Module 1

Types of Information Systems:

Type of System	Function	Example
Functional area IS	Supports the activities within specific functional area	System for processing payroll
Transaction processing system	Processes transaction data from terminal	Walmart checkout point-of-sale business events
Enterprise resource planning	Integrates all functional areas of the organization	Oracle, SAP system
Office automation system	Supports daily work activities of individuals and groups	Microsoft® Office
Management information system	Produces reports summarized from transaction data, usually in one functional area	Report on total sales for each customer
Decision support system	Provides access to data and analysis tools	"What–if" analysis of changes in budget
Expert system	Mimics human expert in a particular area and makes decisions	Credit card approval analysis
Executive dashboard	Presents structured, summarized information about aspects of business important to executives	Status of sales by product
Supply chain management system	Manages flows of products, services, and information among organizations	Walmart Retail Link system connecting suppliers to Walmart
Electronic commerce system	Enables transactions among organizations and between organizations and customers	*www.dell.com*

Managing information systems in modern organizations is a difficult, complex task. Why? (Justify)

Several factors contribute to this complexity.

- First, information systems have enormous strategic value to organizations. Firms rely on them so heavily that, in some cases, **when these systems are not working (even for a short time), the firm cannot function.** (This situation is called "being hostage to information systems.").
- Second, information systems are very expensive to acquire, operate, and maintain.
- A third factor contributing to the difficulty in managing information systems is the evolution of the management information systems (MIS) function within the organization. When businesses first began to use computers in the early 1950s, the MIS department "owned" the only computing resource in the organization, the mainframe. At that time, end users did not interact directly with the mainframe. In contrast, in the modern organization, computers are located in all departments, and almost all employees use computers in their work. This situation, known **as end user computing,** has led to a partnership between the MIS department and the end users.
- As a result of these developments, the responsibility for managing information resources is now divided between the MIS department and the end users. This arrangement **raises**

several important questions: Which resources are managed by whom? What is the role of the MIS department, its structure, and its place within the organization? What is the appropriate relationship between the MIS department and the end users? Regardless of who is doing what, it is essential that the MIS department and the end users work in close cooperation.

- **Confusion in the division of responsibility**: There is no standard way to divide responsibility for developing and maintaining information resources between the MIS department and the end users. Instead, that division depends on several factors: the size and nature of the organization, the amount and type of IT resources, the organization's attitudes toward computing, the attitudes of top management toward computing, the maturity level of the technology, the amount and nature of outsourced IT work, and even the countries in which the company operates.

Explain the benefits of being an informed user of information systems. (When you start working for an organization, why it is beneficial to have IT knowledge)

- You will benefit more from your organization's IT applications because you will understand what is "behind" those applications.
- You will be able to provide input into your organization's IT applications, thus improving the quality of those applications.
- You will quickly be in a position to recommend or participate in the selection of IT applications that your organization will use.
- You will be able to keep up with rapid developments in existing information technologies, as well as with the introduction of new technologies.
- You will understand the potential impacts that "new and improved" technologies will have on your organization and therefore will be qualifi ed to make recommendations concerning their adoption and use.
- You will play a key role in managing the information systems in your organization.
- You will be in a position to use IT if you decide to start your own business.

List positive and negative societal effects of the increased use of information technology.

Positive societal effects: (add more points, explain the following ones)

- IT can provide opportunities for people with disabilities
  (Computers can create new employment opportunities for people with disabilities by integrating speech-recognition and vision-recognition capabilities.)
- IT can provide people with flexibility in their work (e.g., work from anywhere, anytime).
- Robots will take over mundane chores.
- IT will enable improvements in healthcare.

Negative societal effects:

- IT can cause health problems for individuals.
- IT can place employees on constant call.
- IT can potentially misinform patients about their health problems.

Although computers and information systems are generally regarded as agents of "progress," they can adversely affect individuals' health and safety. To illustrate this point, we consider two issues associated with IT**: job stress and long-term use of the keyboard.**

An increase in an employee's workload and/or responsibilities can trigger ***job stress***.

Although computerization has benefited organizations by increasing productivity, it also has created an ever-expanding workload for some employees. Some workers feel overwhelmed and have become increasingly anxious about their job performance. These feelings of stress and anxiety can diminish rather than improve workers' productivity while jeopardizing their physical and mental health. Management can help alleviate these problems by providing training, redistributing the workload among workers, and hiring more workers.

On a more specific level, the long-term use of keyboards can lead to *repetitive strain injuries* such as backaches and muscle tension in the wrists and fingers. ***Carpal tunnel syndrome*** is a particularly painful form of repetitive strain injury that affects the wrists and hands.
Designers are aware of the potential problems associated with the prolonged use of computers. To address these problems, they continually attempt to design a better computing environment. The science of designing machines and work settings that minimize injury and illness is called ergonomics. **The goal of ergonomics is to create an environment that is safe, well lit, and comfortable.** Examples of ergonomically designed products are antiglare screens that alleviate problems of fatigued or damaged eyesight and chairs that contour the human body to decrease backaches.

Discuss ways in which information technology can affect managers and nonmanagerial workers.

Potential IT impacts on managers: (Explain each point)

- IT may reduce the number of middle managers.
- IT will provide managers with real-time or near-real-time information, meaning that managers will have less time to make decisions.
- IT will increase the likelihood that managers will have to supervise geographically dispersed employees and teams.

Potential IT impacts on nonmanagerial workers:

- IT may eliminate jobs.
- IT may cause employees to experience a loss of identity.
- IT can cause job stress and physical problems, such as repetitive stress injury.

Explain how IT has improved healthcare practices.

IT has brought about major improvements in healthcare delivery.

- Medical personnel use IT to make better and faster diagnoses and to monitor critically ill patients more accurately.
- IT has also streamlined the process of researching and developing new drugs.
- Expert systems now help doctors diagnose diseases, and machine vision is enhancing the work of radiologists.
- Surgeons use virtual reality to plan complex surgeries.
- They also employ surgical robots to perform long-distance surgery.
- Finally, doctors discuss complex medical cases via videoconferencing.
- New computer simulations recreate the sense of touch, allowing doctors-in-training to perform virtual procedures without risking harm to an actual patient.
- Information technology can be applied to improve the efficiency and effectiveness of healthcare.

Describe the robotic revolution and consider its implications

Once restricted largely to science fiction movies, robots that can perform practical tasks are becoming more common. In fact, "cyberpooches," "nursebots," and other mechanical beings may be our companions before we know it. Around the world, quasi-autonomous devices have become increasingly common on factory floors, in hospital corridors, and in farm fi elds. For home use, **to vacuum our floors,**

the Scooba to wash our floors, the Dirt Dog to sweep our garages, the Verro to clean our pools, and the Looj to clean our gutters. Robots are increasingly being utilized in a variety of areas. For example, take a look at the commercial use of **drones** and the use of social, collaborative robots in the workplace. Robots are used to perform surgeries. Used for doing mundane jobs. (Cite examples of human bots, botnets used for cyber attacks)

Differentiate between traditional IS and New (Consultative) Functions of the MIS Department

Traditional Functions of the MIS Department

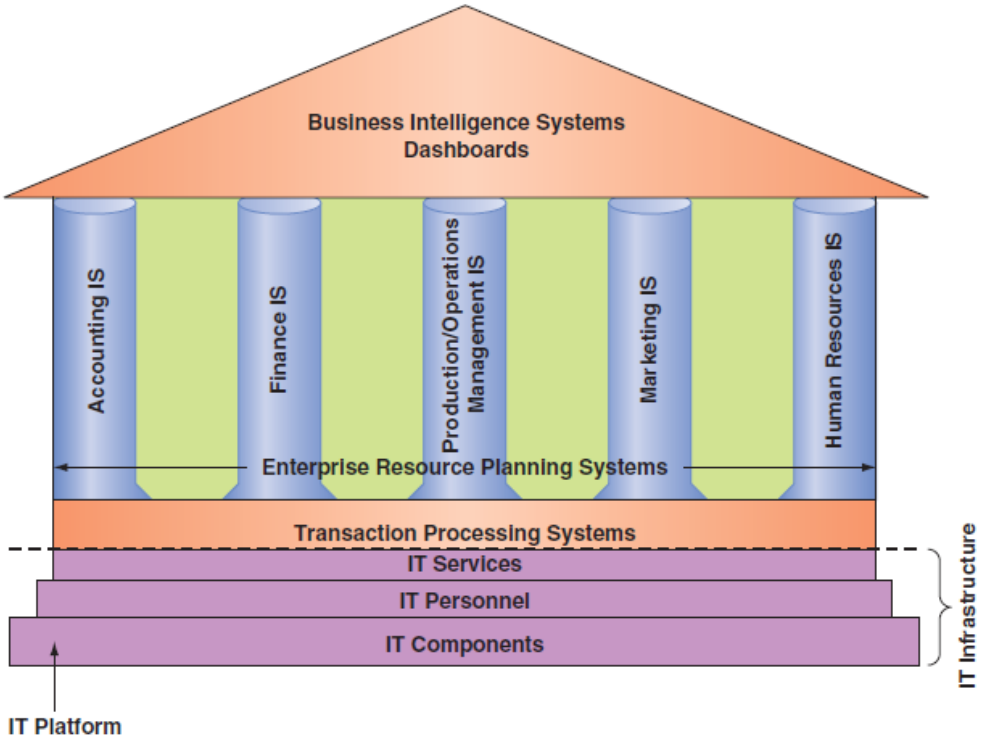
- Managing systems development and systems project management
  - As an end user, you will have critical input into the systems development process. You will learn about systems development in Chapter 13.
- Managing computer operations, including the computer center
- Staffing, training, and developing IS skills
- Providing technical services
- Infrastructure planning, development, and control
  - As an end user, you will provide critical input about the IS infrastructure needs of your department.

New (Consultative) Functions of the MIS Department

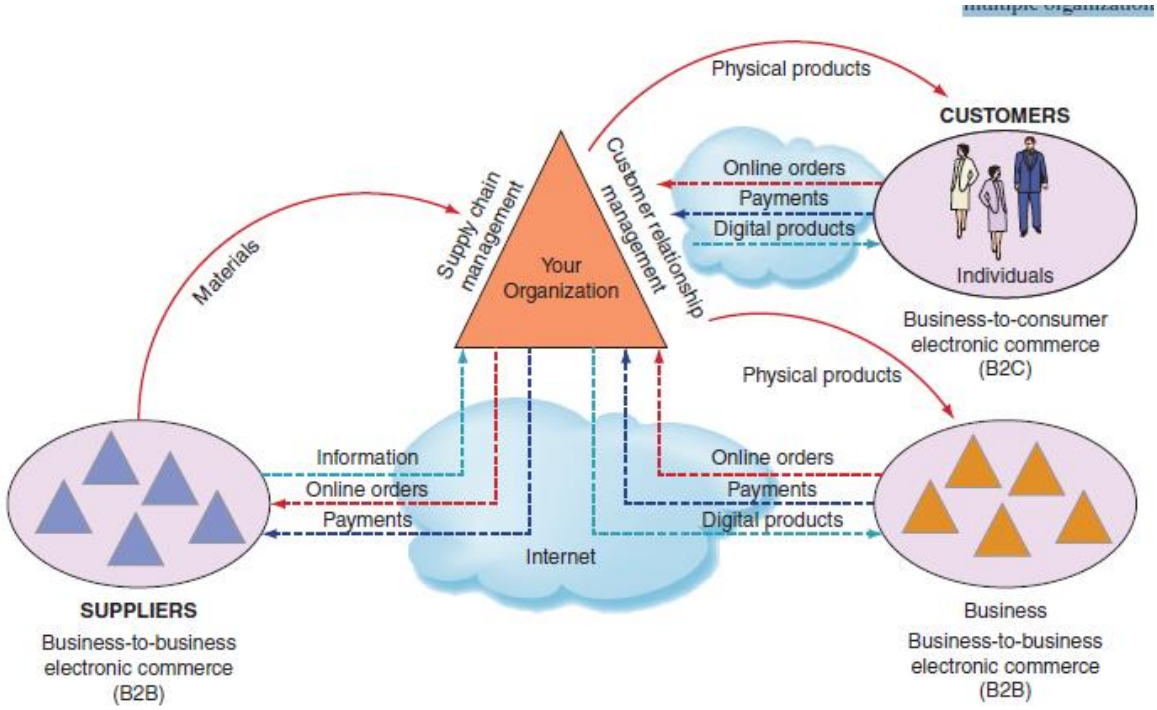
- Initiating and designing specific strategic information systems
  - As an end user, your information needs will often mandate the development of new strategic information systems.
- You will decide which strategic systems you need (because you know your business needs better than the MIS department does), and you will provide input into developing these systems.
- Incorporating the Internet and electronic commerce into the business
  - As an end user, you will be primarily responsible for effectively using the Internet and electronic commerce in your business. You will work with the MIS department to accomplish this task.
- Managing system integration, including the Internet, intranets, and extranets
  - As an end user, your business needs will determine how you want to use the Internet, your corporate intranets, and extranets to accomplish your goals. You will be primarily responsible for advising the MIS department on the most effective use of the Internet, your corporate intranets, and extranets.
- Educating the non-MIS managers about IT
  - Your department will be primarily responsible for advising the MIS department on how best to educate and train your employees about IT.
- Educating the MIS staff about the business
  - Communication between the MIS department and the business units is a two-way street. You will be responsible for educating the MIS staff on your business, its needs, and its goals.
- Partnering with business unit executives
  - Essentially, you will be in a partnership with the MIS department. You will be responsible for seeing that this partnership is one "between equals" and ensuring its success.
- Managing outsourcing
  - Outsourcing is driven by business needs. Therefore, the outsourcing decision resides largely with the business units (i.e., with you). The MIS department, working closely with you, will advise you on technical issues such as communications bandwidth and security.
- Proactively using business and technical knowledge to seed innovative ideas about IT
  - Your business needs will often drive innovative ideas about how to effectively use information systems to accomplish your goals. The best way to bring these innovative uses of IS to life is to partner closely with your MIS department. Such close partnerships have amazing synergies!
- Creating business alliances with business partners
  - The needs of your business unit will drive these alliances, typically along your supply chain. Again, your MIS department will act as your advisor on various issues, including hardware and software compatibility, implementing extranets, communications, and security.

Important Diagrams:

1. Information technology inside your organization.



2. Information systems that function among multiple organizations.



Data and Knowledge Management

What are the Difficulties of Managing Data?

Because data are processed in several stages and often in multiple locations, they are frequently subject to problems and difficulties. Managing data in organizations is difficult for many reasons.

- First, the amount of data **increases exponentially** with time. Much historical data must be kept for a long time, and new data are added rapidly.
- In addition, data are also **scattered throughout organizations**, and they are collected by many individuals using various methods and devices. These data are frequently stored in numerous servers and locations and in different computing systems, databases, formats, and human and computer languages.
- Another problem is that data are **generated from multiple sources**: internal sources (for example, corporate databases and company documents); personal sources (for example, personal thoughts, opinions, and experiences); and external sources (for example, commercial databases, government reports, and corporate Web sites).
- Data also come **from the Web**, in the form of clickstream data. **Clickstream data** are those data that visitors and customers produce when they visit a Web site and click on hyperlinks.
- Clickstream data provide **a trail of the users' activities in the Web site**, including user behavior and browsing patterns.
- Adding to these problems is the fact that **new sources of data, such as blogs, podcasts, videocasts, and RFID tags and other wireless sensors,** are constantly being developed and the data these technologies generate must be managed.
- In addition, **data degrade over time**. For example, customers move to new addresses or change their names, companies go out of business or are bought, new products are developed, employees are hired or fi red, and companies expand into new countries.
- Data are also subject to ***data rot*****.** Data rot refers primarily to problems with the media on which the data are stored. Over time, temperature, humidity, and exposure to light can cause physical problems with storage media and thus make it difficult to access the data.
- Data **security, quality, and integrity** are critical, yet they are easily jeopardized. In addition, legal requirements relating to data differ among countries as well as among industries, and they change frequently.
- Another problem arises from the fact that, over time, organizations have developed information systems for specific business processes, such as transaction processing, supply chain management, and customer relationship management. Information systems that specifically support these processes impose unique requirements on data, which results in **repetition and conflicts across the organization**.
- Two other factors complicate data management. First, IT act regulations by government. Second, companies are drowning in data, much of which is unstructured. As you have seen, the amount of data is increasing exponentially. To be profitable, companies must develop a strategy for managing these data effectively.

Define Data governance, Master Data and Transactional data

- **Data governance** is an approach to managing information across an entire organization. It involves a formal set of business processes and policies that are designed to ensure that data are handled in a certain, well-defi ned fashion.
- **Master data management** is a process that spans all organizational business processes and applications. It provides companies with the ability to store, maintain, exchange, and synchronize a consistent, accurate, and timely "single version of the truth" for the company's master data. **Master data** are a set of core data, such as customer, product, employee, vendor, geographic location, and so on, that span the enterprise information systems. (Give examples)
- ***Transaction data***, which are generated and captured by operational systems, describe the business's activities, or transactions. In contrast, master data are applied to multiple transactions and are used to categorize, aggregate, and evaluate the transaction data. (Give examples)

Database Approach

Using databases eliminates many problems that arose from previous methods of storing and accessing data, such as fi le management systems. Databases are arranged so that one set of software programs—the database management system—provides all users with access to all of the data. (You will study database management systems later in this chapter.)

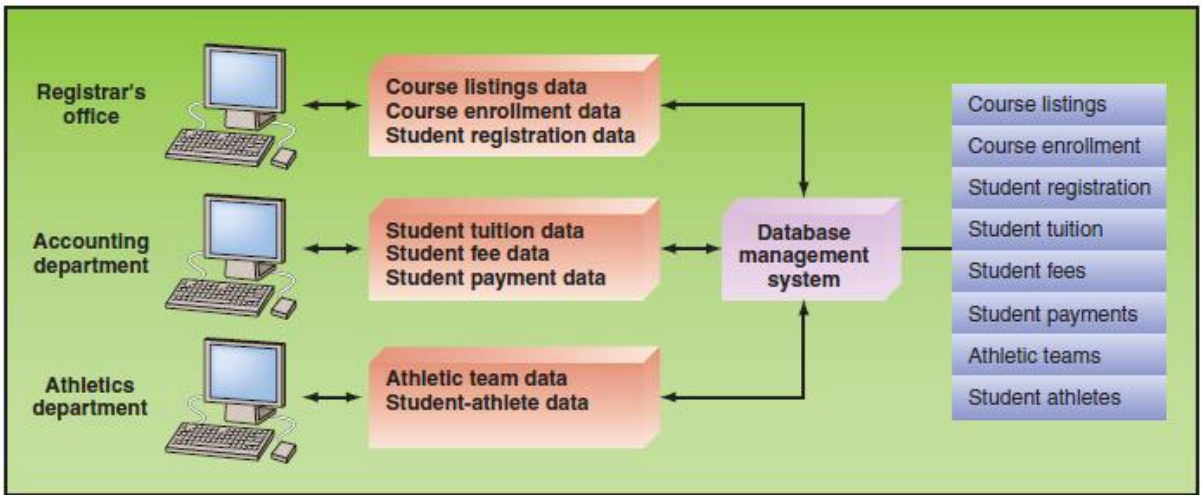
Database systems minimize the following problems:

- *Data redundancy:* The same data are stored in multiple locations.
- *Data isolation:* Applications cannot access data associated with other applications.
- *Data inconsistency:* Various copies of the data do not agree.

In addition, database systems maximize the following:

- *Data security*: Because data are "put in one place" in databases, there is a risk of losing a lot of data at one time. Therefore, databases must have extremely high security measures in place to minimize mistakes and deter attacks.
- *Data integrity*: Data meet certain constraints; for example, there are no alphabetic characters in a Social Security number fi eld.
- *Data independence*: Applications and data are independent of one another; that is, applications and data are not linked to each other, so all applications are able to access the same data.

A sample Database management system. (University)



A **database management system (DBMS)** is a set of programs that provide users with tools to create and manage a database. Managing a database refers to the processes of adding, deleting, accessing, modifying, and analyzing data stored in a database. An organization can access the data by using query and reporting tools that are part of the DBMS or by using application programs specifically written to perform this function. DBMSs also provide the mechanisms for maintaining the integrity of stored data, managing security and user access, and recovering information if the system fails.
There are a number of different database architectures,

- the relational database model because it is popular and easy to use.
- The hierarchical and
- network models

The **relational database model** is based on the concept of two-dimensional tables. A relational database generally is not one big table—usually called a *flat file*—that contains all of the records and attributes.

What are the advantages and disadvantages of relational database model?

Relational databases allow people to compare information quickly by row or column. In addition, items are easy to retrieve by finding the point of intersection of a particular row and column. On the other hand, large-scale relational databases can be composed of many interrelated tables, making the overall design complex with slow search and access times. Redundancy can be a drawback.

What is a Data model (ex: ER diagram), primary key, secondary key, entity, attribute, instance?

- ✓ A **data model** is a diagram that represents entities in the database and their relationships. An **entity** is a person, place, thing, or event—such as a customer, an employee, or a product—about which information is maintained.
- ✓ Entities can typically be identified in the user's work environment. A record generally describes an entity. An **instance** of an entity refers to each row in a relational table, which is a specific, unique representation of the entity.
  For example, your university's student database contains an entity called STUDENT. An instance of the STUDENT entity would be a particular student. For instance, you are an instance of the STUDENT entity in your university's student database.
- ✓ Each characteristic or quality of a particular entity is called an **attribute**. For example, if our entities were a customer, an employee, and a product, entity attributes would include customer name, employee number, and product color.
  (Show a sample database)
  (Student ID, Student Name, Branch, GPA, Date-of-Admission…….)
  Each row of the table corresponds to one student record. (You have your own row in your university's student database.). Attributes of the entity are student name, undergraduate major, grade point average, and admission date. The rows are the records.
- ✓ Every record in the database must contain at least one fi eld that uniquely identifies that record so that it can be retrieved, updated, and sorted. This identifier fi eld (or attribute) is called the **primary key**. For example, a student record in a university would use a unique student number as its primary key.
- ✓ In some cases, locating a particular record requires the use of secondary keys. A **secondary key** is another fi eld that has some identifying information, but typically does not identify the record with complete accuracy. For example, the student's

major might be a secondary key if a user wanted to identify all of the students majoring in a particular fi eld of study. It should not be the primary key, however, because many students can have the same major.

- ✓ A **foreign key** is a field (or group of fields) in one table that uniquely identifies a row of another table. A foreign key is used to establish and enforce a link between two tables.

Define Big Data, and discuss its basic characteristics.

Big Data is composed of high volume, high velocity, and high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery, and process optimization. Big Data has three distinct characteristics: volume, velocity, and variety. These characteristics distinguish Big Data from traditional data:

- *Volume:* Big Data consists of vast quantities of data.
- *Velocity:* Big Data flows into an organization at incredible speeds.
- *Variety:* Big Data includes a huge variety of different data in differing data formats.

Issues with Big Data:

Despite its extreme value, Big Data does have issues. In this section, we take a look at data integrity, data quality, and the nuances of analysis that are worth noting.

• *Big Data can come from untrusted sources:* One of the characteristics of Big Data is variety, meaning that Big Data can come from numerous, widely varied sources. These sources may be internal or external to the organization. For instance, a company might want to integrate data from unstructured sources such as e-mails, call center notes, and social media posts with structured data about its customers from its data warehouse.

• *Big Data is dirty:* Dirty data refers to inaccurate, incomplete, incorrect, duplicate, or erroneous data. Examples of such problems are misspelling of words and duplicate data such as retweets or company press releases that appear numerous times in social media.

Suppose a company is interested in performing a competitive analysis using social media data. The company wants to see how often a competitor's product appears in social media outlets as well as the sentiments associated with those posts. The company notices that the number of positive posts about the competitor is twice as large the number of positive posts about itself. This finding could simply be a case where the competitor is pushing out its press releases to multiple sources, in essence "blowing its own horn." Alternatively, the competitor could be getting many people to retweet an announcement.

• *Big Data changes, especially in data streams:* Organizations must be aware that data quality in an analysis can change, or the data itself can change, because the conditions under which the data are captured can change. For instance, imagine a utility company that analyzes weather data and smart-meter data to predict customer power usage.

What are the major uses/applications of Big Data in an organization?

Human Resources. Employee benefits, particularly healthcare, represent a major business expense. Consequently, some companies have turned to Big Data to better manage these benefits.

Product Development. Big Data can help capture customer preferences and put that information to work in designing new products.

For example, Ford Motor Company (*www.ford .com*) was considering a "three blink" turn indicator that had been available on its European cars for years. Unlike the turn signals on its U.S. vehicles, this indicator fl ashes three times at the driver's touch and then automatically shuts off. Ford decided that conducting a full-scale market research test on

this blinker would be too costly and time consuming. Using text-mining algorithms, researchers culled more than 10,000 mentions and then summarized the most relevant comments. The results? Ford introduced the three-blink indicator on the new Ford Fiesta in 2010, and by 2013 it was available on most Ford products.

Operations. For years, companies have been using information technology to make their operations more efficient.

Marketing. Marketing managers have long used data to better understand their customers and to target their marketing efforts more directly. Today, Big Data enables marketers to craft much more personalized messages.

Government Operations. Aadhar data, Sensor data, traffic data (violators), medical data)

Data Warehouses and Data Marts

In general, data warehouses and data marts support business intelligence (BI) applications.

- A **data warehouse** is a repository of historical data that are organized by subject to support decision makers in the organization.
- Because data warehouses are so expensive, they are used primarily by large companies. A **data mart** is a low-cost, scaled-down version of a data warehouse that is designed for the end user needs in a strategic business unit (SBU) or an individual department. Data marts can be implemented more quickly than data warehouses, often in less than 90 days. Further, they support local rather than central control by conferring power on the user group.

The basic characteristics of data warehouses and data marts include the following:

• *Organized by business dimension or subject:* Data are organized by subject—for example,
by customer, vendor, product, price level, and region.

• *Use online analytical processing:* Typically, organizational databases are oriented toward handling transactions. That is, databases use ***online transaction processing* (OLTP),** where business transactions are processed online as soon as they occur. Data warehouses and data marts, which are designed to support decision makers but not OLTP, use online analytical processing. *Online analytical processing* (OLAP) involves the analysis of accumulated data by end users.

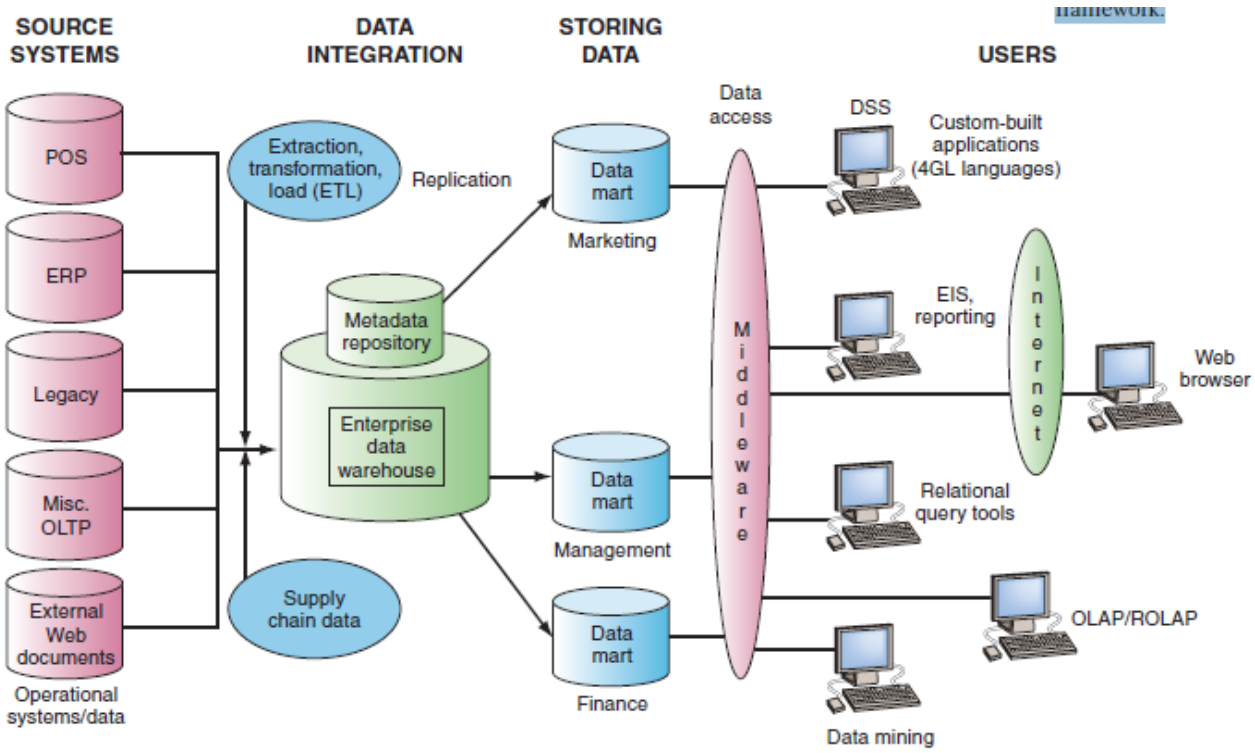
• *Integrated:* Data are collected from multiple systems and then integrated around subjects. For example, customer data may be extracted from internal (and external) systems and then integrated around a customer identifier, thereby creating a comprehensive view of the customer.

• *Time variant:* Data warehouses and data marts maintain historical data (i.e., data that include time as a variable). Unlike transactional systems, which maintain only recent data (such as for the last day, week, or month), a warehouse or mart may store years of data. Organizations utilize historical data to detect deviations, trends, and long-term relationships.

• *Nonvolatile:* Data warehouses and data marts are nonvolatile—that is, users cannot change or update the data. Warehouses and marts are updated, but through IT-controlled load processes rather than by users.

• *Multidimensional:* Typically, the data warehouse or mart uses a multidimensional data structure. Recall that relational databases store data in two-dimensional tables. In contrast, data warehouses and marts store data in more than two dimensions. For this reason, the data are said to be stored in a **multidimensional structure**. A common representation for this multidimensional structure is the *data cube*.

Data warehouse framework.



The environment for data warehouses and marts includes the following: (Explain each point in detail)

• Source systems that provide data to the warehouse or mart
• Data-integration technology and processes that prepare the data for use
• Different architectures for storing data in an organization's data warehouse or data marts
• Different tools and applications for the variety of users
• Metadata, data-quality, and governance processes that ensure that the warehouse or mart meets its purposes

Data Quality. The quality of the data in the warehouse must meet users' needs. If it does not, users will not trust the data and ultimately will not use it.

Governance. To ensure that BI is meeting their needs, organizations must implement *governance* to plan and control their BI activities. Governance requires that people, committees, and processes be in place.

Users. Once the data are loaded in a data mart or warehouse, they can be accessed. At this point the organization begins to obtain business value from BI; all of the prior stages constitute creating BI infrastructure.

Knowledge Management (Imp)

Knowledge management is a process that helps organizations manipulate important knowledge that comprises part of the organization's memory, usually in an unstructured format. For an organization to be successful, knowledge, as a form of capital, must exist in a format that can be exchanged among persons. In addition, it must be able to grow.

Knowledge is information that is *contextual*, *relevant*, and *useful*. Simply put, knowledge is information in action. **Intellectual capital** (or **intellectual assets**) is another term for knowledge.

Explicit and Tacit Knowledge.

- ✓ **Explicit knowledge** deals with more objective, rational, and technical knowledge. In an organization, explicit knowledge consists of the policies, procedural guides, reports, products, strategies, goals, core competencies, and IT infrastructure of the enterprise. In other words, **explicit knowledge is the knowledge that has been codified (documented) in a form that can be distributed to others** or transformed into a process or a strategy.
- ✓ In contrast, **tacit knowledge** is the cumulative store of subjective or experiential learning. In an organization, tacit knowledge consists of an organization's experiences, insights, expertise, know-how, trade secrets, skill sets, understanding, and learning. It also includes the organizational culture, which **reflects the past and present experiences of the organization's people and processes, as well as the organization's prevailing values**. Tacit knowledge is generally imprecise and costly to transfer. It is also highly personal. Finally, because it is unstructured, it is difficult to formalize or codify, in contrast to explicit knowledge.

Example: A salesperson who has worked with particular customers over time and has come to know their needs quite well would possess extensive tacit knowledge. This knowledge is typically not recorded. In fact, it might be difficult for the salesperson to put into writing, even if he or she were willing to share it.

Knowledge management systems (KMSs) refer to the use of modern information technologies—the Internet, intranets, extranets, databases—to systematize, enhance, and expedite intrafirm and interfirm knowledge management. KMSs are intended to help an organization cope with turnover, rapid change, and downsizing by making the expertise of the organization's human capital widely accessible. The goal of knowledge management is to help an organization make the most productive use of the knowledge it has accumulated.

Benefits of KMS:

- ✓ they make **best practices**—the most effective and efficient ways of doing things
- ✓ best-practice knowledge improves overall organizational performance.
- ✓ improved customer service,
- ✓ more efficient product development, and
- ✓ improved employee morale and retention

The KMS Cycle

The reason the system is cyclical is that knowledge is dynamically refined over time. The knowledge in an effective KMS is never finalized because the environment changes over time and knowledge must be updated to reflect these changes. The cycle works as follows:

1. *Create knowledge:* Knowledge is created as people determine new ways of doing things or develop know-how. Sometimes external knowledge is brought in.
2. *Capture knowledge:* New knowledge must be identified as valuable and be represented in a reasonable way.
3. *Refine knowledge:* New knowledge must be placed in context so that it is actionable. This is where tacit qualities (human insights) must be captured along with explicit facts.
4. *Store knowledge:* Useful knowledge must then be stored in a reasonable format in a knowledge repository so that other people in the organization can access it.
5. *Manage knowledge:* Like a library, the knowledge must be kept current. It must be reviewed regularly to verify that it is relevant and accurate.
6. *Disseminate knowledge:* Knowledge must be made available in a useful format to anyone in the organization who needs it, anywhere and anytime.

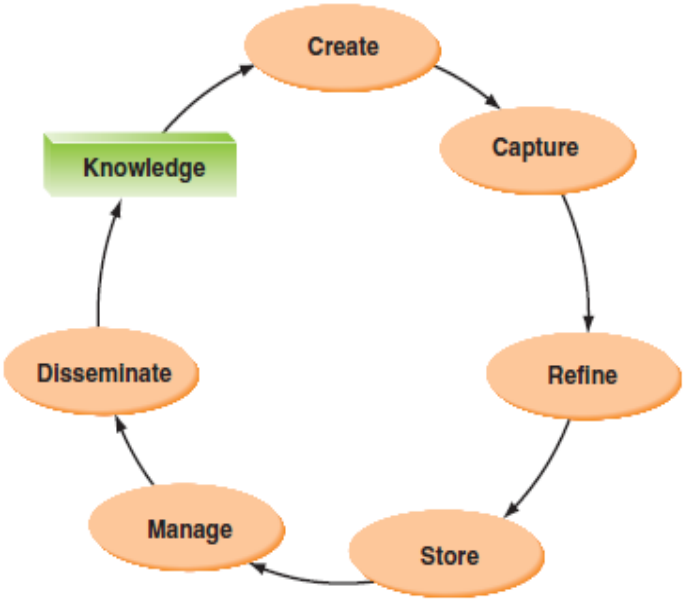


FIGURE 5.8 The knowledge management system cycle.

Challenges to implementing KMSs include the following:

- Employees must be willing to share their personal tacit knowledge.
- Organizations must create a knowledge management culture that rewards employees who add their expertise to the knowledge base.
- The knowledge base must be continually maintained and updated.
- Companies

Ethics and Privacy, Information Security

Ethics refers to the principles of right and wrong that individuals use to make choices that guide their behavior. Deciding what is right or wrong is not always easy or clear-cut. Fortunately, there are many frameworks that can help us make ethical decisions.

Most widely used Ethical Standards (Imp)

- The ***utilitarian approach*** states that an ethical action is the one that provides the most good or does the least harm. The ethical corporate action would be the one that produces the greatest good and does the least harm for all affected parties—customers, employees, shareholders, the community, and the physical environment.
- The ***rights approach*** maintains that an ethical action is the one that best protects and respects the moral rights of the affected parties. Moral rights can include the rights to make one's own choices about what kind of life to lead, to be told the truth, not to be injured, and to enjoy a degree of privacy. Which of these rights people are actually entitled to—and under what circumstances— is widely debated. Nevertheless, most people acknowledge that individuals are entitled to some moral rights (woman's rights, children rights, SC/ST, underprivileged). An ethical organizational action would be one that protects and respects the moral rights of customers, employees, shareholders, business partners, and even competitors.
- The ***fairness approach*** posits that ethical actions treat all human beings equally, or, if unequally, then fairly, based on some defensible standard. For example, most people might believe it is fair to pay people higher salaries if they work harder or if they contribute a greater amount to the fi rm. However, there is less certainty regarding CEO salaries that are hundreds or thousands of times larger than those of other employees. Many people question whether this huge disparity is based on a defensible standard or whether it is the result of an imbalance of power and hence is unfair.
- Finally, **the *common good approach*** highlights the interlocking relationships that underlie all societies. This approach argues that respect and compassion for all others is the basis for ethical actions. It emphasizes the common conditions that are important to the welfare of everyone. These conditions can include a system of laws, effective police and fire departments, healthcare, a public educational system, and even public recreation areas. We pay taxes though government misuse the money we pay many times because it is used for the above causes also.

Explain Ethical Frameworks: (The above standards are used for frameworks – Mention them)

If we combine these four standards, we can develop a **general framework for ethics (or ethical decision making**). This framework consists of five steps:

- Recognize an ethical issue:
  - Could this decision or situation damage someone or some group?
  - Does this decision involve a choice between a good and a bad alternative?
  - Does this issue involve more than simply legal considerations? If so, then in what way?
- Get the facts:
  - What are the relevant facts of the situation?

- º Do I have sufficient information to make a decision?
- º Which individuals and/or groups have an important stake in the outcome?
- º Have I consulted all relevant persons and groups?

• Evaluate alternative actions:
- º Which option will produce the most good and do the least harm? (the utilitarian approach)
- º Which option best respects the rights of all stakeholders? (the rights approach)
- º Which option treats people equally or proportionately? (the fairness approach)
- º Which option best serves the community as a whole, and not just some members? (the common good approach)

• Make a decision and test it:
- º Considering all the approaches, which option best addresses the situation?

• Act and reflect on the outcome of your decision:
- º How can I implement my decision with the greatest care and attention to the concerns of all stakeholders?
- º How did my decision turn out, and what did I learn from this specific situation?

What are the Fundamental tenets of ethics?

Fundamental tenets of ethics include responsibility, accountability, and liability:

- **Responsibility** means that you accept the consequences of your decisions and actions.
- **Accountability** refers to determining who is responsible for actions that were taken.
- **Liability** is a legal concept that gives individuals the right to recover the damages done to them by other individuals, organizations, or systems.

What is *unethical* is not necessarily *illegal*. Explain the statement with an example.

It is critical that we realize that what is *unethical* is not necessarily *illegal*.
For example, a bank's decision to foreclose on a home (for non-repayment of loans) can be technically legal, but it can raise many ethical questions. In many instances, then, an individual or organization faced with an ethical decision is not considering whether to break the law. As the foreclosure example illustrates, however, ethical decisions can have serious consequences for individuals, organizations, and society at large.

We have witnessed many extremely poor ethical decisions, not to mention outright criminal behavior, at many organizations. At each company, executives were convicted of various types of fraud for using illegal accounting practices.

Advancements in information technologies have generated a new set of ethical problems. Justify

1. Regarding Data:

- Organizations to collect, integrate, and distribute enormous amounts of information on individuals, Groups, and institutions. These developments have created numerous ethical problems concerning the appropriate collection and use of customer information, personal privacy, and the protection of intellectual property.
- Sale of data to marketing firms

- These developments affect the academic world as well. For example, vast amounts of information on the Internet make it easier for students to **plagiarize** papers and essays.

2. Other Corporate Issues in Ethics:
Many of the business decisions you will face at work will have an ethical dimension. Consider the following decisions that you might have to make:

• Should organizations monitor employees' Web surfing and e-mail?
• Should organizations sell customer information to other companies?
• Should organizations audit employees' computers for unauthorized software or illegally downloaded music or video files?

3. The diversity and ever-expanding use of IT applications have created a variety of ethical issues. These issues fall into four general categories: **privacy, accuracy, property, and accessibility.**

- *Privacy issues* involve collecting, storing, and disseminating information about individuals.
- *Accuracy issues* involve the authenticity, fidelity, and correctness of information that is collected and processed.
- *Property issues* involve the ownership and value of information.
- *Accessibility issues* revolve around who should have access to information and whether they should pay a fee for this access.

Ethics in the Corporate Environment

Many companies and professional organizations develop their own codes of ethics. A **code of ethics** is a collection of principles intended to guide decision making by members of the organization. For example, the Association for Computing Machinery (*www.acm.org*), an organization of computing professionals, has a thoughtful code of ethics for its members.
The Google Code of Conduct is one of the ways they put Google's values into practice. It's built around the recognition that everything the employees do in connection with work at Google will be, and should be, measured against the highest possible standards of ethical business conduct.
(You can mention the points in the previous 3 questions also – from tenets of ethics)

Describe the issue of privacy as it is affected by IT.

- In general, **privacy** is the right to be left alone and to be free of unreasonable personal intrusions. **Information privacy** is the right to determine when, and to what extent, information about you can be gathered and/or communicated to others.
- Privacy rights apply to individuals, groups, and institutions. The right to privacy is recognized today in all the states and by the government, either by statute or in common law.
- Privacy can be interpreted quite broadly. However, court decisions in many countries have followed two rules fairly closely:
  1. The right of privacy is not absolute. Privacy must be balanced against the needs of society.
  2. The public's right to know supersedes the individual's right of privacy.

(Important) Rapid advances in information technologies have made it much easier to collect, store, and integrate vast amounts of data on individuals in large databases. On an average day, data about you are generated in many ways: surveillance cameras located on toll roads, on other roadways, in busy intersections, in public places, and at work; credit card Transactions; telephone calls (landline and cellular); banking transactions; queries to search engines; and government records (including police records). These data can be integrated to produce a **digital dossier**, which is an electronic profile of you and your habits. The process of forming a digital dossier is called **profiling**.

Data aggregators, such as LexisNexis (*www.lexisnexis.com*), ChoicePoint (*www.choicepoint.com*), and Acxiom (*www.acxiom.com*), are prominent examples of profilers. These companies collect public data such as real estate records and published telephone numbers, in addition to non-public information such as Social Security numbers; financial data; and police, criminal, and motor vehicle records. They then integrate these data to form digital dossiers and sell them to companies that want to know their customers better, a process called ***customer intimacy*.**

Electronic Surveillance

- According to the American Civil Liberties Union (ACLU), tracking people's activities with the aid of information technology has become a major privacy-related problem. The ACLU notes that this monitoring, or **electronic surveillance**, is rapidly increasing, particularly with the emergence of new technologies. Electronic surveillance is conducted by employers, the government, and other institutions.
- Surveillance cameras track you at airports, subways, banks, and other public venues. In addition, inexpensive digital sensors are now everywhere. They are incorporated into laptop webcams, video-game motion sensors, smartphone cameras, utility meters, passports, and employee ID cards.
- Emerging technologies such as low-cost digital cameras, motion sensors, and biometric readers are helping to increase the monitoring of human activity. In addition, the costs of storing and using digital data are rapidly decreasing. The result is an explosion of sensor data collection and storage.
- Another example of how new devices can contribute to electronic surveillance is facial recognition technology. Google and Facebook are using facial-recognition software—Google Picasa and Facebook Photo Albums—in their popular online photo-editing and sharing services. Both companies encourage users to assign names to people in photos, a practice referred to as ***photo tagging***.

Personal Information in Databases

Modern institutions store information about individuals in many databases. Example: credit-reporting agencies. Other institutions that store personal information include banks and financial institutions; cable TV, telephone, and utilities companies; employers; mortgage companies; hospitals; schools and universities; retail establishments; government agencies (Internal Revenue Service, your state, your municipality); and many others.

There are several concerns about the information you provide to these record keepers. Some of the major concerns are as follows:

- Do you know where the records are?
- Are the records accurate?
- Can you change inaccurate data?

- How long will it take to make a change?
- Under what circumstances will the personal data be released?
- How are the data used?
- To whom are the data given or sold?
- How secure are the data against access by unauthorized people?

Information on Internet Bulletin Boards, Newsgroups, and Social Networking Sites

Every day we see more and more *electronic bulletin boards*, *newsgroups*, *electronic discussions* such as chat rooms, and *social networking sites*. These sites appear on the Internet, within corporate intranets, and on blogs. A *blog*, short for "Weblog," is an informal, personal journal that is frequently updated and is intended for general public reading. YouTube videos are another cause of concern.

How does society keep owners of bulletin boards/YouTube/ Social networking sites from disseminating information that may be offensive to readers or simply untrue?

How organizations can ensure Privacy Codes and Policies of customers?

Privacy policies or **privacy codes** are an organization's guidelines for protecting the privacy of its customers, clients, and employees. In many corporations, management has begun to understand that when they collect vast amounts of personal information, they must protect it. In addition, many organizations give their customers some voice in how their information is used by providing them with opt-out choices.

- ✓ The **opt-out model** of informed consent permits the company to collect personal information until the customer specifically requests that the data not be collected.
- ✓ Privacy advocates prefer the **opt-in model** of informed consent, which prohibits an organization from collecting any personal information unless the customer specifically authorizes it.
- ✓

Privacy Policy Guidelines: A Sample

Data Collection Data should be collected on individuals only for the purpose of accomplishing a legitimate business objective. Data should be adequate, relevant, and not excessive in relation to the business objective. Individuals must give their consent before data pertaining to them can be gathered. Such consent may be implied from the individual's actions (e.g., applications for credit, insurance, or employment).
Data Accuracy Sensitive data gathered on individuals should be verified before they are entered into the database. Data should be kept current, where and when necessary. The file should be made available so that the individual can ensure that the data are correct. In any disagreement about the accuracy of the data, the individual's version should be noted and included with any disclosure of the file.
Data Confidentiality Computer security procedures should be implemented to ensure against unauthorized disclosure of data. These procedures should include physical, technical, and administrative security measures. Third parties should not be given access to data without the individual's knowledge or permission, except as required by law. Disclosures of data, other than the most routine, should be noted and maintained for as long as the data are maintained. Data should not be disclosed for reasons incompatible with the business objective for which they are collected.

Discuss how privacy issues can impact transborder data flows./ What are the International Aspects of Privacy.

- As the number of online users has increased globally, governments throughout the world have enacted a large number of inconsistent privacy and security laws. This highly complex global legal framework is creating regulatory problems for companies. Approximately 50% countries have some form of data protection laws. Many of these laws conflict with those of other countries, or they require specific security measures. Other countries have no privacy laws at all.
- The absence of consistent or uniform standards for privacy and security obstructs the flow of information among countries **(*transborder data flows*).** The European Union, for one, has taken steps to overcome this problem. In 1998, the European Community Commission (ECC) issued guidelines to all of its member countries regarding the rights of individuals to access information about themselves.
- The transfer of data into and out of a nation without the knowledge of either the authorities or the individuals involved raises a number of privacy issues. Governments must make an effort to develop laws and standards to cope with rapidly changing information technologies to solve some of these privacy issues.
- Whose (which country's) laws have jurisdiction when records are stored in a different country for reprocessing or retransmission purposes?

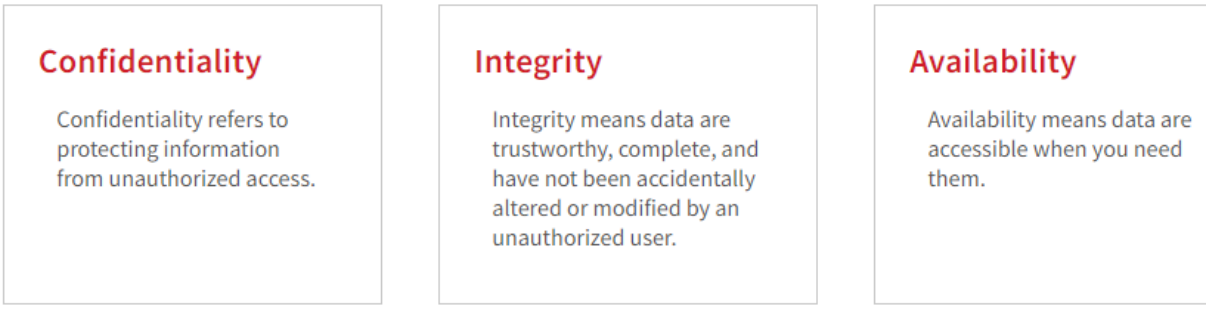
1. Define ethics, list and describe the three fundamental tenets of ethics, and describe the four categories of ethical issues related to information technology.

2. Identify three places that store personal data, and for each one, discuss at least one personal threat to the privacy of the data stored there.

Information Security

- **Security** can be defi ned as the degree of protection against criminal activity, danger, damage, and/or loss. Following this broad definition, **information security** refers to all of the processes and policies designed to protect an organization's information and information systems (IS) from unauthorized access, use, disclosure, disruption, modification, or destruction.
- A **threat** to an information resource is any danger to which a system may be exposed. The **exposure** of an information resource is the harm, loss, or damage that can result if a threat compromises that resource. An information resource's **vulnerability** is the possibility that the system will be harmed by a threat.

The CIA Triad—Confidentiality, Integrity, and Availability—is a guiding model in information security



What are the key factors contributing to the increasing vulnerability of organizational information resources

The five key factors are contributing to the increasing vulnerability of organizational information resources, making it much more difficult to secure them: (Explain each point in detail)

- Today's interconnected, interdependent, wirelessly networked business environment

  (A *trusted network*, in general, is any network within your organization. An *untrusted network*, in general, is)any network external to your organization.

- Smaller, faster, cheaper computers and storage devices
- Decreasing skills necessary to be a computer hacker

  (The reason is that the Internet contains information and computer programs called ***script****s* that users with few skills can download and use to attack any information system connected to the Internet.)

- International organized crime taking over cybercrime

  Groups of well-organized criminal organizations have taken control of a global billion-dollar crime network. The network, powered by skilful hackers, targets known software security weaknesses

- Lack of management support

  For the entire organization to take security policies and procedures seriously, senior managers must set the tone.

Explain the Threats to Information Systems

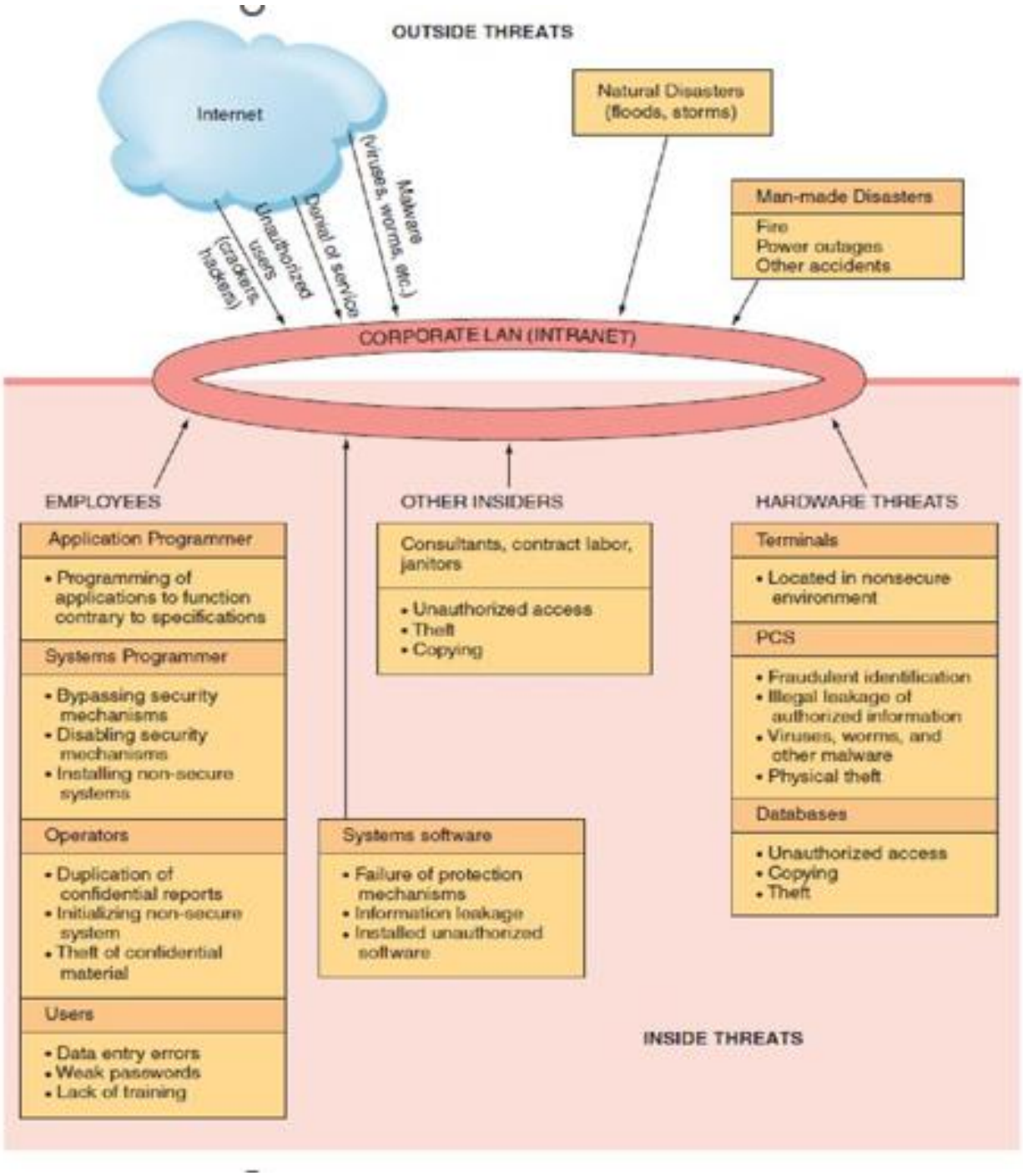
The two major categories of threats are **unintentional threats** and **deliberate threats**.

Unintentional threats to an information system: Through Human errors, Social Engineering etc.

Human Mistakes: (Examples)

Human Mistake	Description and Examples
Carelessness with laptops	Losing or misplacing laptops, leaving them in taxis, and so on.
Carelessness with computing devices	Losing or misplacing these devices, or using them carelessly so that malware is introduced into an organization's network.
Opening questionable e-mails	Opening e-mails from someone unknown, or clicking on links embedded in e-mails (see *phishing attack* in Table 4.2).
Careless Internet surfing	Accessing questionable Web sites; can result in malware and/or alien software being introduced into the organization's network.
Poor password selection and use	Choosing and using weak passwords (see *strong passwords* in the "Authentication" section later in this chapter).
Carelessness with one's office	Leaving desks and filing cabinets unlocked when employees go home at night; not logging off the company network when leaving the office for any extended period of time.
Carelessness using unmanaged devices	Unmanaged devices are those outside the control of an organization's IT department and company security procedures. These devices include computers belonging to customers and business partners, computers in the business centers of hotels, and so on.
Carelessness with discarded equipment	Discarding old computer hardware and devices without completely wiping the memory; includes computers, smartphones, BlackBerry® units, and digital copiers and printers.
Careless monitoring of environmental hazards	These hazards, which include dirt, dust, humidity, and static electricity, are harmful to the operation of computing equipment.

Figure: Security threats



Provide examples of social engineering attacks

- **Social engineering** is an attack in which the perpetrator uses social skills to trick or manipulate legitimate employees into providing confidential company information such as passwords.
- The most common example of social engineering occurs when the attacker impersonates someone else on the telephone, such as a company manager or an information systems employee.
- Other common ploys include posing as an exterminator, an air-conditioning technician, or a fire marshal.

- Two other social engineering techniques are **tailgating and shoulder surfing**. ***Tailgating*** is a technique designed to allow the perpetrator to enter restricted areas that are controlled with locks or card entry. The perpetrator follows closely behind a legitimate employee and, when the employee gains entry, the attacker asks him or her to "hold the door." ***Shoulder surfing*** occurs when a perpetrator watches an employee's computer screen over the employee's shoulder. This technique is particularly successful in public areas such as in airports and on commuter trains and airplanes.

What are the Deliberate Threats to Information Systems (Explain points in detail)

There are many types of deliberate threats to information systems. We provide a list of 10 common types for your convenience.

- Espionage or trespass
- Sabotage or vandalism
- Identity theft
- Software attacks
- Information extortion
- Theft of equipment or information
- Compromises to intellectual property
- Alien software
- Supervisory control and data acquisition (SCADA) attacks
- Cyberterrorism and cyberwarfare

Types of Software attacks

Type	Description
(1) Remote Attacks Requiring User Action	
Virus	Segment of computer code that performs malicious actions by attaching to another computer program.
Worm	Segment of computer code that performs malicious actions and will replicate, or spread, by itself (without requiring another computer program).
Phishing attack	Phishing attacks use deception to acquire sensitive personal information by masquerading as official-looking e-mails or instant messages.
Spear phishing	Phishing attacks target large groups of people. In spear phishing attacks, the perpetrators find out as much information about an individual as possible to improve their chances that phishing techniques will obtain sensitive, personal information.
(2) Remote Attacks Needing No User Action	
Denial-of-service attack	An attacker sends so many information requests to a target computer system that the target cannot handle them successfully and typically crashes (ceases to function).
Distributed denial-of-service attack	An attacker first takes over many computers, typically by using malicious software. These computers are called **zombies** or **bots**. The attacker uses these bots—which form a **botnet**—to deliver a coordinated stream of information requests to a target computer, causing it to crash.
(3) Attacks by a Programmer Developing a System	
Trojan horse	Software programs that hide in other computer programs and reveal their designed behavior only when they are activated.
Back door	Typically a password, known only to the attacker, that allows him or her to access a computer system at will, without having to go through any security procedures (also called a **trap door**).
Logic bomb	A segment of computer code that is embedded within an organization's existing computer programs and is designed to activate and perform a destructive action at a certain time or date.

Describe several reasons why it is difficult to protect information resources.

- Hundreds of potential threats exist.
- Computing resources may be situated in many locations.
- Many individuals control or have access to information assets.
- Computer networks can be located outside the organization, making them difficult to protect.
- Rapid technological changes make some controls obsolete as soon as they are installed.
- Many computer crimes are undetected for a long period of time, so it is difficult to learn from experience.
- People tend to violate security procedures because the procedures are inconvenient.
- The amount of computer knowledge necessary to commit computer crimes is usually minimal. As a matter of fact, a potential criminal can learn hacking, for free, on the Internet.
- The costs of preventing hazards can be very high. Therefore, most organizations simply cannot afford to protect themselves against all possible hazards.
- It is difficult to conduct a cost–benefit justification for controls before an attack occurs because it is difficult to assess the impact of a hypothetical attack.

Compare and contrast risk management, risk analysis and risk mitigation.

- Organizations spend a great deal of time and money protecting their information resources. Before doing so, they perform risk management.
- A **risk** is the probability that a threat will impact an information resource. The goal of **risk management** is to identify, control, and minimize the impact of threats. In other words, risk management seeks to reduce risk to acceptable levels. Organizations perform **risk analysis** to ensure that their IS security programs are cost effective.
- Risk management consists of three processes: risk analysis, risk mitigation, and controls evaluation.
- **Risk analysis** involves three steps: (1) assessing the value of each asset being protected, (2) estimating the probability that each asset will be compromised, and (3) comparing the probable costs of the asset's being compromised with the costs of protecting that asset. The organization then considers how to mitigate the risk.
- In **risk mitigation**, the organization takes concrete actions against risks. Risk mitigation has two functions: (1) implementing controls to prevent identified threats from occurring, and (2) developing a means of recovery if the threat becomes a reality. There are several **risk mitigation strategies** that organizations can adopt. The three most common are risk acceptance, risk limitation, and risk transference.

- ***Risk acceptance:*** Accept the potential risk, continue operating with no controls, and absorb any damages that occur.
- ***Risk limitation*:** Limit the risk by implementing controls that minimize the impact of the threat.
- ***Risk transference*:** Transfer the risk by using other means to compensate for the loss, such as by purchasing insurance.

- Finally, in controls evaluation, the organization examines the costs of implementing adequate control measures against the value of those control measures. If the costs of implementing a control are greater than the value of the asset being protected, the control is not cost-effective.

What are the most important Information Security Controls in an organization

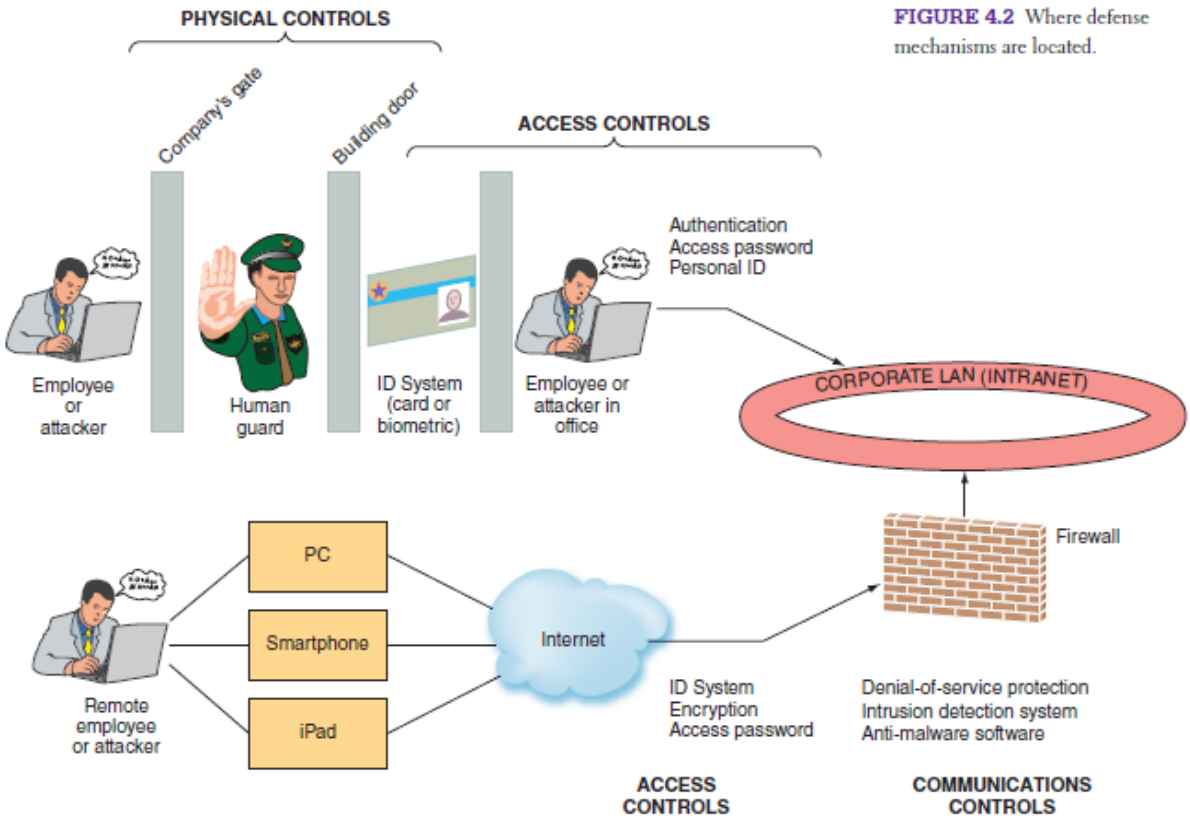


FIGURE 4.2 Where defense mechanisms are located.

(Explain each point in detail yourself)

- ✓ **Physical controls** prevent unauthorized individuals from gaining access to a company's facilities. Common physical controls include walls, doors, fencing, gates, locks, badges, guards, and alarm systems.
- ✓ **Access controls** restrict unauthorized individuals from using information resources. These controls involve two major functions: authentication and authorization. **Authentication (ex: biometrics)** confirms the identity of the person requiring access. After the person is authenticated (identified), the next step is authorization. **Authorization (ex: Passwords)** determines which actions, rights, or privileges the person has, based on his or her verified identity. Let's examine these functions more closely.
- ✓ All users should use *strong passwords*, which are difficult for hackers to discover. The basic guidelines for creating strong passwords are the following:
- ✓ • They should be difficult to guess. • They should be long rather than short.
  - They should have uppercase letters, lowercase letters, numbers, and special characters.
- ✓ • They should not be recognizable words. • They should not be the name of anything or anyone familiar, such as family names or names of pets. • They should not be a recognizable string of numbers, such as a Social Security number or a birthday.
- ✓ A **privilege** is a collection of related computer system operations that a user is authorized to perform. Companies typically base authorization policies on the

principle of **least privilege**, which posits that users be granted the privilege for an activity only if there is a justifiable need for them to perform that activity.

- ✓ **Communications controls** (also called **network controls**) secure the movement of data across networks. Communications controls consist of firewalls, anti-malware systems, whitelisting and blacklisting, encryption, virtual private networks (VPNs), transport layer security, and employee monitoring systems.
- ✓ **Transport layer security**, formerly called **secure socket layer**, is an encryption standard used for secure transactions such as credit card purchases and online banking. TLS encrypts and decrypts data between a Web server and a browser end to end.
- ✓ TLS is indicated by a URL that begins with "https" rather than "http," and it often displays a small padlock icon in the browser's status bar. Using a padlock icon to indicate a secure connection and placing this icon in a browser's status bar are artifacts of specific browsers.
- ✓ **Employee Monitoring Systems**. Many companies are taking a proactive approach to protecting their networks against what they view as one of their major security threats, namely, employee mistakes. These companies are implementing **employee monitoring systems**, which scrutinize their employees' computers, e-mail activities, and Internet surfing activities.
- ✓ **Business Continuity Planning: Business continuity** is the chain of events linking planning to protection and to recovery. The purpose of the business continuity plan is to provide guidance to people who keep the business operating after a disaster occurs. Employees use this plan to prepare for, react to, and recover from events that affect the security of information assets. The objective is to restore the business to normal operations as quickly as possible following an attack. The plan is intended to ensure that critical business functions continue.

1. Identify the three major types of controls that organizations can use to protect their information resources, and provide an example of each one.

(Physical control, Access control, Communication control) – Explained above + diagram

2. Define the three risk mitigation strategies, and provide an example of each one in the context of owning a home.

The three risk mitigation strategies are the following:

***Risk acceptance*,** where the organization accepts the potential risk, continues operating with no controls, and absorbs any damages that occur. If you own a home, you may decide not to insure it. Thus, you are practicing risk acceptance. Clearly, this is a bad idea.

Risk limitation, where the organization limits the risk by implementing controls that minimize the impact of threats. As a homeowner, you practice risk limitation by putting in an alarm system or cutting down weak trees near your house.

Risk transference, where the organization transfers the risk by using other means to compensate for the loss, such as by purchasing insurance. The vast majority of homeowners practice risk transference by purchasing insurance on their houses and other possessions.

Computer networks, wired & wireless technology, pervasive computing, cloud computing model.

1. Differentiate between LAN and WAN

(Draw the diagrams and explain the devices and cables used)

2. Describe an Enterprise network.

Organizations today have multiple LANs and may have multiple WANs. All of these networks are interconnected to form an enterprise network. Figure below displays a model of enterprise computing. Note that the enterprise network in the figure has a backbone network. Corporate **backbone networks** are high-speed central networks to which multiple smaller networks (such as LANs and smaller WANs) connect. The LANs are **called *embedded LANs*** because they connect to the backbone WAN.

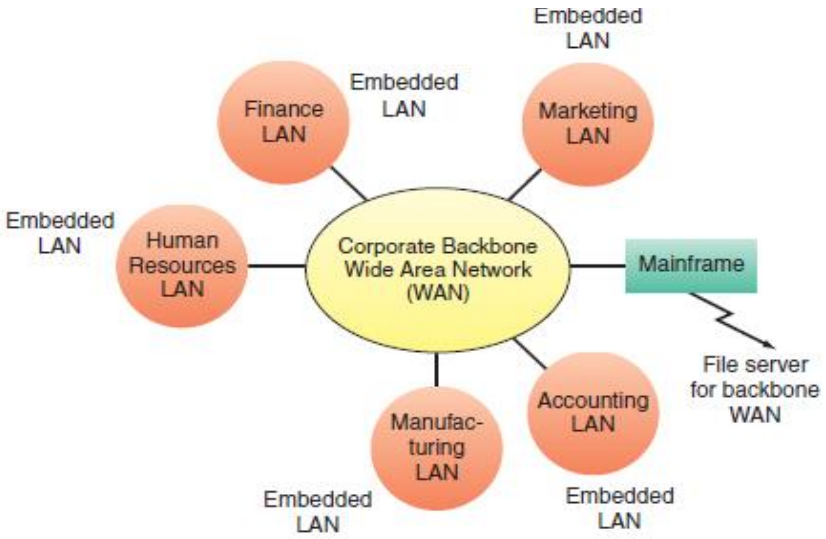


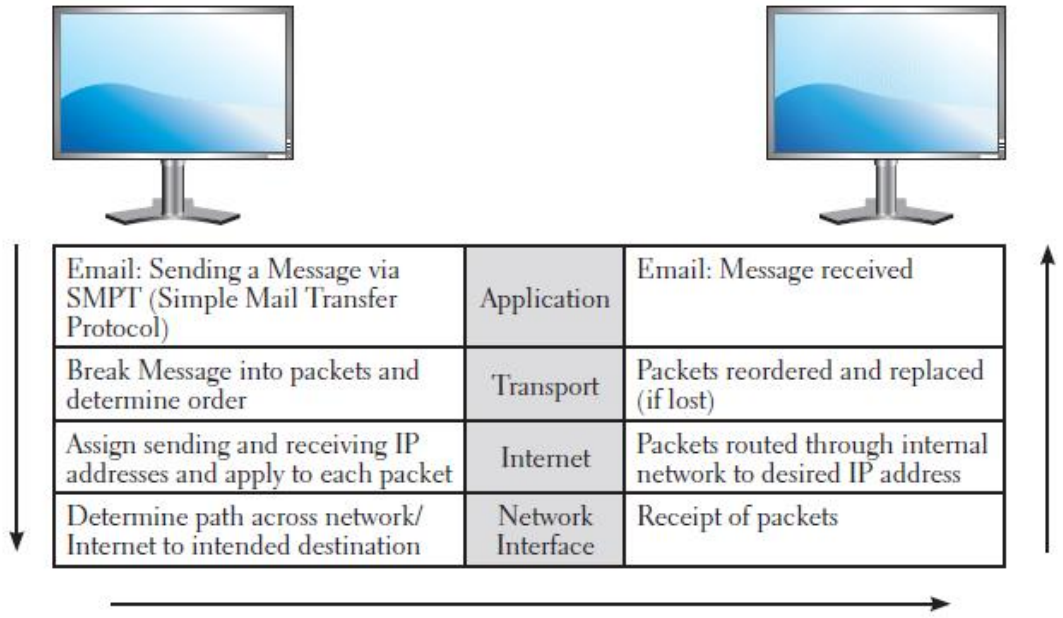
FIGURE 6.2 Enterprise network.

- Traditional networks are rigid and lack the flexibility to keep pace with increasing business networking requirements. The reason for this problem is that the functions of traditional networks are distributed across physical routers and devices (i.e., hardware).
- *Software-defined networks* (SDN) are an emerging technology that is becoming increasingly important to help organizations manage their data flows across their enterprise networks. With SDN, decisions controlling how network traffic flows across network devices are managed centrally by software. The software dynamically adjusts data flows to meet business and application needs.
- Think of SDN as the road system of a modern city. Each traffic officer is replaced by a traffic light and a set of electronic vehicle counters, which are connected to central monitoring and control software. As such, the city's traffic can be instantly and centrally controlled.
- The control software can direct traffic differently at various times of the day (say, rush hours). The software monitors traffic flow and automatically changes the traffic lights to help traffic flow through the city with minimal disruption.

Advantages and Disadvantages of Wireline/Wired Communications Channels

Channel	Advantages	Disadvantages
Twisted-pair wire	Inexpensive Widely available Easy to work with	Slow (low bandwidth) Subject to interference Easily tapped (low security)
Coaxial cable	Higher bandwidth than twisted-pair Less susceptible to electromagnetic interference	Relatively expensive and inflexible Easily tapped (low to medium security) Somewhat difficult to work with
Fiber-optic cable	Very high bandwidth Relatively inexpensive Difficult to tap (good security)	Difficult to work with (difficult to splice)

Describe the four layers of the TCP/IP reference model.(Describe layers in detail)



What are the different types of Network Processing? / Differentiate between Client/Server and Peer-to-peer processing.

Client/server computing links two or more computers in an arrangement in which some machines, called *servers*, provide computing services for user PCs, called *clients*. Usually, an organization performs the bulk of its processing or application/data storage on suitably powerful servers that can be accessed by less powerful client machines. The client requests applications, data, or processing from the server, which acts on these requests by "serving" the desired commodity.

Client/server computing leads to the ideas of "fat" clients and "thin" clients. F*at clients* have large storage and processing power and therefore can run local programs (such as Microsoft Office) if the network goes down. In contrast, *thin clients* may have no local storage and only limited processing power. Thus, they must depend on the network to run applications. For this reason, they are of little value when the network is not functioning.

Peer-to-peer (P2P) processing is a type of client/server distributed processing where each computer acts as *both* a client and a server. Each computer can access (as assigned for security or integrity purposes) all fi les on all other computers.

There are three basic types of peer-to-peer processing.

- ✓ The first type accesses unused CPU power among networked computers. An application of this type is SETI@home (*http://setiathome.ssl.berkeley.edu*). These applications are from open-source projects, and they can be downloaded at no cost.
- ✓ The second form of peer-to-peer is real-time, person-to-person collaboration, such as Microsoft SharePoint Workspace (*http://offi ce.microsoft.com/en-us/sharepoint-workspace*). This product provides P2P collaborative applications that use buddy lists to establish a connection and allow real-time collaboration within the application.
- ✓ The third peer-to-peer category is advanced search and file sharing. This category is characterized by natural language searches of millions of peer systems. It enables users to discover other users, not just data and Web pages. One example of this category is BitTorrent.

Describe the different ways in which you can have an Internet Connection

Service	Description
Dial-up	Still used in the United States where broadband is not available
DSL	Broadband access via telephone companies
Cable modem	Access over your cable TV coaxial cable. Can have degraded performance if many of your neighbors are accessing the Internet at once
Satellite	Access where cable and DSL are not available
Wireless	Very convenient, and WiMAX will increase the use of broadband wireless
Fiber-to-the-home (FTTH)	Expensive and usually placed only in new housing developments

Identify each part of an Internet address (URL)

Domain names consist of multiple parts, separated by dots, that are read from right to left. For example, consider the domain name *business.auburn.edu*. The rightmost part (or zone) of an Internet name is its top-level domain (TLD). The letters *edu* in business.auburn.edu indicate that this is an educational site.

The following are popular TLDs:

com commercial sites
edu educational sites
mil military government sites
gov civilian government sites
org organizations

A top-level domain (TLD) is the domain at the highest level in the hierarchical Domain Name System of the Internet. The top-level domain names are located in the root zone (rightmost zone) of the name. Management of most TLDs is delegated to responsible organizations by ICANN. ICANN operates the Internet Assigned Numbers Authority (IANA), IANA distinguishes the following groups of

TLDs:

• *Country-code top-level domains (ccTLD):* Two letter domains established for countries or territories. For example, *de* stands for Germany, *it* for Italy, and *ru* for Russia.

• *Internationalized country code top-level domains (IDN ccTLD):* These are ccTLDs in non-Latin character sets (e.g., Arabic or Chinese).

• *Generic top-level domains (gTLD):* Top-level domains with three or more characters. gTLDs initially consisted of .gov, .edu, .com, .mil, .org, and .net. In late 2000, ICANN introduced .aero, .biz, .coop, .info, .museum, .name, and .pro. In June 2012, ICANN revealed nearly 2,000 applications for new top-level domains.

Differentiate between Search Engines and Metasearch Engines

- A **search engine** is a computer program that searches for specific information by keywords and then reports the results. A search engine maintains an index of billions of Web pages. It uses that index to find pages that match a set of user-specified keywords. Such indexes are created and updated by *webcrawlers*, which are computer programs that browse the Web and create a copy of all visited pages. Search engines then index these pages to provide fast searches.
- Four search engines accounted for almost all searches in the United States. They are, in order, Google *www.google.com*), Bing (*www.bing.com*), Yahoo! (*www.yahoo.com*), and Ask (*www.ask.com*). The leading search engine in China is Baidu (*www.baidu.com*), which claimed approximately three-fourths of the Chinese market in mid-2015.
- For an even more thorough search, you can use a metasearch engine. **Metasearch engines** search several engines at once and then integrate the findings to answer users' queries. Examples are Surf-wax (*www.surfwax.com*), Metacrawler (*www.metacrawler.com*), Mamma (*www.mamma.com*), KartOO (*www.kartoo.com*), and Dogpile (*www.dogpile.com*).

What are the uses of a Portal and what are the types of Portals?

- Most organizations and their managers encounter information overload. Information is scattered across numerous documents, e-mail messages, and databases at different locations and systems. Finding relevant and accurate information is often time-consuming and may require users to access multiple systems. One solution to this problem is to use **portals**.
- A **portal** is a Web-based, personalized gateway to information and knowledge that provides relevant information from different IT systems and the Internet using advanced search and indexing techniques.
- A **commercial (public) portal** is the most popular type of portal on the Internet. It is intended for broad and diverse audiences, and it offers routine content, some of it in real time (e.g., a stock ticker). Examples are Lycos (*www.lycos.com*) and Microsoft Network (*www.msn.com*).
- In contrast, an **affinity portal** offers a single point of entry to an entire community of affiliated interests, such as a hobby group or a political party. Your university most likely has an affinity portal for its alumni. Ex: www.mu.ac.in
- a **corporate portal** offers a personalized, single point of access through a Web browser to critical business information located inside and outside an organization. These portals are also known as *enterprise portals*, *information portals*, and *enterprise information portals*. In addition to making it easier to find needed information, corporate portals offer customers and employees self-service opportunities.
- Whereas corporate portals are associated with a single company, an **industrywide** portal serves entire industries. An example is TruckNet (*www.truck.net*), a portal for the trucking industry and the trucking community, including professional drivers, owner/operators, and trucking companies.

What are the educational applications of Networks:

E-Learning, Distance Learning, Virtual Universities, Classrooms, Online Assignment submissions, Online Seminars, Virtual Labs…

Explain the applications of Networks related to Collaborations

- **Collaboration** refers to efforts by two or more entities—that is, individuals, teams, groups, or organizations—who work together to accomplish certain tasks. The term **workgroup** refers specifically to two or more individuals who act together to perform some tasks.
- **Workflow** is the movement of information as it progresses through the sequence of steps that make up an organization's work procedures. Workflow management makes it possible to pass documents, information, and tasks from one participant to another in a way that is governed by the organization's rules or procedures. Workflow systems are tools for automating business processes.
- If group members are working in different locations, they constitute a **virtual group (team)**. Virtual groups conduct *virtual meetings*—that is, they "meet" electronically. **Virtual collaboration** (or *e-collaboration*) refers to the use of digital technologies that enable organizations or individuals who are geographically dispersed to collaboratively plan, design, develop, manage, and research products, services, and innovative applications.
- A variety of software products are available to support all types of collaboration. Among the most prominent are Google Drive (*http://drive.google.com*), Microsoft SharePoint Workspace (*www.microsoft.com/harepoint/default.mspx*), Jive (*www.jivesoftware.com*), and IBM Lotus Quickr (*www.ibm.com/lotus/quickr*). In general, these products provide online collaboration capabilities, workgroup e-mail, distributed databases, bulletin whiteboards, electronic text editing, document management, workflow capabilities, instant virtual meetings, application sharing, instant messaging, consensus building, voting, ranking, and various application development tools.

Crowdsourcing: One type of collaboration is **crowdsourcing**, in which an organization outsources a task to an undefined, generally large group of people in the form of an open call. Crowdsourcing provides many potential benefits to organizations.

- First, crowds can explore problems—and often resolve them—at relatively low cost, and often very quickly.
- Second, the organization can tap a wider range of talent than might be present among its employees.
- Third, by listening to the crowd, organizations gain first-hand insight into their customers' desires.
- Finally, crowdsourcing taps into the global world of ideas, helping companies work through a rapid design process.

Although crowdsourcing has numerous success stories, there are many questions and concerns about this system, including the following:

• Should the crowd be limited to experts? If so, then how would a company go about implementing this policy?

• How accurate is the content created by the nonexperts in the crowd? How is accuracy maintained?

• How is crowd-created content being updated? How can companies be certain the content is relevant?

• The crowd may submit too many ideas, with most of them being worthless. In this scenario, evaluating all of these ideas can be prohibitively expensive.

• Content contributors may violate copyrights, either intentionally or unintentionally.

• The quality of content (and therefore subsequent decisions) depends on the composition of the crowd. The best decisions may come if the crowd is made up of people with diverse opinions and ideas. In many cases, however, companies do not know the makeup of the crowd in advance.

Electronic Teleconferencing and Video Conferencing

- **Teleconferencing** is the use of electronic communication technology that enables two or more people at different locations to hold a conference. The biggest disadvantage of conference calls is that they do not allow the participants to communicate face to face nor can they see graphs, charts, and pictures at other locations.
- To overcome these shortcomings, organizations are increasingly turning to video teleconferencing or videoconferencing. In a **videoconference**, participants in one location can view participants, documents, and presentations at other locations.
- The latest version of videoconferencing, called *telepresence*, enables participants to seamlessly share data, voice, pictures, graphics, and animation by electronic means. Telepresence systems range from on-premise, high-end systems to cloud-based systems.
- Zoom, Google Meet

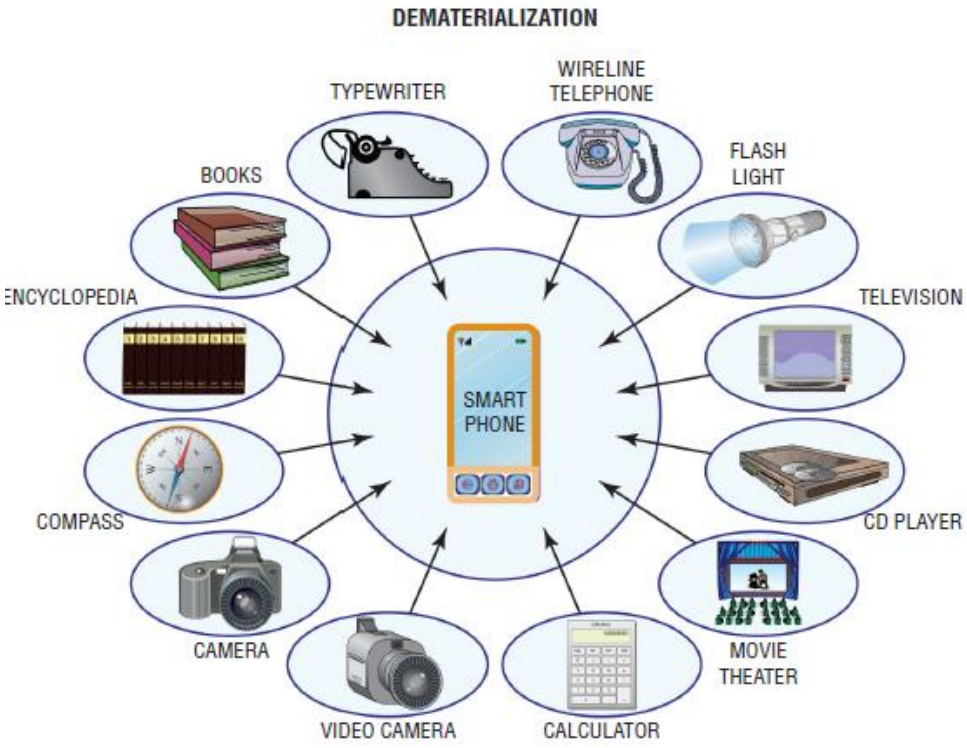
Wireless Technologies

What are the advantages of Wireless Devices?

Wireless devices provide three major advantages to users:

• They are small enough to easily carry or wear.
• They have sufficient computing power to perform productive tasks.
• They can communicate wirelessly with the Internet and other devices.

Modern smartphones exhibit a process called ***dematerialization***. Essentially, dematerialization occurs when the functions of many physical devices are included in one other physical device.



What are the Advantages and Disadvantages of Wireless Media

Channel	Advantages	Disadvantages
Microwave	High bandwidth Relatively inexpensive	Must have unobstructed line of sight Susceptible to environmental interference
Satellite	High bandwidth Large coverage area	Expensive Must have unobstructed line of sight Signals experience propagation delay Must use encryption for security
Radio	High bandwidth Signals pass through walls Inexpensive and easy to install	Creates electrical interference problems Susceptible to snooping unless encrypted

What are the Basic Types of Telecommunications Satellites?

Type	Characteristics	Orbit	Number	Use
GEO	• Satellites stationary relative to point on Earth • Few satellites needed for global coverage • Transmission delay (approximately 0.25 second) • Most expensive to build and launch • Longest orbital life (many years)	22, 300 miles	8	TV signal
MEO	• Satellites move relative to point on Earth • Moderate number needed for global coverage • Requires medium-powered transmitters • Negligible transmission delay • Less expensive to build and launch • Moderate orbital life (6–12 years)	6,434 miles	10–12	GPS
LEO	• Satellites move rapidly relative to point on Earth • Large number needed for global coverage • Requires only low-power transmitters • Negligible transmission delay • Least expensive to build and launch • Shortest orbital life (as low as 5 years)	400–700 miles	Many	Telephone

What is Bluetooth? What is WLAN?

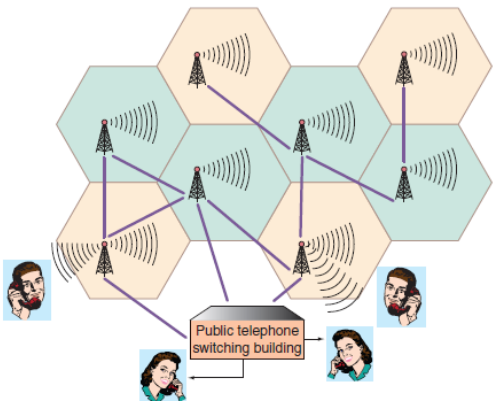
- **Bluetooth** (*www.bluetooth.com*) is an industry specification used to create small personal area networks. A personal area network is a computer network used for communication among computer devices—for example, telephones, personal digital assistants, and smartphones—located close to one person
- Bluetooth 1.0 can link up to eight devices within a 10-meter area (about 30 feet) with a bandwidth of 700 kilobits per second (Kbps) using low-power, radio-based communication. Bluetooth 4.0 can transmit up to approximately 25 megabits per second (Mbps) up to 100 meters (roughly 300 feet). Ericsson, the Scandinavian mobile handset company that developed this standard, called it Bluetooth
- Common applications for Bluetooth are wireless handsets for cell phones and portable music players. **Advantages of Bluetooth** include low power consumption and the fact that it uses omnidirectional radio waves—that is, waves that are

emitted in all directions from a transmitter. For this reason, you do not have to point one Bluetooth device at another to create a connection.

- Medium-range wireless networks are the familiar **wireless local area networks (WLANs)**. The most common type of medium-range wireless network is Wireless Fidelity, or Wi-Fi. WLANs are useful in a variety of settings, some of which may be challenging.
- **Wireless Fidelity (Wi-Fi)** is a medium-range WLAN, which is a wired LAN but without the cables. In a typical configuration, a transmitter with an antenna, called a wireless access point, connects to a wired LAN or to satellite dishes that provide an Internet connection.
- A wireless access point provides service to a number of users within a small geographical perimeter (up to approximately 300 feet), known as a **hotspot**.
- Wi-Fi provides fast and easy Internet or intranet broadband access from public hotspots located at airports, hotels, Internet cafés, universities, conference centers, offices, and homes. Users can access the Internet while walking across a campus, to their office, or through their homes. In addition, users can access Wi-Fi with their laptops, desktops, or PDAs by adding a wireless network card. Most PC and laptop manufacturers incorporate these cards in their products.
- Although **Wi-Fi has** become extremely popular, it is not without **problems**.
  - At this time, users cannot roam from hotspot to hotspot if the hotspots use different Wi-Fi network services. Unless the service is free, users have to log on to separate accounts and, where required, pay a separate fee for each service. (Some Wi-Fi hotspots offer free service, while others charge a fee.)
  - Security is the second barrier to greater acceptance of Wi-Fi. Because Wi-Fi uses radio waves, it is difficult to shield from intruders.
  - The final limitation to greater Wi-Fi expansion is cost. Even though Wi-Fi services are relatively inexpensive, many experts question whether commercial Wi-Fi services can survive when so many free hotspots are available to users.

Explain the features of Wide-Area Wireless Networks / Cellular Networks

- **Cellular telephones (cell phones)** provide two-way radio communications over a cellular network of base stations with seamless handoffs. The cell phone communicates with radio antennas, or towers, placed within adjacent geographic areas called ***cells.***
- A telephone message is transmitted to the local cell—that is, the antenna—by the cell phone and then is passed from cell to cell until it reaches the cell of its destination. At this final cell, the message either is transmitted to the receiving cell phone or it is transferred to the public switched telephone system to be transmitted to a wireline telephone. This is why you can use a cell phone to call other cell phones as well as standard wireline phones.



Cellular technology is quickly evolving, moving toward higher transmission speeds and richer features. The technology has progressed through several stages:

• ***First generation* (*1G*)** cellular networks used analog signals and had low bandwidth (capacity).

• ***Second generation* (*2G*)** uses digital signals primarily for voice communication; it provides data communication up to 10 Kbps.

• ***2.5G*** uses digital signals and provides voice and data communication up to 144 Kbps.

• ***Third generation* (*3G*)** uses digital signals and can transmit voice and data up to 384 Kbps when the device is moving at a walking pace, 128 Kbps when it is moving in a car, and up to 2 Mbps when it is in a fi xed location. 3G supports video, Web browsing, and instant messaging.

• ***Fourth generation* (*4G*)** is not one defi ned technology or standard. The International Telecommunications
Union (ITU) has specified speed requirements for 4G: 100 Mbps (million bits per second) for high-mobility communications such as cars and trains, and 1 Gbps (billion bits per second) for low-mobility communications such as pedestrians. A 4G system is expected to provide a secure all-IP-based mobile broadband system to all types of mobile devices. Many of the current "4G" offerings do not meet the ITU specified speeds, but they
call their service 4G nonetheless. See "IT's Personal" for more information.

• **Long-term evolution (LTE)** is a wireless broadband technology designed to support roaming Internet access via smartphones and handheld devices. LTE is approximately 10 times faster than 3G networks.

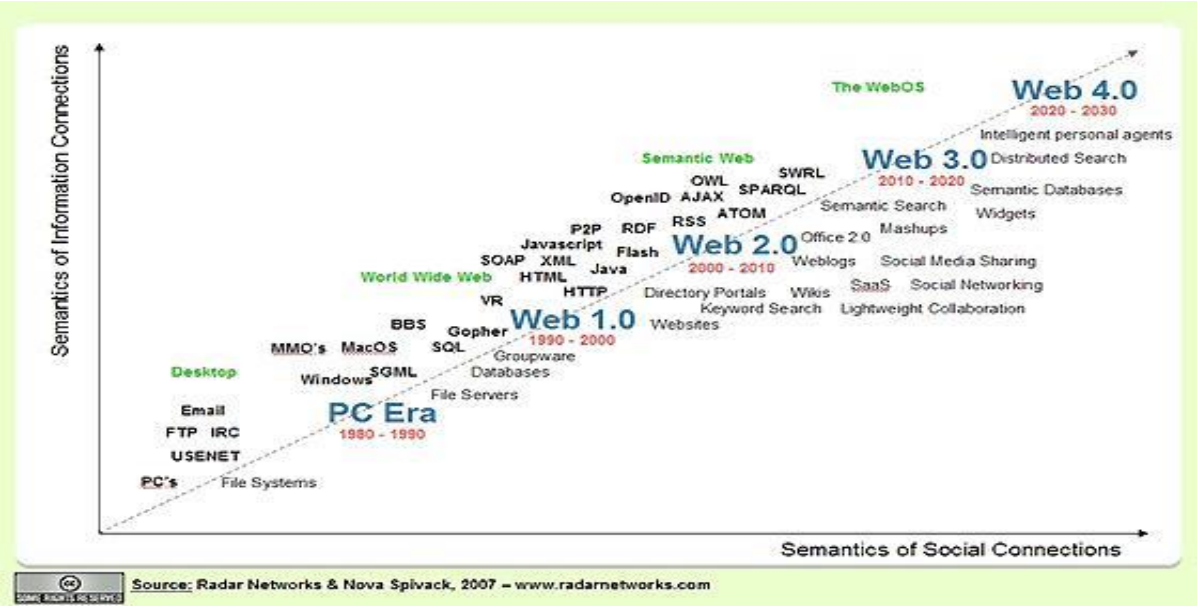
• **XLTE (advanced LTE)** is designed to handle network congestion when too many people in one area try to access an LTE network. XLTE is designed to provide all users with no decrease in bandwidth.

• ***Fifth generation* (*5G*)** is expected to be deployed by 2020. 5G networks are predicted to be faster and more intelligent than previous generations of cellular networks. With 5G, wearable computers (e.g., Fitbit), smartphones, tablets, and other devices with sensors that are location- and context-aware will work together with apps and services that you use.

Describe five Web 2.0 tools and two major types of Web 2.0 sites.

Web 2.0

- **Web 2.0** is a loose collection of information technologies and applications, plus the Web sites that use them. These Web sites enrich the user experience by **encouraging user participation, social interaction, and collaboration**
- Web 2.0 sites often harness **collective** intelligence (e.g., wikis); deliver **functionality as services**, rather than packaged software (e.g., Web services); and feature **remixable applications and data** (e.g., mashups).
- Web 2.0 information technology tools: **tagging, Really Simple Syndication (RSS), blogs, microblogs, and wikis.**
- The two major types of Web 2.0 sites: **social networking sites and mashups.**
- *Social networking* Web sites allow users to upload their content to the Web in the form of text (e.g., blogs), voice (e.g., podcasts), images, and videos (e.g., videocasts).
- **A *mashup*** is a Web site that takes different content from a number of other Web sites and mixes them together to create a new kind of content.



Web 2.0 tools:

1. **Tagging:**

- A tag is a keyword or term that describes a piece of information—for example, a blog, a picture, an article, or a video clip.
- Tagging is the basis of *folksonomies*, which are user-generated classifications that use tags to categorize and retrieve Web pages, photos, videos, and other Web content.
- One specific form of tagging, known as *geotagging*, refers to tagging information on maps, photographs.

- For example, Google Maps allows users to add pictures and information, such as restaurant or hotel ratings, to maps. Therefore, when you access Google Maps, your experience is enriched because you can see pictures of attractions, reviews, and things to do, posted by everyone, and all related to the map location you are viewing.

2. **Really Simple Syndication (RSS)**

- **Really Simple Syndication** is a Web 2.0 feature that allows you to receive the information you want (customized information), when you want it, without having to surf thousands of Web sites.
- RSS allows anyone to *syndicate* (publish) his or her blog, or any other content, to anyone who has an interest in subscribing to it. When changes to the content are made, subscribers receive a notification of the changes and an idea of what the new content contains.
- For example, CNN.com provides RSS feeds for each of its main topic areas, such as world news, sports news, technology news, and entertainment news.

3. Blogs

- A weblog (blog for short) is a personal Web site, open to the public, in which the site creator expresses his or her feelings or opinions via a series of chronological entries. *Bloggers*—people who create and maintain blogs—write stories, convey news, and provide links to other articles and Web sites that are of interest to them.
- The blogosphere is the term for the millions of blogs on the Web.
- Many companies listen to consumers in the blogosphere who express their views on the companies' products. Marketers refer to these views - *consumer-generated media*.
- The primary value of blogs is their ability to bring current, breaking news to the public in the fastest time possible.
- Although blogs can be very useful, they also have shortcomings - bloggers sometimes cut corners, and their blogs can be inaccurate.

4. **Microblogging**

- **Microblogging** is a form of blogging that allows users to write short messages (or capture an image or embedded video) and publish them.
- These messages can be submitted via text messaging from mobile phones, instant messaging, e-mail, or simply over the Web. The content of a microblog differs from that of a blog because of the limited space per message
- **Twitter** is a free microblogging service that allows its users to send messages and read other users' messages and updates, known as **tweets**.
    - Twitter is becoming a very useful business tool. Businesses also use Twitter to gather real-time market intelligence and customer feedback

5. AJAX

- AJAX stands for Asynchronous JavaScript and XML. AJAX is a new technique for creating better, faster, and more interactive web applications with the help of XML, HTML, CSS, and Java Script.

- Ajax uses XHTML for content, CSS for presentation, along with Document Object Model and JavaScript for dynamic content display.
- Conventional web applications transmit information to and from the sever using synchronous requests. It means you fill out a form, hit submit, and get directed to a new page with new information from the server.
- With AJAX, when you hit submit, JavaScript will make a request to the server, interpret the results, and update the current screen. In the purest sense, the user would never know that anything was even transmitted to the server.
- XML is commonly used as the format for receiving server data, although any format, including plain text, can be used.
- AJAX is a web browser technology independent of web server software.
- A user can continue to use the application while the client program requests information from the server in the background.
- Intuitive and natural user interaction. Clicking is not required, mouse movement is a sufficient event trigger.
- Data-driven as opposed to page-driven.

Explain the significance of Social Computing in Business

1. Social Computing in Business: Shopping

Social shopping is a method of electronic commerce that takes all of the key aspects of social networks—friends, groups, voting, comments, discussions, reviews, etc.—and focuses them on shopping. Social shopping helps shoppers connect with one another based on tastes, location, age, gender, and other selected attributes.

- **Ratings, Reviews, and Recommendations**: Prior to making a purchase, customers typically collect information such as what brand to buy, from which vendor, and at what price. Online customers obtain this information via shopping aids such as comparison agents and Web sites. **The ratings and reviews come from the following sources:**
  - ***Customer ratings and reviews*:** integrated into the vendor's Web page, a social network page, a customer review site, or in customer feeds (e.g., Amazon, iTunes, Buzzillions, Epinions).
  - • ***Expert ratings and reviews*:** views from an independent authority (e.g., Metacritic).
  - • ***Sponsored reviews*:** paid-for reviews (e.g., SponsoredReviews, PayPerPost).
  - • ***Conversational marketing*:** individuals converse via e-mail, blog, live chat, discussion groups, and tweets. Monitoring these conversations yields rich data for market research and customer service.

Group Shopping: Group shopping Web sites such as Groupon (*www.groupon.com*) and LivingSocial (*www.livingsocial.com*) offer major discounts or special deals during a short time frame. Group buying is closely associated with special deals (flash sales).

Shopping Communities and Clubs

- Shopping clubs host sales for their members that last just a few days and usually feature luxury brands at heavily discounted prices.
- Luxury brands effectively partner with online shopping clubs to dispose of special-run, sample, overstock, or liquidation goods. These clubs are rather exclusive, which prevents the brands' images from being diminished.
- Kaboodle (*www.kaboodle.com*) is another example of a shopping community. Kaboodle is a free service that lets users collect information from the Web and store it on a Kaboodle list that they can share with other shoppers.

Social Marketplaces and Direct Sales

Social marketplaces act as online intermediaries that harness the power of social networks for introducing, buying, and selling products and services.

Peer-to-Peer Shopping Models

- Peer-to-peer shopping models are the high-tech version of old-fashioned bazaars and bartering systems. Individuals use these models to sell, buy, rent, or barter online with other individuals.
- All of these peer-to-peer sites encourage **collaborative consumption**—that is, an economic model based on sharing, swapping, trading, or renting products and services, enabling access over ownership. Collaborative consumption is also called ***the sharing economy***.
- Collaborative consumption includes person-to-person sharing and business-to-business sharing.
- **Person-to-Person Sharing.** The main sectors of the person-to-person sharing marketplace include the following:
    - *Peer-to-peer lending*: for example, Lending Club
    - *Peer-to-peer accommodations*: for example, Airbnb (*www.airbnb.com*)
    - *Car sharing*
- **Business-to-Business Sharing.** Many companies have embraced this concept. Let's take a look at two of these firms.

2. Social Computing in Business: Marketing

Marketing can be defi ned as the process of building profitable customer relationships by creating value for customers and capturing value in return. There are many components to a marketing campaign, including

(1) define your target audience;
(2) develop your message (i.e., how you will solve their problem);
(3) decide on how you will deliver your message (e.g., e-mail, snail mail, Web advertising, and/or social networks); and
(4) follow up.

Social computing is particularly useful for two marketing processes: **advertising and market research**.

Advertising

- **Social advertising** refers to advertising formats that make use of the social context of the user viewing the ad. Social advertising is the first form of

advertising to leverage forms of social influence such as peer pressure and friend recommendations and likes.

- Most ads in social commerce consist of branded content paid for by advertisers. These ads belong to two major categories: ***social advertisements*** **(or *social ads*) and *social apps***.

Market Research

- Traditionally, marketing professionals used demographics compiled by market research fi rms as one of their primary tools to identify and target potential customers.
- Obtaining this information was time-consuming and costly, because marketing professionals had to ask potential customers to provide it. Today, however, members of social networks provide this information voluntarily on their pages!

➢ Companies are utilizing social computing tools to obtain feedback from customers. This trend is referred to as ***conversational marketing***.

➢ As a result of this strategy, customer reviews are emerging as prime locations for online shoppers to visit. Approximately 90% of consumers consult reviews before making an online purchase, and almost two-thirds are more likely to purchase from a site that offers ratings and reviews.

➢ **Conducting Market Research Using Social Networks**

➢ Customer sentiment expressed on Twitter, Facebook, and similar sites represents an incredibly valuable source of information for companies. Customer activities on social networking sites generate huge amounts of data that must be analyzed, so that management can conduct better marketing campaigns and improve their product design and their service offerings. The monitoring, collection, and analysis of socially generated data, and the resultant strategic decisions are combined in a process known as **social intelligence**

3. Social Computing in Business: Customer Relationship Management

- Customers are now incredibly empowered. Companies are closely monitoring social computing not only because they are mindful of the negative comments posted by social network members but also because they see an opportunity to involve customers proactively to reduce problems by improved customer service.
- Empowered customers know how to *use the wisdom and power of crowds and communities* to their benefit. These customers choose how they interact with companies and brands, and they have elevated expectations.
- Businesses must respond to customers quickly and accurately. Fortunately, social computing provides many opportunities for businesses to do just that, thereby giving businesses the opportunity to turn disgruntled customers into champions for the firm.

4. Social Computing in Business: Human Resource Management

- ***Recruiting:*** Both recruiters and job seekers are moving to online social networks as new recruiting platforms. Enterprise recruiters are scanning online social networks, blogs, and other social resources to identify and find information about potential employees. If job seekers are online and active, there is a good chance that they will be seen by recruiters.
- In addition, on social networks there are many passive job seekers—people who are employed but would take a better job if it appeared. So, it is important that both active and passive job seekers maintain profiles online that truly reflect them.
- ***Employee development:*** HR managers are using social tools to build relationships with employees. As HR managers learn more about employees, they can help them become more engaged and excited about their work.

What is viral Marketing? Explain some innovative methods to advertise in social media.

Viral marketing—that is, word-of-mouth advertising—lends itself especially well to social networking. For example, Stormhoek Vineyards (*www.stormhoek.com*) initiated a marketing campaign by offering bloggers a free bottle of wine. Within six months, roughly 100 of these bloggers had posted voluntary comments—most of them positive—about the winery on their blogs. In turn, these comments were read by other bloggers and led to increased sales.

There are other innovative methods to advertise in social media. Consider the following:

• Use a company Facebook page, including a store that attracts fans and lets them "meet" other customers. Then, advertise in your Facebook store.

• Tweet business success stories to your customers.

• Integrate ads into YouTube videos.

• Mercedes-Benz launched a "Tweet Race," which challenged four teams to drive across the country in Mercedes automobiles to Dallas, Texas, where the 2011 Super Bowl was being played. Each team collected Twitter followers with the help of a celebrity coach. Each tweet or retweet earned the team points, as did other activities, such as photographing other Mercedes cars during the road trip. The team that accumulated the most points by the end of the trip was declared the winner.

Explain why LinkedIn has become so important in the recruiting Process?

- Today, job searchers use traditional job sites and social networks such as LinkedIn. Applicants like you have helped LinkedIn raise its market share in job searches from 4.7 percent in 2010 to more than 14 percent by early 2018.
- To find a job, your best bet is to begin with LinkedIn (*www.linkedin.com*), which has roughly 165 million members. You should definitely have a profile on LinkedIn, which, by the way, is free.
- LinkedIn's success comes from its ability to accurately identify its market segment. The company's automated approach does not lend itself well to the upper tier of the job market— for example, CEO searches—where traditional face-to-face searches continue to be the preferred strategy. At the other end of the spectrum—that is, low-paying, low-skill jobs such as cashiers and truck drivers—job boards provide faster

results. LinkedIn targets the vast sweet spot between these two extremes, helping to fill high-skill jobs that pay anywhere from $50,000 to $250,000 or more per year.

- These sites list millions of jobs and they make it easy to narrow your search using filters. These filters include title, company name, location, and many others. Indeed allows you to search within a specific salary range.

Mashups

- A **mashup** is a Web site that takes different content from a number of other Web sites and mixes them together to create a new kind of content.
- Google Maps is credited with providing the start for mashups. A user can take a map from Google, add his or her data, and then display a map mashup on his or her Web site that plots crime scenes, cars for sale, or anything else

- Other Examples: *(cite your own examples and their features)*
- Craigslist developed a dynamic map of all available apartments in the United States that are listed on their Web site (*www.housingmaps.com*).
- Everyblock.com is a mashup of Web services that integrates content from newspapers, blogs, and government databases to inform citizens of cities such as Chicago, New York, and Seattle about what is happening in their neighbourhoods. This information includes criminal activities, restaurant inspections, and local photos posted on Flickr.

Information Systems within the Organization

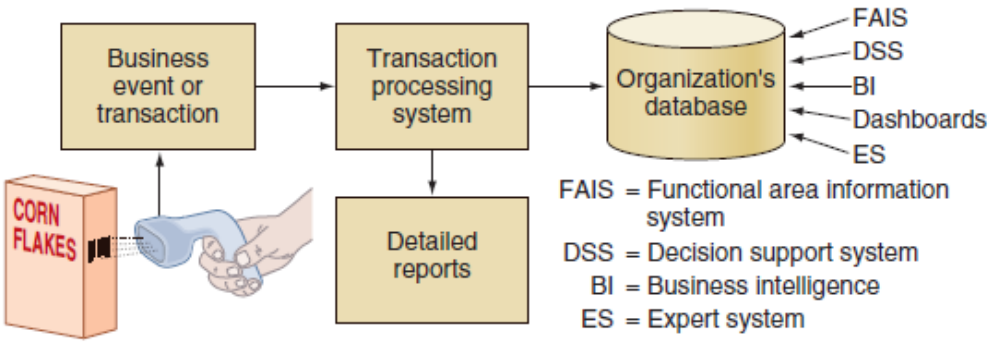
Explain the purpose of transaction processing systems

- A **transaction processing system (TPS)** supports the monitoring, collection, storage, and processing of data from the organization's basic business transactions, each of which generates data. The TPS collects data continuously, typically in *real time*—that is, as soon as the data are generated—and it provides the input data for the corporate databases. The TPSs are critical to the success of any enterprise because they support core operations.
- TPSs are inputs for the functional area information systems and business intelligence systems, as well as business operations such as customer relationship management, knowledge management, and e-commerce.

How TPSs handle the complexities of transactional data?

Consider these examples of how TPSs handle the complexities of transactional data:

- When more than one person or application program can access the database at the same time, the database has to be protected from errors resulting from overlapping updates. The most common error is losing the results of one of the updates.
- When processing a transaction involves more than one computer, the database and all users must be protected against inconsistencies arising from a failure of any component at any time. For example, an error that occurs at some point in an ATM withdrawal can enable a customer to receive cash, although the bank's computer indicates that he or she did not. (Conversely, a customer might not receive cash, although the bank's computer indicates that he or she did.)



- It must be possible to reverse a transaction in its entirety if it turns out to have been entered in error. It is also necessary to reverse a transaction when a customer returns a purchased item. For example, if you return a sweater that you have purchased, then the store must credit your credit card for the amount of the purchase, refund your cash, or offer you an in-store credit to purchase another item. In addition, the store must update its inventory.
  - It is frequently important to preserve an audit trail. In fact, for certain transactions an audit trail may be legally required.

Activities Supported by Functional Area Information Systems (FAIS):

(only main points are given… detailing should be done)

Accounting and Finance
Financial planning—and cost of money
Budgeting—allocates financial resources among participants and activities
Capital budgeting—financing of asset acquisitions
Managing financial transactions
Handling multiple currencies
Virtual close—the ability to close the books at any time on short notice
Investment management—managing organizational investments in stocks, bonds, real estate, and other investment vehicles
Budgetary control—monitoring expenditures and comparing them against the budget
Auditing—ensuring the accuracy of the organization's financial transactions and assessing the condition of the organization's financial health
Payroll
Marketing and Sales
Customer relations—know who customers are and treat them like royalty
Customer profiles and preferences
Sales force automation—using software to automate the business tasks of sales, thereby improving the productivity of salespeople
Production/Operations and Logistics
Inventory management—when to order new inventory, how much inventory to order, and how much inventory to keep in stock
Quality control—controlling for defects in incoming material and defects in goods produced
Materials requirements planning—planning process that integrates production, purchasing, and inventory management of interdependent items (MRP)
Manufacturing resource planning—planning process that integrates an enterprise's production, inventory management, purchasing, financing, and labor activities (MRP II)
Just-in-time systems—a principle of production and inventory control in which materials and parts arrive precisely when and where needed for production (JIT)
Computer-integrated manufacturing—a manufacturing approach that integrates several computerized systems, such as computer-assisted design (CAD), computer-assisted manufacturing (CAM), MRP, and JIT
Product lifecycle management—business strategy that enables manufacturers to collaborate on product design and development efforts, using the Web
Human Resource Management
Recruitment—finding employees, testing them, and deciding which ones to hire
Performance evaluation—periodic evaluation by superiors
Training
Employee records
Benefits administration—retirement, disability, unemployment, and so on

Define Functional Area Information Systems (FAIS) and list its important characteristics

- Each department or functional area within an organization has its own collection of application programs, or information systems. Each of these **functional area information systems** (FAISs) supports a particular functional area in the organization by increasing each area's internal efficiency and effectiveness.
- FAISs often convey information in a variety of reports, which you will see later in this chapter. Examples of FAISs are accounting IS, finance IS, production/ operations management (POM) IS, marketing IS, and human resources IS.

What is the significance of Reports? Compare and contrast the different types of Reports.

All information systems produce reports: transaction processing systems, functional area information systems, ERP systems, customer relationship management systems, business intelligence systems, and so on. We discuss reports here because they are so closely associated with FAIS and ERP systems. These reports generally fall into three categories: **routine, ad hoc (on-demand), and exception.**

1, Routine reports are produced at scheduled intervals. They range from hourly quality control reports to daily reports on absenteeism rates. Although routine reports are extremely valuable to an organization, managers frequently need special information that is not included in these reports.

2. At other times, they need the information that is normally included in routine reports, but at different times ("I need the report today, for the last three days, not for one week"). Such out-of-the routine reports are called **ad hoc (on-demand) reports**. Ad hoc reports can also include requests for the following types of information:

- **Drill-down reports** display a greater level of detail. For example, a manager might examine sales by region and decide to "drill down" by focusing specifically on sales by store and then by salesperson.
- **Key indicator reports** summarize the performance of critical activities. For example, a chief financial officer might want to monitor cash flow and cash on hand.
- **Comparative reports** compare, for example, the performances of different business units or of a single unit during different times.

3. Some managers prefer exception reports. **Exception reports** include only information that falls outside certain threshold standards. To implement *management by exception*, management first establishes performance standards. The company then creates systems to monitor performance (via the incoming data about business transactions such as expenditures), to compare actual performance to the standards, and to identify exceptions to the standards. The system alerts managers to the exceptions via exception reports.

(Give examples for each)

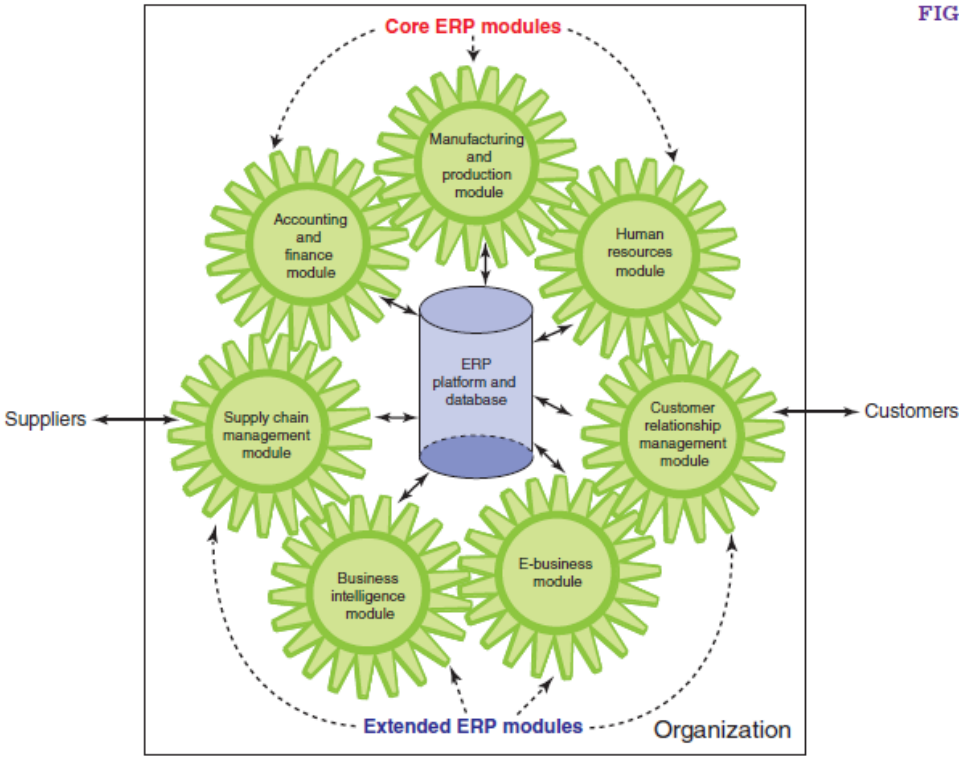
Enterprise Resource Planning (ERP) Systems

Why ERP is required? (What is its significance?)

- Historically, the functional area information systems were developed independent of one another, resulting in ***information silos***. These silos did not communicate well with one another, and this lack of communication and integration made organizations less efficient. This **inefficiency was particularly evident in business processes** that involve more than one functional area, such as procurement and fulfillment.
- Enterprise resource planning (ERP) systems are designed to **correct a lack of communication** among the functional area IS. ERP systems resolve this problem by tightly integrating the functional area IS via a common database. ERP systems credited with greatly increasing organizational productivity.
- The major objectives of ERP systems are **to tightly integrate the functional areas of the organization** and to enable information to flow seamlessly across them. Tight integration means that changes in one functional area are immediately reflected in all other pertinent functional areas. In essence, ERP systems provide the information necessary to control the business processes of the organization.
- It is important to understand here that ERP systems are an evolution of FAIS. That is, ERP systems have much the same functionality as FAIS, and they produce the same reports. ERP systems simply integrate the functions of the individual FAIS.

ERP II systems

FIG



- ERP systems were originally deployed to facilitate business processes associated with manufacturing, such as raw materials management, inventory control, order entry, and distribution.

- Over time, ERP systems evolved to include administrative, sales, marketing, and human resources processes. Companies now employ an enterprisewide approach to ERP that utilizes the Web and connects all facets of the value chain. (ERP II)
- The various functions of ERP II systems are now delivered as e-business suites. The major ERP vendors have developed modular, Web-enabled software suites that integrate ERP, customer relationship management, supply chain management, procurement, decision support, enterprise portals, and other business applications and functions.
- Examples are **Oracle's e-Business Suite** and **SAP's mySAP**. The goal of these systems is to enable companies to execute most of their business processes using a single Web-enabled system of integrated software rather than a variety of separate e-business applications.

Core ERP Modules

CORE ERP MODULES
Financial Management. These modules support accounting, financial reporting, performance management, and corporate governance. They manage accounting data and financial processes such as general ledger, accounts payable, accounts receivable, fixed assets, cash management and forecasting, product-cost accounting, cost-center accounting, asset accounting, tax accounting, credit management, budgeting, and asset management.
Operations Management. These modules manage the various aspects of production planning and execution such as demand forecasting, procurement, inventory management, materials purchasing, shipping, production planning, production scheduling, materials requirements planning, quality control, distribution, transportation, and plant and equipment maintenance.
Human Resource Management. These modules support personnel administration (including workforce planning, employee recruitment, assignment tracking, personnel planning and development, and performance management and reviews), time accounting, payroll, compensation, benefits accounting, and regulatory requirements.
EXTENDED ERP MODULES
Customer Relationship Management. (Discussed in detail in Chapter 11.) These modules support all aspects of a customer's relationship with the organization. They help the organization to increase customer loyalty and retention, and thus improve its profitability. They also provide an integrated view of customer data and interactions, helping organizations to be more responsive to customer needs.
Supply Chain Management. (Discussed in detail in Chapter 11.) These modules manage the information flows between and among stages in a supply chain to maximize supply chain efficiency and effectiveness. They help organizations plan, schedule, control, and optimize the supply chain from the acquisition of raw materials to the receipt of finished goods by customers.
Business Intelligence. (Discussed in detail in Chapter 12.) These modules collect information used throughout the organization, organize it, and apply analytical tools to assist managers with decision making.
E-Business. (Discussed in detail in Chapter 7.) Customers and suppliers demand access to ERP information including order status, inventory levels, and invoice reconciliation. Furthermore, they want this information in a simplified format that can be accessed via the Web. As a result, these modules provide two channels of access into ERP system information—one channel for customers (B2C) and one for suppliers and partners (B2B).

What are the benefits and limitations of ERP?

ERP systems can generate significant business benefits for an organization. The major benefits fall into the following categories:

- *Organizational flexibility and agility:* As you have seen, ERP systems break down many former departmental and functional silos of business processes, information systems, and information resources. In this way, they make organizations more flexible, agile, and adaptive. The organizations can therefore respond quickly to changing business conditions and capitalize on new business opportunities.
- *Decision support:* ERP systems provide essential information on business performance across functional areas. This information significantly improves managers' ability to make better, more timely decisions.
- *Quality and efficiency:* ERP systems integrate and improve an organization's business processes, generating significant improvements in the quality of production, distribution, and customer service.

Despite all of their benefits, however, ERP systems *do have drawbacks*. The major limitations of ERP implementations include the following:

- The business processes in ERP software are often predefined by the best practices that the ERP vendor has developed. ***Best practices*** are the most successful solutions or problem-solving methods for achieving a business objective. As a result, companies may need to change their existing business processes to fit the predefined business processes incorporated into the ERP software. For companies with well-established procedures, this requirement can create serious problems, especially if employees do not want to abandon their old ways of working and therefore resist the changes.
- At the same time, however, an ERP implementation can provide an opportunity to improve and in some cases completely redesign inefficient, ineffective, or outdated procedures. In fact, many companies benefit from implementing best practices for their accounting, finance, and human resource processes, as well as other support activities that companies do not consider a source of competitive advantage.
- The different companies organize their value chains in different configurations to transform inputs into valuable outputs and achieve competitive advantage. Therefore, although they are appropriate for most organizations, they might not be the "best" one for your company if they change those processes that give you competitive advantage.
- ERP systems can be extremely complex, expensive, and time consuming to implement.
- The costs and risks of failure in implementing a new ERP system are substantial. Quite a few companies have experienced costly ERP implementation failures.
- In many cases, orders and shipments were lost, inventory changes were not recorded correctly, and unreliable inventory levels caused major stock outs.

Companies such as Hershey Foods, Nike, and Connecticut General sustained losses in amounts up to hundreds of millions of dollars. (implementation failures)

What are the are the major causes of ERP implementation failure?

The following are the major causes of ERP implementation failure:

- Failure to involve affected employees in the planning and development phases and in change management processes
- Trying to accomplish too much too fast in the conversion process
- Insufficient training in the new work tasks required by the ERP system
- The failure to perform proper data conversion
- No proper testing done for the new system

Describe the three main business processes supported by ERP systems.

- The ***procurement process***, which originates in the warehouse department (need to buy) and ends in the accounting department (send payment).
- The ***fulfillment process*** that originates in the sales department (customer request to buy) and ends in the accounting department (receive payment).
- The ***production process*** that originates and ends in the warehouse department (need to produce and reception of finished goods), but involves the production department as well.

(the details of the steps in each of these processes)

What are the different methods of implementing ERP? OR Compare and contrast on-premise software or software-as-a-service (SaaS) OR Compare Vanilla, Custom and Best of breed approaches for On-premise implementations

Companies can implement ERP systems by using either **on-premise software or software-as-a-service (SaaS).**

- **Software-as-a-Service ERP Implementation.** Companies can acquire ERP systems without having to buy a complete software solution (i.e., on-premise ERP implementation). Many organizations are utilizing software-as-a-service (SaaS).
- In this business model, the company rents the software from an ERP vendor who offers its products over the Internet using the SaaS model. The ERP cloud vendor manages software updates and is responsible for the system's security and availability.
- Cloud-based ERP systems can be a perfect fi t for some companies. For instance, companies that cannot afford to make large investments in IT, yet already have relatively structured business processes that need to be tightly integrated, might benefit from cloud computing.

On-Premise ERP Implementation: Depending on the types of value chain processes managed by the ERP system and a company's specific value chain, there are **three strategic approaches to implementing an on-premise ERP system**:

1. ***The vanilla approach:*** In this approach, a company implements **a standard ERP package**, using the package's built-in configuration options. When the system is implemented in this way, it will deviate only minimally from the package's standardized settings. The vanilla approach can enable the company to perform the implementation more quickly. However, the extent to which the software is adapted to the organization's specific processes is limited.

- Vanilla implementation provides general functions that can support the firm's common business processes with relative ease, even if they are not a perfect fit for those processes.

2. ***The custom approach:*** In this approach, a company implements **a more customized ERP system by developing new ERP functions designed specifically for that fi rm**. Decisions concerning the ERP's degree of customization are specific to each organization. To utilize the custom approach, the organization must carefully analyze its existing business processes to develop a system that conforms to the organization's particular characteristics and processes.

- Customization is expensive and risky because computer code must be written and updated every time a new version of the ERP software is released. Going further, if the customization does not perfectly match the organization's needs, then the system can be very difficult to use.

3. The best of breed approach: This approach combines the benefits of the vanilla and customized systems while avoiding the extensive costs and risks associated with complete customization. Companies that adopt this approach mix and match core ERP modules as well as other extended ERP modules from different software providers to best fit their unique internal processes and value chains. Thus, a company may choose several core ERP modules from an established vendor to take advantage of industry best practices—for example, for financial management and human resource management. At the same time, it may also choose specialized software to support its unique business processes—for example, for manufacturing, warehousing, and distribution. Sometimes companies arrive at the best of breed approach the hard way.

- For example, Dell wasted millions of dollars trying to customize an integrated ERP system from a major vendor to match its unique processes before it realized that a smaller, more flexible system that integrated well with other corporate applications was the answer.

A sample MIS

MIS for Education System (Dec 2019)

Features of Education Management Information System:

Better Communication with Students: With the help of the Education Management Information System, students can **receive individual messages or group messages**. It can be helpful when there is an important announcement to be made on short notice regarding class rescheduling or an upcoming deadline.

Better Communication with Other stakeholders: Industry, recruiting companies, placement activities (**Role of social media in boosting perceptions**). Websites and portals. Accreditation authorities like NBA and NAAC require documented evidences for teaching & learning, research, quality of projects, quality of student placements, and intake – these documents can be maintained by a proper **ERP software**

Better Communication with Parents: An Education Management Information System can simplify the communication between parents and teachers, and school administrators. It can be easily done with the help **of instant messaging and mass communication (Social Media**).With the use of EMIS, parents can be informed about important events and regularly updated about their child's academic progress.

Management of Fee Collections: Fee collection can be made easy with the help of the Educational Management Information System, as it generates automatic alerts to inform school administrators and account managers of missed or late payments. An easier way for fee collections is implementing a **semi-automated or automated payment management system.**

Enquiries and Admissions Management: With the help of the Education Management Information System, the most commonly asked questions and enquiries regarding admissions can be easily answered using automated solutions **(chatbot).** This can free up a lot of time and resources which can be allocated elsewhere.

Examination Management: An Education Management Information System can be useful **for planning, scheduling, and informing important information about exams by using scheduling and communication tools (ERP software)**. It can also be used to publish exam results that can be accessed by the students and teachers. Further detailed reports can be created using this data, and based on this, student performance can be tracked.

Student Information Dashboard: This feature **(dashboard**)helps teachers and parents to access essential information on students' academic activities quickly and easily. This may include fee attendance records, exam results, payment history, and general academic progress. The simplified communication tools of the system will help in better communication of students and parents with teachers.

Attendance Management: With the integration of the Education Management Information System, attendance tracking and its management **(ERP solutions)** and be entirely automated. Teachers and school administrators do not need to track

attendance manually but simply evaluate automatically generated reports and check where there are issues.

Lesson Plans & Assignments: An Education Management Information System makes it easy for teachers to share assignments and lesson plans with students and their parents in advance.

Database and Information management:

Sample databases are:

- Student data, (name rollNo Address, , contact information, marks obtained, calculated information like CGPA….)
- Faculty data: Name, Department, experience, Qualification, Areas of interest, research etc)
- Placement data: Year, Company, no of students, CTC
- Examination data: Exam time table, examiner names, remuneration, student registration etc
- Payroll: Employee name, designation, Basic pay, tax, PF,…

MIS in Manufacturing Sector

Indian Manufacturing Sector

• According to India Brand Equity Foundation, India's manufacturing sector contributes about 16% to GDP
• India was ranked the 4th most competitive manufacturing nation in Deloitte's Global Index for 38 nations
• India`s manufacturing sector can reach US$ 1 trillion by 2025, as predicted by McKinsey & Co.

1. **Transaction Processing System**: A transaction process system (TPS) is an information processing system for business transactions involving the collection, modification, and retrieval of all transaction data. Characteristics of a TPS include performance, reliability, and consistency.

MIS of Toyota **(an example taken here**) enables the gathering of huge amounts of business information, and offers a significant time saving advantage to the employees

- ❖ MIS enables quick decision making and more immediate reflexes for the company
- ❖ To attain effective MIS, Toyota's planning procedure involves taking into account the MIS needs at the strategic levels
- ❖ Functional aspects **of TPS (Transaction Processing system)** in **Toyota (an example taken here**) as
  - • Import management system
  - • Stores management system
  - • Sales system

General MIS in any Manufacturing sector have these IS

- • Production management
- • Personnel management
- • Financial management
- • Material management
- • Marketing management

Most important MIS modules in a manufacturing business are:

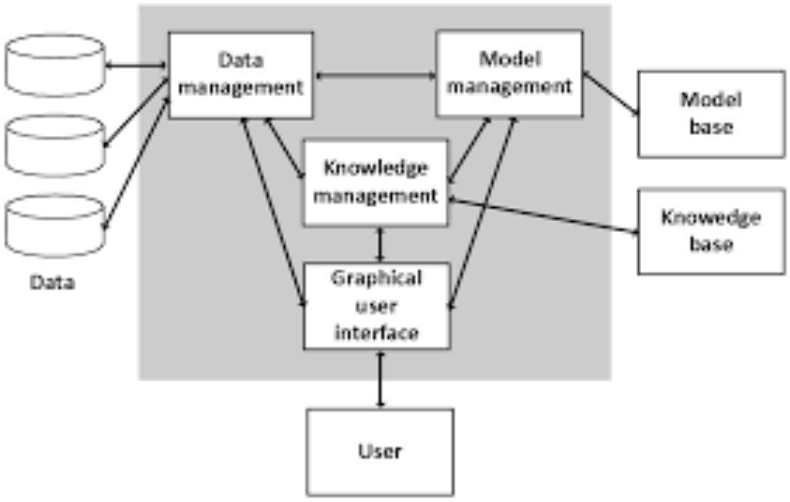
- ➢ MIS in Finance (Budgeting, stocks, projections…. **ERP solutions**)
- ➢ MIS in Marketing (Customer support, Competitive strategies, Advertising ….**Role of social media)**
- ➢ MIS maintaining Quality (**Social Media** for feedbacks and customer support)

MIS should produce **reports** and data of various forms like:

- ▪ MIS give critical data like which machine did not operate, the operator and the real time situations when it malfunctioned
- ▪ Toyota utilizes a variety of these affordable, highly dependable management information systems throughout its production process to stop defects.
- ▪ Suppliers can monitor this information in real time, including release schedules, receipts, and other important information
- ▪ monitor the assembly process in real time.

- Jidoka tracks the production verification and consumption information consistently
- Parts utilized in the production are removed from the stock list, and costs are presented to detail the value of work in process
- MIS help the organization to reduce order-to shipment period, enhances its supply chain activities
- Toyota started to implement **SAP software system** which also provides financial information to the finance department of the company and its concerned personnel
- The people of the finance department of Toyota analyzes previous and current financial figures, anticipates future financial outputs, **using SAP**
-

2. Decision Support System



• A DSS is a computer- based information system that supports business or organizational decision- making activities.

• A DSS is a collection of integrated software applications and hardware that form the backbone of an organization's decision making process and help to make decisions, which may be rapidly changing and not easily specified in advance

3. Toyota uses **Warehouse Management System** as its Decision Support System.

It is used due to the fact that knowledge generated of it is used in decision making process.

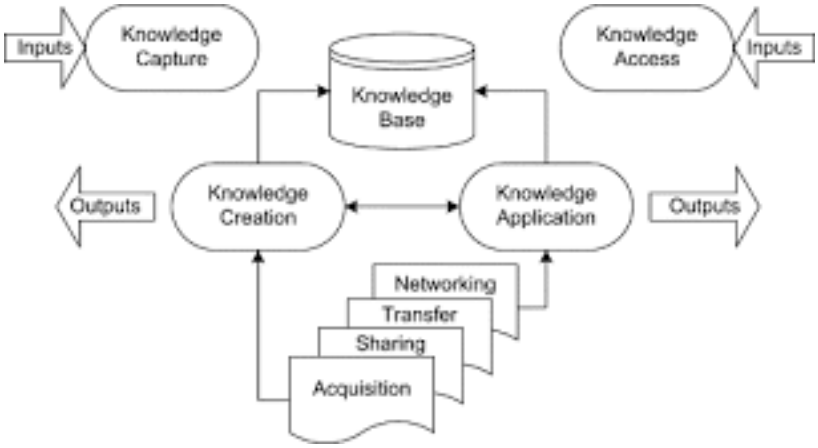
It primarily aims to:

- Control the movement and storage of materials within a warehouse.
- Process the associated transactions , including shipping, receiving, put away and picking.

Toyota Warehouse System combined with the logistics equipment of Toyota Material Handling Company, they are able to provide customers with optimized logistics solutions at their worksite. Decision Support System

4. Knowledge Management System

The knowledge management cycle describes the way in which knowledge is captured , processed and distributed in an organization.



5. STRATEGIC INFORMATION SYSTEM

SIS is an information systems used to prepare strategies that changes the goals, processes or products to help organization gain competitive advantage.

Example: Two competitive strategies adopted by Dell: Differentiation as competitive advantage for DELL

- Dell computers best known for distribution
- No middle men
- Customers can log on to the site from anywhere and provide specifications for computer hardware they require.

Wireless Application Protocol Wireless Application protocol (WAP) provides speed as a competitive advantage for DELL, allows people to react immediately from virtually any place in the world Source

6. Databases:

- Employee & shift details
- Material & store data
- Payroll
- Supplier Information
- Logistics information