoming a low-cost producer of products and services in the industry, or finding ways to help its suppliers or customers to reduce their costs or to increase the cost of their competitors.
- **Differentiation Strategy.** Developing ways to differentiate a firm's products and services from its competitors' or reduce the differentiation advantages of competitors.
- **Innovation Strategy.** Finding new ways of doing business. This may involve the development of unique products and services, or entry into unique markets or market niches.
- **Growth Strategies.** Significantly expanding a company's capacity to produce goods and services, expanding into global markets, diversifying into new products and services, or integrating into related products and services.
- **Alliance Strategies.** Establishing new business linkages and alliances with customers, suppliers, competitors, consultants, and other companies. These linkages may include mergers, acquisitions, joint ventures, forming of "virtual companies".

FIGURE 2.1
Businesses can develop competitive strategies to counter the actions of the competitive forces they confront in the marketplace.



Strategic uses of Information Technology

FIGURE 2.2 A summary of how information technology can be used to implement the five basic competitive strategies. Many companies are using Internet technologies as the foundation for such strategies.

Basic Strategies in the Business Use of Information Technology
Lower Costs • Use IT to substantially reduce the cost of business processes. • Use IT to lower the costs of customers or suppliers.
Differentiate • Develop new IT features to differentiate products and services. • Use IT features to reduce the differentiation advantages of competitors. • Use IT features to focus products and services at selected market niches.
Innovate • Create new products and services that include IT components. • Develop unique new markets or market niches with the help of IT. • Make radical changes to business processes with IT that dramatically cut costs, improve quality, efficiency, or customer service, or shorten time to market.
Promote Growth • Use IT to manage regional and global business expansion. • Use IT to diversify and integrate into other products and services.
Develop Alliances • Use IT to create virtual organizations of business partners. • Develop interenterprise information systems linked by the Internet and extranets that support strategic business relationships with customers, suppliers, subcontractors, and others.

Other competitive strategies

- ✓ **Locking in customers and suppliers** – building valuable new relationships that it deters them from abandoning a company for its competitors, or intimidating it into accepting less profitable business arrangements.
- ✓ **Building switching costs** – investments in IS technology can make customers or suppliers dependent on the continued use of innovative, mutually beneficial interenterprise information systems.
- ✓ **Raising barriers to entry** – by making investments in IT to improve its operations or promote innovation, a firm could also erect barriers to entry that would discourage or delay other companies from entering the market.
- ✓ **Leveraging investment in IT** – by developing new products and services that would not be possible without a strong IT capability.

Building a customer-focused business

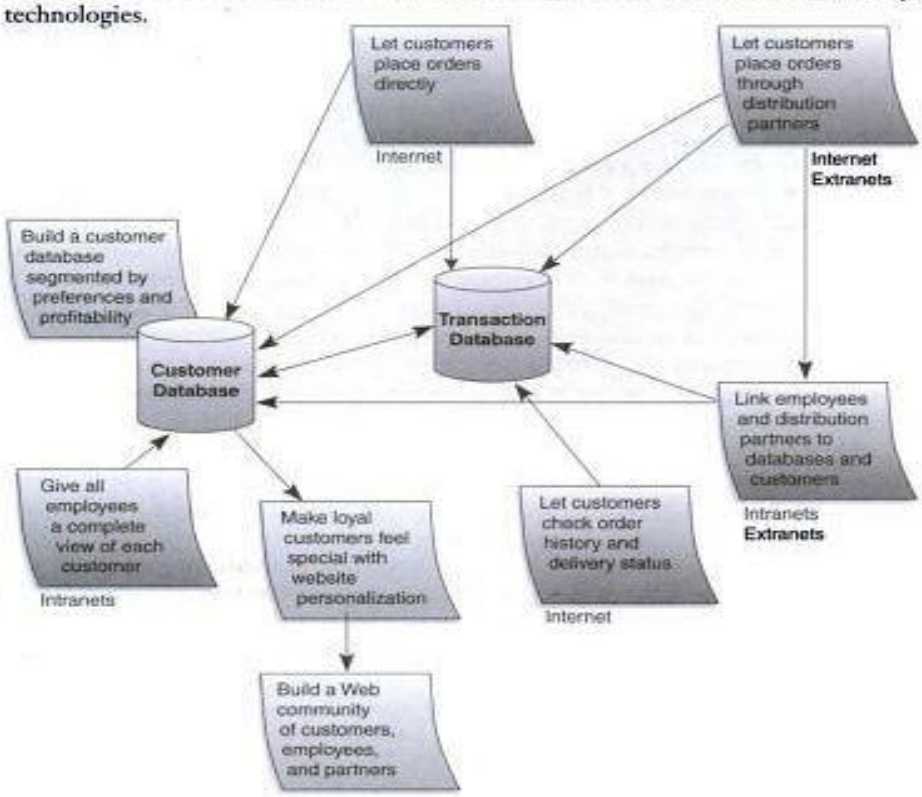
For many companies, the chief business value of becoming a **customer-focused business** lies in its ability to help them keep customers loyal, anticipate their future needs, respond to customer concerns, and provide top quality customer service.

Internet technologies can make customers the focal point of customer relationship management (CRM) and other e-business applications. CRM systems and Internet, intranet, and extranet websites create new channels for interactive communications within a company, with customers, and with the suppliers, business partners, and others in the external environment. This enables continual interaction with customers by most business functions and encourages cross-functional collaboration with customers in product development, marketing, delivery, service, and technical support.

Typically, customers use Internet to ask questions, lodge complaints, evaluate products, request support, and make and track their purchases.

Figure 2.5 illustrates the interrelationships in a customer-focused business.

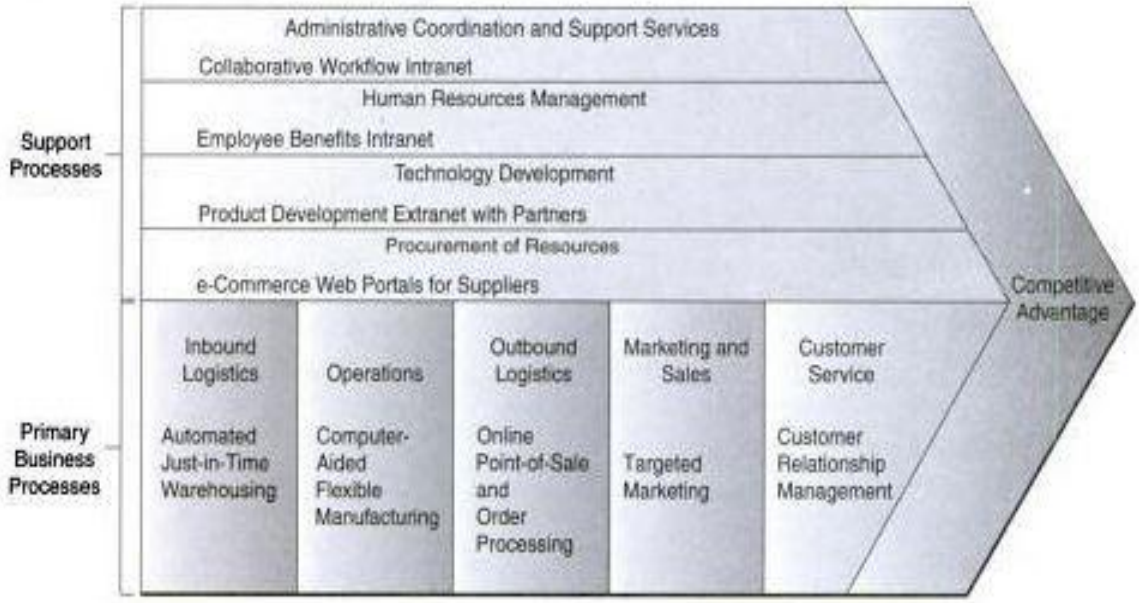
FIGURE 2.5 How a customer-focused business builds customer value and loyalty using Internet technologies.



The value chain and strategic IS

The value chain concept views a firm as a series, chain, or network of basic activities that add value to its products and services, and thus add a margin of value both to the firm and its customers. In the value chain conceptual framework, some business activities are primary processes; others are support processes.

FIGURE 2.6 The value chain of a firm. Note the examples of the variety of strategic information systems that can be applied to a firm's basic business processes for competitive advantage.



USING INFORMATION TECHNOLOGY FOR STRATEGIC ADVANTAGE

Reengineering Business Processes

Reengineering is a fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in cost, quality, speed and service.

FIGURE 2.7
Some of the key ways that business process reengineering differs from business improvement.

	Business Improvement	Business Process Reengineering
Level of Change	Incremental	Radical
Process Change	Improved new version of process	Brand new process
Starting Point	Existing processes	Clean slate
Frequency of Change	One-time or continuous	Periodic one-time change
Time Required	Short	Long
Typical Scope	Narrow, within functions	Broad, cross functional
Horizon	Past and present	Future
Participation	Bottom-up	Top-down
Path to Execution	Cultural	Cultural, structural
Primary Enabler	Statistical control	Information technology
Risk	Moderate	High

Source: Adapted from Howard Smith and Peter Fingar, *Business Process Management: The Third Wave*. Tampa, FL: Meghan-Kiffer Press, 2003, p. 118.

The Role of IT

Information Technology plays a major role in reengineering most 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 communications and collaboration among the people responsible for their operation and management.

FIGURE 2.8 The order management process consists of several business processes and crosses the boundaries of traditional business functions.

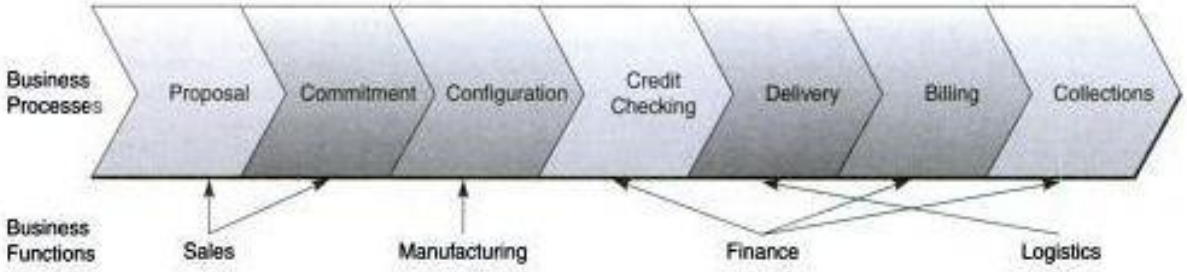


FIGURE 2.9 Examples of information technologies that support reengineering the order management processes.

Reengineering Order Management
• Customer relationship management systems using corporate intranets and the Internet.
• Supplier managed inventory systems using the Internet and extranets.
• Cross-functional ERP software for integrating manufacturing, distribution, finance, and human resource processes.
• Customer-accessible e-commerce websites for order entry, status checking, payment, and service.
• Customer, product, and order status databases accessed via intranets and extranets by employees and suppliers.

Becoming an Agile Company

Agility in business performance is the ability of a company to prosper in rapidly changing, continually fragmenting global markets for high-quality, high-performance, customer-configured products and services. An **agile company** can make profit in markets with broad product ranges and short model lifetimes, and can produce orders individually and in arbitrary lot sizes. It supports *mass customization* by offering individualized products while maintaining high volumes of production. Agile companies heavily depend on Internet technologies.

To be an agile company, a business must implement four basic strategies:

- ✓ Customers of an agile company perceive products or services as solutions to their individual problems.
- ✓ An agile company cooperates with customers, suppliers and other companies, and even with competitors.
- ✓ An agile company organizes using flexible organizational structures so that it thrives on change and uncertainty.
- ✓ An agile company leverages the impact of its people and the knowledge they possess.

Figure 2.10 summarizes another useful way to think about agility in business. This framework emphasizes the roles that customers, business partners, and IT can play in developing and maintaining the strategic ability of a company.

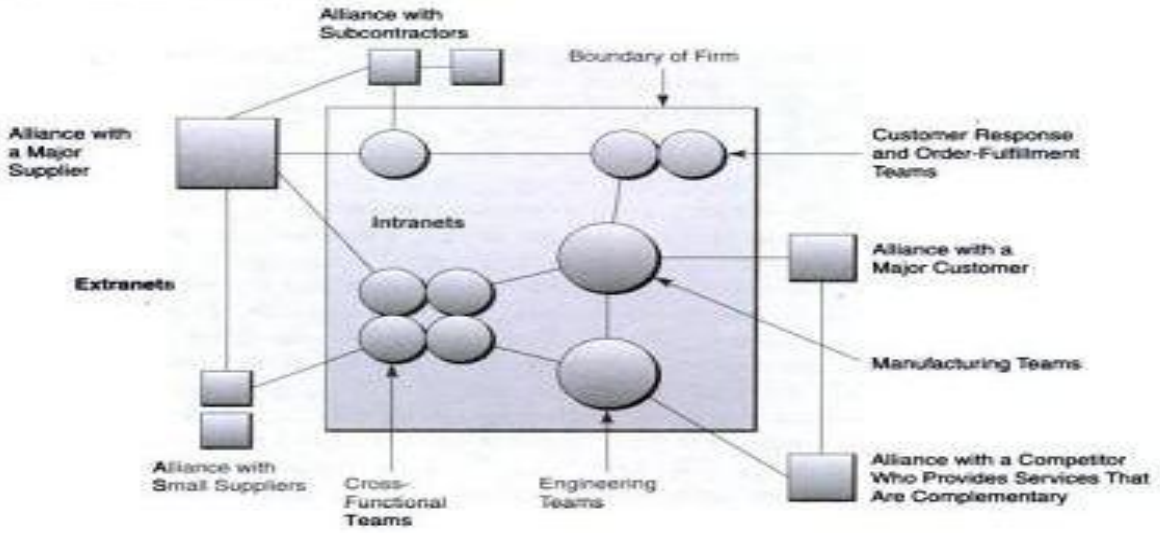
FIGURE 2.10 How information technology can help a company be an agile competitor with the help of customers and business partners.

Type of Agility	Description	Role of IT	Example
Customer	Ability to co-opt customers in the exploitation of innovation opportunities • as sources of innovation ideas • as cocreators of innovation • as users in testing ideas or helping other users learn about the idea	Technologies for building and enhancing virtual customer communities for product design, feedback, and testing	eBay customers are its de facto product development team because they post an average of 10,000 messages each week to share tips, point out glitches, and lobby for changes.
Partnering	Ability to leverage assets, knowledge, and competencies of suppliers, distributors, contract manufacturers, and logistics providers in the exploration and exploitation of innovation opportunities	Technologies facilitating interfirm collaboration, such as collaborative platforms and portals, supply-chain systems, etc.	Yahoo! has accomplished a significant transformation of its service from a search engine into a portal by initiating numerous partnerships to provide content and other media-related services from its website.
Operational	Ability to accomplish speed, accuracy, and cost economy in the exploitation of innovation opportunities	Technologies for modularization and integration of business processes	Ingram Micro, a global wholesaler, has deployed an integrated trading system allowing its customers and suppliers to connect directly to its procurement and ERP systems.

Creating a virtual company

A virtual company (*virtual organisation or virtual corporation*) is an organisation that uses IT to link people, organisations, assets and ideas. It has also developed alliances and extranet links that form **interenterprise information systems** with suppliers, customers, subcontractors, and competitors. Thus, virtual companies create flexible and adaptable virtual workgroups and alliances keyed to exploit fast-changing business opportunities.

FIGURE 2.11 A virtual company uses the Internet, intranets, and extranets to form virtual workgroups and support alliances with business partners.



Virtual Company Strategies

- Share infrastructure and risk with alliance partners.
- Link complementary core-competencies.
- Reduce concept-to-cash time through sharing.
- Increase facilities and market coverage.
- Gain access to new markets and share market or customer loyalty
- Migrate from selling products to selling solutions.

Building Knowledge-Creating Company

Lasting competitive advantage today can only come from innovative use and management of organizational knowledge by knowledge creating companies. 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.

Knowledge creating companies exploit two kinds of knowledge.

- Explicit knowledge – data, documents, things written down or stored on computers.
- Tactic knowledge – the "how - tos" of knowledge, which resides in workers.

Knowledge management systems – the goal of such systems is to help knowledge workers create, organise, and make available important business knowledge, wherever and whenever it's needed in an organisation. This includes processes, procedures, patents, reference works, formulae, "best practices", forecasts and fixes. This helps the company become a more innovative and agile provider of high-quality products and customer services, and a formidable competitor in the marketplace.

FIGURE 2.13
Knowledge management can be viewed as three levels of techniques, technologies, and systems that promote the collection, organization, access, sharing, and use of workplace and enterprise knowledge.

UNIT 3
ELECTRONIC BUSINESS SYSTEMS

ENTERPRISE BUSINESS SYSTEMS

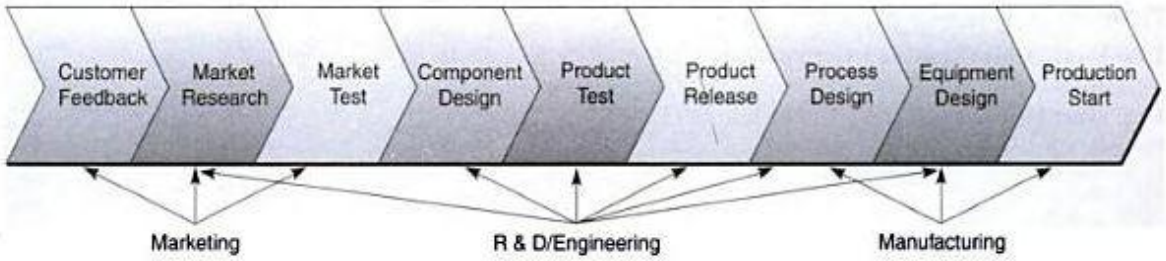
Introduction

E – Business is the use of the Internet and other networks and information technologies to support electronic commerce, enterprise communications and collaboration, and Web – enabled business processes, both within a networked enterprise and with its customers and business partners. E – Business includes **e-commerce**, which involves the buying, and selling and marketing and servicing of products, services, and information over the Internet and other networks.

Cross-Functional Enterprise Applications

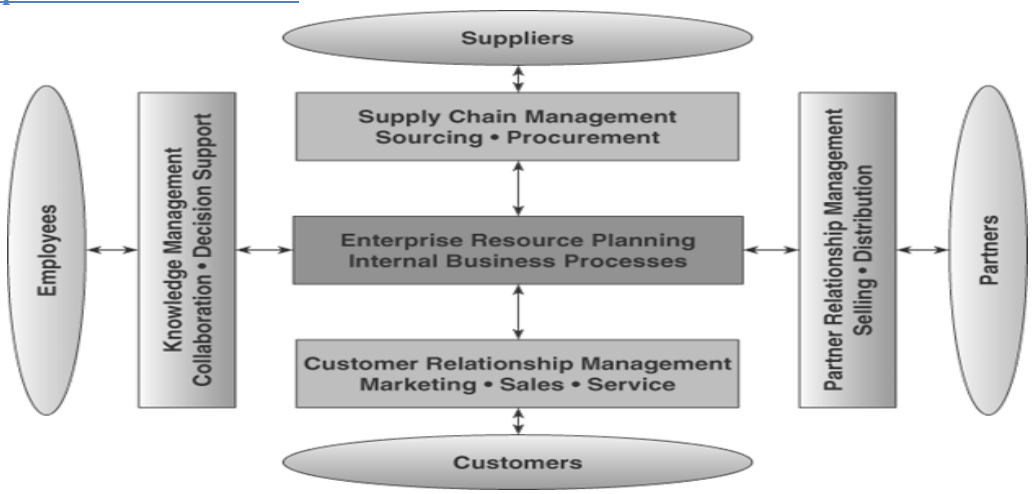
Many companies today are using IT to develop integrated **cross-functional enterprise systems** that cross the boundaries of traditional business functions in order to reengineer and improve vital business processes all across the enterprise. This improves the efficiency and effectiveness of business processes, and develops strategic relationships with customers, suppliers and business partners.

FIGURE 7.1 The new product development process in a manufacturing company. This is an example of a business process that must be supported by cross-functional information systems that cross the boundaries of several business functions.



Many companies first moved from functional mainframe-based **legacy systems** to integrated cross-functional **client/server** applications. This typically involved installing **enterprise resource planning, supply chain management, or customer relationship management** software from SAP America, Oracle and others. These software focuses on supporting integrated clusters of business processes involved in the operations of a business.

Enterprise application Architecture

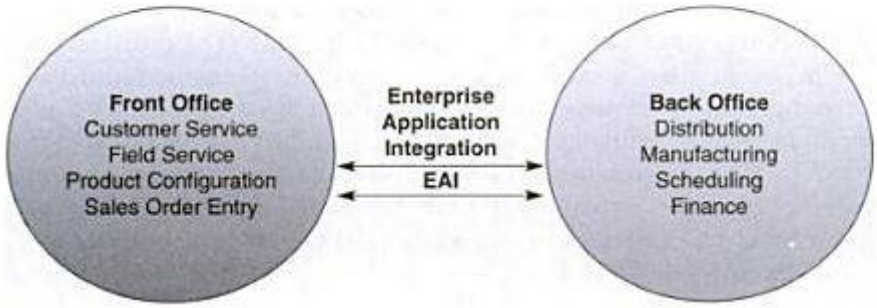


- The fig below presents an Enterprise application Architecture ,which illustrates the interrelationships of the major cross-functional applications.
- Provides a conceptual framework which helps to visualize the basic components, processes, and interfaces of major e-business applications.
- Focuses on accomplishing fundamental business processes in concert with Customers, Suppliers, Partners, employee stakeholders.
- Thus, Enterprise Resource Planning.

Enterprise application integration

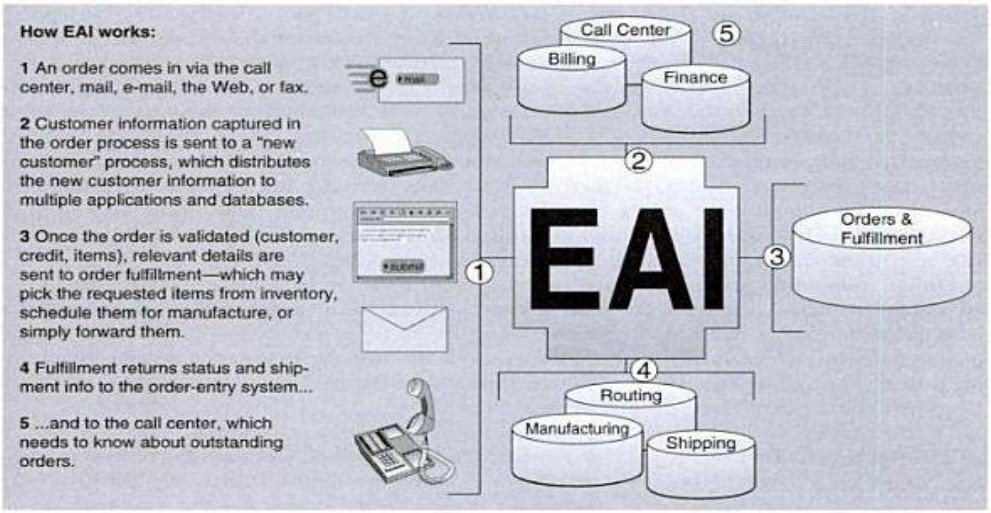
Enterprise application integration (EAI) software is being used by many companies to connect their major e-business applications. EAI software enables users to model the business processes involved in the interactions that should occur between business applications. EAI also provides **middleware** that performs data conversion and co-ordination, application communication and messaging services, and access to the application interfaces involved. Thus, EAI software can integrate a variety of enterprise application clusters by letting them exchange data according to rules derived from the business process models developed by users.

FIGURE 7.3 Enterprise application integration software interconnects front-office and back-office applications.



Integration is a vital capability that provides real business value to a business enterprise that must respond quickly and effectively to business events and customer demands. EAI also streamlines sales order processing so products and services can be delivered faster.

FIGURE 7.4 An example of a new customer order process showing how EAI middleware connects several business information systems within a company.



Transaction Processing Systems

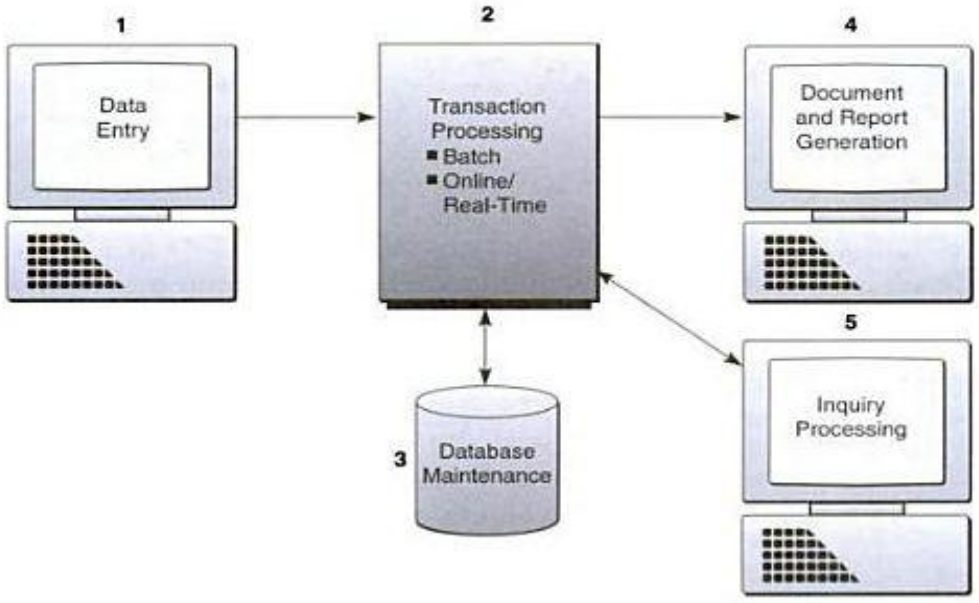
Transaction processing systems (TPS) are cross-functional information systems that process data resulting from the occurrence of business transactions.

Transactions are events that occur as part of doing business, such as sales, purchases, deposits, withdrawals, refunds, and payments. Data about the customer, product, salesperson, and store and so on, must be captured and processed. This in turn causes additional transactions, such as credit checks, customer billing, inventory changes, and increases in accounts retrievable balances, which generate even more data. Therefore, TPS play a vital role in supporting the operation of an e-business enterprise.

Online transaction processing systems plays a strategic role in e-commerce. Many firms are using the Internet, extranets and other networks that tie them electronically to their customers or suppliers for online transaction processing (OLTP). They provide superior service to customers and other trading partners. This capability adds value to their products and services, and thus gives them an important way to differentiate themselves from their competitors.

The transaction processing cycle

FIGURE 7.5 The transaction processing cycle. Note that transaction processing systems use a five-stage cycle of data entry, transaction processing, database maintenance, document and report generation, and inquiry processing activities.



- **Data Entry.** The first step of the transaction processing cycle is the capture of business data. This is done by scanning of bar codes and credit card readers or e-commerce website on the Internet. The proper recording and editing of data so they are quickly and correctly captured for processing is one of the major design challenges of information systems.
- **Transaction Processing.** TPS process data in two basic ways:
  - **Batch Processing:** transaction data are accumulated over a period of time and processed periodically.
  - **Real Time Processing: (online processing)** data are processed immediately after a transaction occurs. They depend on the capabilities of *fault tolerant* computer systems that can continue to operate even if parts of the system fail.
- **Database Maintenance.** It is done by TPS so that they are always correct and up-to-date. For ex: maintaining proper account balances of credit card holders. Database maintenance ensures that these and other changes are reflected in the data records stored in the company's databases.
- **Document and Report Generation.** TPS produce a variety of documents like purchase orders, paycheques, sales receipts, invoices and customer statements. It also produces reports such as a payroll register, or edits reports that describe errors detected during processing.

- **Inquiry Processing.** Many TPS allow you to use the internet, intranets, extranets and web browsers or database management query languages to make inquiries and receive responses concerning the results of transaction processing activity. Responses are displayed in a variety of pre-specified formats or screens.

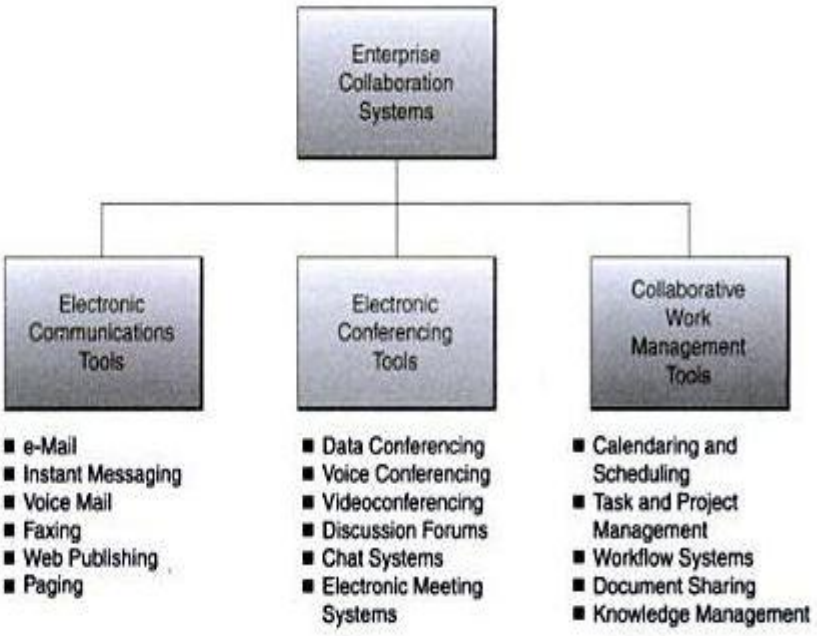
Enterprise Collaboration Systems

ECS are cross-functional information systems that enhance communication, coordination and collaboration among the members of business teams and workgroups. Information technology provides tools to help us collaborate – to communicate ideas, share resources, and coordinate our cooperative work efforts as members of the many formal and informal process and project teams and workgroups. Thus, the goal of **enterprise collaboration systems** is to enable us to work together more easily and effectively helping us to:

- ✓ **Communicate:** sharing information with each other.
- ✓ **Coordinate:** coordinating our individual work efforts and use of resources with each other.
- ✓ **Collaborate:** working together cooperatively on joint projects and assignments.

Tools for Enterprise Collaboration

FIGURE 7.6
Electronic communications, conferencing, and collaborative work software tools enhance enterprise collaboration.



Electronic communication tools include e-mail, voice mail, faxing, web publishing, bulletin board system, paging, and internet phone systems. These tools enable you to electronically send messages, documents, and files in data, text, voice or multimedia over computer networks. This helps in sharing of data with other team members,

Electronic conferencing tools help people communicate and collaborate while working together. A variety of conferencing methods enables the team members and workgroups at different locations to exchange ideas interactively at the same time or at different times. These include data and voice conferencing, videoconferencing, chat systems and discussion forums. Electronic conferencing options also include *electronic meeting systems* and other *group support systems* where team members meet at same time and place in a *decision room* setting, or use internet to work collaboratively anywhere in the world.

Collaborative work management tools help people accomplish or manage group work activities. This category of software includes calendaring and scheduling tools, tasks, and project management, workflow systems, and knowledge management tools. Other tools for joint work, such as joint document creation, editing, and revision, are found in the software suites.

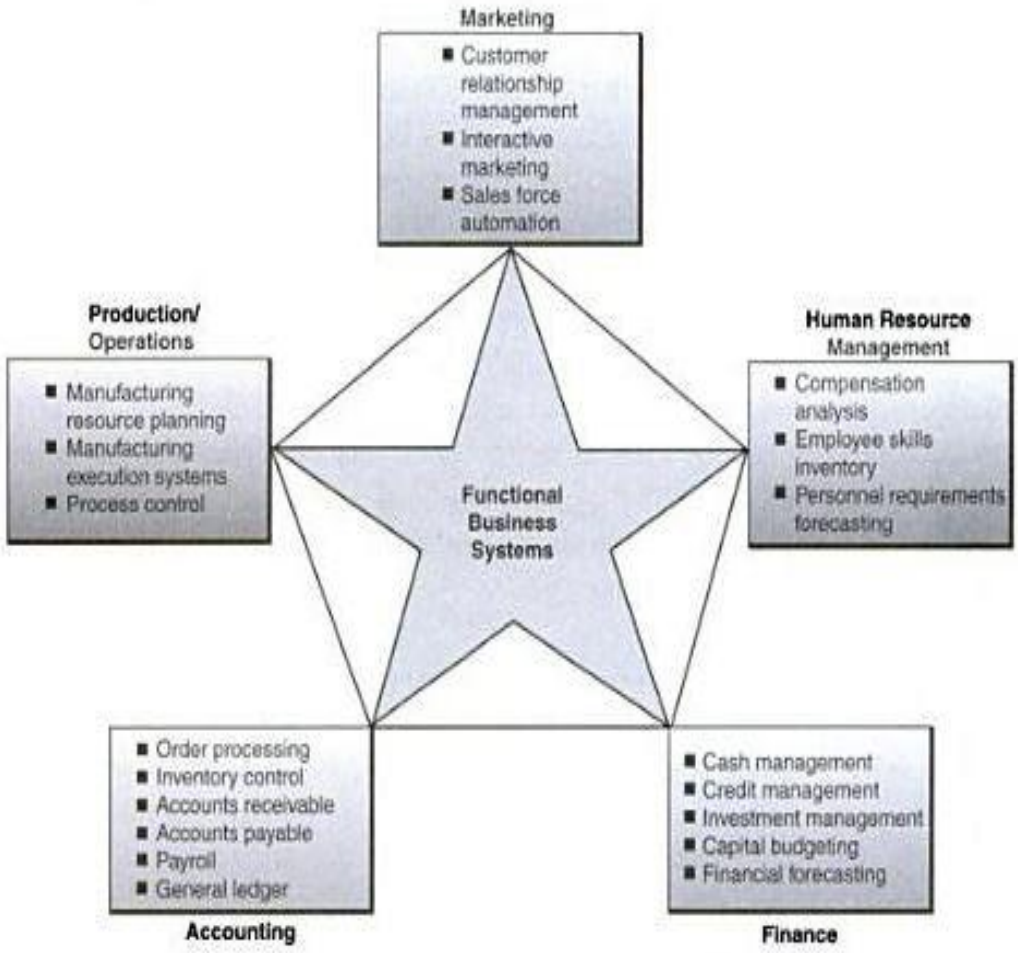
FUNCTIONAL BUSINESS SYSTEMS

Introduction

Functional business systems – variety of types of information systems such as transaction processing, management information, decision support etc... that supports the business functions of accounting, finance, marketing, operations management, and human resource management.

IT in Business- it is important to have a specific understanding of how information systems affect a particular business function. Figure 7.7 illustrates how information systems can be grouped into business function categories.

FIGURE 7.7 Examples of functional business information systems. Note how they support the major functional areas of business.



Marketing Systems

The business function of marketing is concerned with the planning, promotion, and sale of existing markets, and the development of new products and new markets to better attract and serve present and potential customers.

FIGURE 7.8 Marketing information systems provide information technologies to support major components of the marketing function.

- Interactive marketing – where customers can become partners in creating, marketing, purchasing, and improving products and services.
- Sales force automation – use mobile computing and internet technologies to automate many information processing activities for sales support and management.
- Other systems – assist marketing managers in customer relationship management, product planning, pricing, and other product management decisions, advertising, sales promotion and targeted marketing strategies, and market research and forecasting.

Interactive Marketing

- This describes a customer-focused marketing process that is based on using the Internet, intranets, and extranets to establish two-way transactions between a business and its customers.
- The goal is to enable a company to profitably use those networks to attract and keep customers who will become partners with the business in creating, purchasing, and improving products and services.
- Customers are actively engaged in network-enabled proactive and interactive processes.
- Various Internet technologies like chat, discussion groups, web forms, questionnaires, instant messaging and email enables customers to involve in product development, delivery and service issues.
- Outcome – rich mixture of vital marketing data, new product ideas, volume sales, and strong customer relationships.

Targeted Marketing

It has become an important tool in developing advertising and promotion strategies to strengthen a company's e-commerce initiatives as well as its traditional business venues.

FIGURE 7.9
The five major components of targeted marketing for electronic commerce.

- **Community.** Companies can customize their Web advertising messages and promotion methods to appeal to people in specific communities. They can be *communities of interest,* such as *virtual communities* of online sporting enthusiasts or arts and crafts hobbyists, or geographic communities formed by the websites of a city or other local organisation.
- **Content.** Advertising such as electronic billboards or banners can be placed on a variety of selected websites, in addition to a company's website. The content of these messages is aimed at the targeted audience.
- **Context.** Advertising appears only in Web pages that are relevant to the content of a product or service. So, it is targeted only at people who are already looking for information about a subject matter that is related to a company's products.
- **Demographic/psychographic.** Web marketing efforts can be aimed only at specific types or classes of people: unmarried, twenty-something, middle income, male college graduates etc.
- **Online behaviour.** This strategy is based on a variety of tracking techniques like Web "cookie" files recorded on the visitor's disk drive from previous visits. This enables a company to track a person's online behaviour at a website.

Manufacturing Systems

Manufacturing information systems support the production/operations function that includes all activities concerned with the planning and control of the processes producing goods or services. Information systems used for operations management and transaction processing support all firms that must plan, monitor and control inventories, purchases, and the flow of goods and services.

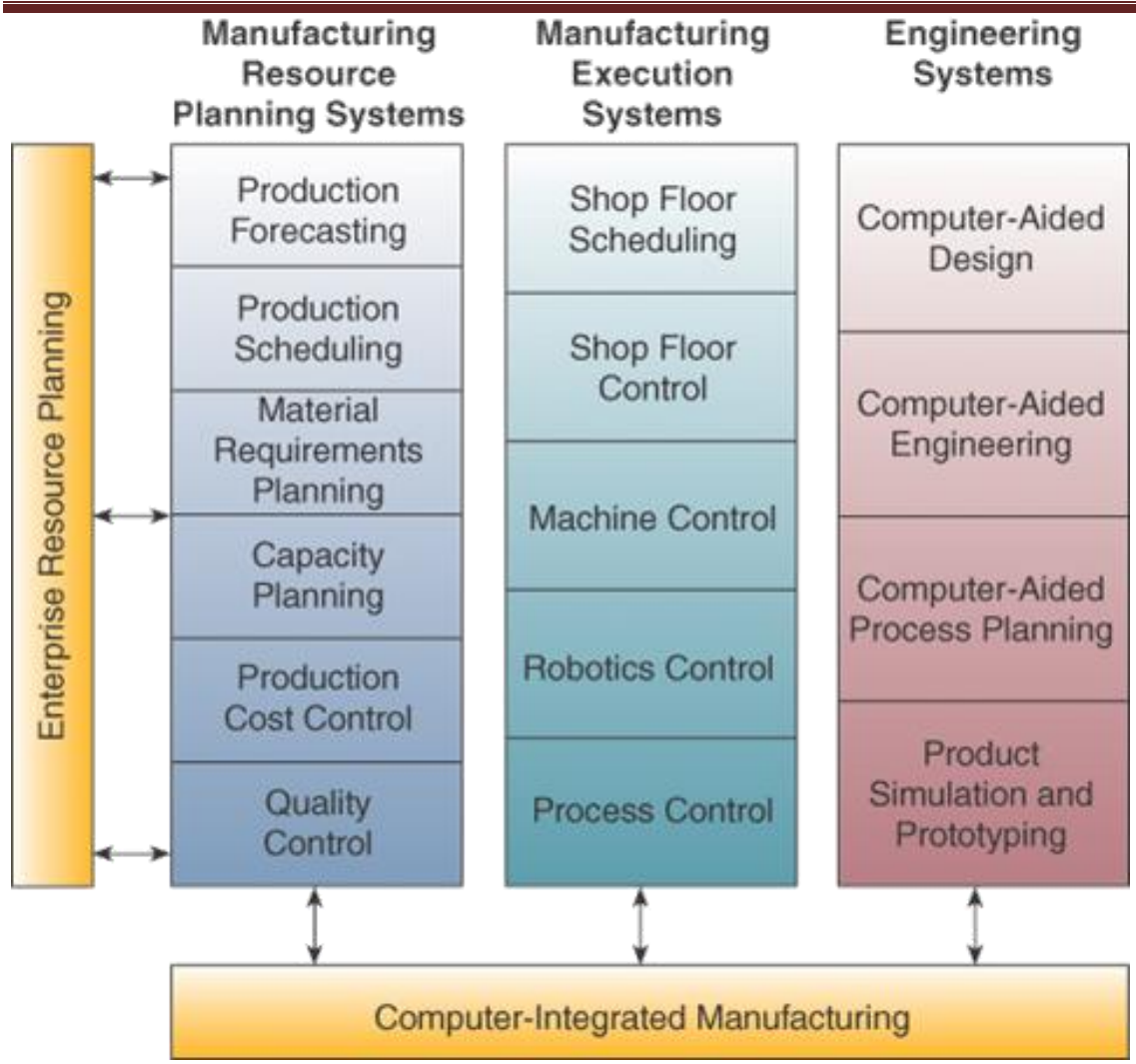
Computer-Integrated Manufacturing

CIM stresses that the objectives of computer-based systems in manufacturing must be to:

- ✓ **Simplify** (reengineer) production processes, product designs, and factory organisation as a vital foundation to automation and integration.
- ✓ **Automate** production processes and the business functions that support them with computers, machines and robots.
- ✓ **Integrate** all production and support processes using computer networks, cross-functional business software and other information technologies.

The overall goal of CIM is to create flexible, agile, manufacturing processes that efficiently produce products of the highest quality. Thus, CIM supports the concepts of **flexible manufacturing systems, agile manufacturing, and total quality management.**

FIGURE 7.11 manufacturing IS support computer-integrated manufacturing.



- Computers are used to help engineers design better products using both **computer-aided engineering (CAE) & computer-aided design (CAD)** systems, and better production processes with **computer-aided process planning.**
- They are also used to help plan the types of material needed in the production process, which is called **material requirements planning (MRP),** and to integrate MRP with production scheduling and shop floor operations which is known as **manufacturing resource planning.**
- **Computer-aided manufacturing (CAM)** – automate the production process.
- **Manufacturing execution systems (MES)** – performance monitoring information systems for factory floor operations. They monitor, track, and control the five essential components involved in a production process: materials, equipment, personnel, instructions and specifications and production facilities.
- **Process control** – use of computers to control an ongoing physical process like in petroleum refineries, cement plants, steel mills, chemical plants, food product manufacturing plants, pulp and paper mills, electric power plants and so on. It requires the use of special sensing devices.
- **Machine control** (numerical control) – use of computers to control the actions of machines.

Human Resource Systems

The Human Resource Management (HRM) function involves the recruitment, placement, evaluation, compensation, and development of the employees of an organisation. The goal of HRM is the effective and efficient use of the human resources of a company.

Thus, **human resource information systems** are designed to support:

- Planning to meet the personnel needs of the business.

- Development of employees to their full potential.
- Control of all personnel policies and programs.

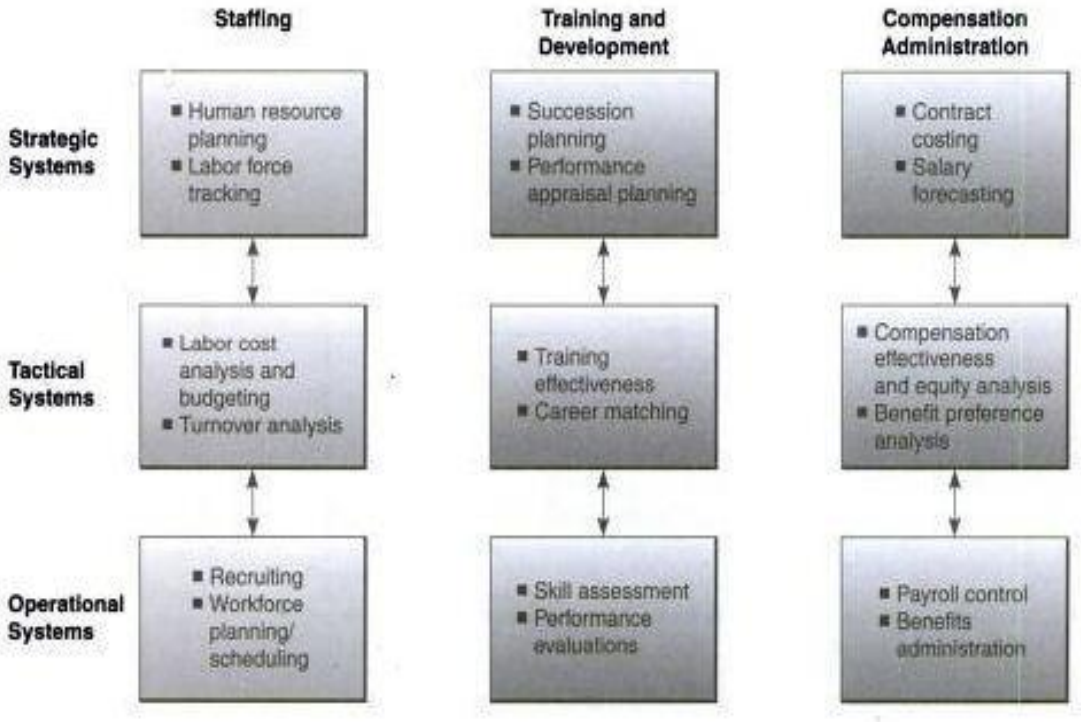
Originally, businesses used computer-based information systems to

- Produce paycheques and payroll reports
- Maintain personnel records
- Analyze the use of personnel in business operations

Many firms have also developed HRIS that also support

- Recruitment, selection and hiring
- Job placement
- Performance appraisals
- Employee benefits analysis
- Training and development
- Health, safety and security

FIGURE 7.12 Human resource information systems support the strategic, tactical, and operational use of the human resources of an organization.



HRM and the Internet – companies are also using commercial recruiting services and databases on the WWW, posting messages in selected Internet newsgroups and communicating with job applicants via e-mail. The Internet has a wealth of information and contacts for both employers and job hunters such as monster.com, hotjobs.com. These websites are full of reports, statistics, and other useful HRM information, such as job reports by industry, or listings of the top recruiting markets by industry and profession.

HRM and Corporate Intranets – Intranets allow the HRM department to provide around-the-clock services to their customers: the employees. It can collect information online from employees for input to their HRM files, and they can enable managers and other employees to perform HRM tasks. It can serve as a superior training tool. Employees can easily download instructions and processes to get the information or education they need. Thus, the intranet eliminates the need to loan out and track training videos.

Accounting Systems

Accounting information systems record and report business transaction and other economic events. Operational accounting systems emphasize legal and historical record-keeping and production of accurate financial statements. It include transaction processing systems such as order processing, inventory control, accounts receivable, and accounts payable, payroll and general ledger systems. Management accounting systems emphasize cost accounting reports, the development of financial budgets and projected financial statements and analytical reports comparing actual to forecasted performance.

FIGURE 7.14 Important accounting IS for transaction processing and financial reporting

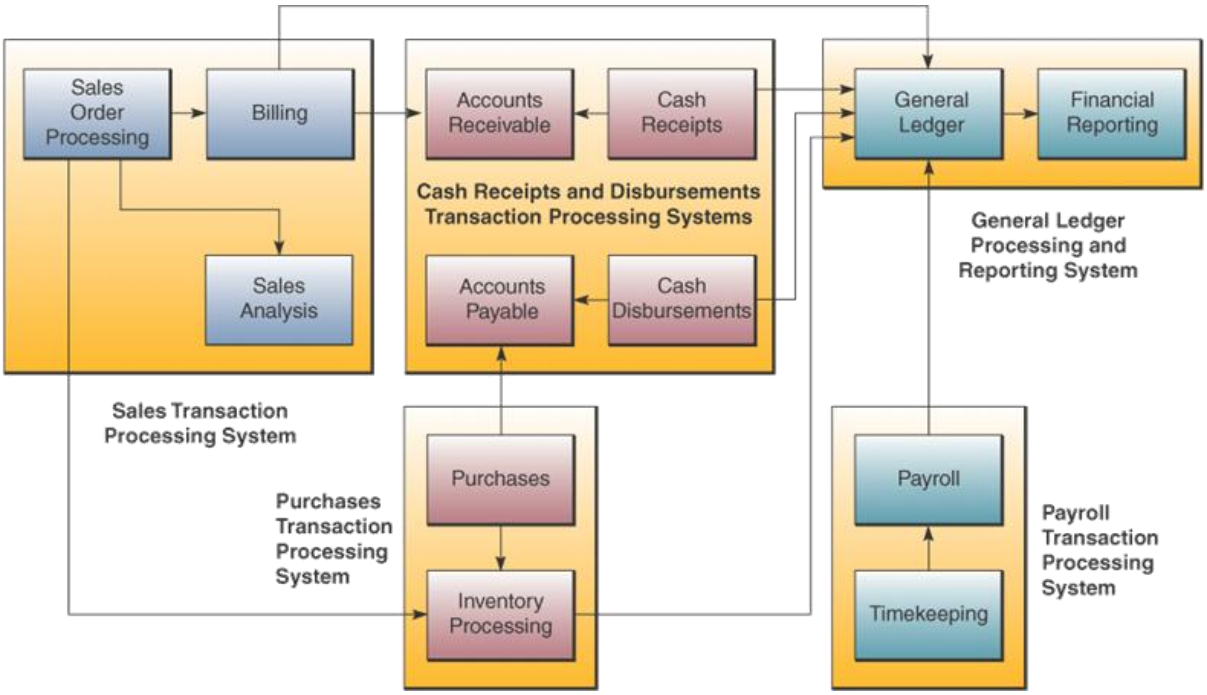


FIGURE 7.15 A summary of six essential accounting information systems used in business.

Common Business Accounting Systems
• **Order Processing** Captures and processes customer orders and produces data for inventory control and accounts receivable.
• **Inventory Control** Processes data reflecting changes in inventory and provides shipping and reorder information.
• **Accounts Receivable** Records amounts owed by customers and produces customer invoices, monthly customer statements, and credit management reports.
• **Accounts Payable** Records purchases from, amounts owed to, and payments to suppliers, and produces cash management reports.
• **Payroll** Records employee work and compensation data and produces paychecks and other payroll documents and reports.
• **General Ledger** Consolidates data from other accounting systems and produces the periodic financial statements and reports of the business.

Online Accounting Systems – they monitor and track business activity. The online, interactive nature of such networks calls for new forms of transaction documents, procedures, and controls. This particularly applies to systems like order processing, inventory control, accounts receivable, and accounts payable.

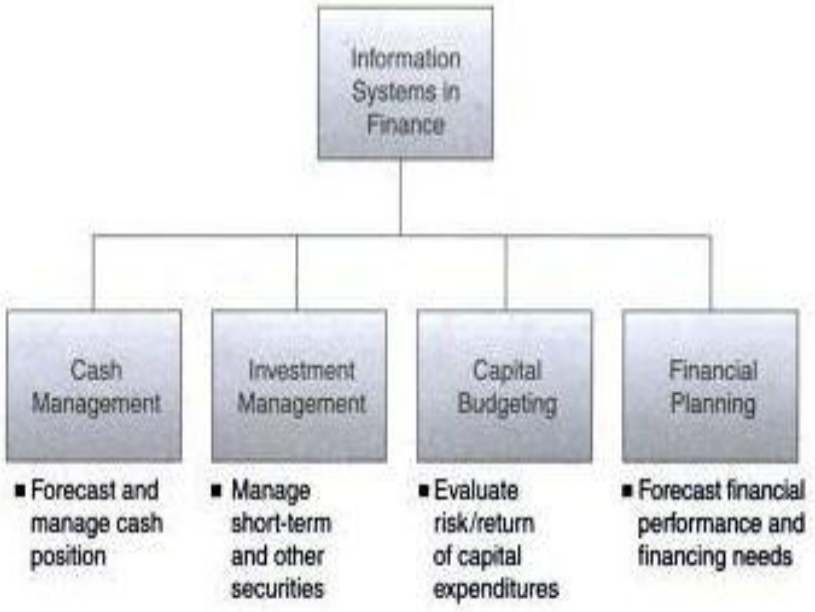
Financial Management Systems

Computer-based **financial management systems** support business managers and professionals in decision concerning:

- ✓ The financing of a business
- ✓ The allocation and control of financial resources within a business

Major **financial management system** categories include cash and investment management, capital budgeting, financial forecasting, and financial planning.

FIGURE 7.17
Examples of important financial management systems.



Example 1: **capital budgeting** – involves evaluating the profitability and financial impact of proposed capital expenditures which are analysed using **return on investment(ROI)** evaluation technique. It uses spreadsheet models for analysis of expected cash flows and probability analysis of risk.

Example 2: **financial planning** – evaluate the present and projected financial performance of a business. Financial analysts use financial forecasts concerning the economic situation, business operations, and type of financing available, interest rates and stock and bond prices to develop an optimal financing plan for the business. Electronic spreadsheet packages, DSS software, and web-based groupware can be used to build the financial models.

UNIT 4
ENTERPRISE BUSINESS SYSTEMS

CUSTOMER RELATIONSHIP MANAGEMENT

Introduction

Many companies are implementing *customer relationship management* (CRM) business initiatives and information systems as part of a customer-focused or *customer-centric* strategy to improve their chances for success in today's competitive business environment.

What is CRM ?

- CRM uses information technology to create a cross-functional enterprise system that integrates and automates many of the *customer serving* processes in sales, marketing, and customer services that interact with a company's customers.
- CRM systems also create an IT framework of Web-enabled software and databases that integrates these processes with the rest of a company's business operations.
- CRM systems include a family of software modules that provides the tools that enable a business and its employees to provide fast, convenient, dependable, and consistent service to its customers.
- Examples – Siebel systems, Oracle, PeopleSoft, SAP AG, Epiphany

FIGURE 8.1
The major application clusters in customer relationship management.

❖ **Contact and Account Management**
- CRM software helps sales, marketing, and service professionals capture and track relevant data about every past and planned contact with prospects and customers, as well as other business and life cycle events of customers.
- Information is captured from all customers' touch-points, such as telephone, fax, e-mail, the company's website, retail stores, kiosks and personal contact.
- CRM systems store the data in a common customer database that integrates all customer account information and makes it available throughout the company via Internet, intranet or other network links.

❖ **Sales**
- A CRM system provides sales reps with the software tools and company data sources they need to support and manage their sales activities, and optimize cross-selling and up-selling.
- CRM also gives them real-time access to a single common view of the customer, enabling them to check on all aspects of a customer's account status and history before scheduling their sales calls.

- Ex: CRM alerts bank sales rep to call customers who make large deposits/payment problems.

❖ **Marketing and Fulfilment**

- CRM systems help marketing professionals accomplish direct marketing campaigns by automating such tasks as qualifying leads for targeted marketing and scheduling and tracking direct marketing mailings.
- CRM software helps marketing professionals capture and manages prospect and customer response data in the CRM database and analyse the customer and business value of a company's direct marketing campaigns.
- CRM also assists in the fulfilment of prospect and customer responses and requests by quickly scheduling sales contacts and providing appropriate information on products and services to them.

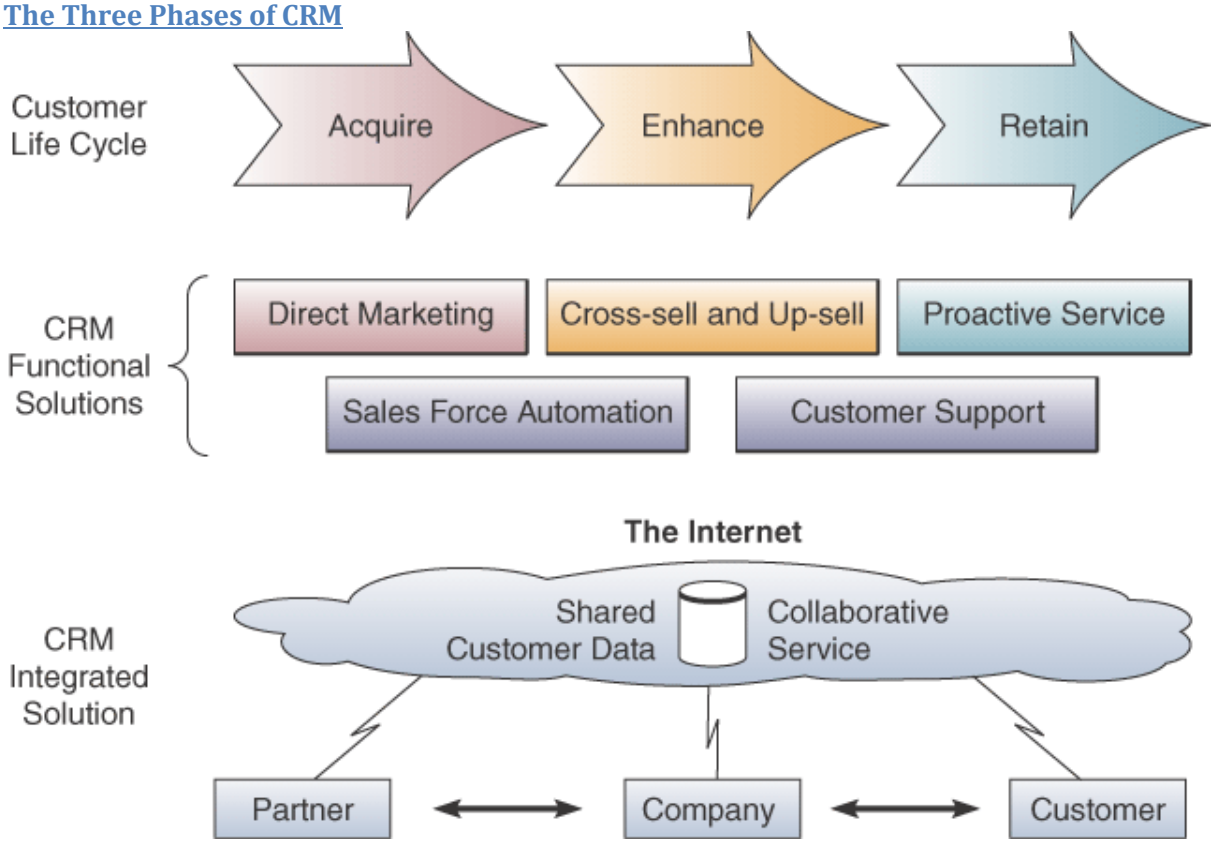
❖ **Customer Service and Support**

- A CRM system provides service reps with software tools and real-time access to the common customer database shared by sales and marketing professionals.
- CRM helps customer service managers create, assign, and manage requests for service by customers.
- *Call centre* software routes calls to customer support agents based on their skills and authority to handle specific kinds of service requests.
- *Help Desk* software assists customer service reps in helping customers who are having problems with a product or service by providing suitable suggestions.
- Web-based self services of company website provide online support.

❖ **Retention and Loyalty Programs**

- CRM systems try to help a company identify, reward, and market to their most loyal and profitable customers.
- CRM analytical software includes data mining tools and other analytical marketing software, while CRM databases may consist of a customer data warehouse and CRM data marts.
- All the tools identify loyal and profitable customers and direct and evaluate a company's targeted marketing and relationship marketing programs towards them.

The Three Phases of CRM



- **Acquire.**
  A business relies on CRM software tools and databases to help it acquire new customers by doing a superior job of contact management, sales prospecting, selling, direct marketing and fulfilment. The goal of these CRM functions is to help customers perceive the value of a superior product offered by an outstanding company.
- **Enhance.**
  Web-enabled CRM account management and customer services and support tools help keep customers happy by supporting superior service from a responsive networked team of sales and service specialists and business partners. And CRM sales force automation and direct marketing and fulfilment tools help companies' cross-sell and up-sell to their customers, thus increasing their profitability to the business. The value perceived by customers is the convenience of one-stop shopping at attractive prices.
- **Retain**
  CRM analytical software and databases help a company proactively identify and reward its most loyal and profitable customers to retain and expand their business via targeted marketing and relationship marketing programs.

Benefits and Challenges of CRM

❖ **Benefits**
- CRM allows a business to identify and target their best customers so they can be retained as lifelong customers for greater and more profitable services.
- It makes possible real-time customisation and personalisation of products and services based on customer wants, needs, buying habits and life cycles.
- CRM can also keep track of when a customer contacts the company.
- CRM systems can enable a company to provide a consistent customer experience and superior service and support.

❖ **Challenges / Failures**
- According to some research and surveys, 50% of CRM projects did not produce proper results, 20% of them damaged customer relationships etc.
- Research shows that lack of understanding and preparations are major reasons.
- In many cases, failed CRM projects were implemented without the participation of the business stakeholders involved.
- Employees and customers were not prepared for the new processes or challenges that were part of the new CRM implementation.

Trends in CRM

Figure 8.4 outlines four types or categories of CRM.

✓ Most businesses start out with **operational** CRM systems such as sales force automation and customer service centres.
✓ Then, **analytical** CRM applications are implemented using several analytical marketing tools, such as data mining, to extract vital data about customers and prospects (for targeted marketing campaigns).
✓ **Collaborative** CRM systems involve business partners as well as customers. This includes systems for customer self-service and feedback, as well as **partner relationship management (PRM)** systems.

FIGURE 8.4 Many companies are implementing CRM systems with some or all of these capabilities.

Types of CRM	Business Value
Operational CRM	• **Supports customer interaction with greater convenience through a variety of channels, including phone, fax, e-mail, chat, and mobile devices** • **Synchronizes customer interactions consistently across all channels** • **Makes your company easier to do business with**
Analytical CRM	• Extracts in-depth customer history, preferences, and profitability information from your data warehouse and other databases • Allows you to analyze, predict, and derive customer value and behavior and forecast demand • Lets you approach your customers with relevant information and offers that are tailored to their needs
Collaborative CRM	• **Enables easy collaboration with customers, suppliers, and partners** • **Improves efficiency and integration throughout the supply chain** • **Allows greater responsiveness to customer needs through sourcing of products and services outside of your** enterprise
Portal-based CRM	• Provides all users with the tools and information that fit their individual roles and preferences • Empowers all employees to respond to customer demands more quickly and become truly customer-focused • Provides the capability to instantly access, link, and use all internal and external customer information

ENTERPRISE RESOURCE PLANNING

Introduction

ERP serves as a cross-functional enterprise backbone that integrates and automates many internal business processes and information systems within the manufacturing, logistics, distribution, accounting, finance, and human resource functions of a company.

What is ERP ?

Enterprise resource planning is a cross-functional enterprise system driven by an integrated suite of software modules that supports the basic internal business processes of a company.

FIGURE 8.5
The major application components of enterprise resource planning demonstrate the cross-functional approach of ERP systems.

- ERP gives a company an integrated real-time view of its core business processes, such as production, order processing, and inventory management, tied together by the ERP application software and a common database maintained by a database management system.
- ERP systems track business resources (such as cash, raw materials), and the status of commitments made by the business (such as customer orders, purchase orders), no matter which department (manufacturing, accounting etc.) has entered the data into system.
- ERP software suites typically consist of integrated modules of manufacturing, distribution, sales, accounting and human resource applications.

- ERP systems support many vital human resource processes, from personnel requirements planning to salary and benefits administration, and accomplish most required financial record-keeping and managerial accounting applications.

FIGURE 8.6 some of the business process flows and customers and supplier information flows supported by ERP systems.

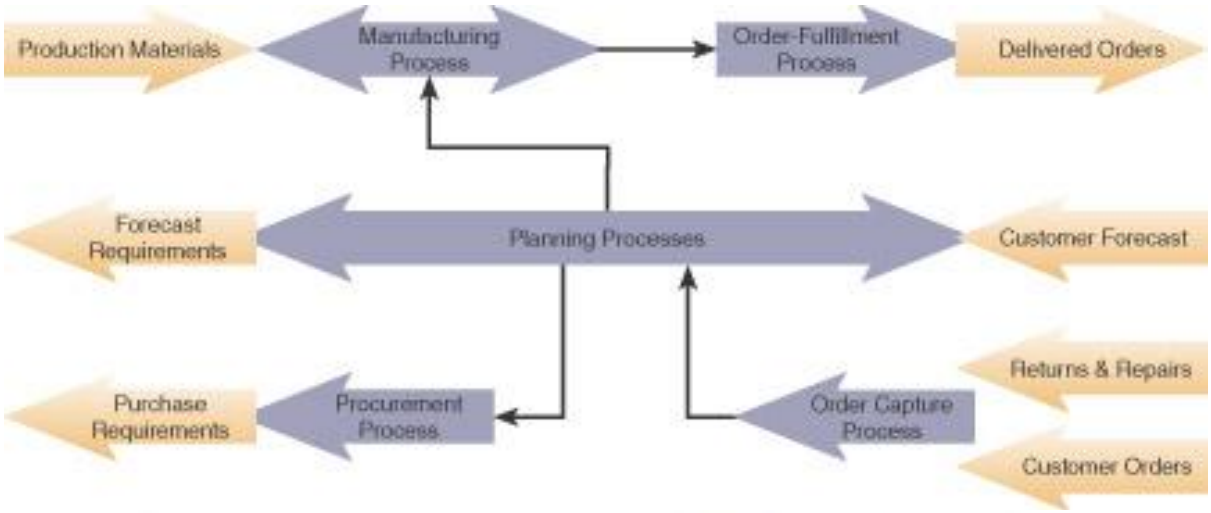


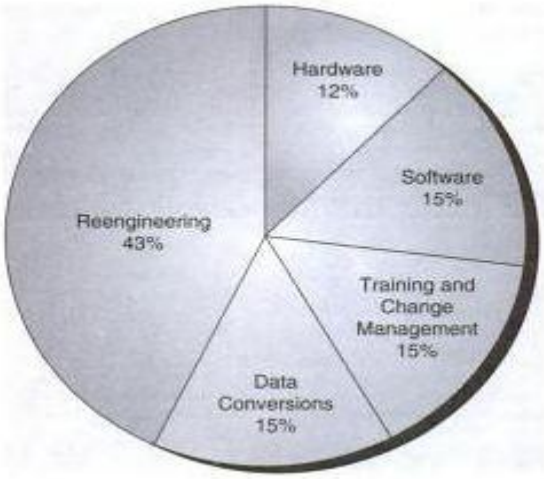
FIGURE 8.7 The business processes and functions supported by the ERP system implemented by the Colgate-Palmolive Company.

Benefits and Challenges of ERP

- ✓ **Quality and Efficiency.** ERP creates a framework for integrating and improving a company's internal business processes that result in significant improvements in the quality and efficiency of customer service, production and distribution.
- ✓ **Decreased Costs.** Many companies report significant reduction in transaction processing costs and hardware, software and IT support staff compared to the non-integrated legacy systems that were replaced by their new ERP systems.
- ✓ **Decision Support.** ERP provides vital cross-functional information business performance quickly to managers to significantly improve their ability to make better decisions in a timely manner across the entire business enterprise.
- ✓ **Enterprise Agility.** Implementing ERP systems breaks down many business processes, information systems, and information resources. This results in more flexible organisational structures, managerial responsibilities, and work roles.

The Costs of ERP

FIGURE 8.8
Typical costs of implementing a new ERP system.



The costs and risks of failure in implementing new ERP systems are substantial. Most companies have had successful ERP implementations, but some of them experienced costly failures that heavily damaged their overall business. Big losses in revenue, profits and market share resulted when information systems failed. Orders and shipments were lost, inventory changes were not recorded correctly and unreliable inventory levels caused major stock-outs for weeks & months.

Causes of ERP Failure

- Business managers and IT professionals under-estimated the complexity of the planning, development and training needed to prepare new ERP system.
- Failure to involve affected employees in the planning and development phases and to change management programs.
- Insufficient training in the new work tasks required by the ERP system, and failure to do enough data conversion and testing.
- Due to over-reliance by company or IT management on the claims of ERP software vendors.

Trends in ERP

FIGURE 8.9
Trends in the evolution of ERP applications.

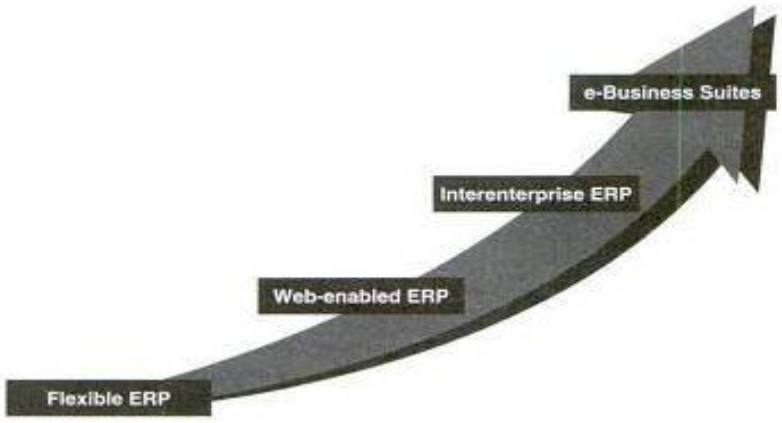


Figure 8.9 illustrates four major developments and trends in ERP

Four important trends are shaping ERP's continuing evolution:

- Improvements in integration and flexibility
- Extensions to e-business applications
- A broader reach to new users
- Adoption of Internet technologies

First, the ERP software packages were often criticised for their inflexibility. Web-enabling ERP software is a second development in the evolution of ERP. The growth of the Internet and corporate intranets and extranets prompted software companies to use Internet technologies to build Web interfaces and networking capabilities into ERP systems. This had led to development of interenterprise ERP systems that provide Web-enabled links between key business systems of a company and its customers, suppliers, distributors and others. This gave rise to integration of internal-facing ERP applications with the external-focused applications of supply chain management (SCM) and a company's supply chain partners.

All of these developments have provided the business and technological momentum for the integration of ERP functions into **e-business suites.** The major ERP software companies have developed modular, Web-enabled software suites that integrate ERP, CRM, SCM, procurement, decision support, enterprise portals, and other business functions and applications.

FIGURE 8.10 The application components in Oracle's e-Business Suite software product.

SUPPLY CHAIN MANAGEMENT

Introduction

SCM helps a company get the right products to the right place at the right time, in the proper quantity and at an acceptable cost. The goal of SCM is to efficiently manage this process by forecasting demand; controlling inventory; enhancing the network of business relationships of a company has with customers, suppliers, distributors and others; and receiving feedback on the status of every link in the supply chain.

What is SCM ?

Supply chain management is a cross-functional interenterprise system that uses information technology to help support and manage the links between some of a company's key business processes and those of its suppliers, customers and business partners. The goal of SCM is to create a fast, efficient and low-cost network of business relationships, or **supply chain**, to get a company's products from concept to market. A supply chain is also called as a **value chain** since each supply chain process should add value to the products or services a company produces.

FIGURE 8.11
Supply chain management software and Internet technologies can help companies reengineer and integrate the functional SCM processes that support the supply chain life cycle.

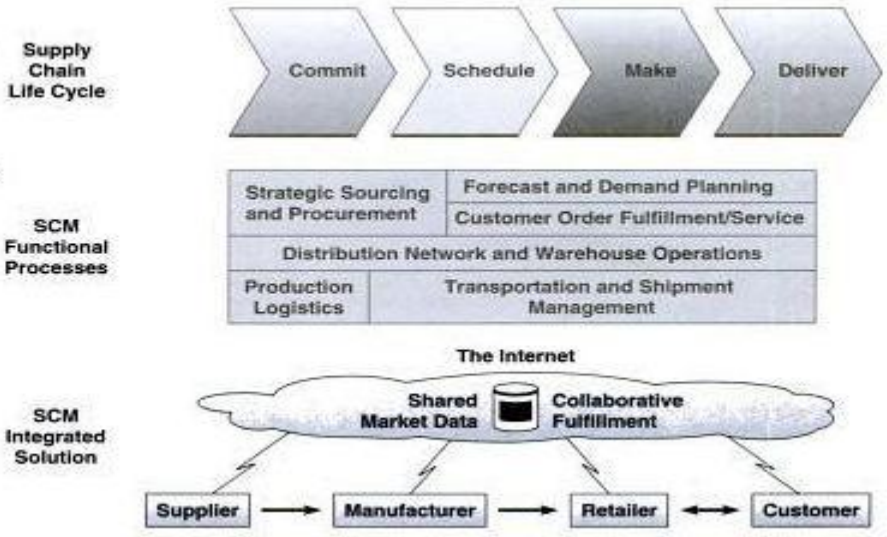
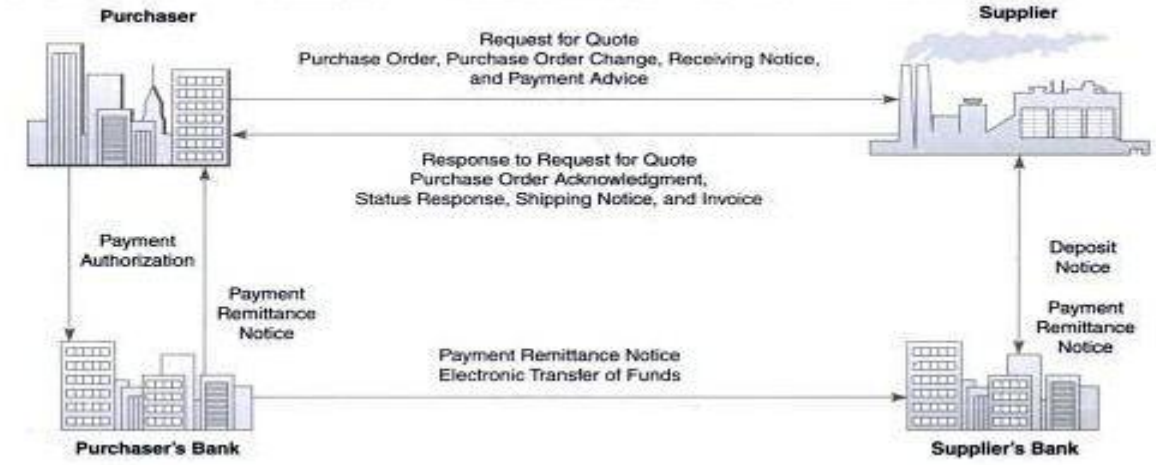


Figure 8.11 illustrates the basic business processes in the **supply chain life cycle**. It also emphasizes how many companies today are reengineering their supply chain processes, aided by Internet technologies and supply chain management software. The objective is to significantly reduce costs, increase efficiency and improve their supply chain cycle times.

Electronic Data Interchange

FIGURE 8.12 A typical example of electronic data interchange activities, an important form of business-to-business electronic commerce. EDI over the Internet is a major B2B e-commerce application.



- **Electronic Data Interchange (EDI)** was one of the earliest uses of information technology for SCM.
- EDI involves the electronic exchange of business transaction documents over the Internet and other networks between supply chain trading partners.
- Data representing a variety of business transaction documents (purchase orders, invoices) are automatically exchanged between computers using standard document message formats without paper documents or human intervention.
- EDI automatically tracks inventory changes; triggers orders, invoices, and other documents related to transactions; and schedules and confirm delivery and payment.
- By digitally integrating the supply chain, EDI streamlines processes, saves time, and increases accuracy.

The Role of SCM

FIGURE 8.13 The objectives and outcomes of supply chain management are accomplished for a business with the help of interenterprise SCM information systems.

SCM Objectives		SCM Outcomes
What? Establish objectives, policies, and operating footprint	Strategic	• Objectives • Supply policies (service levels) • Network design
How much? Deploy resources to match supply to demand	Tactical	• Demand forecast • Production, procurement, logistics plan • Inventory targets
When? Where? Schedule, monitor, control, and adjust production	Operational	• Work center scheduling • Order/inventory tracking
Do Build and transport	Execution	• Order cycle • Material movement

The top 3 levels of figure 8.13 show the strategic, tactical and operational objectives and outcomes of SCM planning, which are then accomplished by the business partners in a supply chain at the execution level of SCM. The role of IT in SCM is to support these objectives with interenterprise information systems that produce many of the outcomes a business needs to effectively manage its supply chain.

Benefits and Challenges of SCM

Benefits

- SCM systems can provide them with key business benefits such as faster, more accurate order processing, reductions in inventory levels, quicker times to market, lower transaction and material costs, and strategic relationships with their suppliers.
- They are aimed at helping a company achieve agility and responsiveness in meeting the demands of their customers and the needs of their business partners.

Figure 8.14 emphasize the major business benefits that are possible with effective supply chain management systems.

FIGURE 8.14 The supply chain management functions and potential benefits offered by the SCM module in the mySAP e-business software suite.

SCM Functions	SCM Outcomes
Planning	
Supply chain design	• Optimize network of suppliers, plants, and distribution centers
Collaborative demand and supply planning	• Develop an accurate forecast of customer demand by sharing demand and supply forecasts instantaneously across multiple tiers • Internet-enable collaborative scenarios, such as collaborative planning, forecasting, and replenishment (CPFR), and vendor-managed inventory
Execution	
Materials management	• Share accurate inventory and procurement order information • Ensure materials required for production are available in the right place at the right time • Reduce raw material spending, procurement costs, safety stocks, and raw material and finished goods inventory
Collaborative manufacturing	• Optimize plans and schedules while considering resource, material, and dependency constraints
Collaborative fulfillment	• Commit to delivery dates in real time • Fulfill orders from all channels on time with order management, transportation planning, and vehicle scheduling • Support the entire logistics process, including picking, packing, shipping, and delivery in foreign countries
Supply chain event management	• Monitor every stage of the supply chain process, from price quotation to the moment the customer receives the product, and receive alerts when problems arise
Supply chain performance management	• Report key measurements in the supply chain, such as filling rates, order cycle times, and capacity utilization

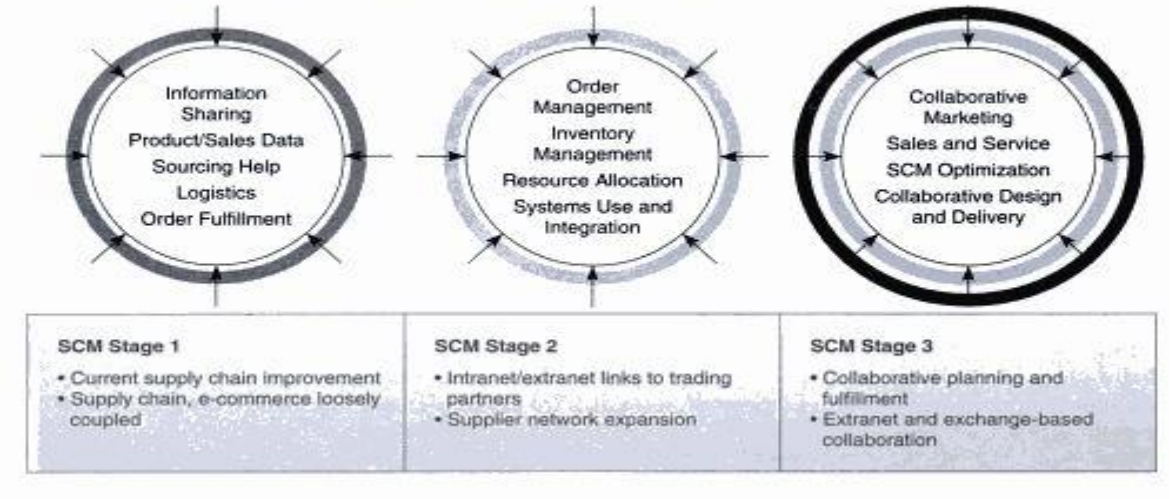
Challenges / Problems

- Lack of proper demand planning knowledge, tools, and guidelines is a major source of SCM failure.
- Inaccurate or over-optimistic demand forecasts will cause major production, inventory, and other business problems.
- Inaccurate production, inventory and other business data provided by a company's other information systems are a frequent cause of SCM problems.
- Lack of adequate collaboration among marketing, production, and inventory management departments within a company, and with suppliers, distributors and others
- SCM software tools are immature, incomplete and hard to implement by many companies.

FIGURE 8.15
Achieving the goals and objectives of supply chain management is a major challenge for many companies today.

Trends in SCM

FIGURE 8.16 Stages in the use of supply chain management.



- **Stage 1**
  A company concentrates on making improvements to its internal supply chain processes and its external processes and relationships with suppliers and customers. Its e-commerce website provides access to online catalogs and useful information.
- **Stage 2**
  A company accomplishes substantial supply chain management applications by using selected SCM software programs internally, as well as externally via intranet and extranet links among suppliers, distributors, customers, and other trading partners. Companies' tries to expand its network to increase its operational efficiency and effectiveness.
- **Stage 3**
  A company begins to develop and implement cutting-edge collaborative supply chain management applications using advance SCM software, full-service extranet links and private and public e-commerce exchanges. Companies strive to optimise the development and management of their supply chains in order to meet their strategic customer value and business value goals.

UNIT 5
ELECTRONIC COMMERCE SYSTEMS

ELECTRONIC COMMERCE FUNDAMENTALS

Introduction to e-commerce

- Identify the major categories and trends of e-commerce applications.
- Identify the essential processes of an e-commerce system, and give examples of how they are implemented in e-commerce applications.
- Identify and give examples of several key factors and Web store requirements needed to succeed in e-commerce.
- Identify and explain the business value of several types of e-commerce marketplaces.
- Discuss the benefits and trade-offs of several e-commerce clicks and bricks alternatives.

What is Electronic Commerce?

Electronic commerce encompasses the entire online process of developing, marketing, selling, delivering, servicing, and paying for products and services transacted on internet worked, global marketplaces of customers, with the support of a worldwide network of business partners.

The scope of e-commerce

FIGURE 9.2 E-commerce involves accomplishing a range of business processes to support the electronic buying and selling of goods and services.

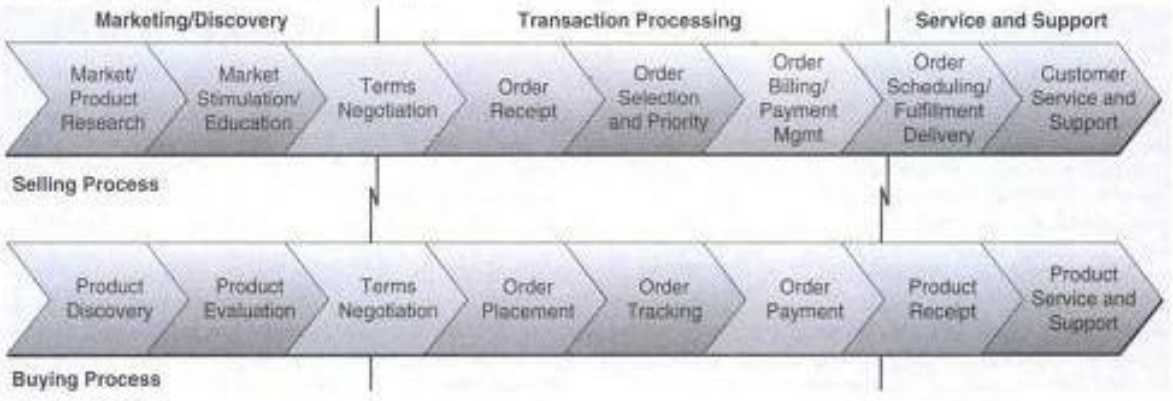
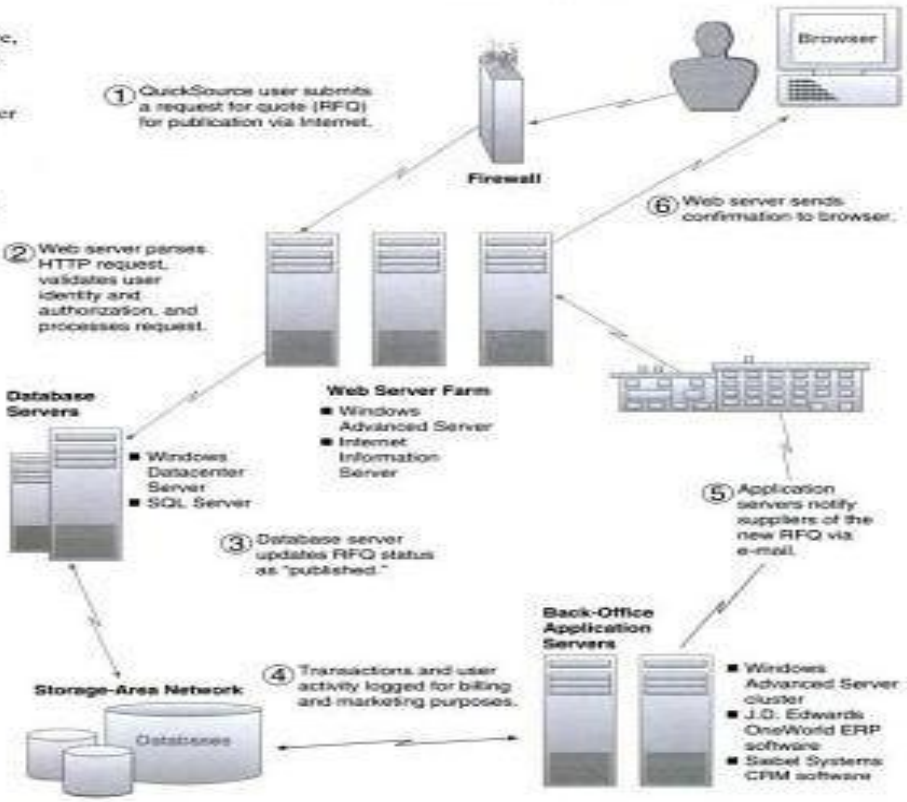


Figure 9.2 illustrates the range of business processes involved in the marketing, buying, selling, and servicing of products and services in companies that engage in e-commerce. Companies involved in e-commerce either as buyers or sellers rely on Internet-based technologies and e-commerce applications and services to accomplish marketing, discovery, transaction processing, and product and customer service processes. For example, electronic commerce can include interactive marketing, ordering, payment, and customer support processes at e-commerce catalog and auction sites on the WWW.

e-commerce technologies

Figure 9.3 illustrates some of the hardware, software, data and network components.

FIGURE 9.3
The hardware, software, network, and database components and IT architecture of B2B online auctions provider FreeMarkets Inc. are illustrated in this example of their Internet-based QuickSource auction service.



Categories of e-commerce

- **Business-to-Consumer (B2C)** – businesses develop attractive electronic marketplaces to sell products and services to consumers
- **Business-to-Business (B2B)** – involves both electronic business marketplaces and direct market links between businesses
- **Consumer-to-Consumer (C2C)** – includes auction websites and electronic personal advertising

Essential e-commerce Processes

FIGURE 9.4 This e-commerce process architecture highlights nine essential categories of e-commerce processes.

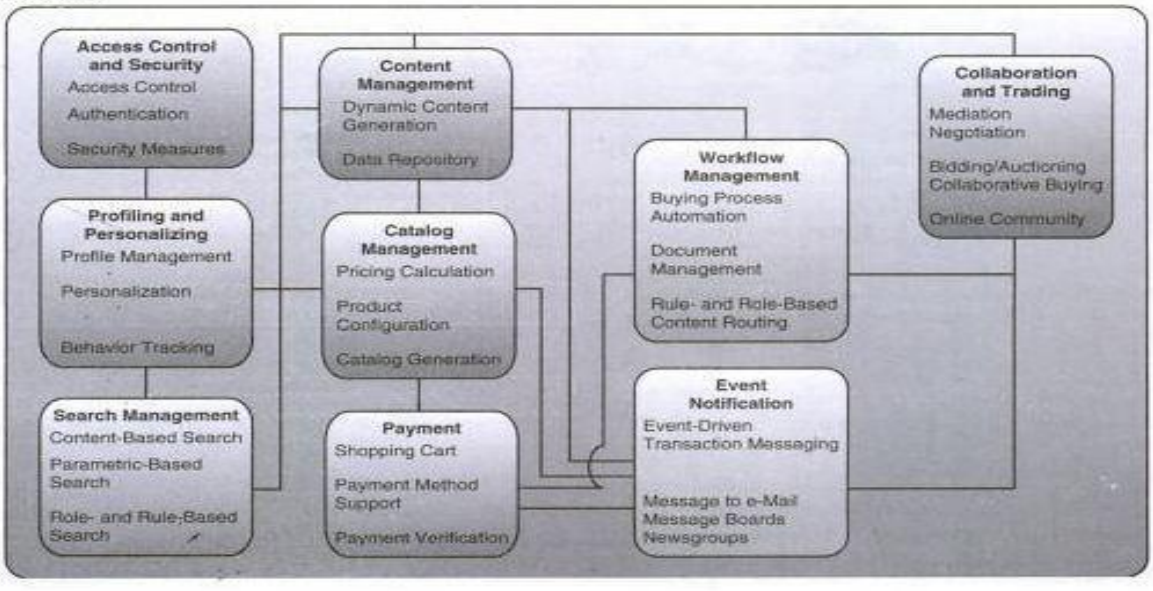


Figure 9.4 illustrates the nine key components of an *e-commerce process architecture* that is the foundation of the e-commerce initiatives of many companies today. An example would be an intranet-based human resource system used by a company's employees, which might use all but the catalog management and product payment processes as shown in figure 9.4

- **Access Control and Security**
  E-commerce processes must establish mutual trust and secure access between the parties in an e-commerce transaction by authenticating users, authorizing access, and enforcing security features
- **Profiling and Personalizing**
  Processes can occur that gather data on you and your website behaviour and choices, and build electronic profiles of your characteristics and preferences. These profiles are then used to recognize you as an individual user and provide you with a personalized view of the contents of the site, as well as product recommendations and personalized Web advertising
- **Search Management**
  Efficient and effective search processes provide a top e-commerce website capability that helps customers find the specific product or service they want to evaluate or buy
- **Content and Catalog Management**
  Content Management – software that helps e-commerce companies develop, generate, deliver, update, and archive text data and multimedia information at e-commerce websites
  Catalog Management – software that helps generate and manage catalog content
- **Workflow Management**
  Software that helps employees electronically collaborate to accomplish structured work tasks within knowledge-based business processes
- **Event Notification**
  Software that notifies customers, suppliers, employees, and other stakeholders of their status in a transaction based on events initiated by one of the parties
- **Collaboration and Trading**
  Processes that support the vital collaboration arrangements and trading services needed by customers, suppliers, and other stakeholders

Electronic Payment Processes

e-commerce payments are also complex because of the wide variety of debit and credit alternatives and financial institutions and intermediaries that may be part of the process. Therefore, a variety of **electronic payment systems** have evolved over time.

- ✓ **Web payment processes** - most e-commerce systems on the web (B2C) depend on credit card payment processes. But many B2B systems rely on more complex payment processes based on the use of purchase orders as shown in figure 9.6

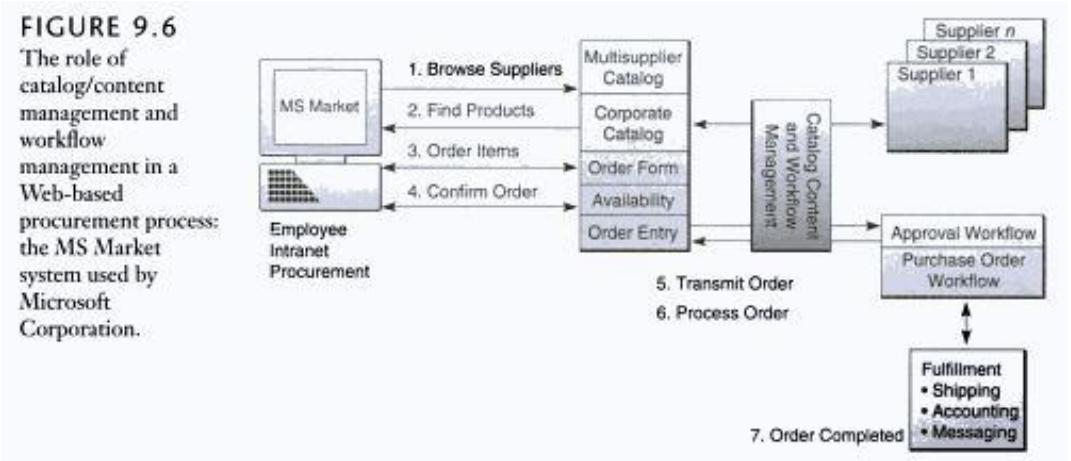
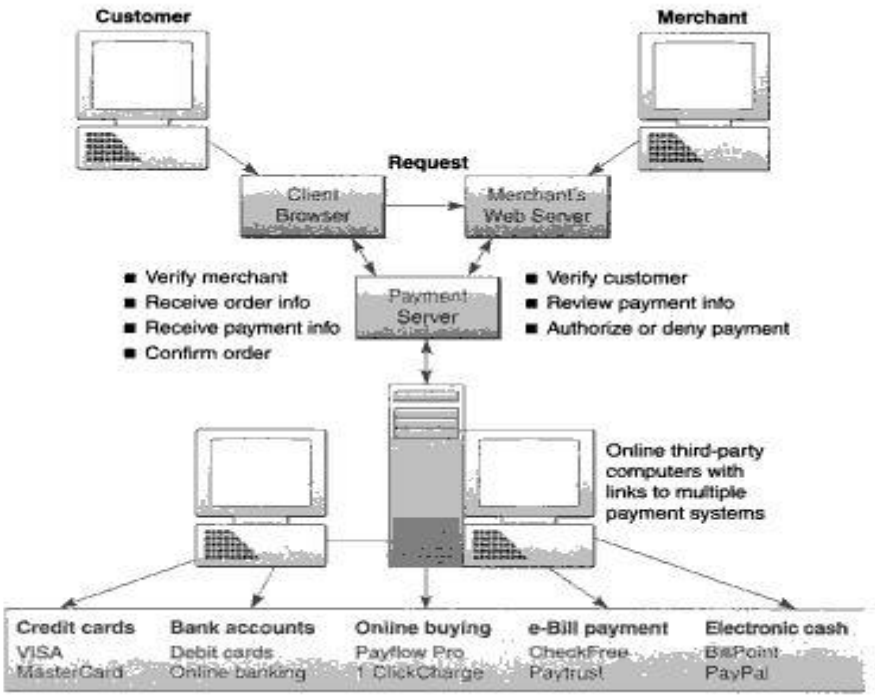


FIGURE 9.6
The role of catalog/content management and workflow management in a Web-based procurement process: the MS Market system used by Microsoft Corporation.

However both types of e-commerce typically use an electronic *shopping cart* process, which enables customers to select products from website catalog displays and put them temporarily in a virtual shopping basket for later

checkout and processing. Figure 9.7 illustrates and summarises a B2C electronic payment system with several payment alternatives.

FIGURE 9.7
An example of a secure electronic payment system with many payment alternatives.



Electronic Funds Transfer (EFT) systems are a major form of electronic payment systems in banking and retailing industries. They use IT to capture and process money and credit transfers between banks and businesses and their customers. For example, banking networks support teller terminals at all bank offices and automated teller machines (ATMs) at locations throughout the world. Banks, credit card companies, and other businesses may support pay-by-phone services. This makes it possible for you to use a credit card or debit card to instantly pay for gas, groceries or other purchases at participating retail outlets.

Secure Electronic Payments

When you make an online purchase on the Internet, your credit card information is vulnerable to interception by *network sniffers,* software that easily recognizes credit card number formats. Several basic security measures are being used to solve this security problem:

- Encrypt (code and scramble) the data passing between the customer and merchant.
- Encrypt the data passing between the customer and the company authorizing the credit card transaction or,
- Take sensitive information online.

For example, many companies use the Secure Socket Layer (SSL) security method developed by Netscape Communications that automatically encrypts data passing between your Web browser and a merchant's server. However, sensitive information is still vulnerable to misuse once it's decrypted (decoded and unscrambled) and stored on a merchant's server. So a digital wallet payment system was developed.

The Secure Electronic Transaction (SET) standard for electronic payment security extends this digital wallet approach. SET has been agreed to by VISA, MasterCard, IBM, Microsoft, Netscape, and most of the industry players. See figure 9.8

FIGURE 9.8
VeriSign provides electronic payment, security, and many other e-commerce services.

E-COMMERCE APPLICATIONS AND ISSUES

E-Commerce Application Trends

e-commerce is changing how companies do business both internally and externally with their customers, suppliers, and other business partners. How companies apply e-commerce to their businesses is also subject to change as their managers confront a variety of e-commerce alternatives. The applications of e-commerce by many companies have gone through several major stages as e-commerce matures in the business world.

e-commerce trends (figure 9.9)

- B2C e-commerce is moves from simple Web storefronts to interactive marketing capabilities that provide a personalised shopping experience for customers, and then toward a totally integrated Web store that supports a variety of customer shopping experiences.
- B2C e-commerce is also moving toward a self-service model where customers configure and customize the products and services they wish to buy, aided by configuration software and online customer support.
- B2B e-commerce participants moved quickly from self-service on the Web to configuration and customization capabilities and extranets connecting trading partners.
- As B2C e-commerce moves toward full-service and wide-selection retail Web portals, B2B is also trending toward the use of e-commerce portals that provide catalog, exchange, and auction markets for business customers within or across industries.
- Both trends are enabled by e-business capabilities like CRM and SCM.

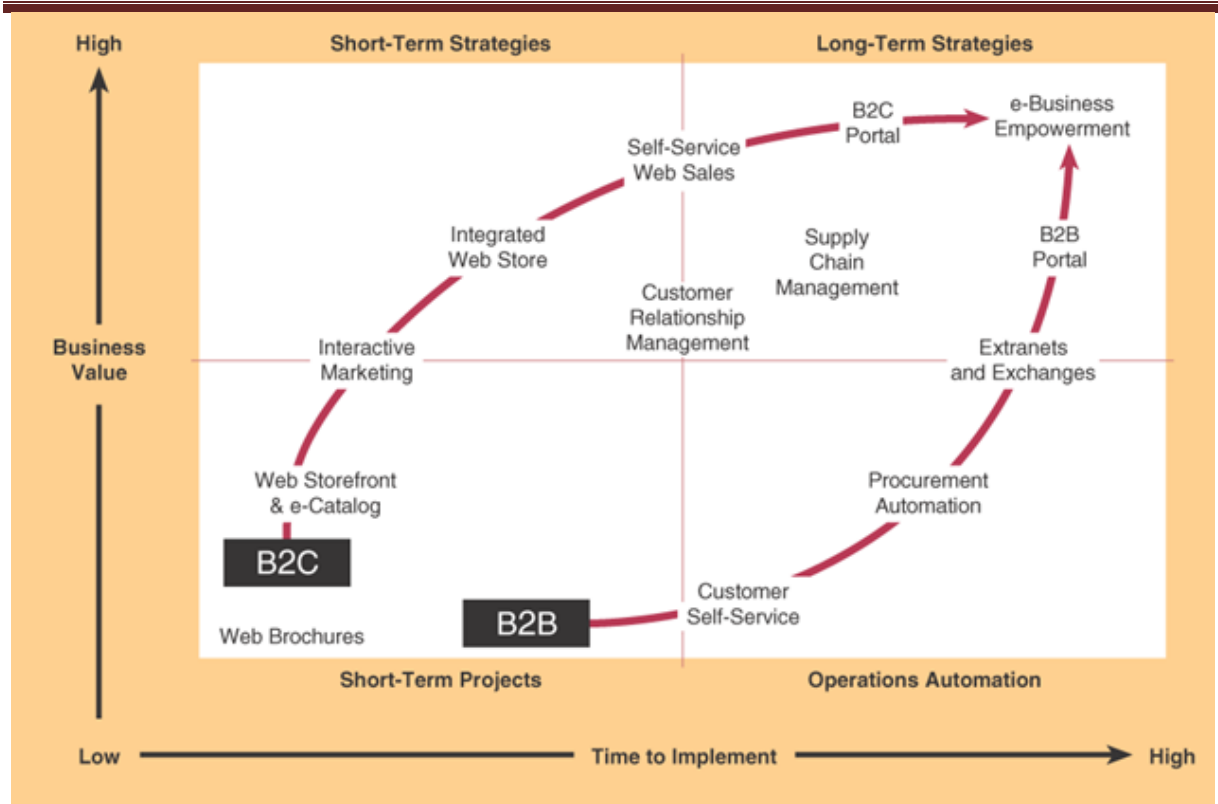


FIGURE 9.9 trends in B2c and B2B e-commerce and business strategies and value driving these trends

Business to Consumer e-commerce

e-commerce applications that focus on the consumer share an important goal:

- To attract potential buyers
- Transact goods and services
- Build customer loyalty through individual courteous treatment and engaging community features.

What does it take to create a successful B2C e-commerce business venture?

One obvious answer is to create a Web business initiative that offers attractive products or services of great customer value, and whose business plan is based on realistic forecasts of profitability within the first year or two of operation – a condition that was lacking in many failed dot-coms.

e-commerce Success Factors

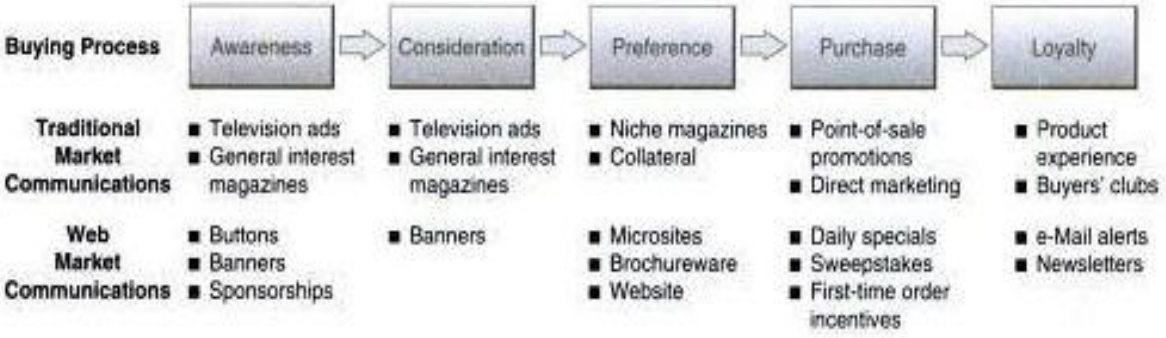
The key to e-tail success is to optimize several key factors such as selection and value, performance and service efficiency, the look and feel of the site, advertising and incentives to purchase, personal attention, community relationships, and security and reliability. Let us briefly examine each of these factors that are essential to the success of a B2C web business.

Some of the key factors for success in e-commerce:

- **Selection and Value** – attractive product selections, competitive prices, satisfaction guarantees, and customer support after the sale
- **Performance and Service** – fast, easy navigation, shopping, and purchasing, and prompt shipping and delivery.
- **Look and Feel** – attractive web storefront, website shipping areas, multimedia product catalog pages, and shopping features.

- **Advertising and Incentives** – targeted web page advertising and e-mail promotions, discounts and special offers, including advertising at affiliate sites. Figure 9.12 compares major marketing communications choices in traditional and e-commerce marketing to support each step of the buying process.
- **Personal Attention** – personal web pages, personalized product recommendations, Web advertising and e-mail notices, and interactive support for all customers
- **Community Relationships** – virtual communities of customers, suppliers, company representatives, and others via newsgroups, chat rooms, and links to related sites
- **Security and Reliability** – security of customer information and website transactions, trustworthy product information, and reliable order fulfilment.

FIGURE 9.12 How traditional and Web marketing communications differ in supporting each step of the buying process.



Web Store Requirements

Most business-to-consumer e-commerce ventures take the form of retail business sites on the World Wide Web. These websites must be able to demonstrate the key factors for e-commerce success.

FIGURE 9.13 These Web store requirements must be implemented by a company or its website hosting service, in order to develop a successful e-commerce business.

Developing a Web Store		
• Build	• Market	
Website design tools	Web page advertising	
Site design templates	E-mail promotions	
Custom design services	Web advertising exchanges with affiliate sites	
Website hosting	Search engine registrations	
Serving Your Customers		
• Serve	• Transact	• Support
Personalized Web pages	Flexible order process	Website online help
Dynamic multimedia catalog	Credit card processing	Customer service e-mail
Catalog search engine	Shipping and tax calculations	Discussion groups and chat rooms
Integrated shopping cart	E-mail order notifications	Links to related sites
Managing a Web Store		
• Manage	• Operate	• Protect
Website usage statistics	24x7 website hosting	User password protection
Sales and inventory reports	Online tech support	Encrypted order processing
Customer account management	Scalable network capacity	Encrypted website administration
Links to accounting system	Redundant servers and power	Network firewalls and security monitors

- **Developing a Web Store**
  - Build website using simple website design tools.
  - Building your Web storefront and product catalog Web pages, as well as tools to provide shopping cart features, process orders, handle credit card payments etc.
  - Market website to attract visitors and transform them into loyal web customers.

- Website should include Web page and e-mail advertising and promotions for web visitors and customers, and Web advertising exchange programs with other web stores.
- Can register your web business with its own domain name. (ex: youshop.com).

❖ **Serving your Customers**

- Serve customers by creating user profiles, customer files, personal Web pages and promotions that help develop a one-to-one relationship.
- Transact with customers by providing dynamically changing catalog, fast catalog search engine, and convenient shopping cart system integrated with promotions, payment, shipping, and account information.
- Support customers with help menus, tutorials, FAQs and e-mail correspondence with customer service representatives.

❖ **Managing a Web Store**

- Manage both the business and the website
- Operate twenty-four hours a day, seven days a week
- Protect Web store transactions and customer records, and repel hacker attacks and other security threats.
- Build or contract for sufficient network capacity to handle peak Web traffic loads, and redundant network servers and power sources to respond to system or power failures.

(If this question is asked for 10 marks, elaborate the answer by looking at the diagram).

Business-to-Business e-Commerce

✓ B2B e-commerce is the wholesale and supply side of the commercial process, where businesses buy, sell, or trade with other businesses.
✓ It relies on many different information technologies, most of which are implemented at e-commerce websites on the World Wide Web and corporate intranets and extranets.
✓ B2B applications include electronic data interchange, electronic funds transfer, and so on.
✓ Many businesses are integrating their Web-based e-commerce systems with their e-business systems for supply chain management, customer relationship management, and online transaction processing, as well as to their traditional, or legacy, computer-based accounting and business information systems.

e-commerce Marketplaces

Five major types of e-commerce marketplaces used by businesses today are:

- **One to Many** – sell-side marketplaces host one major supplier who dictates product catalog offerings and prices
- **Many to One** – buy-side marketplaces attract many suppliers that flock to these exchanges to bid on the business of a major buyer
- **Some to Many** – distribution marketplaces unite major suppliers who combine their product catalogs to attract a larger audience of buyers
- **Many to Some** – procurement marketplaces unite major buyers who combine their purchasing catalogs to attract more suppliers and thus more competition and lower prices
- **Many to Many** – auction marketplaces used by many buyers and sellers that can create a variety of buyers' or sellers' auctions to dynamically optimize prices.

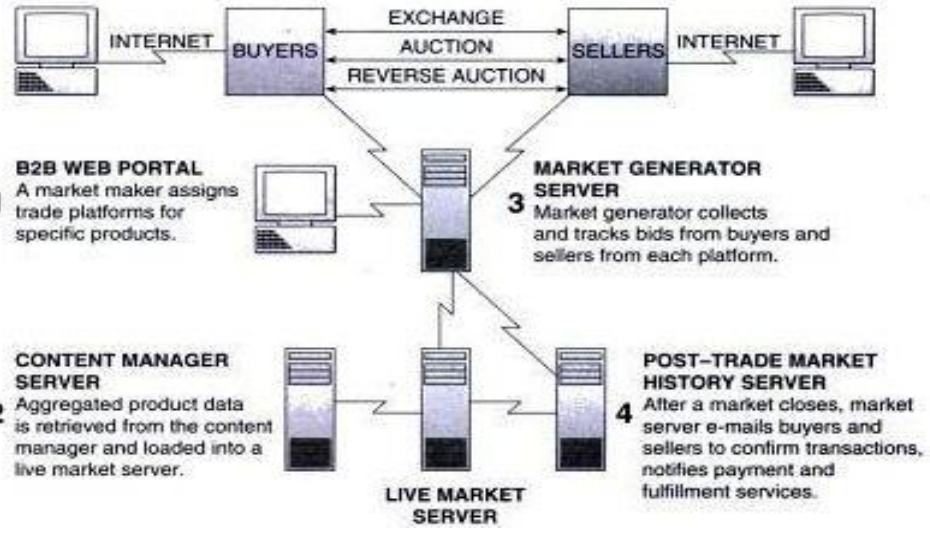
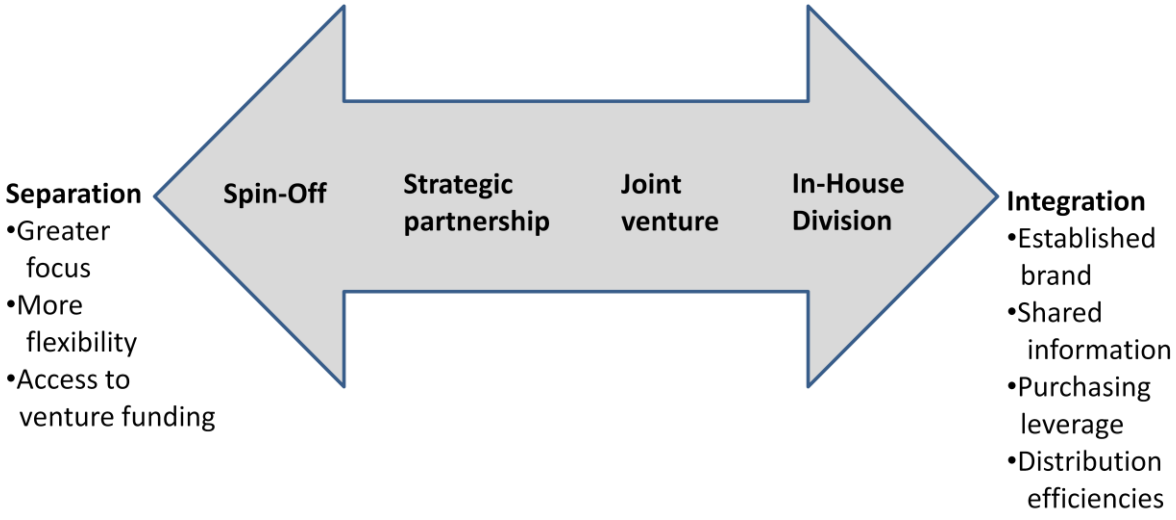


FIGURE 9.16
This is an example of a B2B e-commerce Web portal that offers exchange, auction, and reverse auction electronic markets.

e-Commerce Portals - websites developed and hosted by third-party market-maker companies who serve as **infomediaries** that bring buyers and sellers together in **catalog, exchange**, and **auction** markets. See figure 9.16. Infomediaries are companies that serve as intermediaries in e-business and e-commerce transactions. These B2B e-commerce sites make business purchasing faster, simpler, and more cost-effective.

Clicks and Bricks in e-commerce

FIGURE 9.17 Companies have a spectrum of alternatives and benefits trade-offs when deciding upon an integrated or separate e-commerce business.



e-commerce integration – Office Depot is a prime example of why many companies have chosen integrated clicks and bricks strategies, where their e-commerce business is integrated in some major ways into the traditional business operations of a company. The business case for such strategies rests on:

- Capitalizing on any unique strategic capabilities that may exist in a company's traditional business operations that could be used to support an e-commerce business.
- Gaining several strategic benefits of integrating e-commerce into a company's traditional business; such as the sharing of established brands and key business information and joint buying power and distribution efficiencies.

Thus, customers can shop at OfficeDepot.com at their home or business, or at in-store kiosks. Then they can choose to pick up their purchases at the stores or have them delivered.

Other Clicks and Bricks Strategies – range from partial e-commerce integration using joint ventures and strategic partnerships, to complete separation via the spin-off of an independent e-commerce company.

e-Commerce channel Choices

An **e-commerce channel** is the marketing or sales channel created by a company to conduct and manage its chosen e-commerce activities. How this e-commerce channel is integrated with a company's traditional sales channels (retail/wholesale outlets, catalog sales, direct sales etc) is a major consideration in developing its e-commerce strategy.

FIGURE 9.18
Key questions for developing an e-commerce channel strategy.

A Checklist for Channel Development
1. What audiences are we attempting to reach?
2. What action do we want those audiences to take? To learn about us, to give us information about themselves, to make an inquiry, to buy something from our site, to buy something through another channel?
3. Who owns the e-commerce channel within the organization?
4. Is the e-commerce channel planned alongside other channels?
5. Do we have a process for generating, approving, releasing, and withdrawing content?
6. Will our brands translate to the new channel or will they require modification?
7. How will we market the channel itself?

Both e-commerce integration and separation have major business benefits and shortcomings. Thus, deciding on a clicks and bricks strategy and e-commerce channel depends heavily on whether or not a company's unique business operations provide strategic capabilities and resources to successfully support a profitable business model for their e-commerce channel. Most companies are implementing some measures of clicks and bricks integration, because "the benefits of integration are almost always too great to abandon entirely".

UNIT 7
SECURITY AND ETHICAL CHALLENGES

SECURITY, ETHICAL, AND SOCIETAL CHALLENGES OF IT

Introduction

- Identify several ethical issues in how the use of information technologies in business affects employment, individuality, working conditions, privacy, crime, health, and solutions of societal problems. See figure 13.1
- Identify several types of security management strategies and defences, and explain how they can be used to ensure the security of business applications of information technology.
- Propose several ways that business managers and professionals can help to lessen the harmful effects and increase the beneficial effects of the use of information technology. Why Study Challenges of IT?
- Information technology in business presents major security challenges, poses serious ethical questions, and affects society in significant ways.

Business/IT Security, Ethics, and Society

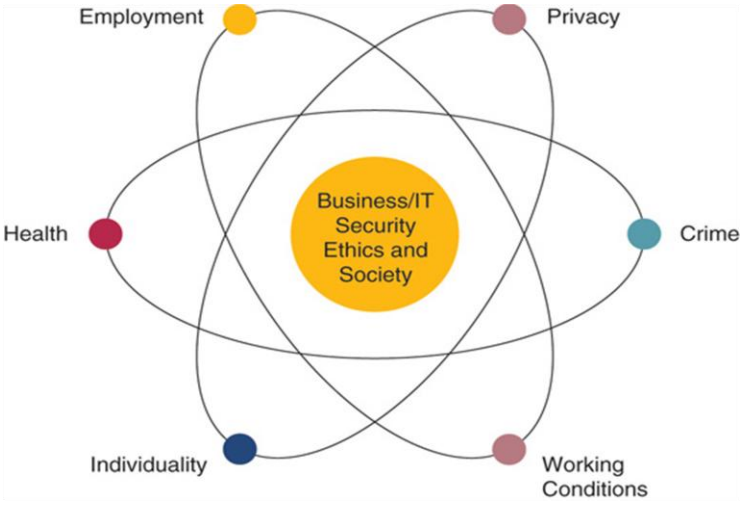


FIGURE 13.1
Important aspects of the security, ethical, and societal dimensions of the use of information technology in Business. Remember that Information technologies Can support both beneficial And detrimental effects on Society in each of the areas Shown.

Ethical Responsibility of Business Professionals

Business professionals have a responsibility to promote ethical uses of information technology in the workplace. As a manager or business professional, it will be your responsibility to make decisions about business activities and the use of information technologies, which may have an ethical dimension that must be considered. For example,

- ✓ Should you electronically monitor your employees' work activities and e-mail?
- ✓ Should you let employees use their work computers for private business or take home copies of software for their personal use?
- ✓ Should you electronically access your employees' personnel records or workstation files?
- ✓ Should you sell customer information extracted from transaction processing systems to other companies?

Business Ethics – is concerned with the numerous ethical questions that managers must confront as part of their daily business decision making. Figure 13.2 outlines some of the basic categories of ethical issues and specific business practices that have serious ethical consequences.

FIGURE 13.2

Equity	Rights	Honesty	Exercise of Corporate Power
Executive Salaries	Corporate Due Process	Employee Conflicts of Interest	Product Safety
Comparable Worth	Employee Health Screening	**Security of Company Information**	Environmental Issues
Product Pricing	**Customer Privacy**	Inappropriate Gifts	Disinvestment
Intellectual Property Rights	**Employee Privacy**	Advertising Content	Corporate Contributions
Noncompetitive Agreements	Sexual Harassment	Government Contract Issues	Social Issues Raised by Religious Organizations
	Affirmative Action	Financial and Cash Management Procedures	Plant/Facility Closures and Downsizing
	Equal Employment Opportunity	Questionable Business Practices in Foreign Countries	Political Action Committees
	Shareholder Interests		**Workplace Safety**
	Employment at Will		
	Whistle-Blowing		

Social Contract theory

- **Condition 1:** requires companies to enhance the economic satisfaction of consumers and employees. They must do that without polluting the environment or depleting natural resources, misusing political power, or subjecting their employees to dehumanising working conditions.
- **Condition 2:** requires companies to avoid fraudulent practices, show respect for their employees as human beings, and avoid practices that systematically worsen the position of any group in society.

The **stakeholder theory** of business ethics maintains that managers have an ethical responsibility to manage a firm for the benefit of all its stakeholders, which are all individuals and groups that have a stake in or claim on a company. This usually includes the corporation's stockholders, employees, customers, suppliers, and the local community.

Technology Ethics

Figure 13.3 outlines four principles of technology ethics.

FIGURE 13.3 Ethical principles to help evaluate the potential harms or risks of the use of new technologies.

Principles of Technology Ethics
• **Proportionality.** The good achieved by the technology must outweigh the harm or risk. Moreover, there must be no alternative that achieves the same or comparable benefits with less harm or risk.
• **Informed Consent.** Those affected by the technology should understand and accept the risks.
• **Justice.** The benefits and burdens of the technology should be distributed fairly. Those who benefit should bear their fair share of the risks, and those who do not benefit should not suffer a significant increase in risk.
• **Minimized Risk.** Even if judged acceptable by the other three guidelines, the technology must be implemented so as to avoid all unnecessary risk.

These principles can serve as basic ethical requirements that companies should meet to help ensure the ethical implementation of information technologies and information systems in business.

One common example of technology ethics involves some of the health risks of using computer workstations for extended periods in high-volume data entry job positions. Many organizations display ethical behaviour by scheduling work breaks and limiting the CRT exposure of data entry workers to minimize their risk of developing a variety of work-related health disorders such as hand injuries and overexposure to CRT radiation.

Ethical Guidelines

What more specific guidelines might help your ethical use of information technology?

Many companies and organizations answer that question with detailed policies for ethical computer and internet usage by their employees. Another way is to examine statements of responsibilities contained in codes of professional conduct for IS professionals. Example: **AITP – association of information technology** – an organization of professionals in the computing field. Its code of conduct outlines the ethical considerations inherent in the major responsibilities of an IS professional. Figure 13.4 is a portion of the AITP code of conduct.

AITP Standards of Professional Conduct

In recognition of my obligation to my employer I shall:

- Avoid conflicts of interest and ensure that my employer is aware of any potential conflicts.
- Protect the privacy and confidentiality of all information entrusted to me.
- Not misrepresent or withhold information that is germane to the situation.
- Not attempt to use the resources of my employer for personal gain or for any purpose without proper approval.
- Not exploit the weakness of a computer system for personal gain or personal satisfaction.

In recognition of my obligation to society I shall:

- Use my skill and knowledge to inform the public in all areas of my expertise.
- To the best of my ability, ensure that the products of my work are used in a socially responsible way.
- Support, respect, and abide by the appropriate local, state, provincial, and federal laws.
- Never misrepresent or withhold information that is germane to a problem or a situation of public concern, nor will I allow any such known information to remain unchallenged.
- Not use knowledge of a confidential or personal nature in any unauthorized manner to achieve personal gain.

You can be a **responsible professional** by

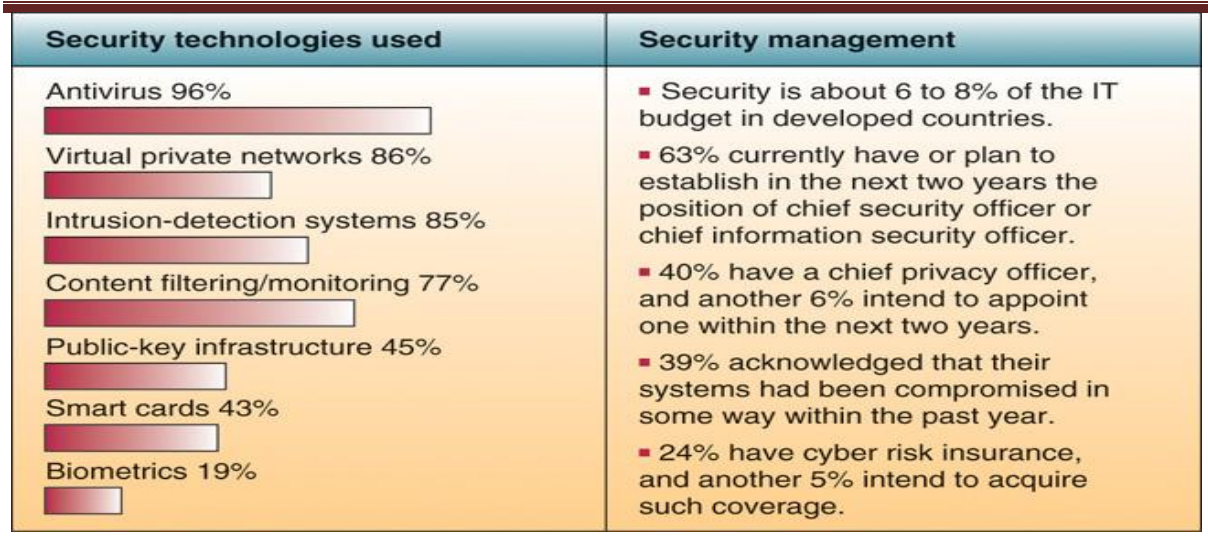
- ✓ Acting with integrity
- ✓ Increasing your professional competence
- ✓ Setting high standards of personal performance
- ✓ Accepting responsibility for your work
- ✓ Advancing the health, privacy and general welfare of the public.

Computer Crime

It is a growing threat to society caused by the criminal or irresponsible actions of the individuals who are taking advantage of the widespread use of vulnerability of computers and the internet and other networks. **Computer crime** is defined by the AITP as including:

- ✓ The unauthorized use, access, modification, and destruction of hardware, software, data, or network resources
- ✓ The unauthorized release of information
- ✓ The unauthorized copying of software
- ✓ Denying an end user access to his or her own hardware, software, data, or network resources
- ✓ Using or conspiring to use computer or network resources illegally to obtain information or tangible property

FIGURE 13.5 How large companies are protecting themselves from cybercrime.



Hacking - The obsessive use of computers, or the unauthorized access and use of networked computer systems. Hackers can be outsiders or company employees who use the Internet and other networks to steal or damage data and programs. A hacker may also use remote services that allow one computer on a network to execute programs on another computer to gain privileged access within a network.

Common Hacking Tactics

- **Denial of Service** – hammering a website's equipment with too many requests for information, effectively clogging the system, slowing performance or even crashing the site
- **Scans** – widespread probes of the Internet to determine types of computers, services, and connections
- **Sniffer** – programs that covertly search individual packets of data as they pass through the Internet, capturing passwords or entire contents
- **Spoofing** – faking an e-mail address or Web page to trick users into passing along critical information like passwords or credit card numbers
- **Trojan Horse** – a program that, unknown to the user, contains instructions that exploit a known vulnerability in some software
- **Back Doors** – a point hidden point of entry to be used in case the original entry point has been detected or blocked
- **Malicious Applets** – tiny programs that misuse your computer's resources, modify files on the hard disk, send fake e-mail, or steal passwords
- **War Dialling** – programs that automatically dial thousands of telephone numbers in search of a way in through a modem connection
- **Logic Bombs** – an instruction in a computer program that triggers a malicious act
- **Buffer Overflow** – a technique for crashing or gaining control of a computer by sending too much data to the buffer in a computer's memory
- **Password Crackers** – software that can guess passwords
- **Social Engineering** – a tactic used to gain access to computer systems by talking unsuspecting company employees out of valuable information such as passwords
- **Dumpster Diving** – sifting through a company's garbage to find information to help break into their computers.

Cyber Theft →Computer crime involving the theft of money

Unauthorised Use at Work → *Time and resource theft* may range from doing private consulting or personal finances, or playing video games, to unauthorized use of the Internet on company networks. **FIGURE 13.7** Internet Abuses in the workplaces

Internet Abuses	Activity
General e-Mail Abuses	Include spamming, harassments, chain letters, solicitations, spoofing, propagations of viruses/worms, and defamatory statements.
Unauthorized Usage and Access	Sharing of passwords and access into networks without permission.
Copyright Infringement/ Plagiarism	Using illegal or pirated software that costs organizations millions of dollars because of copyright infringements. Copying of websites and copyrighted logos.
Newsgroup Postings	Posting of messages on various non-work-related topics from sex to lawn care advice.
Transmission of Confidential Data	Using the Internet to display or transmit trade secrets.
Pornography	Accessing sexually explicit sites from workplace as well as the display, distribution, and surfing of these offensive sites.
Hacking	Hacking of websites, ranging from denial-of-service attacks to accessing organizational databases.
Non-Work-Related Download/Upload	Propagation of software that ties up office bandwidth. Use of programs that allow the transmission of movies, music, and graphical materials.
Leisure Use of the Internet	Loafing around the Internet, which includes shopping, sending e-cards and personal e-mail, gambling online, chatting, game playing, auctioning, stock trading, and doing other personal activities.
Usage of External ISPs	Using an external ISP to connect to the Internet to avoid detection.
Moonlighting	Using office resources such as networks and computers to organize and conduct personal business (side jobs).

Software Piracy → unauthorized copying of computer programs. Unauthorised copying is illegal because software is intellectual property that is protected by copyright law and user licensing agreements.

Piracy of Intellectual Property → unauthorized copying of copyrighted material, such as music, videos, images, articles, books and other written works especially vulnerable to copyright infringement.

Computer Viruses and Worms

- Computer Virus – a program code that cannot work without being inserted into another program
- Worm – distinct program that can run unaided.
- A computer virus or worm can spread destruction among many users.
- They destroy the contents of memory, hard disks and other storage devices.
- Copy routines in the virus or worm spread the virus and destroy the data and software of many computer users.
- Computer viruses typically enter a computer system through e-mail and file attachments via the internet and online services, or through illegal or borrowed copies of software.
- A virus usually copies itself into the files of a computer's operating system.
- Then the virus spreads to main memory and copies itself into the files of a computer's hard disk and any inserted floppy disks.
- The virus spreads to other computers through e-mail, file transfers, other telecommunication activities, or floppy disks from infected computers.
- You should use *antivirus programs* that can help diagnose and remove computer viruses from infected files on your hard disk.

Privacy Issues

Information technology makes it technically and economically feasible to collect, store, integrate, interchange and retrieve data and information quickly and easily. Confidential information on individuals contained in centralized computer databases by credit bureaus, government agencies, and private business firms has been stolen or misused, resulting in the invasion of privacy, fraud, and other injustices. The unauthorised use of such information has seriously damaged the privacy of the individuals. Errors in such databases could seriously hurt the credit standing or reputation of an individual.

Important privacy issues – for example

- Accessing individuals' private e-mail conversations and computer records, and collecting and sharing information about individuals gained from their visits to Internet websites and newsgroups (violation of privacy).
- Always knowing where a person is, especially as mobile and paging services become more closely associated with people rather than places (computer monitoring).
- Using customer information gained from many sources to market additional business services (computer matching).
- Collecting telephone numbers, e-mail addresses, credit card numbers, and other personal information to build individual customer profiles (unauthorised personal files).

Privacy on the Internet

- E-mail can be encrypted
- Newsgroup postings can be sent through anonymous remailers
- ISP can be asked not to sell your name and personal information to mailing list providers and other marketers
- Decline to reveal personal data and interests on online service and website user profiles

Computer Matching

Using physical profiles or personal data and profiling software to match individuals with data.

Another threat is the unauthorised matching of computerized information about you extracted from the databases of the sales transaction processing systems and sold to information brokers or other companies.

Privacy Laws

They are the rules that regulate the collection and use of personal data by businesses.

Computer Libel and Censorship

The opposite side of the privacy debate is the right of people to know about matters others may want to keep private (freedom of information), the right of people to express their opinions about such matters (freedom of speech), and the right of people to publish those opinions (freedom of the press).

- **Spamming** – indiscriminate sending of unsolicited e-mail messages to many Internet users
- **Flaming** – sending extremely critical, derogatory, and often vulgar e-mail messages or newsgroup postings to other users on the Internet or online services.

Other Challenges

These challenges include the potential ethical and societal impacts of business applications of IT in the areas of employment, individuality, working conditions and health.

❖ **Employment Challenges**

- The impact of information technologies on employment is directly related to the use of computers to achieve automation of work activities.
- It has created new jobs and increased productivity, while also causing a significant reduction in some types of job opportunities.
- Jobs require different skills and education. Therefore, individuals may become unemployed unless they can be retrained with new positions or responsibilities.
- Many new jobs, including Internet webmasters, e-commerce directors, system analysts, and user consultants, have been created to support e-business and e-commerce applications.
- Jobs have been created by activities that are heavily dependent on information technology, in such areas as space exploration, micro-electronic technology and telecommunications.

❖ **Computer Monitoring**

- Computers are being used to monitor the productivity and behaviour of millions of employees while they work to increase the efficiency and quality of service.
- It has been criticised as unethical because it violates workers' privacy and personal freedom.
- Critics also say that an employee's right of due process may be harmed by the improper use of collected data to make personnel decisions.
- It has also been blamed for causing health problems among monitored workers since it increases stress on employees who must work under constant electronic surveillance.
- Computer monitoring creates an "electronic sweatshop", where workers are forced to work at a hectic pace under poor working conditions.
- Political pressure is building to outlaw or regulate computer monitoring in the workplace.

➢ **Challenges in Working Conditions**

- Information technology has eliminated monotonous tasks in the office and the factory.
- For example – word processing and DTP helps to do documents easily. – Robots help in repetitive welding and spray painting jobs in automotive industry.
- This allows people to concentrate on more challenging and interesting assignments, upgrades the skill level of the work to be performed, and creates challenging jobs requiring highly developed skills in the computer industry and organizations.
- It upgrades the quality of work and working conditions and content of work activities.
- IT must take some responsibility for the criticism of assembly-line operations that require the continual repetition of elementary tasks, thus forcing a worker to work like a machine instead of like a skilled craftsperson.
- Many automated operations are also criticised for relegating people to a "do nothing" stand-by role, which have a detrimental effect on quality of work.

➢ **Challenges to Individuality**

- Computer-based systems are criticised as impersonal systems that dehumanize and depersonalise activities that have been computerised, since they eliminate the human relationships present in non-computer systems.
- Another aspect is that, these systems do not seem to possess any flexibility. They demand strict adherence to detailed procedures if the system is to work.
- The negative impact of IT on individuality is reinforced by horror stories that describe how inflexible and uncaring some organisations with computer-based processes are when it comes to rectifying their own mistakes.
- We know how computerised customer billing and accounting systems continued to demand payment and send warning notices to a customer whose account has been already paid.
- However, many business applications of IT are designed to minimize depersonalisation and regimentation.

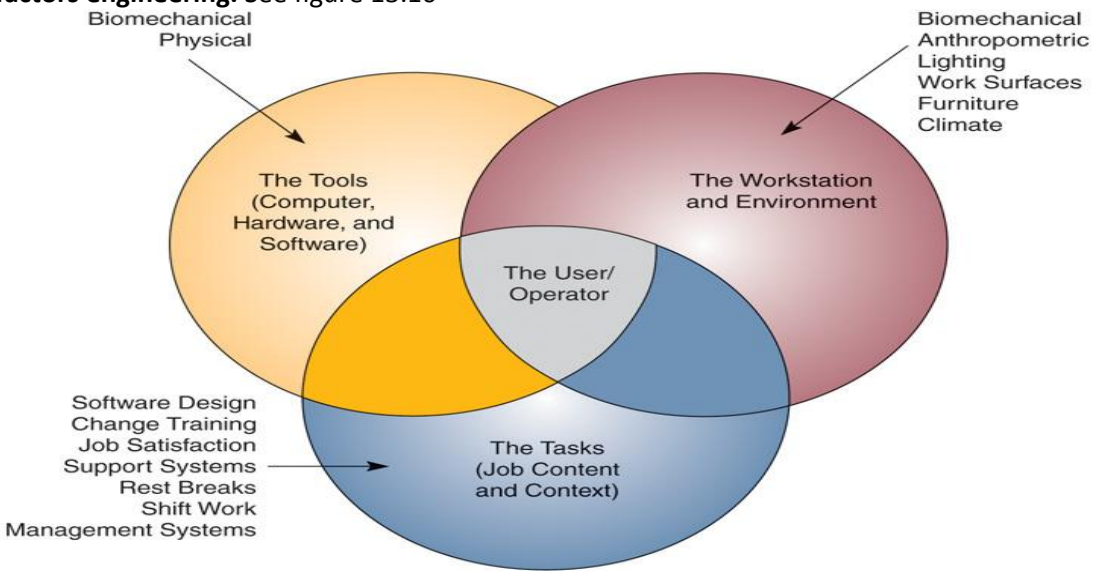
Health Issues

- Heavy use of computers is reportedly causing health problems like job stress, damaged arm and neck muscles, eye strain, radiation exposure and even death by computer-caused accidents.
- Workers, unions, and government officials criticise computer monitoring as putting so much stress on employees that it leads to health problems.
- People who sit at PC workstations or visual display terminals (VDTs) suffer from "*cumulative trauma disorders*" (CTDs). Their fingers, wrists, arms, necks, and backs may become so weak and painful that they cannot work.
- Some computer workers may suffer from "*carpal tunnel syndrome*", a painful, crippling ailment of the hand and wrist that typically requires surgery to cure.

- Radiation caused by CRTs that produce most video displays in another health concern. CRTs produce an electromagnetic field (EMF) that may cause harmful radiation of employees who work too close and too long in front of video monitors.
- Some pregnant workers have reported miscarriages and foetal deformities due to prolonged exposure to CRTs at work.

Ergonomics

Solutions to some of these health problems are based on the science of **ergonomics**, sometimes called **human factors engineering.** See figure 13.10



- ✓ The goal of ergonomics is to design healthy work environments that are safe, comfortable, and pleasant for people to work in, thus increasing employee morale and productivity.
- ✓ Ergonomics stresses the healthy design of the workplace, workstations, computers and other machines, and even software packages.
- ✓ Ergonomics job design can also provide more variety in job tasks for those workers who spend most of their workday at computer workstations.

Societal Solutions

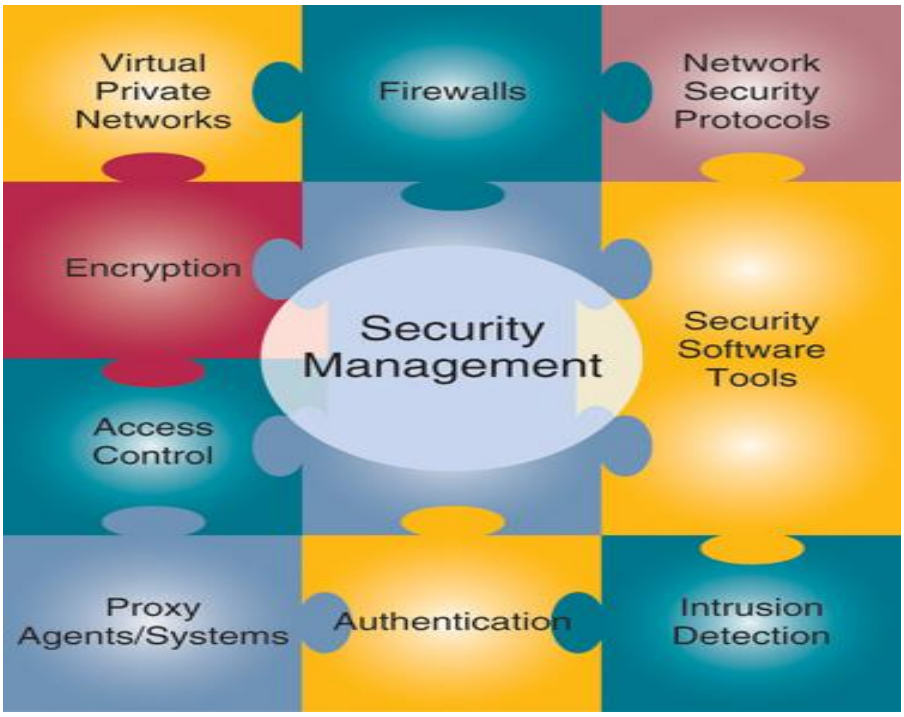
- We can use information technologies to solve human and social problems through **societal solutions** such as medical diagnosis, computer-assisted instruction, governmental program planning, environmental quality control, and law enforcement.
- For example – computers can help diagnose an illness, prescribe necessary treatment, and monitor the progress of hospital patients.
- Computer-assisted instruction (CAI) and computer-based training (CBT) enable interactive instruction tailored to the needs of students.
- Distance learning is supported by telecommunications networks, video conferencing, e-mail, and other technologies.
- IT can be used for crime control through various law enforcement applications. (alarms)
- Computers have been used to monitor the levels of pollution in the air and in bodies of water, to detect the sources of pollution, and to issue early warnings when dangerous levels are reached.
- Computers are also used for the program planning of many government agencies in such areas as urban planning, population density and land-use studies, highway planning and urban transit studies.
- Computers are being used in job placement systems to help match unemployed persons with available jobs.
- IT possesses the potential for great harm or great good for all humankind.

SECURITY MANAGEMENT OF INFORMATION TECHNOLOGY

Introduction

Business managers and professionals alike are responsible for the security, quality and performance of the business information systems in their business units. Computer and information security is more than simply securing the hardware. The data presents a much greater challenge thus requiring more sophisticated security solutions.

FIGURE 13.11 Examples of important security measures that are part of the security management of information systems.



Tools of Security Management

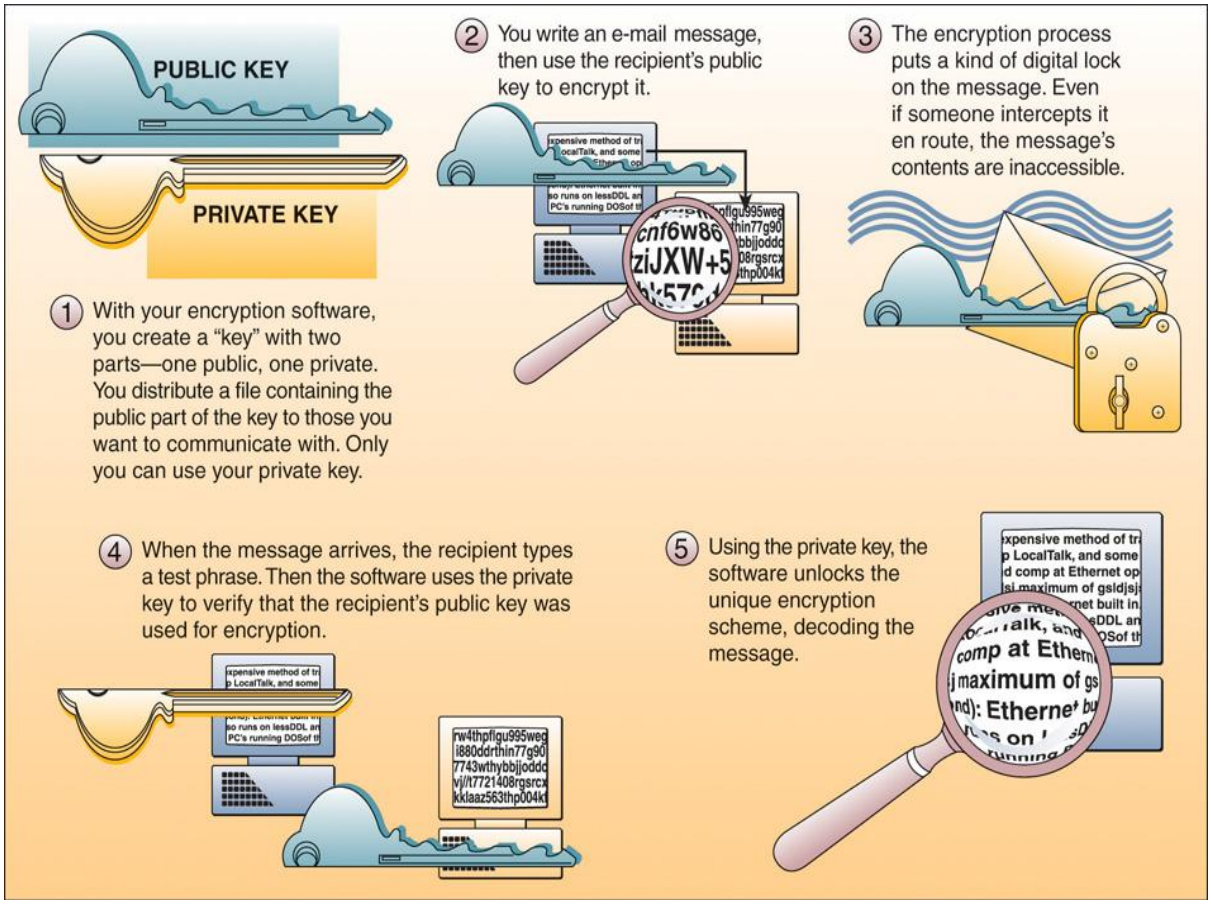
The goal of **security management** is the accuracy, integrity and safety of all information system processes and resources. Thus, effective security management can minimize errors, fraud, and losses in the information systems that interconnect today's companies and their customers, suppliers, and other stakeholders. As figure 13.11 illustrates, security management is a complex task.

Internetworked Security Defences

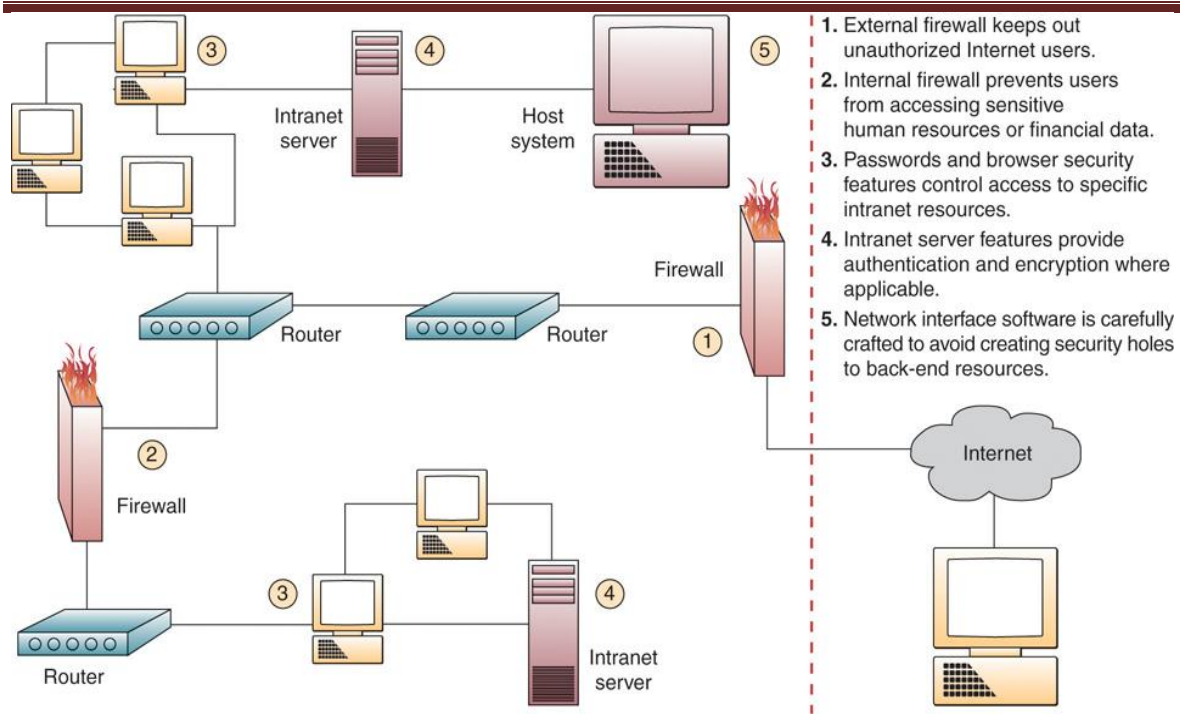
Many companies are still in the process of getting fully connected to the Web and the Internet for e-commerce and reengineering their internal business processes with intranets, e-business software, and extranet links to customers, suppliers, and other business partners. Vital network links and business flows need to be protected from external attack by cyber criminals or subversion by the criminal or irresponsible acts of insiders. This requires a variety of security tools and defensive measures and a coordinated security management program.

- **Encryption**
  - It has become an important way to protect data and other computer network resources especially on the Internet, intranets and extranets.
  - Passwords, messages, files, and other data can be transmitted in scrambled form and unscrambled by computer systems for authorised 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 data when they are received.
  - The most widely used encryption method uses a pair of public and private keys unique to each individual.
  - Encryption programs are sold as separate products or built-into other software used for the encryption process.

FIGURE 13.12 How public key/ private key encryption works.



- **Firewalls**
  - A network firewall can be a communications processor, typically a *router*, or a dedicated server, along with firewall software.
  - A firewall serves as "gatekeeper" system that protects a company's intranets and other computer networks from intrusion by providing a filter and safe transfer point for access to and from the Internet and other networks.
  - It screens all network traffic for proper passwords or other security codes, and allows only authorised transmissions in and out of the network.
  - Firewall software has become an essential component for individuals connecting to the Internet with DSL or cable modems, because of their vulnerable "always-on" connection status.
  - Firewalls can deter, but not completely prevent, unauthorised access (hacking) into computer networks.
  - A firewall may allow access only from trusted locations on the Internet to particular computers inside the firewall. Or it may allow only "safe" information to pass.
  - In other cases, it is impossible to distinguish safe use of a particular network service from unsafe use and so all requests must be blocked.
  - The firewall may then provide substitutes for some network services (such as e-mail or file transfers) that perform most of the same functions but are not as vulnerable to penetration.
  - **FIGURE 13.13** illustrates an Internet/intranet firewall system for a company



- **Denial of Service Defences**
  - Major attacks against e-commerce and corporate websites in the past few years have demonstrated that the Internet is extremely vulnerable to a variety of assaults by criminal hackers, especially **distributed denial of service (DDOS)** attacks.
  - Figure 13.14 outlines the steps organisations can take to protect themselves from DDOS attacks.

FIGURE 13.14
How to defend against denial of service attacks.

Defending against Denial of Service
• **At the zombie machines:** Set and enforce security policies. Scan regularly for Trojan Horse programs and vulnerabilities. Close unused ports. Remind users not to open .exe mail attachments.
• **At the ISP:** Monitor and block traffic spikes. Filter spoofed IP addresses. Coordinate security with network providers.
• **At the victim's website:** Create backup servers and network connections. Limit connections to each server. Install multiple intrusion-detection systems and multiple routers for incoming traffic to reduce choke points.

  - Denial of Service assaults via the Internet depend on three layers of networked computer systems:
    - ✓ 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.
  - As figure 13.14 shows, defensive measures and security precautions need to are taken at all three levels of the computer networks involved.
  - These are the basic steps companies and other organizations can take to protect their websites from denial of service and other hacking attacks.
- **E-mail Monitoring**
  - Internet and other online e-mail systems are one of the favourite avenues of attack by hackers for spreading computer viruses or breaking into networked computers.
  - E-mail is also the battleground for attempts by companies to enforce policies against illegal, personal, or damaging messages by employees, and the demands of some employees and others who see such policies as violations of privacy rights.
- **Virus Defences**

- Many companies are building defences against the spread of viruses by centralising the distribution and updating of **antivirus software** as a responsibility of their IS departments.
- Other companies are outsourcing the virus protection responsibility to their Internet service providers or to telecommunications or security management companies.
- The antivirus companies are also marketing *security suites* of software that integrate virus protection with firewalls, Web security, and content blocking features.

Other Security Measures

These include both hardware and software tools like fault tolerant computers and security monitors, and security policies and procedures like passwords and backup files.

- **Security Codes**
  - Multilevel **password** system is used for security management.
  - First, an end user logs on to the computer system by entering his or her unique identification code, or user ID.
  - The end user is then asked to enter a password in order to gain access into the system.
  - Passwords should be changed frequently and consist of unusual combinations of uppercase and lowercase letters and numbers.
  - Next, to access an individual file, a unique filename must be entered.
  - In some systems, password to read the contents of a file differs from that required to write to a file. This feature adds another level of protection to stored data.
  - Passwords can be scrambled, or encrypted, to avoid theft or improper use.
  - Smart cards, which contain microprocessors that generate random numbers to add to an end user's password, are used in some secure systems.
- **Backup Files**
  - Backup files are the duplicate files of data or programs.
  - Files can also be protected by *file retention* measures that involve storing copies of files from previous periods.
  - If current files are destroyed, the files from previous periods can be used to reconstruct new current files.
  - Several generations of files are kept for control purposes.
  - Master files from several recent periods of processing (known as *child, parent, grandparent* files etc,) may be kept for backup purposes.
  - Such files may be stored off-premises in special storage vaults in remote locations.
- **Security Monitors**
  - Security of a network may be provided by specialised system software packages known as **system security monitors.**
  - System security monitors are programs that monitor the use of computer systems and networks and protect them from unauthorised use, fraud and destruction.
  - Such programs provide the security measures needed to allow only authorised users to access the networks.
  - Security monitors also control the use of the hardware, software, and data resources of a computer system.
  - Security programs monitor the use of computer networks and collect statistics on any attempts at improper use.
  - They then produce reports to assist in maintaining the security of the network.
- **Biometric Security**
  - Biometric security is a fast-growing area of computer security.
  - These are security measures provided by computer devices that measure physical traits that make each individual unique.
  - This includes voice verification, finger-prints, hand geometry, signature dynamics, keystroke analysis, retina scanning, face recognition, and genetic pattern analysis.

- Biometric control devices use special-purpose sensors to measure and digitise a biometric profile of an individual's fingerprints, voice, or other physical trait.
- The digitised signal is processed and compared to a previously processed profile of the individual stored on magnetic disk.
- If the profiles match, the individual is allowed entry into a computer network and given access to secure system resources.

➢ **Computer Failure Controls**

- Computer systems fail for several reasons – power failures, electronic circuitry malfunctions, and telecommunications network problems, hidden programming errors, computer viruses, computer operator errors, and electronic vandalism.
- Programs of preventive maintenance of hardware and management of software updates are commonplace.
- A backup computer system capability can be arranged with *disaster recovery organisations.*
- Major hardware or software changes are usually carefully scheduled and implemented to avoid problems.
- Finally, highly trained data centre personnel and the use of performance and security management software help keep a company's computer system and networks working properly.

➢ **Fault Tolerant Systems**

- Many firms use **fault tolerant** computer systems that have redundant processors, peripherals, and software that provide a *fail-over* capability to backup components in the event of system failure.
- This may provide a *fail-safe* capability where the computer system continues to operate at the same level even if there is a major hardware or software failure.
- Many fault tolerant computer systems offer a *fail-soft* capability where the computer system can continue to operate at a reduced but acceptable level in the event of a major system failure.

FIGURE 13.17
Methods of fault tolerance in computer-based information systems.

Layer	Threats	Fault Tolerant Methods
Applications	Environment, hardware, and software faults	Application-specific redundancy and rollback to previous checkpoint
Systems	Outages	System isolation, data security, system integrity
Databases	Data errors	Separation of transactions and safe updates, complete transaction histories, backup files
Networks	Transmission errors	Reliable controllers; safe asynchrony and handshaking; alternative routing; error-detecting and error-correcting codes
Processes	Hardware and software faults	Alternative computations, rollback to checkpoints
Files	Media errors	Replication of critical data on different media and sites; archiving, backup, retrieval
Processors	Hardware faults	Instruction retry; error-correcting codes in memory and processing; replication; multiple processors and memories

➢ **Disaster Recovery**

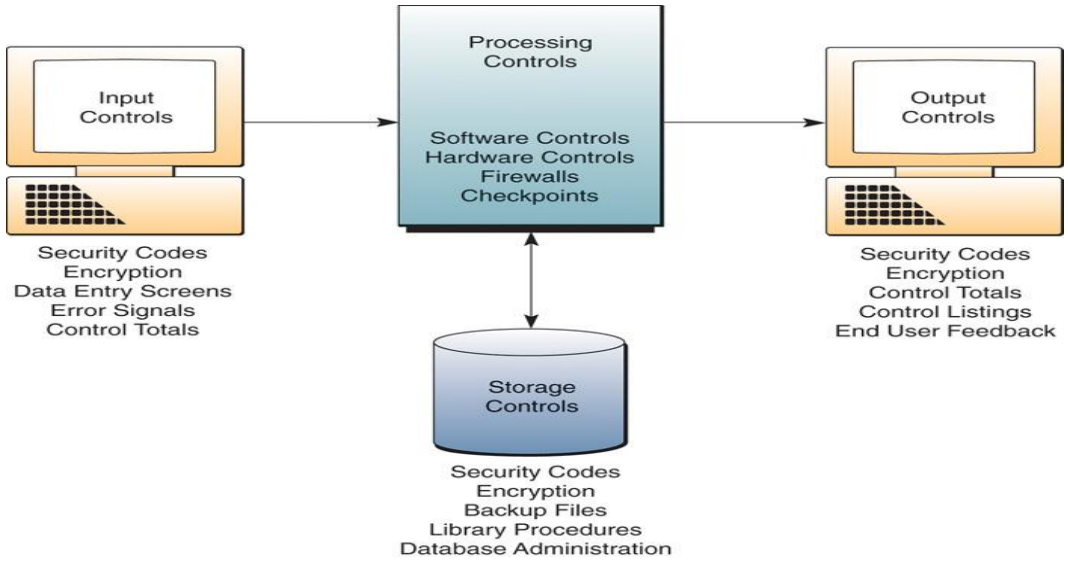
- Hurricanes, earthquakes, fires, floods, criminal and terrorist acts, and human error can all severely damage an organisation's computing resources, and thus the health of the organisation itself.
- That's why organisations develop **disaster recovery** procedures and formalise them in a *disaster recovery plan*.
- It specifies which employees will participate in disaster recovery and what their duties will be; what hardware, software, and facilities will be used; and the priority of applications that will be processed.
- Arrangements with other companies for use of alternative facilities as disaster recovery site and offsite storage of an organisation's databases are also part of an effective disaster recovery effort.

System Controls and Audits

Two final security management requirements that need to be mentioned are the development of information system controls and **auditing business systems.**

Information system controls are methods and devices that attempt to ensure the accuracy, validity, and propriety of information system activities. Information system (IS) controls must be developed to ensure proper data entry, processing techniques, storage methods, and information output. Thus, IS controls are designed to monitor and maintain the quality and security of the input, processing, output, and storage activities of any information system.

FIGURE 13.18 Examples of information system controls.



For ex: IS controls are needed to ensure the proper entry of data into a business system and thus avoid the *garbage in, garbage out* (GIGO) syndrome. Computer software can include instructions to identify incorrect, invalid, or improper input data as it enters the computer system.

Auditing IT Security

- IT security management should be periodically examined, or audited by a company's internal auditing staff or external auditors from professional accounting firms.
- Such audit review and evaluate whether proper and adequate security measures and management policies have been developed and implemented.
- It verifies the accuracy and integrity of the software used, as well as the input of data and output produced by business applications.
- The auditors may develop special test programs or use audit software packages.
- An **audit trail** can be defined as the presence of documentation that allows a transaction to be traced through all stages of its information processing.
- The audit trail of manual information systems is quite visible and easy to trace.
- Many times, this *electronic audit trail* takes the form of *control logs* that automatically record all computer network activity on magnetic disk or tape devices.
- This audit feature can be found on many online transaction processing systems, performance and security monitors, operating systems, and network control programs.
- Such an audit trail helps auditors check for errors or fraud, but also helps IS security specialists trace and evaluate the trail of hacker attacks on computer networks.

Figure 13.19 summarises ten security management steps you can take to protect your computer system resources from hacking and other forms of cybercrime.

FIGURE 13.19

Security Management for Internet Users

1. Use antivirus and Firewall software and update it often to keep destructive programs off your computer.
2. Don't allow online merchants to store your credit card information for future purchases.
3. Use a hard-to-guess password that contains a mix of numbers and letters, and change it frequently.
4. Use different passwords for different websites and applications to keep hackers guessing.
5. Install all operating system patches and upgrades.
6. Use the most up-to-date version of your Web browser, e-mail software, and other programs.
7. Send credit card numbers only to secure sites; look for a padlock or key icons at the bottom of the browser.
8. Use a security program that gives you control over "cookies" that send information back to websites.
9. Install firewall software to screen traffic if you use DSL or a cable modem to connect to the Net.
10. Don't open e-mail attachments unless you know the source of the incoming message.

UNIT 8
ENTERPRISE AND GLOBAL MANAGEMENT OF INFORMATION TECHNOLOGY

MANAGING INFORMATION TECHNOLOGY

Business and IT

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 organisational function.

Managing Information Technology

Figure 14.1 illustrates one popular approach to **managing information technology** in a large company.

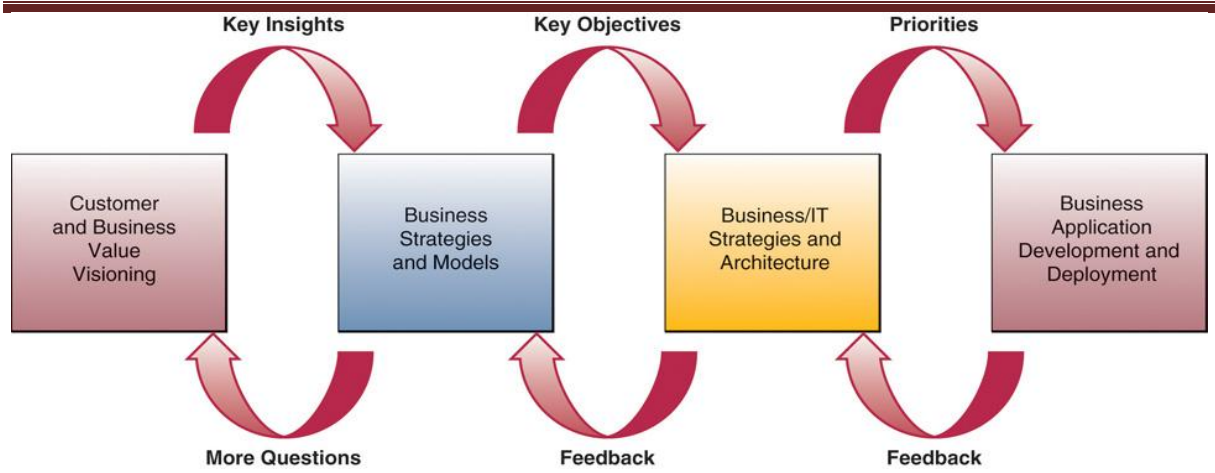
This managerial approach has three major components:

- **Managing the joint development and implementation of business/IT strategies**
  Led by the CEO and CIO (chief information officer), proposals are developed by business and IT managers and professionals for using IT to support the strategic business priorities of the company. This business/ IT planning process *align* IT with strategic business goals. The process also includes evaluating the business case for investing in the development and implementation of each proposed business/IT project.
- **Managing the development and implementation of new business/IT applications and technologies**
  This is the primary responsibility of the CIO and CTO (chief technology officer). This area of IT management involves managing the processes for information systems development and implementation, as well as the responsibility for research into the strategic business uses of new information technologies.
- **Managing the IT organisation and the IT infrastructure**
  The CIO and IT managers share responsibility for managing the work of IT professionals who are typically organised into a variety of project teams and other organisational sub-units. In addition, they are responsible for managing the IT infrastructure of hardware, software, databases, telecommunications networks, and other IT resources, which must be acquired, operated, monitored, and maintained.

Business/IT Planning

Figure 14.3 illustrates the **business/IT planning process**, which focuses on discovering innovative approaches to satisfying a company's customer value and business value goals. The planning process leads to development of strategies and business models for new business applications, processes, products, and services.

FIGURE 14.3



The business/IT planning process has three major components:

- **Strategy development**
  Developing business strategies that support a company's business vision. For example, using information technology to create innovative e-business systems that focus on customer and business value.
- **Resource management**
  Developing strategic plans for managing or outsourcing a company's IT resources, including IS personnel, hardware, software, data and network resources.
- **Technology Architecture**
  Making strategic IT choices that reflect information technology architecture designed to support a company's business/IT initiatives.

Information Technology Architecture

The **IT architecture** that is created by the strategic business/IT planning process is a conceptual design, or blueprint that includes the following major components:

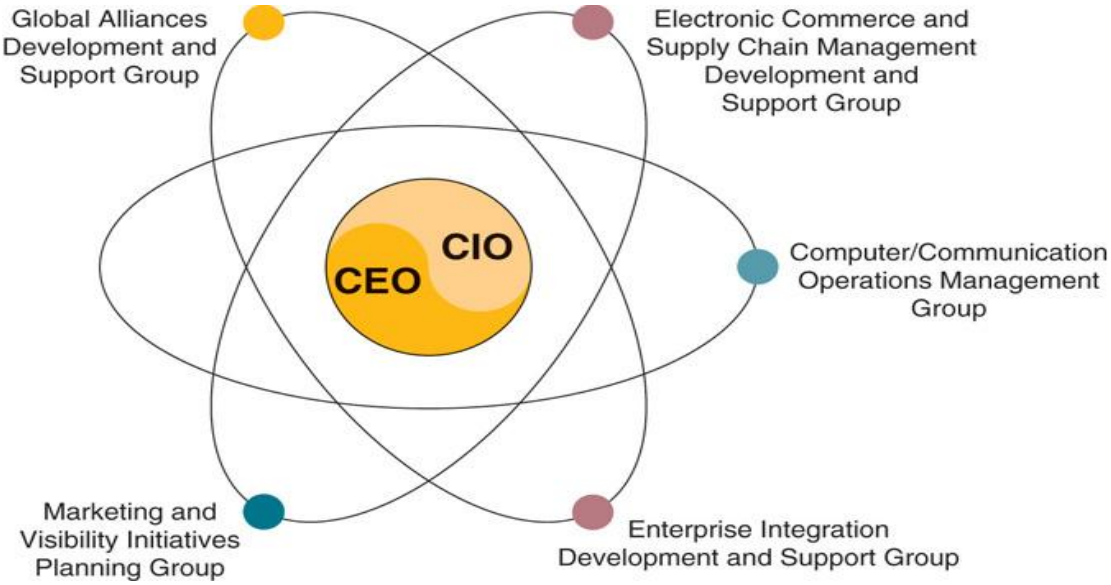
- ✓ **Technology platform.** The Internets, intranets, extranets and other networks, computer systems, system software, and integrated enterprise application software provide a computing and communications infrastructure, or platform that supports the strategic use of information technology for e-business, e-commerce and other business/IT applications.
- ✓ **Data resources.** Many types of operational and specialised databases, including data warehouses and Internet/intranet databases store and provide data and information for business processes and decision support.
- ✓ **Applications Architecture.** Business applications of IT are designed as an integrated architecture or portfolio of enterprise systems that support strategic business initiatives, as well as cross-functional business processes. It support for developing and maintaining the interenterprise SCM and integrated ERP and CRM applications.
- ✓ **IT Organisation.** The organisational structure of the IS function within a company and the distribution of IS specialists are designed to meet the changing strategies of a business. The form of the IT organisation depends on the managerial philosophy and business/IT strategies formulated during the strategic planning process.

Managing the IS Function

- ❖ **Organising IT**
  - In the early years of computing, the development of large mainframe computers and telecommunications networks and terminals caused a **centralisation** of computer hardware and software, databases, and information specialists at the corporate level of organisations.

- Next, the development of minicomputers and microcomputers accelerated a **downsizing** trend, which promoted a move back toward **decentralisation** by many business firms.
- Distributed client/server networks at the corporate, department, workgroup, and team levels came into being.
- This promoted creation of *information centres* to support end user and workgroup computing.
- Lately, the trend is to establish more centralised control over the management of the IT resources of a company especially e-business and e-commerce initiatives.
- This has resulted in the development of hybrid structures with both centralised and decentralised components. See figure 14.5

FIGURE 14.5 The organisational components of the IT



- Corporations **outsource** i.e. turn over all or parts of their IS operations to outside contractors known as *system integrators*.
- In addition, some companies are outsourcing software procurement and to support to *application service providers* (ASPs), who provide and support business application and other software via the Internet and intranets to all of a company's employee workstations.

❖ **Managing Application Development**

- It involves managing activities such as systems analysis and design, prototyping, applications programming, project management, quality assurance, and system maintenance for all major business/IT development projects.
- It requires managing the activities of teams of systems analysts, software developers, and other IS professionals.
- Project management is a key IT management responsibility if business/IT projects are to be completed on time and within their budgets, as well as meeting their design objectives.
- Their role is to evaluate new application development tools and to help IS specialists use them to improve their application development efforts.

❖ **Managing IS operations**

- IS operations management is concerned with the use of hardware, software, network, and personnel resources in the corporate or business unit **data centres** of an organisation.
- Operational activities that must be managed include computer system operations, network management, production control, and production support.
- **System performance monitors** monitor the processing of computer jobs, help develop a planned schedule of computer operations that can optimise computer system performance, and produce detailed statistics that are invaluable for effective planning and control of computing capacity.
- This evaluation provides information for capacity planning, production planning and control, and hardware/software acquisition planning.

- System performance monitors also supply information needed by **chargeback systems** that allocate costs to users based on the information services rendered.
- All costs incurred are recorded, reported, allocated, and charged back to specific end user business units, depending on their use of system resources.
- Many performance monitors also feature **process control** capabilities.
- These performance monitors provide more efficient computer operations than human-operated systems.

❖ **Human Resource Management of IT**

- It is considered as challenging task because success of failure of an organisation depends on the quality of its people.
- Managing information services functions involves the management of managerial, technical, and clerical personnel.
- Employees must be continually trained to keep up with the latest developments in a fast-moving and highly technical field.
- Employee job performances must be continually evaluated and outstanding performances rewarded with salary increases or promotions.
- Salary and wage levels must be set, and career paths must be designed so individuals can move to new jobs through promotion and transfer as they gain in seniority and expertise.

❖ **The CIO and other IT Executives**

- The **chief information officer** (CIO) oversees all use of information technology in many companies, and brings them into alignment with strategic business goals.
- CIO does not direct day-to-day information service activities. Instead, CIOs concentrates on business/IT planning and strategy.
- They also work with the CEO and other top executives to develop strategic uses of information technology in electronic business and commerce that help make the firm more competitive in the marketplace.
- They emphasize that the chief role of IT is to help a company meet its strategic business objectives.

❖ **Technology Management**

- Development in information systems technology have had, and will continue to have, a major impact on the operations, costs, management work environment, and competitive position of many organisations.
- All information technologies must be managed as a technology platform for integrating internally focussed or externally facing business applications.
- Such technologies include the Internet, intranets and a variety of e-commerce and collaboration technologies, as well as integrated enterprise software for CRM, ERP and SCM.
- Technology management is the primary concern of **chief technology officer** (CTO) who is in charge of all information technology planning and deployment.

❖ **Managing User Services**

- Teams and workgroups of business professionals commonly use PC workstations, software packages, and the Internet, intranets, and other networks to develop and apply IT to their work activities.
- Many companies have responded by creating **user services**, or client services, functions to support and manage end user and workgroup computing.
- End user services provide both opportunities and problems for business unit managers.
- IS specialists with titles such as user consultant, account executive, or business analyst may also be assigned to end user work groups.
- These specialists perform a vital role by troubleshooting problems, gathering and communicating information, coordinating educational efforts, and helping business professionals with application development.
- Most organisations establish and enforce policies for the acquisition of hardware and software by end users and business units.
- Development of applications with proper security and quality controls to promote correct performance and safeguard the integrity of corporate and departmental networks and databases.

Failures in IT Management

Managing IT is not an easy task. Thus, IT is not being used effectively and efficiently and there have been failures in IT management. For example:

- IT is not being used *effectively* by companies that use IT primarily to computerise traditional business processes, instead of developing innovative e-business processes involving customers, suppliers and other business partners, e-commerce and web-enabled decision support.
- IT is not being used *efficiently* by information systems that provide poor response time and frequent downtimes, or IS professionals and consultants who do not properly manage application development projects.

Management Involvement and Governance

- ✓ The experiences of successful organisations reveal that extensive and meaningful **managerial and end user involvement** is the key ingredient of high quality information systems performance.
- ✓ Involving business managers in the governance of the IS function and business professionals in the development of IS applications should thus shape the response of management to the challenge of improving the business value of IT.
- ✓ Involving managers in the management of IT requires the development of *governance structures* that encourage their active participation in planning and controlling the business uses of IT.
- ✓ This helps managers avoid IS performance problems in their business units and development projects.
- ✓ With this high degree of involvement, managers can improve the strategic business value of information technology.

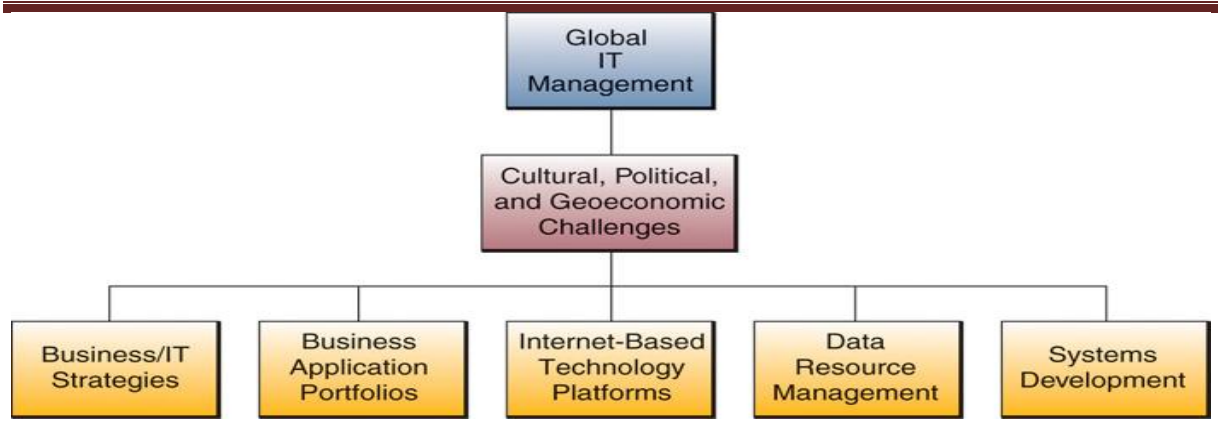
MANAGING GLOBAL IT

The International Dimension

International dimensions have become a vital part of managing a business enterprise in the internetworked global economies and markets of today. Whether you become a manager in a large corporation or the owner of a small business, you will be affected by international business developments, and deal in some way with people, products, or services whose origin is not from your home country.

Global IT Management

- Figure 14.8 illustrates the major dimensions of the global e-business technology management.
- All global activities must be adjusted to take into account the cultural, political, and geo-economic challenges that exist in the international business community.
- Developing appropriate business and IT strategies for the global marketplace should be the first step in **global information technology management.**
- Once that is done, end user and IS managers can move on to developing the portfolio of business applications needed to support business/IT strategies; the hardware, software, and Internet-based technology platforms to support those applications; the data resource management methods to provide necessary databases; and finally the systems development projects that will produce the global information systems required.
- **FIGURE 14.8 the major dimensions of global e-business technology management**



Cultural, Political, and Geo-economic Challenges

Global information technology management must focus on developing global business IT strategies and managing global e-business application portfolios, Internet technologies, platforms, databases and systems development projects. But managers must also accomplish that from a perspective and through methods that take into account the cultural, political, and geo-economic differences that exist when doing business internationally.

- **Cultural challenges**
  - Includes differences in languages, cultural interests, religions, customs, social attitudes, and political philosophies.
  - Global IT managers must be trained and sensitized to such cultural differences before they are sent abroad or brought into a corporation's home country.
  - Other cultural challenges include differences in work styles and business relationships.
  - For example:
    - ✓ Should one take one's time to avoid mistakes, or hurry to get something done early?
    - ✓ Should one go it alone or work cooperatively?
    - ✓ Should the most experienced person lead, or should leadership be shared?
- **Political Challenges**
  - Many countries have rules regulating or prohibiting transfer of data across their national boundaries, especially personal information such as personnel records.
  - Others severely restrict, tax, or prohibit imports of hardware and software.
  - Still others have local content laws that specify the portion of the value of a product that must be added in that country if it is to be sold there.
  - Other countries have reciprocal trade agreements that require a business to spend part of the revenue they earn in a country in that nation's economy.
- **Geo-economic challenges**
  - Refers to the effects of geography on the economic realities of international business activities.
  - It is still difficult to communicate in real-time across the world's 24 time zones.
  - It is still difficult to get good-quality telephone and telecommunications service in many countries.
  - There are still problems finding the job skills required in some countries, or enticing specialists from other countries to live and work there.
  - There are still problems in the great differences in the cost of living and labour costs in various countries.

Global Business/IT Strategies

Figure 14.9 illustrates that many firms are moving toward **transnational strategies** in which they integrate their **global business/IT applications** through close cooperation and interdependence among their international subsidiaries and their corporate headquarters.

Comparing Global Business/IT Strategies

International	Global	Transnational
• Autonomous operations. • Region specific. • Vertical integration. • Specific customers. • Captive manufacturing. • Customer segmentation and dedication by region and plant.	• Global sourcing. • Multiregional. • Horizontal integration. • Some transparency of customers and production. • Some cross regionalization.	• Virtual business operations via global alliances. • World markets and mass customization. • Global e-commerce and customer service. • Transparent manufacturing. • Global supply chain and logistics. • Dynamic resource management.
Information Technology Characteristics		
• Stand-alone systems. • Decentralized/no standards. • Heavy reliance on interfaces. • Multiple systems, high redundancy and duplication of services and operations. • Lack of common systems and data.	• Regional decentralization. • Interface dependent. • Some consolidation of applications and use of common systems. • Reduced duplication of operations. • Some worldwide IT standards.	• Logically consolidated, physically distributed, Internet connected. • Common global data resources. • Integrated global enterprise systems. • Internet, intranet, extranet Web-based applications. • Transnational IT policies and standards.

Businesses are moving away from

- ✓ Multinational strategies where foreign subsidiaries operate autonomously.
- ✓ International strategies in which foreign subsidiaries are autonomous but are dependent on headquarters for new processes, products, and ideas
- ✓ Global strategies where a company's worldwide operations are closely managed by corporate headquarters.

In the transnational approach, a business depends heavily on its information systems and Internet technologies to help it integrate its global business activities. A transnational business tries to develop an integrated and cooperative worldwide hardware, software and Internet-based architecture for its IT platform.

Global Business/IT Applications

- The applications of IT developed by global companies depend on their **global business/IT strategies** and their expertise and experience in IT.
- IT applications also depend on a variety of **global business drivers**, that is, business requirements caused by the nature of the industry and its competitive or environmental forces.
- Figure 14.11 summarises some of the business requirements that make global IT a competitive necessity.
- Many global IT applications particularly finance, accounting, and office applications, have been in operation for many years.
- However, as global operations expand and global competition heats up, there is increasing pressure for companies to install global e-commerce and e-business applications for their customers and suppliers.
- Explosive business use of the Internet, intranets, and extranets for electronic commerce has made such applications much more feasible for global companies.

FIGURE 14.11
These are some of the business reasons driving global business applications.

Business Drivers for Global IT
• **Global customers.** Customers are people who may travel anywhere or companies with global operations. Global IT can help provide fast, convenient service.
• **Global products.** Products are the same throughout the world or are assembled by subsidiaries throughout the world. Global IT can help manage worldwide marketing and quality control.
• **Global operations.** Parts of a production or assembly process are assigned to subsidiaries based on changing economic or other conditions. Only global IT can support such geographic flexibility.
• **Global resources.** The use and cost of common equipment, facilities, and people are shared by subsidiaries of a global company. Global IT can keep track of such shared resources.
• **Global collaboration.** The knowledge and expertise of colleagues in a global company can be quickly accessed, shared, and organized to support individual or group efforts. Only global IT can support such enterprise collaboration.

Global IT Platforms

- The management of technology platforms is another major dimension in global IT management – that is, managing the hardware, software, data resources, telecommunications networks, and computing facilities that support global business operations.
- The management of a **global IT platform** is not technically complex but also has major political and cultural implications.
- For example, hardware choices are difficult in some countries because of high prices, high tariffs, import restrictions, long lead times for government approvals, lack of local service or spare parts and lack of documentation.
- Managing international data communications networks, including Internet, intranet, extranet and other networks, is a key global IT challenge.
- Establishing computing facilities internationally is another global challenge.
- Companies with global business operations usually establish or contract with systems integrators for additional data centres in their subsidiaries in other countries.
- However, off-shore data centres can pose major problems in head quarter's support, hardware and software acquisition, maintenance and security.

FIGURE 14.12
The top 10 issues in managing international data communications.

International Data Communications Issues
Network management issues
• Improving the operational efficiency of networks
• Dealing with different networks
• Controlling data communication security
Regulatory issues
• Dealing with transborder data flow restrictions
• Managing international telecommunication regulations
• Handling international politics
Technology issues
• Managing network infrastructure across countries
• Managing international integration of technologies
Country-oriented issues
• Reconciling national differences
• Dealing with international tariff structures

The Internet as a Global IT Platform

- ✓ The Internet and the World Wide Web have now become vital components in international business and commerce.

- ✓ Within a few years, the Internet, with its interconnected network of thousands of networks of computers and databases, has established itself as a technology platform free of many traditional international boundaries and limits.
- ✓ By connecting their businesses to this online global infrastructure, companies can expand their markets, reduce communications and distribution costs, and improve their profit margins without massive cost outlays for new telecommunications facilities.
- ✓ The Internet, along with its related intranet and extranet technologies, provides a low-cost interactive channel for communications and data exchange with employees, customers, suppliers, distributors, manufacturers, product developers, financial backers, information providers, and so on.

Global Data Access Issues

- Global data access issues have been a subject of political controversy and technology barriers in global business operations for many years, but have become more visible with the growth of the Internet and the pressures of e-commerce.
- A major example is the issue of **transborder data flows** (TDF), in which business data flow across international borders over the telecommunications networks of global information systems.
- Many countries view TDF as violating their national sovereignty because transborder data flows avoid customs duties and regulations for the import or export of goods and services.
- Others view TDF as violating their laws to protect the local IT industry from competition or their labour regulations for protecting local jobs.
- Data flow business issues that seem politically sensitive are those that affect the movement out of a country of personal data in e-commerce and human resource applications.

Internet Access Issues

FIGURE 14.16
Countries that restrict or forbid Internet access by their citizens.

Internet has become a global battleground over public access to data and information at business and private sites on the World Wide Web. Most of the countries has decided that restricting Internet access is not a viable policy, and in fact, would hurt their countries' opportunities for economic growth and prosperity. Instead, national and international efforts are made to rate and filter Internet content deemed inappropriate or criminal, such as websites for child pornography or terrorism.

Global Systems Development

- Conflicts over local versus global system requirements
- Difficulties in agreeing on common system features such as multilingual user interfaces and flexible design standards
- Disturbances caused by systems implementation and maintenance activities
- Global standardization of data definitions
- Differences in language, culture and technology platforms can make global data standardisation quite difficult.
- However, businesses are moving ahead to standardise data definitions and structures.
- By moving their subsidiaries into data modelling and database design, they hope to develop a global data architecture that supports their global business objectives.

Systems Development Strategies

- Transform an application used by the home office into a global application.
- System used by a subsidiary that has the best version of an application will be chosen for global use
- Set up a multinational development team with key people from several subsidiaries to ensure that the system design meets the needs of local sites as well as corporate headquarters.
- Parallel Development – parts of the system are assigned to different subsidiaries and the home office to develop at the same times based on the expertise and experience at each site
- Centres of Excellence – an entire system may be assigned for development to a particular subsidiary based on their expertise in the business or technical dimensions needed for successful development
- Offshore Development – outsource the development work to a global development company.

FIGURE 14.17 Internet-enabled Collaboration