Chapter 1 - Summary

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Management Information Systems

- Deal with the planning for—and the development, management, and use of—information technology tools to help people perform all of the tasks related to information processing and management.

Information Technology

- Relates to any computer-base tool that people use to work with information and to support the information and information-processing needs of an organization.
- Using technology to organize information
- Without understanding properly you will not be able to be successful without implementation of the technology to do regular tasks.

Both terms are used interchangeably throughout an organization.

The Importance of Planning for IT

- Application Portfolio:
  - A prioritized list of existing and potential IT systems, organized by application.
  - Applications that have to be added, or modified if they already exist.
- The IT Architecture outlines the way an organization's information resources should be used to accomplish its mission.
  - Encompasses both the technical and managerial aspects of information resources.
    - Technical: Hardware and operating systems, networking, data management systems, and applications software.
    - Managerial: Specify how managing the IT department is accomplished, how the functional area managers will be involved, and how IT decisions will be made.

IT Strategic Plan

- A set of long-range goals that describe the IT infrastructure and identify the major IT initiatives needed to achieve the organization's goals.
- Must meet 3 objectives:
  - Must be aligned with the organization's strategic plan

    - Must provide for an IT architecture that enables users, applications and databases to be seamlessly networked and integrated.
    - Must efficiently allocate IS development resources among competing projects so the projects can be completed on time and within budget and have the required functionality.

IT Steering Committee

- A committee, composed of a group of managers and staff representing various organizational units, set up to establish IT priorities and to ensure that the management information systems function is meeting the needs of the enterprise.
- Major task is to link corporate and IT strategy together, to approve allocation of resources for MIS function and establish performance measures for the MIS function and ensure they are met.

IT Operational Plan

- Such plan consists of a clear set of projects that the IS department and the functional area managers will execute in support of the IT strategic plan.
- Consists of:
    - Mission – The mission of the IS function (derived from the IT strategy)
    - IS environment – A summary of the information needs of the functional areas and of the organization as a whole.
    - Objectives of the IS function – The best current estimate of the goals of the IS function.
    - Constraints on the IS function – Technological, financial, personnel, and other resource limitations on the IS function.
    - The application portfolio – A prioritized inventory of present applications and a detailed plan of projects to be developed or continued during the current year.
    - Resource allocation and project management: A listing of who is going to do what, how, and when.

IT planning is crucial when developing a new product or service, such as the drug-dispensing kiosks.

Business Process

- A collection of related activities that produce a product or a service of value to the organization, its business partners, and/or its customers.
- A process has inputs and outputs and activities may be measured.
- Processes may have as low 1 or several functional areas.
- Example: Accounting Business Process → Accounts Payable, Accounts Receivable, Cash Receipts, Invoice Billing, Etc.
- May lead to competitive advantage if they innovate and become more efficient than competitors.
- May lead to liabilities if they become inefficient.
- Example: Purchase tickets online, the firm must have up to date prices, if not firm will hurt.
- The following are significant measures of competitive performance in the organization:
    - Customer satisfaction, cost reduction, cycle and fulfillment time, quality, product differentiation, productivity.
- IT is the key enabler of achieving business process excellence.
    - Business Process Reengineering is an approach that improves the efficiency and effectiveness of an organizations business process.
    - Starts off by viewing the process from a "clean sheet" perspective and than reconstructing them to improve business functions.
- A less radical, less disruptive and more incremental approach was developed to replace the BPR was called BPM (Business Process Management).

Business Process Management

- A management technique that includes methods and tools to support the design, analysis, implementation, management, and optimization of business processes.
- Initially BPM helps companies improve profitability by decreasing costs and increasing revenues. Overtime, created a competitive advantage by improving organizational flexibility.

Information Systems: Concepts and Definitions

- One of the primary goals of information systems is to economically process data into information and knowledge.

Data Items

- An elementary description of things, events, activities, and transactions that are recorded, classified, and stored but not organized to convey any specific meaning.
    - Numbers, letters, figures, sounds, or images. A student grade in a class and the number of hours an employee worked in a certain week, or the price of a ring tone.

Information

- Data that have been organized so that they have meaning and value to the recipient.
    - Example: GPA are data, but a student's name coupled with his or her GPA is information.

Knowledge

- Consists of data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current business problem.

Information Technology Architecture

- A high-level map or plan of the information assets in an organization.
    - A guide for current operations and a blueprint for future directions.
    - Analogous to an architecture of a house. Shows how all aspects of information technology in an organization fit together.

Information Technology Infrastructure

- Consists of the physical facilities, IT components, IT services, and IT personnel that support the entire organization.
    - IT Components (Platform): Computer hardware, software, and communications technologies that provide the foundation for all of an organization's information systems.
    - IT Personnel: Use IT Components to produce IT Services
    - IT Services: Data Management, Systems Development, and Security Concerns.

The Global, Web-Based Platform

Globalization

- The integration and interdependence of economic, social, cultural, and ecological facets of life, enabled by rapid advances in information technology.

Three Stages of Globalization:

- Globalization 1.0 - Countries
  - Lasted from 1492-1800. During this era, the force behind globalization was how much muscle, horsepower, wind power, or steam power a country had and could deploy.
- Globalization 2.0 - Companies
  - Lasted from 1800-2000. During this era, the force behind globalization was multinational companies. Headquarters in one country, but operated in several countries.
    - First half was driven by fall in transportation costs.
      - Steam engine and railroads.
    - Second half was driven by fall of telecommunications costs.
      - Telephones, computers, satellites, fiber optic cable, and the Internet and World Wide Web.
- Globalization 3.0 – Groups and Individuals
  - Around year 2000, we entered globalization 3.0. This era was driven by the convergence of 10 forces that Freidman calls "flatteners."
  - Friedman's Ten Flatteners
    - Fall of the Berlin Wall
      - Shifted the world toward free-market economies and way from centrally planned economies.
    - Netscape goes public
      - Popularized the internet and the World Wide Web
    - Development of workflow software
      - Enabled computer applications to work with one another without human intervention.
    - Uploading

        - Empowered everybody to create content and put it on the Web.
- Outsourcing
    - Contracting with an outside company to perform a specific function that your company was doing itself and then integrating their work back into your operation; for example, moving customer call centers to India.
- Offshoring
    - Relocating an entire operation, or just certain tasks, to another country; for example, moving an entire manufacturing operation to China.
- Supply chaining
    - Technological revolution led to the creation of networks composed of companies, their suppliers, and their customers, all of whom could collaborate and share information for increased efficiency.
- Insourcing
    - Delegating operations or jobs within a business to another company that specializes in those operations; for example, Dell hires FedEx to "take over" Dell's logistics process.
- Informing
    - Your ability to search for information, best illustrated by search engines.
- The steroids
    - Computing, instant messaging and file sharing, wireless technologies, voice over internet protocol, video conferencing, and computer graphics.
    - Technologies that amplify the other flatteners
    - Enable all forms of computing and collaboration to be digital, mobile, and personal.

Outsourcing, Offshoring, Insourcing, Informing, Uploading, Supply Chaining, The Steroids, Fall of berlin wall, Netscape, Workflow Software!

Business Pressures, Organizational Responses, and IT Support

Business Environment

- Combination of social, legal, economic, physical, and political factors that affect business activities.

Market Pressures

- Global Economy and Strong Competition
  - Facilitated by the emergency of the global, web-based platform.
  - NAFTA and UE have contributed to increased world trade.
  - Developed countries tend to have high labor costs as opposed to developing countries. Companies that are dependent on labor move to countries that have a lower cost. IT makes such moves easier to implement.
- The Need for Real-time Operations
  - Enables immediate processing of information. When a firm does not have adequate information systems and technology to provide real-time processing it losses its competitive edge.
- The Changing Nature of the Workforce
  - IT enables a more diversified workforce. Single parents, members of visible minorities, the increase of women applicants, people with disabilities to work. Even allows people to work from home.
- Powerful Customers
  - Consumers become more knowledgeable, able to check reviews, prices and purchase items at electronic auctions. Organizations recognize the importance of customers and have increased their efforts to acquire and retain them.

Technological Pressures

- Technological Innovation and Obsolescence
  - Changed in product innovation requires organizations to keep up with consumer demands. Example: Upgrading your iPhone to the next generation iPhone.
  - A state-of-the-art product today may be obsolete tomorrow.

- Information Overload
    - Amount of information available on the Internet doubles approximately every year, and much of it is free. Managers must sift through such information efficiently and effectively in order for the organization to be competitive.

Societal/Political/Legal Pressures

- Social Responsibility
    - **Organizational Social Responsibility** (Individual Social Responsibility)
        - Efforts by organization to solve various social problems.
    - A major social problem is the state of the physical environment.
    - **Digital Divide**
        - Wide gap between those who have access to information and communications technology and those who do not.
            - Exists both, within and among countries.
    - Example: Reduce electricity bill in Vegas by remotely turning off all unused computers in the city.
- Compliance with Government Regulations and Deregulation
    - Pressures relating to government regulations regarding health, safety, environmental control, and employment equity.
- Ethical Issues
    - General standards of right and wrong.
    - Information ethics specifically are standards of right and wrong in information-processing practices.
- Protection Against Fraud or Terrorist Attacks
    - Organizations need to prevent identity theft by protecting their information.

Organizational Responses

- Organizations respond to pressures by implementing IT such as strategic systems, customer focus, make-to-order and mass customization, and e-business.
- Strategic Systems

    - Enable them to increase their market share and/or profits, to better negotiate with suppliers, or to prevent competitors entering their markets.
- Customer Focus
    - Attempts to provide superb customer service can make the difference between attracting and keeping customers on the one hand and losing them to competitors on the other.
- Make-to-Order and Mass Customization
    - **Make-to-order**
        - Strategy of producing customized products and services.
    - **Mass Customization**
        - A production process in which items are produced in large quantities but are customized to fit the desires of each customer.
    - Mass customization is simply an attempt to perform make-to-order on a large scale.
        - Bodymetrics
- E-Business and E-Commerce
    - For most effective responses, companies formulate strategies.
    - In the new digital economy, these strategies rely heavily on IT, especially strategic information systems.

Why are Information Systems Important to Me?

- Information systems and technologies are integral to your life.
    - Think of all you can do on-line: Register for classes, take classes, access class syllabi, information, PowerPoint slides, conduct banking, pay your bills, sell your "stuff."
- Information systems field offers many career opportunities.
    - Myths about IT careers:
        - 1) There are no computing jobs
        - 2) There will be no IT jobs when I graduate
        - 3) All IT-related jobs are moving offshore
        - 4) Computing and IT salaries are low due to cheaper overseas labor.
- All functional areas in an organization use information systems.

- Organizations cannot function without information technology.
- Accounting/Finance
  - Managers use IT systems to forecast revenues and business activities, to determine the bests sources and use of funds, and to perform audits to ensure that the organization is fundamentally sound.
- Marketing
  - Price, Promotion, Site and Product Analysis
- Human Resources
  - Use IT to manage the recruiting process, analyze and screen job applicants, and hire new employees.

Business first before technology.

Chapter 2 - Summary

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Information Technology (IT) Governance and Management

IT Governance

- A structure of relationships and processes to direct and control the enterprise in order to achieve the enterprise's goals by adding value while balancing risk versus return over IT and its processes.
    - First, relationships and processes; these would be designed by those who lead the organization.
    - Second, achieve goals by adding value; they should make money or bring some sort of intangible benefit to the organization. be hacked into and
    - Third, balance between risks and profits; systems should be secure so that they cannot private data exposed.
- **Purpose of IT Governance is to provide effective oversight over the use of technology**
- Steering committee is important to manage information technology in an organization, while governance is important to manage IT throughout the organization.
    - Includes planning, acquisition, implementations, and ongoing support, as well as monitoring and evaluation so that decisions can be made about potential changes.
- Many things may go wrong without governance.
    - Include objectives not being met, systems could be error prone, over budget, or hard to use.
- Smaller businesses implement IT governance by having an aware and knowledgeable owner-manager who actively selects business practices and software.
- Organizations select such systems so they can thrive and compete.

Types and Purposes of Information Systems

- Inside your organization IT provides, Platform, Infrastructure, Transaction Processing Systems, Enterprise Resources Planning Systems and Functional Area's IS.
- Outside your organization IT provides, Supply Chain Management, Customer Relationship Management and Business to Business.

Computer-Based Information Systems

Information System

- Collects, processes, stores, analyses, and disseminates information for a specific purpose.

Computer-Based Information System

- Information system that uses computer technology to perform some or all of its intended tasks.

Hardware

- Devise such as the processor, monitor, keyboard, and printer. Together these devices accept data and information, process it, and display it.

Software

- Program or collection of programs that enables the hardware to process data.

Database

- Collection of related files or tables containing data.

Network

- Connecting system (wire line or wireless) that permits different computers to share resources.

Procedures

- Set of instructions about how to combine the above components in order to process information and generate the desired output.

People

- Individuals who use the hardware and software, interface with it, or use its output.

Major Capabilities

- Perform high-speed, high-volume numerical computations
- Provide fast, accurate communication and collaboration
- Store huge amounts of information in a small, easy-to-access space
- Allow quick and inexpensive access to vast amounts of data
- Interpret vast amounts of data quickly and efficiently
- Increase efficiency of people working in groups in one place or in several locations anywhere
- Automate both semi-automatic business processes and manual tasks

Application Program

- Computer program designed to support a specific task or business process.

- A collection of application programs in a single department is usually referred to as a departmental information system.
    - Example: Human Resources Information System

Functional Area Information System (FAIS)

- A system that provides information to managers (usually mid-level) in the functional areas, in order to support managerial tasks of planning, organizing, and controlling operations.
- Supports the activities within a specific functional area.
    - System for processing payroll.

Enterprise Resource Planning (ERP)

- Designed to correct a lack of communication among the functional area information systems.
- Nearly all ERP systems are transaction processing systems, but not all.
- Integrates all functional areas of the organization.
    - Oracle, SAP

Transaction Processing System

- An information system that supports the monitoring, collection, storage, processing, and distribution of data from the organization's basic business transactions.
- Processes transaction data from business events.
    - Example: When a cashier swipes a product for you to purchase, it records the transaction, typically in real time.

Interorganizational Information Systems (IOSs)

- Information systems that connect two or more organizations.
- Support interorganizational operations; supply chain management is the best known.
- **Supply Chain**
    - The flow of materials, information, money, and services from raw material suppliers through factories and warehouses to the end consumers.
- Soft products include digitizable products, information flows and financial flows. Such flows/products can be represented in electronic form. They go through the internet.
    - Example: Music downloads
- Hard products include physical products. They are shipped.

    - Example: Computer from Dell.

Electronic Commerce Systems

- Another type of interorganizational information system. Enable organizations to conduct transactions, called business-to-business (B2B) electronic Commerce, and customers to conduct transactions with businesses, called business-to-consumer (B2C) electronic commerce.

Support for Organizational Employees

- Clerical workers: support managers and work groups at all levels of the organizations.
    - Bookkeepers, secretaries, insurance claim processors.
- Lower-level managers: handle the day-to-day operations of the organization, making routine decisions such as assigning tasks to employees and placing purchase orders.
- Middle managers make tactical decisions, which deal with activities such as short-term planning, organizing, and control.
- **Knowledge workers**: professional employees such as financial and marketing analysts, engineers, lawyers, and accountants.
    - All knowledge workers are experts in a particular subject area.
    - Provide advice to middle-managers or executives. Function in their area of expertise.
- Executives; make decisions that deal with situations that can significantly change the manner in which business is done.
    - Introducing a new product line, acquiring other businesses, and relocating operations to a foreign country.

IT Support for each level of employee:

- **Office Automation Systems** (OASs) - All
    - Typically support the clerical staff, lower and middle managers, and knowledge workers and are often used by other employees, too. Use to develop documents, schedule resources, communicate via email, videoconferencing.
    - Supports daily work activities of individuals and groups.
        - Microsoft Office
- **Business Intelligence** (BI) **Systems – Mainly middle managers and knowledge workers**

    - Computer-based support for complex, non-routine decisions, primarily for middle managers and knowledge workers. Also support lower level managers. Allow users to perform their own data analysis.
- **Expert Systems** (ESs) – Mainly knowledge workers
    - Attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain. Primarily designed to support knowledge workers.
    - Mimics human expertise in a particular are and makes a decision.
        - Credit card approval analysis
- **Dashboards** (also called **digital dashboards**) – All managers and executives (executive dashboards)
    - Support all managers of the organization. They provide rapid access to timely information and direct access to structured information in the form of reports. Tailored dashboards to executive needs are called *executive dashboards*.
        - Status of sales by product.

Competitive Advantage and Strategic Information Systems

- Through a competitive strategy an organization seeks a competitive advantage.
- **Competitive Advantage**
    - An advantage over competitors in some measure such as cost, quality, or speed. Leads to control of the market and to larger than average profits.
- **Strategic Information Systems** (SISs)
    - Systems that help an organization gain a competitive advantage by supporting its strategic goals and/or increasing performance and productivity.
    - Any information system that helps an organization gain a competitive advantage or reduce a competitive disadvantage is a strategic information system.
- **Competitive Forces Model**

- A business framework devised by Michael Porter that analyzes competitiveness by recognizing five major forces that could endanger a company's position.
- **Threat of entry of new competitors**
  - **Entry Barrier**: A product or service feature that customers have learned to expect from organizations in a certain industry.
    - Pay at pump – gas station example.
  - The web makes it less of a barrier to entry.
- **Bargaining Power of Suppliers**
  - Supplier power is high when buyers have few choices from whom to buy and low when buyers have many choices.
  - Internet impact is mixed. One side, suppliers are easier to find on an alternative basis. While, suppliers prosper by locking in customers.
- **Bargaining Power of Buyers**
  - Buyer power is high when buyers have many choices and low when buyers have few choices.
  - Loyalty programs lower buyer power.
- **Threat of Substitute Products or Services**
  - Many substitutes = High threat. Low substitutes = Low threat.
  - Internet is a threat. Provides substitute products easily. Companies may create competitive advantage via switching costs that include time and money.
- **Rivalry among existing firms in the industry**
  - Threat is high when there is intense competition between firms, and low when there is low competition.

Porter's Value Chain Model

- Model that shows the primary activities that sequentially add value to the profit margin; also shows the support activities.
- Used to identify specific activities in which they can use competitive strategies for greatest impact.
- Divides into two categories, primary activities and support activities.

- **Primary Activities**: Business activities that relate to the production and distribution of the firm's products and services, thus creating value for which customers are willing to pay.
    - Include purchasing materials, processing materials into products, and delivering products to customers.
    - Inbound Logistics (Inputs), Operations (Manufacturing and Testing), Outbound Logistics (Storage and Distribution), Marketing and Sales and After-Sales Services.
- **Support Activities**: Do not add value directly to the firm's products or services. They contribute to the firm's competitive advantage by supporting the primary activities.
    - The firm's infrastructure (accounting, finance, management), Human resources management, product and technology research and development, and procurement.
- **Value System** (Industry Value Chain): A business value system that includes producers, suppliers, distributors, and buyers, all with their value chains.

Strategies for Competitive Advantage

- **Cost Leadership Strategy**
    - Produce products/services at lowest cost in the industry.
        - Wal-Mart
- **Differentiation Strategy**
    - Offer different products/services or product features.
        - WestJet Airlines
- **Innovation Strategy**
    - Introduce new products/services, add new features to existing products and services, or develop new ways to produce them.
        - RIM – QWERTY keyboard on smartphones.
- **Operational Effectiveness Strategy**
    - Improve the manner in which internal business processes are executed so that a firm performs similar activities better than its rivals.
        - Petro-Canada replaced its nearly 150 different corporate intranet sites with one portal, which was centrally managed using an Oracle Application Server product.
- **Customer Orientation Strategy**

    - Concentrate on making customers happy. Web-based systems are particularly effective in this area.

The Importance of Information Systems and their Management

IT Affects Management

IT will Reduces the number of middle managers

- IT makes managers more productive
    - Increases the number of employees who can report to a single manager.

IT will change the manager's job

- IT can change the manner in which managers make decisions.
- Will be able to plan activities more than putting out fires.
- May gather information more quickly by using search engines and intranets.
- May complete tasks more efficiently and effectively.

IT Affects Employees

IT affects employee perceptions of job security.

- There are mixed feelings about IT. Many fear that IT leads to higher unemployment by replacing employees with machines, while others believe IT creates new categories of employment, potentially lowering unemployment.

IT creates psychological effects

- Many people experienced a loss of identity. They feel like just another number because of computerization.
- Internet allows individuals to shop at home from their living rooms, could produce effects such as depression and loneliness.

IT affects employees' health and safety

- Work load may increase employees job stress.
- Keyboard overuse 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.
- In response to such issues, **Ergonomics** is invented.
    - The science of adapting machines and work environments to people, focuses on creating an environment that is safe, well lit, and comfortable.

IT provides opportunities for people with disabilities or other impairments

- Individuals who cannot type may be able to use a voice-operated keyboard, and individuals who cannot travel can work at home.

IT Provides Quality-of-Life Improvements

Robot revolution

- Robot for military purposes, self-driving vehicles
- Tractor for picking up crops around the clock

Improvements in healthcare

- IT to make better and faster diagnoses and to monitor ill individuals more accurately.
- IT also has streamlined the process of researching and developing new drugs.

Managing Information Resources

- Information resources is a general term that includes all the hardware, software, data, and networks in an organization.
- Firms rely on such resources heavily that in some cases, when they are not working an organization cannot function.
- ISD (Information Systems Department) owned the only computing resource in the organization: the mainframe. At that time, end users did not interact directly with the mainframe.
- Today the main function of the Information Systems Department is to use Information Technology (IT) to solve end users' business problems.

Which IT Resources Are Managed and by Whom?

- ISD is responsible for corporate-level and shared resources
- End users are responsible for departmental resources
- It is important that both work closely together and cooperate regardless of who's doing what.

The Role of the Information Systems Department (ISD)

- **Chief Information Officer** (CIO)
    - The executive in charge of the information systems department in an organization.
- Role of the ISD is changing from a pure technical one to a more managerial and strategic one.

Chapter 3 - Summary

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Ethics

- Refers to the principles of right and wrong that individuals use to make choices to guide their behaviors.

Code of Ethics

- Collections of principles that is intended to guide decision making by members of the organization.

Fundamental tenets of ethics include:

Responsibility

- Means that one accept the consequences of their decisions and actions.

Accountability

- Refers to determining who is responsible for actions that were taken.

Liability

- Legal concept that provides individuals the right to recover the damages done to them by other individuals, organizations, or systems.
    - What is unethical is not necessarily illegal.

Four general categories of issues with IT applications:

- *Privacy*: Involve collecting, storing, and disseminating information about individuals.
- *Accuracy*: Involve the authenticity, integrity, and accuracy of information that is collected and processed.
- *Property*: Involve the ownership and value of information.
- *Accessibility*: Revolve around who should have access to information and whether they should have to pay for this access.

Privacy

- The right to be left alone and to be free of unreasonable personal intrusions.

Digital Dossier

- An electronic description of you and your habits.

Profiling

- The process of forming a digital dossier.

Electronic Surveillance

- Monitoring or tracking people's activities with the help of computers.

    - Employees have very limited protection against surveillance by employers. The law supports the right of employers to read their employees' email and other electronic documents and to monitor their employees; Internet use.

Privacy Policies (Privacy Codes)

- An organization's guidelines with respect to protecting the privacy of customers, clients, and employees.
    - Having a privacy policy in place can help organizations avoid legal problems.

Opt-out Model

- A model of informed consent that permits a company to collect personal information until the customer specifically requests that the data not be collected.

Opt-in Model

- A model of informed consent, in which a business is prohibited from collecting any personal information unless the customer specifically authorizes it.

Threats on Information Technology (Vulnerability of organizational information assets):

- Trusted Network: Is any network that is within your organization and adequately protected.
- Untrusted Network: Any network external to your organization.
- PIPEDA applies to customer information that is collected by business or non-profit organizations.
- Smaller, faster, cheaper and more portable storage media makes it more easier to steal or lose a computer that contains sensitive information.
- Hacking is becoming easier for individuals. The internet provides information and scripts that users may download and begin hacking.
- **Cyber Crime**: Illegal activities taking place over computer networks, particularly the internet.
    - Cyber extortion: Occur when individuals attack an organizations website, and then demand money from the website owners to call off the attack.

- Downstream Liability
    - If company A information systems were compromised by perpetrator and used to attack companies B's systems, then company A could be liable for damages to company B.
- Unmanaged devices include: customer computers, business partners' mobile devices, computers in the business centers of hotels, and many others.
- Management support. Manages must set the tone. Lower level managers may be even more important. These managers in close contact with employees every day and thus are in a better position to determine whether employees are following security procedures.
- **Threat**: Any danger to which a system may be exposed.
- **Exposure**: The harm, loss, or damage that can result if a threat compromises the resource.
- **Vulnerability**: Possibility that the system will suffer harm by a threat.
- **Risk**: Likelihood that a threat will occur.
- **Information Systems Controls**: The procedures, devices, or software aimed to preventing a compromise to the system.

Threats to Information Systems

- **Unintentional Acts**:
    - Acts with no malicious intent. Three types of unintentional acts: human errors, deviations in the quality of service by service providers, and environmental hazards. Human errors represent by far the most serious threats to information security.
    - Human Errors:
        - The higher the level of employee, the higher the threat poses to the organization.
        - Human resources and information systems pose the greater threat.
        - Contract labor and consultants may be overlooked. They have access to the company's network, information systems, and information assets.

        - Human errors or mistakes pose a large problem as a result of laziness, carelessness, or a lack of awareness concerning information technology.
    - Tailgating: Follow employee, when access is granted, ask to hold the door.
    - Shoulder Surfing: Looks at employees computer screen over that persons shoulder.
    - Carelessness with laptops: Losing, misplacing, leaving them in taxis, etc.
    - Carelessness with portable devices: Losing or misplacing these devices, or using them carelessly so that **Malware** (malicious software such as viruses and worms) is introduced into an organization's network.
    - Opening questionable emails: Prone to phishing attacks.
    - Careless Internet Surfing: Accessing questionable websites.
    - Poor password selection and use: Choosing weak passwords.
    - Carelessness with ones office: Leaving unlocked desks and filing cabinets when employees go home at night; not logging off the company network.

    - Human Errors can also be deliberate actions. Such actions fall into three categories including social engineering, reverse social engineering and social data mining.
    - **Social Engineering**: An attack in which the perpetrator uses social skills to trick or manipulate a legitimate employee into providing confidential company information such as passwords.
    - **Reverse Social Engineering**: The employees approach the attacker.
        - Example: Attacker is employed by the company. Co-workers know he is "good with computers" ask him for help. Thus, the attacker loads Trojan horses that sends him the username and passwords of those employees the attacker helps.

    - **Social Data Mining**: Also called buddy mining. Occurs when attackers seek to learn who knows whom in an organizations and how in order to target specific individuals.

    - Deviations in the Quality of Service by Service Providers:
        - Consists of situations in which a product or service is not delivered to the organization as expected.
    - Environmental Hazards:
        - Dirt, dust, humidity, and static electricity. Which is hazards that are harmful to the safe operation of computing equipment.
- **Natural Disasters**:
    - Include floods, earthquakes, hurricanes, tornadoes, lightning, and in some cases, fires.
        - Must engage in proper planning for backup and recovery of information systems and data.
- **Technical Failures**:
    - Issues with hardware and software.
        - Most common hardware problem is a crash of a hard disk drive.
        - Most common software problem is errors –called bugs— in computer programs.
- **Management Failures**:
    - Involve a lack of funding for information security efforts and a lack of interest in those efforts.
- **Deliberate Acts**: Account for a large number of information security breaches.
    - Espionage or Trespass:
        - Unauthorized individual attempts to gain illegal access to organizational information.
        - Industrial espionage crosses a legal boundary.
        - Competitive intelligence consists of legal information-gathering techniques.
    - Information Extortion:

        - Attacker threats to steal or actually steals information from a company. Demands payment for not stealing, returning or not disclosing.
    - Sabotage or Vandalism:
        - Deliberate acts that involve defacing an organization's website, possibly causing the organization to lose its image and experience a loss of confidence by its customers.
    - Theft of Equipment and Information:
        - Slurping: Perpetrators plug portable devices into a USB port on a computer and download huge amounts of information very quickly and easily.
        - Dumpster Diving: Looking through commercial or residential garbage to find information that has been discarded.
    - **Identify Theft**:
        - Deliberate assumption of another person's identity, usually to gain access to their financial information or to frame them for a crime.
            - Dumpster diving
    - Compromises to Intellectual Property:
        - **Intellectual Property**: Is the property created by individuals or corporations that is protected under trade secret, patent, and copyright laws.
        - **Trade Secret**: An intellectual work, such as a business plan, that is a company secret and is not based on public information.
            - Example: Corporate strategic plan
        - **Patent**: Document that grants the holder exclusive rights on an invention or process for 20 years.
        - **Copyright**: A statutory grant that provides the creators of intellectual property with ownership of the property for the life of the creator plus 50 years.
        - **Piracy**: Copying a software program without making payment to the owner.
    - Software Attacks:

- **Virus**: Computer code that performs malicious actions by attaching to another computer program.
- **Worm**: Computer code that performs malicious actions and will replicate, or spread, by itself (without requiring another computer program).
- **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 to access a computer system at will, without having to go through any security procedures (Also called trap door).
- **Blended Attack**: An attack using multiple delivery methods, and combines multiple components, such as phishing, spam, worms, and Trojans in one attack.
- **Logic Bomb**: Computer code that is embedded with an organization's existing computer programs and is designed to activate and perform a destructive action at a certain time or date.
- **Password Attacks**: A password attack that uses massive computing resources to try every possible combination of password options to uncover a password.
- **Dictionary Attack**: Attack that tries combinations of letters and numbers that most likely to succeed, such as all words from a dictionary.
- **Brute Force Attack**: Attack that uses massive computing resources to try every possible combination of password options to uncover a password.
- **Denial-of-Service Attack**: An attack in which the 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: The attacker first takes over many computers (called zombies or bots), typically by using malicious software. Attack uses these

bots (which form a botnet) to deliver a coordinated stream of information requests to a target computer, causing it to crash.

- **Phishing Attack**: An attack involving deception to acquire sensitive personal information by masquerading as official-looking e-mails or instant messages.
- Spear Phishing Attack: Attack in which the perpetrators find out as much information about individual as possible to improve their chances that phishing techniques will be able to obtain sensitive personal information. Contrast with *phishing attacks*, which target large groups of people.
- **Zero-day Attack**: An attack that take advantage of a newly discovered, previously unknown vulnerability in a software product. Perpetrators attack the vulnerability before the software vendor can prepare a patch for the vulnerability.

- Alien Software:
  - **Alien Software**: Secret software that is installed on your computer through duplicitous methods.
    - Not as malicious as viruses, worms, or Trojan horses.
    - Uses up valuable system resources.
    - Report on your web surfing habits and other personal behavior.
    - Does not come with an uninstaller program is indication of pestware.
      - **Adware**: Software that is designed to help pop-up advertisements appear on your screen (majority of pestware).
  - **Spyware**:
    - Software that collects personal information about users without their consent.
      - **Keystroke Loggers** (Keyloggers): Record your keystrokes and record your web browsing history. Purpose range from

criminal (password detection) to advertising. (CAPTCHA prevents keyloggers)
- **Screen Scrapers** (Screen Grabbers): Records a continuous "movie" of a screen's contents rather than simply recording keystrokes.

- **Spamware**: Pestware that is designed to use your computer as a launchpad for spammers.
  - **Spam**: Unsolicited e-mail, usually for the purpose of advertising for products and services.
    - E-mails seem to come from you. E-mails are sent to everyone on your address book.
- **Cookies**: Small amounts of information that websites store on your computer, temporarily or more or less permanently.
  - Save passwords
  - Used for shopping carts for online merchants.
  - **Tracking cookies**: can be used to track your path through a website, the time you spend there, what links you click on, and other details that the company wants to record.

- Supervisory Control and Data Acquisition (SCADA) Attacks:
  - SCADA systems are used to monitor or to control chemical, physical, or transport processes such as oil refineries, water and sewage treatment plants, electrical generators, and nuclear power plants.
  - If an attacker can gain access to the network, he can disrupt the power grid over a large area, or disrupt the operations of a large chemical plant.
- Cyber-terrorism and Cyber-warfare:
  - **Cyber-terrorism**: A premeditated, politically motivated attack against information, computer systems, computer programs, and data that results in violence against non-combatant targets by sub-national groups or clandestine agents.
    - Carried out by individuals or groups.

        - **Cyber-warfare**: War in which a country's information systems could be paralyzed from a massive attack by destructive software.
            - Involves nations.

What companies are doing:

- Why so difficult to stop cyber-criminals? One reason is that on-line commerce industry is not willing to install safeguards that would make it harder to complete transactions.
- **Penetration Test**: Is a method of evaluating the security of an information system by simulating an attack by a malicious perpetrator.
    - Idea is to proactively discover weaknesses before real attackers exploit them.

Protecting Information Resources:

- **Risk Management**: A process that identifies, controls, and minimizes the impact of threats in an effort to reduce risk to manageable levels.
- Three processes in risk management include risk analysis, risk mitigation and controls evaluation.
    - **Risk Analysis**: Process by which an organization assesses the value of each asset being protected, estimates the probability that each asset will be compromised, and compares the probable cost of the asset's being compromised with the cost of protecting the asset.
    - **Risk Mitigation**: The organization takes concrete actions against risks.
        - Implement controls to prevent identifiable threats from occurring.
        - Develop means of recovery should the threat become a reality.
        - Common risk mitigation strategies include:
            - **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 of compensate for the loss, such as by purchasing insurance.
    - **Controls Evaluation**: The organization identifies security deficiencies and calculates the costs of implementing adequate control measures.
        - Control is not cost effective when the cost of implementing a control is greater than the asset being protected.
- **Controls**: Purpose is to safeguard assets, optimize the use of the organizations resources, and prevent or detect errors or fraud.
    - Done in layers starting from control environment, general controls and application controls.
    - **Control Environment**: Encompasses management attitudes toward controls, as evidenced by management actions, as well as by stated policies and procedures that address ethical issues and the quality of supervision.
    - **General Control**: Apply to more than one functional or application area.
        - Passwords are general controls.
        - **Physical Controls**: Prevent unauthorized individuals from gaining access to a company's facilities.
            - Walls, doors, gates, locks, badges, guards, alarm.
        - **Access Controls**: Restrict unauthorized individuals from using information resources. May be physical or logical controls.
            - **Logical Controls**: Implemented by software.
                - Login times, login attempts, etc.
            - **Authentication**: Determines the identity of the person requiring access.
            - Methods:
                - Something the user is: **Biometrics**— examine a persons natural physical characteristics.

    - Fingerprint, retina scans, iris recognition.
- Something the user has: **Regular ID cards**—or dumb cards—typically have the person's picture, often his or her signature. **Smart ID cards**—have a chip embedded in them with pertinent information about the user. **Tokens**—embedded chips and a digital display that presents a login number that the employees use to access the organization's network. Changes with each login.
- Something the User Does: **Voice Recognition**—User speaks a phrase that has been previously recorded under controlled, monitored conditions. Matches the voice. **Signature Recognition**—User signs his name, and the system matches this signature with one previously recorded under controlled, monitored conditions. Match the speed and pressure of the signature.
  Something the User Knows: Include passwords and pass phrases. **Strong Passwords**—password that is difficult to guess; is longer rather than shorter; contains upper-and lowercase letters, numbers, and special characters; and is not recognizable word or string of numbers.
  Pass Phrase—a series of characters that is longer than a password but can be memorized easily
  Multifactor Authentication: Consists of 2 or more authentication methods used.

        - **Authorization**: Determines which actions, rights, or privileges the person has based on verified identity.
            - **Privilege**: A collection of related computer system operations that can be performed by users of the system.
            - **Least Privilege**: A principle that users be granted the privilege for some activity only if there is a justifiable need to grant this authorization.
- Communication Controls **(3rd GENERAL CONTROL)**
    - **Communications (network) control**: Secure the movement of data across networks.
        - **Firewall**: A system that prevents a specific type of information from moving between untrusted networks, such as the Internet, and private networks, such as a company's network.
            - **Demilitarized Zone (DMZ)**: Located between the two firewalls. A separate organizational local area network that is located between an organization's internal network and an external network, usually the Internet.
        - **Anti-malware Systems**: Also called AV or antivirus software. Software packages that attempt to identify and eliminate viruses, worms, and other malicious software.
            - Generally reactive.
            - Proactive and reactive software is being developed by the leading vendors.
        - **Whitelisting**: A process in which a company identifies the software that it will allow to run and does not try to recognize malware.
            - **Blacklisting**: Allows everything to run unless it is on the blacklist.

- **Intrusion Detection Systems**: Designed to detect all types of malicious network traffic and computer usage that cannot be detected by a firewall.
    - Example: Designed to detect denial-of-service attacks.
- **Encryption**: Process of converting an original message into a form that cannot be read by anyone except the intended receiver.
    - Majority use **Public-key encryption**—also known as asymmetric encryption—uses two different keys: a public key and a private key.
    - **Certificate Authority**: A third party that acts as a trusted intermediary between computers (and companies) by issuing digital certificates and verifying the worth and integrity of the certificates.
        - **Digital Certificate**: An electronic document attached to a file certifying that the file is from the organization it claims to be from and has not been modified from its original format.
- **Virtual Private Networking**: A private network that uses a public network (internet) to connect users.
    - "Virtual" due to the connections created when a transmission needs to be made and than terminated after the transmission is sent.
    - Common carriers include telephone service providers.
    - Advantages—allow remote users to access the company network. Also, allow flexibility—mobile users can access the organization's network from properly configured remote devices. Lastly, organizations can impose their security through VPNs.

- **Tunneling**: Encrypts each data packet to be sent and places each encrypted packet inside another packet.

- **Secure Socket Layer (SSL)**: Now called **Transport Layer Security (TLS)** an encryption standard used for secure transactions such as credit card purchases and on-line banking.
- **Vulnerability Management Systems**: AKA Security on Demand, extends the security perimeter that exists for the organization's managed devices.
- **Employee Monitoring Systems**: Monitor employees' computers, e-mail activities, and Internet surfing activities.

- **Application Controls**: Controls specific to one application. Are security controls fall into three major categories; input controls, processing controls and output controls.
  - Payroll and the approval of payroll wage rates.
  - **Input Controls**: Programmed routines that edit input data for errors before they are processed.
    - Social insurance numbers should not contain any alphabetical characters.
  - **Processing Controls**: Programmed routines that perform actions that are part of the record-keeping of the organization, reconcile and check transactions, or monitor the operation of applications.
    - Match entered quantities of goods received in the shipping area to amount ordered in authorized purchase orders.
  - **Output Controls**: Programmed routines that edit output data for errors, or help to ensure that output is provided only to authorized individuals.
    - Documentation specifying authorized recipients have received their reports, paycheques, or other critical documents.

Business Continuity Planning Backup, and Recovery

- The purpose of the business continuity plan is to keep the business operating after a disaster occurs.
- Strategies for business continuity:
    - **Hot Site**: A fully configured computer facility, with all services, communications links, and physical plant operations.
        - Reduce most risk, but most expensive.
    - **Warm Site**: Provides many of the same services and options as the hot site. However, a warm site typically does not include the actual applications the company needs.
        - Often does not include user work stations.
        - Includes computing equipment such as servers
    - **Cold Site**: Provides only basic services and facilities, such as a building or room with heating, air conditioning, and humidity control.
        - No computer hardware, or user work stations.
        - Reduce least risk, but least expensive.
    - **Off-site Data Storage**: A service that allows companies to store valuable data in a secure location geographically distant from the company's data center.
- **Audit**: In an IS environment, an audit is an examination of information systems, their inputs, outputs, and processing.

Chapter 4 - Summary

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Data is increasing at a hyperactive pace. We need sophisticated tools to manage such data. We transform data into information by sorting the data and making it easier to read. Than professionals use this organized data (information) and their experience to address a business problem. Thus, creating knowledge.

- Data needs to be high quality
    - Complete, accurate, timely, consistent, accessible, relevant and concise.

Difficulties of Managing Data:

- Increases rapidly over time.
- Scattered throughout organization that is collected by various methods of different individuals.
    - Numerous servers and locations, different computing systems, databases, formats, and human and computer languages.
- Multiple Sources
    - Internal sources
        - Corporate databases and company documents
    - Personal sources
        - Personal thoughts, opinions, experiences
    - External sources
        - Commercial databases, government reports and corporate websites
- **Clickstream Data**:
    - Data that visitors and customers produce when they visit a website and click on hyperlinks.
        - Provides user browsing patterns and users' activities in the website.
- Data degrade over time. Customers move to new addresses or change their names, companies go out of business or are bought out, new products are developed, employees are hired and fired, companies expand into new countries and so on.
- Data rot—refers primarily to problems with the media on which data are stored.
    - Physical problems to the media where data is stored makes it difficult to access it.

    - Finding machines to access certain data may be difficult.
        - Hard to find PC with floppy disk reader
- Data errors—information that is out of date, inaccurate, or technically corrupt.
- Legal requirements relating to data differ among countries and industries.
    - Change periodically

The Data Life Cycle:

- Process to effectively and efficiently manage data.
    - Collection of data from various sources:
        - May be collected manually or by assistance of technology (i.e., POS):
            - Internal data
                - Employee names, SIN
            - External data
                - Statistics Canada, Bank of Canada, Newspapers
            - Personal data
                - Opinions, Sales estimates from employees
    - Data is stored in one or more databases:
        - Processed to fit the format of:
            - Data Warehouse
            - Data Mart
    - Access data in the warehouse or mart for analysis
    - Analysis using various tools:
        - Look for patterns, and with intelligent systems, which support data interpretation.
- Such activities ultimately generate knowledge that support decision making in firms.

The Database Approach

- **Database Management System** (DBMS): A set of programs that provides users with tools to add, delete, access, and analyze data stored in one location.
    - Minimize the following problems:

        - Data redundancy: The same data are stored in many places.
        - Data isolation: Applications cannot access data associated with other applications.
        - Data inconsistency: Various copies of the data do not agree.
    - Maximize the following problems:
        - Data security: Databases have high security measures in place to deter mistakes and attacks.
        - Data integrity: Data meet certain constraints, no alphabetic characters in a SIN field.
        - Data independence: Applications and data are independent of one another. Applications can be designed to access the same data.

Data Hierarchy:

- **Bit** (Binary digit): Represents the smallest unit of data a computer can process. 0 or 1.
- **Byte** (Group of 8 bits): Represents a single character. A byte can be a letter, a number or a symbol.
- **Field**: A logical grouping of characters into a word, a small group of words, or an identification number.
    - Students name in a university computer file would appear in the "name" field.
    - SIN would appear in the SIN field.
    - A field can contain an image or other type of media.
- **Record**: A logical grouping of related fields, such as a students name, course taken, the date, and the grade.
- **File** or **Table**: A logical grouping of related records.
- **Database**: A logical grouping of related tables.

Designing The Database:

- Since the organization of data changed, new terms have been provided:
- **Data model**: A diagram that represents entities in the database and their relationships.

- **Entity**: (Previously known as a record) is a person, place, thing, or event—such as a customer, an employee, or a product—about which information is maintained.
- **Attribute**: Each characteristic or quality of a particular entity (previously called a field)
    - Customer name, employee number, product color.
- **Primary key** (identifier): Attribute or field that uniquely identifies a record so that it can be retrieved, updated, and sorted.
    - Student record at a College would most likely use student ID number as the primary key.
- **Secondary key**: Fields that have some identifying information but typically do not identify the record or entity with complete accuracy.
    - Students major might be secondary key if a user wanted to find all students in a particular major field of study. Primary key would not suit such example because many students have the same major.

Entity-Relationship Modeling:

- **Entity-Relationship (ER) modeling**: The planning and developing of a database.
- **Entity-relationship (ER) diagram**: Graphical representation of a database consisting of entities, attributes, and relationships.
- **Entity classes**: Grouping of entities of a provided type.
- **Instance**: Representation of one particular entity.
- **Identifiers**: Another name for a primary key, attributes (or fields) that are unique to the entity instance.
    - Attribute or field that uniquely identifies a record so that it can be retrieved, updated, and sorted.
- Relationships between 2 items are called binary relationships:
    - One-to-one relationship:
        - (1:1), A single-entity instance of one type is related to a single-entity instance of another type.
            - Student to parking permit. No student can have more than 1 parking permit and no parking permit can be provided to more than 1 student.
    - One-to-many relationship:

        - (1:M), Professor can have many classes, but each class can only have one professor.

    Many-to-many relationship:

        - (M:M), Students can have many classes, and a class can have many students.

Relational Database Management Systems

- Popular examples are Microsoft Access, Oracle 11g, IBM DB2

The Relational Database Model:

- The storage of data in two-dimensional tables where tables are related and each one contains entities (as records listed in rows) and attributes (as fields listed in columns).
- Generally not one big table called flat file, which contains all the records and attributes.
- Designed with a number of related tables.

Query Languages:

- **Structured Query Language** (SQL): Database language used to manage data in a relational database management system.
    - Most popular query language.
    - SELECT, FROM, WHERE.
- **Query by Example** (QBE): Language to find information in a database where the user fills out a grid or template (form) to construct a sample or description of the data wanted.
    - Able to use drag-and-drop feature in a DBMS such as Microsoft Access
        - Quicker than using SQL commands.
- Allows to the user to have the database report back results.

Data Dictionary:

- **Data dictionary**: Central repository that defines the format necessary to enter the data into the database.
- Describing or defining the nature of the data in the database

Normalization:

- **Normalization**: Method for analyzing and reducing a relational database to its most streamlined form for minimum redundancy, maximum data integrity, and best processing performance.

    - When normalized attributed in the table depend only on the primary key.
- Way of optimizing and analyzing your data in the database.
- Represent entity relationships in the most optimal way.

Data Warehousing

Essentially a data warehouse is a collection of databases.

- Make it easier and faster for users to access and query data.
- **Data Warehouse**: A repository of historical data organized by subject to support decision makers in the organization.
    - Facilitate the analysis of data via business intelligence tools such as:
        - Data mining
        - Decision support
- Characteristics of Data Warehouse:
    - Organized by business dimension or subject
    - Consistent
        - 0 and 1 or m and f for gender. In data warehouse it is consistent.
    - Historical
        - Kept for many years for use of rends, forecasting, making comparisons overtime.
    - Non-volatile
        - Do not change after entered into warehouse
    - Has ability to use on-line analytical processing
        - **On-line analytical processing** (OLAP): Performing complex, multi-dimensional analyses of data stored in a database or data warehouse.
        - **On-line transaction processing** (OLTP):Processing of business transactions electronically in real time.
        - Data warehouses are not designed to support OLTP but to support decision makers, provide better support for OLAP.
    - Multi-dimensional
        - Data warehouses store data in more than two dimensional tables.

        - **Multi-dimensional structure**: Process in data warehouses of storing and representing data in more than two dimensions.
            - Data cube (common representation of this multi-dimensional structure)
    - Relationship with relational databases
        - Data in data warehouses come from the company's operational databases which can be relational databases.
- Benefits of Data Warehouse:
    - End user are able to access needed data quickly and easily via web browsers because the data are located in one place.
    - End users can conduct extensive analysis with data in ways that may not have been possible before.
    - End users can obtain a consolidated view of organizational data.
- Benefits may improve business knowledge, provide competitive advantage, enhance customer service and satisfaction, facilitate decision making, and streamline business processes.
- Drawback may include:
    - Very expensive to build and to maintain
    - Incorporating data from obsolete mainframe systems can be difficult and expensive
    - People may be reluctant to share data with other departments
    - If transferred from other systems they may go through a cleansing process that changes the information
        - Reduces accuracy of data
- Used primarily by large companies

Data Marts:

- **Data mart**: small data warehouse that is designed for the end user's needs in a strategic business unit (SBU) or a department.
- Less costly than data warehouses
- Typical data mart = $100,000 compared to $1 million or more for a data warehouse.
- Data marts may be implemented quickly, often in less than 90 days.

- More rapid response due to less information that needs to be processed compared to a data warehouse
- Easier to learn and navigate
- Support local rather than central control by conferring power on the user group.

Data Governance

- 2 factors complicate data management:
    - Government Regulations:
        - Sarbanes-Oxley Act in USA
        - PIPEDA in Canada
    - Companies are drowning in data, much of them unstructured.
- **Data governance**: Approach to managing information across an entire organization.
- Strategy:
    - **Master data**: Set of core data, such as customer, product, employee, vendor, geographic location, and so on, that span the enterprise information systems.
        - Applied to multiple transactions and used to categorize, aggregate, and evaluate the transaction data.
            - Differ from transaction data:
                - Generated and captured by operational systems, describe the activities, or transactions, of the business.
    - Example: You (Oleg) purchase a 15” MacBook Pro laptop from BestBuy.
        - Master data includes product sold, vendor.
        - Transaction data includes 15” MacBook Pro, BestBuy.
    - **Master Data Management**: Process of storing, maintaining, exchanging, and synchronizing consistent, accurate, and timely core master data that spans all organizational business processes and applications.

Knowledge Management

- Concepts:

    - **Knowledge Management** (KM): Process that helps organizations manipulate important knowledge that is part of the organization's memory, usually in an unstructured format.
        - Knowledge must grow and be exchanged among people for an organization to be successful.
    - **Knowledge**: Information that is contextual, relevant, and actionable.
        - Data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity.
        - Knowledge is information in action
    - **Intellectual capital** (or intellectual assets): Another term for knowledge.
- Explicit and Tacit Knowledge
    - **Explicit knowledge**: Codified (documented) knowledge in a form that can be distributed to others or transformed into a process or strategy.
        - Policies, procedural guides, reports, products, strategies, goals, and core competencies of the enterprise.
        - Manuals
    - **Tacit knowledge**: Cumulative store of subjective or experiential learning (an organization's experiences, insights, expertise, know-how, trade secrets, skill sets, understanding, and learning).
        - Organizational culture
        - Generally imprecise, and costly to transfer.
        - Highly personal, thus making it difficult to codify in contract to explicit knowledge.
        - Difficult to put into writing.
        - Experience

Knowledge Management Systems:

- **Knowledge management systems** (KMSs): Process that helps organizations manipulate important knowledge that is part of the organization's memory, usually in an unstructured format.

    - Help organizations cope with turnover, rapid change, and downsizing by making the expertise of the organization's human capital widely accessible.

Benefits:

- **Best practices**: The most successful solutions or problem-solving methods for achieving a business outcome.
    - Account managers can now make available their tacit knowledge about how best to handle large accounts.
        - Can be used to train new account managers.
- Improved customer service
- Efficient product development
- Improved employee morale and retention

Challenges to implementing effective KMSs:

- Employees must be willing to share their tacit knowledge
    - Organizations should set up incentives for employees to share their expertise to the knowledge base.
- Knowledge base must be continuously updated
    - New knowledge added, old, outdated knowledge deleted.
    - Need investment to carry out such operations.

The Knowledge Management System Cycle:

- 1) Create Knowledge
    - People determine new ways of doing things
    - Develop know-how
    - External knowledge is brought in
- 2) Capture knowledge
    - New knowledge must be identified as valuable and represented in reasonable fashion.
- 3) Refine knowledge
    - New knowledge must be placed in context so that it is actionable.
    - Tacit qualities must be captured along with explicit facts.
- 4) Store knowledge
    - Stored in reasonable format in a knowledge repository for others to access it.
- 5) Manage knowledge

    - Like a library, knowledge is kept current. Reviewed regularly to verify that it is relevant and accurate.
- 6) Disseminate knowledge
    - Made available in a useful format to anyone in the organization who needs it, anywhere and anytime!

Chapter 5 - Summary

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Networks have 3 main usages or applications including discovery, communication and collaboration.

Discovery:

- **Search engine**: A computer program that searches for specific information, by keywords, and reports the results.
- WebCrawler's: computer programs that browse the Web and create a copy of all visited pages.
    - Search engines than index these pages, to create fast searches.
- **Metasearch Engines**: Search several engines at once and integrate the findings of the various search engines to answer queries posted by users.
- Language barrier on the internet is overcome by automatic translation
- **Portal**: 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.
- Four types of portals:
    - **Commercial (public) portals**: Most popular on the Internet. A website that offers fairly routine content for diverse audiences; offers customization only at the user interface.
        - Sympatico.ca
    - **Affinity portals**: Offer a single point of entry to an entire community of people with affiliated interests, such as hobby groups or a political party.
        - Alumni association at york university
    - **Corporate portals**: Offer a personalized, single point of access through a web browser to critical business information located inside and outside of an organization.
        - A.K.A enterprise portals, information portals, or enterprise information portals.
        - Associated with a single company.
    - **Industry-wide portals**: Serve entire industries.
        - Example: TruckNet.

    - The four portals are differentiated by the audiences they serve. Another type is a mobile portal is distinguished by its technology.
        - **Mobile portal**: Portals that are accessible from mobile devices.
            - Any of the four above may be accessed via mobile device.

Communication:

- Electronic Mail
    - Largest-volume application running on the Internet.
    - Email has replaced all but the telephone.
- Web-Based Call Centers
    - Email, telephone, simultaneous voice/web session.
- Electronic Chat Rooms
    - **Chat room**: virtual meeting place where groups of regulars come to "gab."
    - Exchange messages in real time.
    - Two types, web-based chat and internet relay chat.
- Voice Communication
    - **Internet Telephony (aka VoIP)**: Communication technology where analogue voice signals are digitized, sectioned into packets, and then sent over the Internet.
- Unified Communications
    - **Unified communications (UC)**: simplifies and integrates all forms of communications—voice, voice mail, fax, chat, e-mail, instant messaging, short message service, presence (location) services, and videoconferencing—on a common hardware and software platform.

Collaboration:

- **Collaboration**: refers to efforts by two or more entities (that is, individuals, teams, groups, or organizations) who work together to accomplish certain tasks.
- **Work group**: refers specifically to two or more individuals who act together to perform some task.

- **Workflow**: movement of information as it flows through the sequence of steps that makes up an organization's work procedures.
    - Tool for automating business processes
- **Virtual group (team)**: Group members who are in different locations and connected by means of collaboration technology.
    - Conduct virtual meetings.
- **Virtual collaboration**: refers to the use of digital technologies that enable organizations or individuals to collaboratively plan, design, develop, manage, and research products, services, and innovate applications.

Collaboration Software:

- Microsoft SharePoint Workspace
- Google Docs
    - Free web-based word processor, spreadsheet, and presentation application.
    - Allows multiple users at the same time to share and edit documents.
- IBM Lotus Quickr
    - Provides on-line team spaces which enables users to collaborate.
- Jive
    - Uses forums, wikis, blogs to allow people to share content with version management via discussion rooms, calendars, and to-do lists.

Electronic Teleconferencing:

- Tools that support collaborations.
- **Teleconferencing**: use of electronic communication that allows two or more people at different locations to hold a simultaneous conference.
    - Telephone conference call
        - Lacks face-to-face element
    - **Videoconference**: participants in one location can see participants' documents and presentations at other locations.

Web 2.0 Technologies:

- Web 1.0 was the first generation of the World Wide Web
- Web 2.0 is a popular term that is proving difficulties to define.
    - **Web 2.0**: is a loose collection of information technologies and applications, and the websites that use them.
- **AJAX**: Asynchronous Java Script and XML is a web development technique that allows portions of web pages to reload with fresh data instead of requiring the entire web page to reload.
    - Speeds up response time and increases user satisfaction.
- **Tagging**: A keyword or term that describes a piece of information (picture, blog an article or a video clip).
- **Weblog**: Blog for short. Personal website, open to the public, in which the site creator expresses his feelings or opinions.
    - **Blogosphere**: Term for the millions of blogs on the Web.
- **Wikis**: A website on which anyone can post material and make changes to other material.
- **Really Simple Syndication** (RSS): Allows users to receive the information they want (customized information), when they want it, without having to surf thousands of websites.
- **Podcasts**: A digital audio file that is distributed over the Web using RSS for playback on portable media players and personal computers.
- **Videocast**: Same as a podcast, except that it is a digital video file.

Web 2.0 Website Categories:

- **Social Networking**: websites allow users to upload their content to the Web in the form of text (for example, blogs), voice (for example, podcasts), images, and videos (for example, videocasts).
- **Aggregators**: websites that provide collections of content from the Web. Well-known aggregator websites include:
    - Bloglines
    - Digg
    - Simply Hired
    - Technorati
- **Mashups**: a website that takes different content from a number of other websites and mixes them together to create a new kind of content.

E-Learning and Distance Learning

- **E-learning**: refers to learning supported by the Web.
    - Take place inside classrooms as a support to conventional teaching.
        - Students can work on the Web during class.
    - Virtual class rooms, all work done on the Web.
- **Distance learning** (DL): refers to any learning situation in which teachers and students do not meet face-to-face.
- Benefits:
    - Deliver current content that is high quality and consistent.
    - Flexibility to learn anywhere, at any time, and at their own pace.
    - Learning time generally shorter, may be trained within a provided time-frame.
    - Reduces training costs in that sense, as well as the expense of renting facility space.
- Drawbacks:
    - Must be computer literate
    - Lack face-to-face interaction
    - Assessing work may be problematic
        - Who truly completed the work?

Virtual Universities: On-line universities that students use to take classes from home or at an off-site location, via the Internet.

Telecommuting:

- **Telecommuting**: Ability to work from anywhere and at any time enabled by information technology.
    - Knowledge workers are being called the distributed workforce.
- Advantages:
    - Employees
        - Reduced stress
        - Improved family life
        - Employment opportunities for housebound people such as single parents/persons with disabilities
    - Employer
        - Increased productivity

        - Ability to retain skilled employees
        - Ability to attract employees who don't live within commuting distance
- Disadvantages:
    - Employees
        - Increased feelings of isolation
        - Possible loss of fringe benefits
        - Lower pay (in some cases)
        - No workplace visibility
        - Potential for slower promotions
        - Lack of socialization
    - Employers
        - Difficulties in supervising work
        - Potential data security problems
        - Training costs

Chapter 6 - Summary

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Overview of E-Business and E-Commerce:

- E-commerce provides opportunities for companies to expand worldwide at a small cost, increase market share and reduce costs.
- Many small businesses are able to operate and compete in market spaces once dominated by larger companies.
- **Electronic commerce**: Process of buying, selling, transferring, or exchanging products, services, or information via computer networks, including the Internet.
- **E-business**: Process of buying, selling, transferring, or exchanging products, services, or information via computer networks, including the Internet. The electronic servicing of customers, collaboration with business partners, and performance of transactions within an organization.

Pure Versus Partial E-Commerce:

- **Bricks-and-mortar organizations**: Purely physical organizations.
- **Virtual** (pure-play) **organizations**: Company engaged only in electronic commerce.
    - Pure EC
        - Example: Buying an e-book from Amazon.ca or Buy.com.
- **Clicks-and-mortar organizations**: An organization that conducts some e-commerce activities over the Internet, yet its primary business is conducted in the physical world.
    - Partial EC
        - Example: Buying a shirt from Wal-Mart on-line or a book from Amazon.ca.

Types of E-Commerce:

- **Business-to-consumer** (B2C): Electronic transactions where the sellers are organizations and the buyers are individuals.
- **Business-to-business** (B2B): Electronic transactions where both the sellers and the buyers are organizations.
- **Consumer-to-consumer** (C2C): The selling of products or services between individuals.
    - Example: eBay, auctions, classified ads

- **Business-to-employee** (B2E): The provision of information and services from an organization to its employees via electronic means.
    - Discounted insurance, travel packages, and tickets to events on the corporate intranet. Sell company products to employees at a discount.
- **E-government**: The government's use of Internet technology in general and e-commerce in particular to deliver information and public services to citizens and business partners and suppliers.
    - G2C EC or G2B EC
        - Example of G2C EC is electronic benefits transfer in which governments transfer benefits such as employment insurance or Canada Pension Plan payments directly to recipients' banks accounts.
- **Mobile commerce** (m-commerce): Buying and selling goods that is conducted entirely in a wireless environment.
    - Using cell phones to shop over the Internet.
- **Business model**: Method by which a company generates revenue to sustain itself.
    - On-line direct marketing: Sell directly to customers. Efficient for digital products and services. Allows customization.
    - Electronic tendering system: Request quotes from suppliers.
    - Name-your-own-price: Customers decide how much they are willing to pay.
    - Find-the-best-price: Customers specify a need; an intermediary compares providers and shows the lowest price. Customers must accept the offer in a short time or may lose the deal.
    - Affiliate marketing: Vendors ask partner to place logos on partner's site. Vendor commissions the partners if the logo is used and product is purchased.
    - Viral marketing: Receivers send information about your product to their friends.
    - Group purchasing: Small buyers aggregate demand to get a large volume, then the group conducts tendering or negotiates a low price.

- On-line auctions: Companies run auctions of various types on the Internet. C2C is very popular.
- Product customization: Customers use the Internet to self-configure products or services. Sellers then price them and fulfill them quickly (build-to-order).
- Electronic marketplaces and exchanges: Transactions are conducted efficiently in electronic marketplaces.
- Bartering on-line: Intermediary administer on-line exchanges of surplus products and/or company receives "points" for its contribution, and the points may be used to purchase other needed items.
- Deep discounters: Company offers deep price discounts. Appeals to customers who consider only price in their purchasing decisions.
- Membership: Only members can use the services provided, including access to certain information, conducting trades, etc.

Major E-Commerce Mechanisms:

- **Auction**: Competitive process in which either a seller solicits consecutive bids from buyers or a buyer solicits bids from sellers.
  - **Forward auctions**: An auction selling goods or services where buyers bid continuously for them.
    - Highest bidder wins the items, eBay.
  - **Reverse auctions**: An auction selling goods or services where the supplying firms place bids for them.
    - Lowest bidder wins the items, government and large corporations use this approach.
      - A buyer want to buy a product or service, buyer posts a request for quotation.
- May be conducted on seller's site, buyer's site, or a third party's site (eBay).
- Electronic storefront: represents a single store
- Electronic Mall (Cybermall or e-mall): collection of individuals shops under one Internet address.
  - Closely related to B2C EC.

- **Electronic marketplace**: Central virtual market space on the Web where many buyers and many sellers can conduct electronic commerce and electronic business activities.
    - Related to B2B EC.

Benefits of E-Commerce:

- Makes national and international markets more accessible by lowering the costs of processing, distributing, and retrieving information.
- Customers are able to access a vast amount of products and services around the clock
- Major society benefit is the ability to easily and conveniently deliver information, services, and products to people in cities, rural areas and developing countries.

Limitations of E-Commerce:

- Technological:
    - Lack of universally accepted security standards
    - Insufficient telecommunications bandwidth
    - Expensive accessibility
- Non-technological:
    - Perception that EC is insecure
    - Unresolved legal issues
    - Lacks a critical mass of sellers and buyers

Business-to-Consumer (B2C) EC:

- B2B EC is larger by volume than B2C EC.
    - B2C is more complex.
- Electronic Storefronts and Malls:
    - **Electronic retailing** (e-tailing): Direct sale of products and services through electronic storefronts or electronic malls.
    - **Electronic storefront**: Website that represents a single store.
    - **Electronic malls**: Collection of individual shops under one Internet address.
        - AKA referral malls, in most cyber malls you cannot buy anything but, instead, transferred from the mall to a participating storefront.

- On-line Service Industries:
  - **Disintermediation**: Process of eliminating intermediaries ("middle men") when conducting business transactions.
  - **Cyberbanking**: Conducting various banking activities from home, at a place of business, or on the road instead of at a physical bank location.
  - **Virtual banks**: Bank with only an Internet presence.
  - On-line securities trading
  - On-line job market
  - Travel services
    - Expedia.ca, Travelocity.ca, itravel2000.com
- Issues in E-tailing:
  - **Channel conflict**: Problem in electronic retailing where different distribution channels compete for the same customer.
    - **Multi-channeling**: Integrating a company's on-line and traditional selling channels.
  - Order fulfillment issue: Must process orders in a timely manner, fulfill returns for damaged/defective products, collect the money from customers. Very difficult to accomplish such tasks because company has to ship small packages to many customers effectively and efficiently.
    - Additionally, includes customer service
- On-line Advertising:
  - Internet advertising redefines the advertising process
    - Media-rich, dynamic and interactive.
    - May be updated at any time at minimal cost and therefore be kept current.
    - Reach large numbers of potential buyers all over the world.
    - Cheaper than radio, television and print ads.
    - Targeted to specific interest groups
      - Downside:
        - No concrete way to measure effectiveness of advertising online. Thus, cannot justify costs toward internet advertising.

- Advertising Methods:
    - **Banners**: Electronic billboard on a website. These typically contain a short text or graphical message to promote a product or a vendor.
        - Most commonly used form of advertising on the Internet.
        - Advantage:
            - Customized to the target audience.
        - Disadvantage:
            - Convey limited information due to their small size.
            - Many viewers ignore them.
    - **Pop-up ad**: Website advertisement that appears in front of the active browser window.
    - **Pop-under ad**: Website advertisement that appears underneath the active browser window.
    - E-mail: Company has a list of e-mail addresses, place them in a customer database.
        - **Spamming**: Indiscriminate distribution of electronic ads without the permission of the receiver.
        - Responses to spamming:
            - **Permission marketing**: Asking consumers to provide their permission to voluntarily accept marketing tools such as on-line advertising and e-mail.
                - CashSurfers.com
            - **Viral marketing**: On-line "word-of-mouth" marketing.

Business-to-Business (B2B) EC:

- **Sell-side marketplace model**: The selling of products or services to other organizations electronically from a company's own private e-marketplace website and/or from a third-party website.
    - Forward auction
- **Buy-side marketplace**: Electronic business model in which organizations attempt to buy needed products or services from other organizations electronically.

    - Reverse auction
    - **E-procurement**: The purchasing of goods and services using electronic means.
    - **Group purchasing**: The combining of orders by multiple buyers so that they constitute a large volume and therefore attract more seller attention.
        - May negotiate for a volume discount
- **Public exchanges** (exchanges): E-marketplace in which there are many sellers and many buyers.
    - Frequently owned and operated by third parties.
    - **Vertical exchanges**: Website connecting buyers and sellers in a provided industry.
    - **Horizontal exchanges**: Website connecting buyers and sellers across many industries, used mainly for maintenance, repair, and operations materials.
    - **Functional exchanges**: Website where services such as temporary help or extra office space are traded on an "as-needed" basis.

Electronic Payments:

- **Electronic payment systems**: System for paying for goods and services through electronic means.
    - Include: electronic checks, credit cards, purchasing cards, electronic cash.
- Electronic Checks:
    - Similar to regular paper checks.
    - Used mostly in B2B
    - Need a checking account in a bank prior to establishing e-checks.
    - E-mail and encrypted electronic check to the seller. Seller deposits the check in a bank account, and funds are transferred from buyer account to seller account.
    - E-checks carry a signature like regular checks but in digital form. May be verified.
- Electronic Credit and Debit Cards;

    - Allow clients to charge online payments to their credit card account.
    - 1) Credit card information and purchase amount are encrypted in your browser.
    - 2) Information arrives at store you are trying to purchase items from example, Amazon, it is not opened. Rather transferred automatically to a clearinghouse where the information is decrypt for verification and authorization.
    - 3) Clearinghouse asks the bank that issued you your credit card to verify your credit card information
    - 4) Card issuer bank verified your information an reports this to the clearinghouse.
    - 5) Clearing house reports the result of verification of your credit card to Amazon.
    - 6) Amazon reports a successful purchase and amount to you
    - 7) Your card issuer bank sends funds in the amount of purchase to Amazon's bank
    - 8) Your card issuer bank notifies you of the debit on your credit card.
    - 9) Amazon's bank notifies Amazon of the funds credited to its account
        - Primarily used in B2C or Small-to-Medium Enterprises (SMEs)
        - Alternative to credit cards to enhance ones security for fraud or identity theft protection is the use of virtual credit cards.
- Purchasing Cards:
    - The B2B equivalent of electronic credit cards.
    - Payment are settled within a week.
    - Used for unplanned B2B purchases, and corporations generally limit the amount per purchase (1000-2000).
- Electronic Cash:
    - Appears in four major forms including the following:
        - **Stored-value money cards**: Card the size of a credit card that stores a fixed amount of prepaid money.
            - Example: York University card.

        - **Smart cards**: (or smart ID card) Card containing an embedded chip with pertinent information about the user.
            - Contain more than 100 times of information than stored-value money card.
            - Multi-purpose, may be used as a credit card, debit card or stored-value money card.
            - Ideal for small payments, of a few dollars or less.
        - **Person-to-person payment**: Form of e-cash that enables two individuals or an individual and a business to transfer funds without using a credit card.
            - Examples: PayPal (limited to the amount of money on account).
        - **Digital wallets** (e-wallets): Software mechanisms that provide security measures, combined with convenience, to electronic commerce purchasing.
            - Wallet stores the financial information of the buyer, such as credit card number, shipping information, and so on.
                - Enables the buyer with the convenience of not re-entering sensitive information for each purchase.
                - If stored on merchants website, does not have to travel on the Internet for each purchase, making the information more secure.

Ethical and Legal Issues in E-Business:

- Ethical Issues:
    - Privacy concern when conducting business online. Encryption is one way to provide such protection.
    - Tracking is another privacy issue.
    - EC may eliminate the need for some of a company's employees, as well as brokers and agents.
- Legal Issues Specific to E-Commerce:
    - Fraud on the internet

        - Scams
    - Domain Names:
        - Competition over domain names. Use of similar domain names as other companies.
        - **Cybersquatting**: Registering or using domain names for the purpose of profiting from the goodwill or trademark belonging to someone else.
        - Domain tasters
            - Able to try the domain for 5 days and than return it back at no cost.
            - Benefit from quick profits.
            - Risk 0 while profit margin is 100%.
    - Taxes and Other Fees:
        - Issues regarding who should be taxed?
            - The province in which the seller is located?
            - The province in which the server is located?
    - Copyright:
        - When people purchase the software, they have bought the right to use it, not the right to distribute it.
        - The right to distribute the software remains with the copyright holder.
        - Copying material from websites without permission is a violation of copyright laws.

Chapter 7 - Summary

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Wireless Technologies:

- Include devices
  - Example: Smart phones
- Transmission media
  - Example: Microwave, satellite, radio
- Wireless Devices:
  - **Wireless application protocol** (WAP): The standard that enables wireless devices with tiny display screens, low-bandwidth connections, and minimal memory to access web-based information and services.
  - **Microbrowsers**: Internet browsers with a small file size that can work within the low-memory constraints of wireless devices and the low bandwidths of wireless networks.
  - **Short message service** (SMS): A service provided to digital cellphones that can send and receive short text messages (up to 160 characters in length).
  - Downside to smartphones:
    - Individuals are able to copy and pass on confidential information.
      - Potential solution is cell phone jamming devises.
- Wireless Transmission Media:
  - Transmit signals over the air or in space.
    - **Microwave transmission**: A wireless system that uses microwaves for high-volume, long-distance, point-to-point communication.
      - Advantages: High bandwidth, relatively inexpensive
      - Disadvantages: Must have unobstructed line of sight, susceptible to environmental interference
    - **Satellite transmission**: A wireless transmission system that uses satellites for broadcast communications.
      - Advantages: High bandwidth, large coverage area
      - Disadvantages: Expensive must have unobstructed line of sight, signals experience

propagation delay, must use encryption for security

- Geostationary (GEO)
    - Farthest from the earth
    - Remain stationary relative to point on earth
    - Few satellites needed for global coverage
    - Most expensive to build launch
    - Delay approximately 25 seconds
    - Longest orbital life (many years)
    - **Propagation delay**: The one-quarter second transmission delay in communication to and from geostationary earth orbit satellites.
        - Use: TV Signal
- Medium Earth Orbit (MEO)
    - Satellites move relative to point on earth
        - Tracking is needed
    - 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)
        - Use: GPS
- Low Earth Orbit (LEO)
    - Closest to the earth
    - Satellites move rapidly relative to point on earth
        - Must be tracked by recievers
    - 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)
            - Use: Telephone
    - **Global positioning system** (GPS): A wireless system that uses satellites to enable users to determine their position anywhere on earth.
        - Provided by 24 MEO satellites that are shared worldwide.
    - Internet over Satellite (IoS): In many regions of the world, IoS is the only option available for Internet connections because installing necessary cables is either too expensive or is physically impossible.
        - GEO satellites from a dish mounted on the side of individuals homes provides the capability of IoS.
- **Radio transmission**: Transmission that uses radio-wave frequencies to send data directly between transmitters and receivers.
    - Advantages: High bandwidth, signals pass through walls, inexpensive and easy to install.
    - Disadvantages: Creates electrical interference problems, susceptible to snooping unless encrypted.
    - **Satellite radio** (digital radio): A wireless system that offers uninterrupted, near CD-quality music that is beamed to radios from satellites.
- **Infrared**: A type of wireless transmission that uses red light not commonly visible to human eyes.
    - Advantages: Low to medium bandwidth, used only for short distances
    - Disadvantages: Must have unobstructed line of sight

        - Example of uses: Remote control units for televisions, VCRs, DVDs, and CD players.

Wireless Computer and Internet Access:

- Short-Range Wireless Networks:
    - **Bluetooth**: Chip technology that enables short-range connection (data and voice) between wireless devices.
        - **Personal area network**: A computer network used for communication among computer devices close to one person.
        - Common uses: Wireless headsets for cell phones, portable music players.
        - Omnidirectional radio waves enables users of Bluetooth not to directly point one Bluetooth device at another for a connection to occur.
    - **Ultra-wideband** (UWB): A high-bandwidth wireless technology with transmission speeds in excess of 100 Mbps that can be used for such applications as streaming multimedia from a personal computer to television.
        - May be used in health-care environment where personnel and equipment wear tags that are enabled with Ultra-wideband technology provide real-time location of them.
    - **Near-field communications** (NFC): The smallest of the short-range wireless networks that is designed to be embedded in mobile devices such as cellphones and credit cards.
        - Example: PayPass
- Medium-Range Wireless Networks:
    - **Wireless fidelity** (Wi-Fi): A set of standards for wireless local area networks based on the IEEE 802.11 standard.
        - Benefits: Fast and easy Internet or intranet broadband access from public hotspots located at airports, hotels, Internet cafes, coffee shops, universities, conference centers, offices and homes. Low cost and its ability to provide simple Internet access.

        - Drawbacks: Roaming—cannot roam from hotspot to hotspot if the hotspots use different Wi-Fi network services, unless its free, security—difficult to shield from intruders due to Wi-Fi using radio waves, and cost—although Wi-Fi services are relatively inexpensive, many expert question whether commercial Wi-Fi services can survive when so many free hotspots are available to users.
            - **Wireless local area network** (WLAN): A computer network in a limited geographical area that uses wireless transmission for communication.
                - A wired LAN without the cables
                - **Wireless access point**: An antenna connecting a mobile device to a wired local area network.
                    - **Hotspot**: A small geographical perimeter within which a wireless access point provides service to a number of users.
                    - **Wireless network interface card** (NIC): A device that has a built-in radio and antenna and is essential to enable a computer to have wireless communication capabilities.
    - **Mesh networks**: Multiple Wi-Fi access points used to create a wide area network; a series of interconnected LANs.
- Wide-Area Wireless Networks:
    - **Cellular telephones** (cell phones): Telephones that use radio waves to provide two-way communication.
        - 1G: Used analog signals and had low bandwidth (capacity)
        - 2G: Digital signals primarily for voice communication
        - 3G: Digital signals
        - 4G: Under development and does not fall under one defined technology or standard.

    - Wireless Broadband or WiMAX:
        - Secure system
        - Voice and video features
        - Can transmit broadband Internet connections to antennas on homes and businesses kilometers away
        - Long-distance broadband wireless access to rural areas and other locations that are not currently being served

Mobile Computing and Mobile Commerce:

- 2 major characteristics that differentiate mobile computing from other forms include:
    - Mobility: users carry a device with them and can initiate a real-time contact with other systems from wherever they happen to be.
    - Broad reach: many individuals carry an open mobile device, they can be reached instantly, even across great distances.
- 2 characteristics create five value-added attributes:
    - Ubiquity: a mobile device can provide information and communication regardless of the user's location.
    - Convenience and Instant Connectivity: Internet-enabled mobile device, you can access the Web, intranets and other mobile devices quickly and easily without booting up a PC or placing a call via a modem.
    - Customization: customize information and send it to individuals consumers as an SMS.
    - Localization: knowing a clients physical location helps the company advertise its products and services.

Mobile Commerce:

- Development of m-commerce is provided by the following factors:
    - Widespread availability of mobile devices
    - No need for a PC
    - The "cell phone culture"
        - Use of SMS in young people and increasing use of instant messaging.
    - Declining prices
    - Bandwidth improvement

        - WiMAX

Mobile Commerce Applications:

- Financial Services:
    - Mobile banking
    - Wireless electronic payment systems
    - Micropayment
        - Payments for less than $10 are considered micropayments.
        - In Germany you can use your cell phone to pay the taxi driver.
    - **Mobile wallet** (m-wallet, wireless wallet): A technology that allows users to make purchases with a single click from their mobile devices.
    - Wireless bill payments
- Intrabusiness Applications:
    - Companies may use non-voice mobile services to assist employees in dispatch functions; that is, to assign jobs to mobile employees, along with detailed information about the job
        - Example: Transportation, utilities, field service, health care security.
- Accessing Information:
    - **Mobile portals**: A portal that aggregates and provides content and services for mobile users.
    - **Voice portals**: A website with an audio interface.
- Location-based Applications:
    - **Location-based commerce** (L-commerce): commerce transactions targeted to individuals in specific locations at specific times.
        - Shopping from Wireless Devices:
            - Can shop at amazon using their cell phone wirelessly or participate at auctions such as eBay.
        - Location-based services:
            - Provide information specific to a location including nearest business or service (ATM), receive alerts (warnings of a traffic jam), can find a friend.

        - Location-based advertising:
            - Once marketers know the current locations and preferences of mobile users, they are able to send user-specific advertising messages to wireless devices about nearby shops, malls, etc.
- Wireless Telemedicine:
    - Storing digital images and transferring them from one location to another
    - Patient-medical specialist consultation in different locations in real-time
    - Robots to perform remote surgery
- Telemetry Applications:
    - **Telemetry**: The wireless transmission and receipt of data gathered from remote sensors.
        - Uses: Identify maintenance problems in equipment, doctors can monitor patients and control medical equipment from a distance, car manufacturers use telemetry applications for remote vehicle diagnosis and preventative maintenance.

Pervasive Computing:

- Invisible "everywhere computing" that is embedded in the objects around us—floor, lights, cars, washing machine, cell phones, clothes and so on.
- **Radio-frequency identification technology** (RFID): A wireless technology that allows manufacturers to attach tags with antennas and computer chips on goods and then track their movement through radio signals.
    - Active RFID tags:
        - Use internal batteries for power and they broadcast radio waves to a reader. More expensive due to batteries than passive RFID tags and can be read over greater distances.
            - Used for more expensive items
    - Passive RFID tags:

        - Rely entirely on readers for their power. They are less expensive than active tags and can be read only up to 6 meters.
            - Used for less expensive items
    - Alternative to RFID is RuBee and a competitor is Memory Spot (HP)
        - RuBee:
            - Surpasses the disadvantages associated to radio wave signal interference by functioning better in such environment using magnetic signals. Not susceptible to magnetic interference.
        - Memory Spot:
            - Tiny chip that is able to hold a small amount of information. Competitor of RFID tags.
    - RFID tags:
        - Developed to replace bar codes.
            - Bar codes require line of sight to the scanning device
            - Bar codes are printed on paper, they can be ripped, soiled, or lost
            - Bar code identifies the manufacturer and product but not the actual item
- **Wireless sensor networks** (WSNs): Network of interconnected, battery-powered, wireless sensors (called motes) placed in the physical environment.
    - Motes collect data from many points over an extended space.
    - Each mote activates for a fraction of a second when it has data to transmit and then relays that data to its nearest neighbor.
    - Advantage:
        - If one mote fails another can pick up the data.
            - Efficient and reliable
        - Easily upgradable by adding more motes to increase bandwidth where and when required.
        - Determine information with greater accuracy

        - Example: which direction a person is moving, weight of a vehicle, amount of rainfall over a field of crops
    - Example of a wireless sensor: ZigBee

Wireless Security:

- There are four major threats unique to wireless networks:
    - Rogue access: unauthorized access point to a wireless network
        - Evil twin attack—attacker is in the vicinity with a Wi-Fi enabled computer and a separate connection to the Internet. Using a hotspotter—a device that detects wireless networks and provides information on them—the attacker simulates a wireless access point with the same network name or SSID as the one that authorized users expect. Users connect to it not knowing it is a replica of the real access point and may provide confidential information to the attacker once connected and asked for various information
            - More prone in public hotspots McDonald's or Starbucks than in corporate networks
    - War driving: act of locating wireless local are networks while driving/walking around a city or elsewhere. Intruder may obtain free Internet connection and possible gain access to important data and other resources
    - Eavesdropping: efforts by unauthorized users to access data that are travelling over wireless networks
    - Radio-frequency (RF) jamming: person or a device intentionally or unintentionally interferes with your wireless network transmissions

Chapter 8 - Summary

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Transaction Processing Systems:

Transaction: Any business event that generates data worth capturing and storing in a database.

- Examples include product manufactured, service sold, person hired, payroll check generated.

Transaction Processing Systems (TPSs): Monitor, collect, store, and process data generated from all business transactions.

- Have to handle large volume and large variations in volume (peak times) efficiently.
- Must avoid errors and downtime, record results accurately and securely, and maintain privacy and security.
- Process:
  - First data are collected by people or sensors and are entered into the computer via an input device.
    - Source data automation (try to automate the process as much as possible)
  - System processes data in one of two ways:
    - **Batch processing**: The use of a transaction processing system to process data in batches at fixed periodic intervals.
      - Collects data from transactions as they occur placing them in groups or batches. Then processes the batches periodically (say, every night).
    - **On-line processing**: AKA Real-time transaction processing—Processing where transactions are processed on-line as soon as they occur.
      - By means of on-line technologies and in real time.
  - Business event or transaction (scanning barcode)
    - Transaction processing system → Organizations database
      - Detailed reports
    - Organizations database includes:
      - Functional Area Information System
      - Decision Support System
      - Business Intelligence

        - Expert System

Functional Area Information Systems:

- A system that provides information to managers (usually mid-level) in the functional areas, in order to support managerial tasks of planning, organizing, and controlling operations.
    - Access data from the corporate databases.

Information Systems for Accounting and Finance:

- Accounting: Payroll, accounts payable/receivable, auditing, budgeting, profitability planning.
- Finance: Manage cash, manage financial transactions, investment management, financial planning.
- Primary mission is to manage money flows into, within, and out of organizations. Mission is broad as to money being involved in all functions of an organization. Thus, accounting and finance information systems are very diverse and comprehensive.
- Financial planning and budgeting:
    - Plan for the acquisition of resources and their use
        - **Financial and economic forecasting**: Knowledge about availability and cost of money. Cash flow projections are significant because they tell organizations what funds they need and when, and how to acquire them.
        - **Budgeting**: Annual budget, which allocates the company's financial resources among participants and activities.
            - Several software packages available to support budgeting preparation and control.
    - Managing financial transactions:
        - **Global stock exchanges**: Financial markets operate in global, 24/7/365, distributed electronic stock exchanges that use the Internet both to buy and sell stocks and to broadcast real-time stock prices.
        - **Managing multiple currencies**: Global trade involves multiple currencies. Conversion ratios of these currencies change very quickly. Financial/accounting

systems take financial data from different countries and convert the currencies from and to any other currency in seconds. Manage multiple languages as well.
        - **Virtual close**: Companies want to close their books at any time to provide them with real-time information on the organization's financial health.
        - **Expense management automation**: (EMA) refers to systems that automate the data entry and processing of travel and entertainment expenses. Web-based applications the enable companies to quickly and consistently to collect expense information, enforce company policies and contracts, and reduce unplanned purchases or travel expenses. Also enable companies to reimburse their employees more quickly, because expense approvals are not delayed by poor documentation.
    - Investment Management:
        - To monitor, interpret, and analyze the huge amounts of on-line financial data, financial analysts employ two major types of IT tools:
            - Internet search engines
            - Business intelligence and decision support software
    - Control and Auditing:
        - **Budgetary control**: Using the annual budget that is prepared, the organization divides those amounts into monthly allocations. Managers at various levels monitors departmental expenditures and compare them against the budget and the operational progress of the corporate plans.
        - **Internal auditing**: Internal auditors can evaluate the controls at the organization and evaluate the organization's risk assessment and governance processes.

        - **Financial ratio analysis**: Assessing a company's financial ratios including liquidity, activity, debt and profitability ratios.

Information Systems for Marketing:

- Set pricing, profile customers, customer relations, sales force automation, sales forecasting, advertising planning.
- Needs to know customers needs and wants to be successful. Customer-centric organizations are so important that customer relationship management is devoted to them.

Information Systems for Production/Operations Management:

- Order fulfillment, order processing, quality control, inventory management, product life cycle management.
- Responsible for transforming inputs into useful outputs and for the operation of the business.
- In-House Logistics and Materials Management:
    - Deals with orderings, purchasing, inbound logistics (receiving), and outbound logistics (shipping) activities.
    - **Inventory management**: When to order and how much to order.
        - EQL (Economic order quantity) model supports such decisions.
        - VMI (vendor-managed inventory) eliminates the need for the company to submit purchase orders. Suppliers monitor inventory levels and ship products as they are needed.
    - **Quality control**: May be collected by web-based sensors and interpreted in real time, or they can be stored in a database for future analysis.
- Planning Production and Operations:
    - Material requirements planning (MRP) – Planning process that integrates production, purchasing, and inventory management of interdependent items.
    - Manufacturing resource planning (MRP II) – involves more complex integrated software. Involves more complex planning which also involves allocated related resources such as money and labor.

    - MRP II has evolved into enterprise resource planning.
- **Computer-Integrated Manufacturing**: An approach that integrates various automated factory systems.
    - 3 Goals:
        - Simplify manufacturing technologies and techniques
        - Automate as many of the manufacturing processes as possible
        - Integrate and coordinate design, manufacturing, and related functions via computer systems.
- Product Life Cycle Management:
    - Product life cycle management (PLM) is a business strategy that enables manufacturers to share product-related data to support product design and development and supply chain operations.
    - PLM applies web-based collaborative technologies to product development.
    - PLM enables collaboration between manufacturing process and logistics essentially forming a single team that manages the product from its inception through it completion.

Information Systems for Human Resource Management:

- Maintain employee records, benefits administration, performance evaluation, employment planning, outsourcing.
- Use HRIS portals to advertise job openings and conduct on-line hiring and training.
- Recruitment:
    - With millions of resumes available on-line, with the help of specialized search engines companies are able to narrow down the applicants. On-line recruiting may reach more candidates, which may bring better applicants. Cost is lower than traditional recruiting methods such as newspapers or in trade journals.
- Human Resources Maintenance and Development:
    - Evaluations are digitized and are used to support many decisions, ranging from rewards, to transfers, to layoffs.

    - Intelligent computer instruction and multimedia support for instructional activities are used to train and re-train employees.
- Human Resources Planning and Management:
    - **Payroll and employees' records**: Automated process where paychecks being printed or money being transferred electronically into employees' bank accounts.
    - **Benefits administration**: Employees' work contributions to their organizations are rewarded by wages, bonuses, and other benefits. Benefits include expanded health and dental care, pension contributions, fitness programs, and child care centers.
    - **Employee relationship management**: (ERM) – companies are developing employee relationship management applications.
        - Example: call center for employees' problems.

Functional Area Information Systems Reports:

- **Routine reports**: Reports produced at scheduled intervals.
    - Range from hourly quality control reports to daily reports on absenteeism rates.
- **Ad-hoc (on-demand) reports**: Non-routine reports that often contain special information that is not included in routine reports.
    - **Drill-down reports**: Reports that show a greater level of detail than is included in routine reports.
    - **Key-indicator reports**: Reports that summarize the performance of critical activities.
        - Chief financial officer might want to monitor cash flow and cash on hand.
    - **Comparative reports**: Reports that compare performances of different business units or time periods.
- **Exception reports**: Reports that include only information that exceeds certain threshold standards.
    - First creates performance standards.
    - Next, sets up system to monitor performance
    - Next, compare actual performance with the standards, and identify predefined exceptions.

    - Managers are alerted to the exceptions via exception reports.
        - Exception reports save managers' time and help them focus on problem areas.

Enterprise resource planning (ERP) **systems**: Information system that takes a business process view of the overall organization to integrate the planning, management, and use of all of an organization's resources, **employing a common software platform and database.**

- Major objective of ERP systems is to tightly integrate the functional areas of the organization and to enable information to flow seamlessly across the functional areas.
    - Changes in one functional area are immediately reflected in all other pertinent functional areas.
    - Essentially, ERP systems provide information necessary to control the business processes.
        - Leading ERP software vendor is SAP, others include Oracle, PeopleSoft.

Evolution of ERP Systems:

- Over time, ERP systems evolved to include administrative, sales, marketing, and human resources processes. Companies that use an enterprise-wide approach to ERP using Web to connect all facets of the value chain are called ERP II.

ERP II Systems: Interorganizational ERP systems that provide web-enabled links between key business systems (such as inventory and production) of a company and its customers, suppliers, distributors, and others.

- Goal of these systems is to enable companies to operate most of their business processes using a single web-based system of integrated software rather than a variety of separate e-business applications.
- Core ERP Modules:
    - **Financial Management**: Support accounting and financial reporting. Manage accounting data and financial processes such as general ledger, accounts payable, account receivable, fixed assets, cash management and forecasting.

    - **Operations Management**: Demand forecasting, procurement, inventory management, materials purchases, shipping, production planning, production scheduling, materials requirements planning, quality control, distribution, transportation, and plant and equipment maintenance.
    - **Human Resource Management**: Personnel administration, recruitment, assignment tracking, personnel planning and development, performance management and reviews, time accounting, payroll, compensation, benefits accounting, and regulatory requirements.
- Extended ERP Modules:
    - **Customer Relationship Management**: Support all aspects of customer's relationships with the organization. Help the organization increase customer loyalty, retention and thus improve profitability.
    - **Supply Chain Management**: Manage information flows between and among stages in a supply chain to maximize supply chain efficiency and effectiveness. Help organizations plan, schedule, control, and optimize supply chain from the acquisition of raw materials to the receipt of finished goods by customers.
    - **Business Intelligence**: Collect information used throughout the organization, organize it, and apply analytical tools to assist managers with decision making.
    - **E-Business**: Customers and suppliers demand access to ERP information including order status, inventory levels, and invoice reconciliation. Further, they want this information in a simplified format available through 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)

Benefits and Limitation of ERP Systems:

- Benefits:
    - **Organizational flexibility and agility**: ERP systems eliminate the lack of communication between departmental

and functional business processes, information systems, and information resources.
        - Thus, make organizations more flexible, agile and adaptive. May react quickly to changing business conditions and also capitalize on new business op.
    - **Decision support**: Enables managers to make better and more timely decisions by using the information provided by ERP systems.
    - **Quality and efficiency**: ERP systems integrate and improve an organization's business processes, resulting in significant improvements in the quality and efficiency of customer service, production and distribution.
    - **Decreased costs**: ERP systems can reduce transaction costs, and hardware and software costs. In addition, the integrated ERP system requires a smaller IT support staff than did the previous non-integrated information systems.
- Drawbacks:
    - **Best practices**: The most successful solutions or problem-solving methods for achieving a business outcome.
        - An ERP system is only as good as the best practices that the ERP vendor has developed.
    - Can be extremely complex, expensive (substantial losses can result in a failed ERP system), and time-consuming to implement.
    - Causes of failed implementations include:
        - Failure to involve affected employees in the planning and development phases and in change management processes.
        - Trying to do too much too fast in the conversion process
        - Insufficient training in the new work tasks required by the ERP system
        - Failure to perform proper data conversion and testing for the new system.

Enterprise Application Integration (EAI) **system**: A system that integrates existing systems by providing layers of software that connect applications together.

Chapter 9 - Summary

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Defining Customer Relationship Management:

- **Customer Relationship Management**: A customer-focused and customer-driven organizational strategy that concentrates on satisfying customers by addressing their requirements for products and services, and then by providing high-quality, responsive service.
    - Personal marketing. Market to each person individually as opposed to mass marketing.
- Not a process or a technology per se; rather, it is a way of thinking and acting in a customer-centric fashion.
- Builds long-term customer relationships that create value for the company as well as for the customer.
    - As well as grow relationships with existing customers.
- Repeat customers are the largest generator of revenue for an enterprise.
- Getting a customer back is more expensive than continuing to satisfy a customer.
- CRM Process:
    - Target population (marketing efforts to attract potential clients).
    - Prospects/potential customers (customer acquired by selling goods/services to them)
    - Customers (Support and resell)
        - Certain customers become loyal, repeat customers.
            - The organization than segments the consumers into to categories including high-value repeat customers and low-value repeat customers.
        - The organization will also lose a certain percentage of customers, a process called customer churn.
    - Goal of CRM is to maximize high-value repeat customers while minimizing customer churn.

CRM varies according to circumstances, all successful CRM policies share 2 basic elements:

- **Customer Touch Points**: Any interaction between a customer and an organization.

    - Examples: Telephone, direct mailings, physical interactions, e-mail, websites, smart phones, internet, computer, sales representative, field service technician, service center, call center.
- **Data Consolidation**: Enable the organization's functional areas to readily share information about customers.
    - 360-degree view is the complete data set on each customer.
    - **Collaborative CRM**: A function of customer relationship management systems where communications between the organization and its customers are integrated across all aspects of marketing, sales, and customer support processes.

A CRM system in an organization contains two major components: operational CRM and analytical CRM.

Operational CRM: The component of customer relationship management that supports the front-office business processes that directly interact with customers; i.e., sales, marketing, and service.

- Benefits:
    - Efficient, personalized marketing, sales and service
    - A 360-degree view of each customer
    - Ability of sales and service employees to access a complete history of customer interaction with the organization, regardless of the touch point.
- **Customer-facing CRM applications**: Areas where customers directly interact with the organization, including customer service and support, sales force automation, marketing, and campaign management.
    - Customer Service and Support:
        - Systems that automate service requests, complaints, product returns, and request for information.
        - **Customer interaction centers** (CIC): A customer relationship management operation where organizational representatives use multiple communication channels to interact with customers in functions such as inbound teleservice and outbound telesales.

        - Use CIC to create a call list for the sales team, whose members contact sales prospects.
            - Outbound telesales
        - Customers who initiate a sales order, inquire about products and services before placing an order, or obtain information about a transaction that they have already made are called inbound teleservice.
- **Sales force automation** (SFA): The component of an operational customer relationship management system that automatically records all the aspects in a sales transaction process. Includes the following:
    - *Contact management system* which tracks all contact that has been made with a customer, the purpose of the contact, and any follow-up that might be necessary.
        - Reduces duplicated contacts and redundancy (reducing risk of irritating customers)
    - *Sales lead tracking syste*m which lists potential customers or customers who have purchased related products.
    - *Sales forecasting system* which is a mathematical technique for estimating future sales.
    - *Product knowledge system* which is comprehensive source of information regarding products and services.
    - Some more-developed SFA systems have on-line product-building features called *configurations*.
- Marketing:
    - Enables marketers to identify and target their best customers, manage marketing campaigns, and generate quality leads for the sales teams.
    - **Cross-selling**: The practice of marketing additional related products to customers based on a previous purchase.

        - **Up-selling**: A sales strategy where the organizational representative will provide to customers the opportunity to purchase higher-value related products or services as opposed to or along with the consumer's initial product or service selection.
        - **Bundling**: A form of cross-selling where an enterprise sells a group of products or services together at a lower price than the combined individual price of the products.
    - **Campaign Management Applications**: Customer relationship management applications that help organizations plan marketing campaigns so that the right messages are sent to the right people through the right channels.
- **Customer-touching CRM applications**: AKA electronic CRM (e-CRM) applications. Applications and technologies with which customers interact and typically help themselves.
    - Search and comparison capabilities:
        - Comparison websites, or on-line stores and malls offer search and comparison capabilities.
    - Technical and Other Information and Services:
        - Induce a customers to make a purchase or to remain loyal.
            - Examples: Allow consumers to download product manuals.
    - Customized Products and Services:
        - Mass customization, a process in which customers can configure their own products
            - Example: Apple allows to configure your own mac:
    - Personalized Web Pages:
        - Many organizations permit their customers to create their own personalized web pages.
    - FAQs:

        - Frequently asked questions are a simple tool for answering repetitive customer queries.
    - E-mail and Automated Response:
        - Most popular tool for customer service is e-mail. Inexpensive and fast, e-mail is used not only to answer inquiries from customers but also to disseminate information, send alerts and product information, and conduct correspondence regarding any topic:
    - **Loyalty Programs**:
        - A program that recognizes customers who repeatedly use the products or services offered by a vendor.

Analytical CRM: Customer relationship management systems that analyze customer behavior and perceptions in order to provide actionable business intelligence.

- Typically provide information on customer request and transactions, as well as on customer responses to an organization's marketing, sales and service initiatives.
- Create statistical models of customer behavior and the value of customer relationships over time, as well as forecasts of customer acquisition, retention, and loss.
- Important technologies in analytical CRM systems include data warehouses, data mining, decision support, and other business intelligence technologies.
    - Once analysis is complete, information is delivered to the organization in the form of reports and digital dashboards.
- Analyzes customer data for a variety of purposes:
    - Designing and executing targeted marketing campaigns
    - Increasing customer acquisition, cross-selling, and up-selling
    - Providing input into decisions relating to products and services (e.g., pricing, and product development)
    - Providing financial forecasting and customer profitability analysis.

Other Types of CRM:

- **On-demand CRM**: A customer relationship management system that is hosted by an external vendor in the vendor's data centre.
    - Benefits:
        - Cost
        - Only need to know how to access and use it
            - Concept also known as utility computing and software-as-a-service
    - Drawbacks:
        - Vendor may be unreliable
        - Hosted software is difficult or impossible to modify, and only the vendor can upgrade it
        - Difficult to integrate vendor-hosted CRM software
        - Providing strategic client data to vendors has potential risk involved
- **Mobile CRM**: An interactive customer relationship management system where communications related to sales, marketing, and customer service activities are conducted through a mobile medium for the purpose of building and maintaining customer relationships between an organization and its customers.
    - Put simply, mobile CRM involves interacting directly with customers through their own portable devices such as smart phones.
- **Open-source CRM**: Customer relationship management software whose source code is available to developers and users.
    - May be on-premise or on-demand.
        - Benefits:
            - Favorable pricing and a wide variety of applications
            - Easy to customize
            - Updates and bug (software error) fixes occur rapidly
                - Support information available free of charge
        - Drawbacks:
            - Quality control (biggest risk)
                - Created by a large community of unpaid developers, may be lack of central authority

that is responsible for overseeing the quality of the product

- Must have same IT platform in place as the platform on which open-source CRM was developed.

Chapter 10 - Summary

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The Structure of Supply Chains:

- Supply chain comes from a picture of how the partnering organizations are linked together.
  - Refers to the flow of materials, information, money, and services from raw material suppliers, through factories and warehouses, to the end customers.
  - Also includes organizations and processes.
- Involves 3 segments:
  - Upstream:
    - Purchasing from external suppliers occurs
    - SC managers select suppliers to deliver the goods and services the company needs in order to produce their own.
    - SC managers develop the pricing, delivery, and payment processes between a company and its suppliers.
      - Managing inventory, receiving and verifying shipments, transferring goods to manufacturing facilities, and authorizing payments to suppliers.
  - Internal:
    - Packaging, assembly, or manufacturing takes place.
    - SC managers schedule activities necessary for productions, testing, packaging, and preparing goods for delivery.
      - Monitor quality levels, productions output, and worker productivity.
  - Downstream:
    - Distribution takes place.
    - Frequently by external distributors.
    - Coordinate the receipt of orders from customers, develop a network of warehouses, select carriers to deliver their products to customers, and develop invoicing systems to receive payments from customers.
- Consists of 3 flows:
  - Material flows:

        - Physical products, raw materials, supplies, and so forth that flow along the chain.
        - Include reverse flows (or reverse logistics)—returned products, recycled products, and disposal of materials or products.
        - "dirt to dust" product life cycle approach
    - Information flows:
        - Data that are related to demand, shipments, orders, returns, and schedules, as well as changes in any of these data.
    - Financial flows:
        - Involve money transfers, payments, credit card information and authorization, payment schedules, e-payments, and credit-related data.
- Purpose of the supply chain concept is to improve trust and collaboration among supply chain partners, thus improving supply chain visibility and inventory velocity.
    - **Supply chain visibility**: Ability for all organizations in a supply chain to access or view relevant data on purchased materials as these materials move through their suppliers' production processes and transportation networks to their receiving docks.
    - **Inventory velocity**: Time between the receipt of incoming goods and the dispatch of finished, outbound products.
        - The greater your inventory velocity, the more quickly you can deliver your products and services, which in turn increases customer satisfaction.

Problems Along the Supply Chain and Their Solutions:

- Poor customer service is one major consequence of ineffective supply chains
- Poor quality products result
- High inventory costs and loss of revenues
    - Stem primarily from 2 sources:
        - Uncertainties
            - Major source is demand forecast

        - Delivery times
        - Quality problems in materials
    - Need to coordinate several activities, internal units, and business partners
        - **Bullwhip effect**: Erratic shifts in orders from customers, manufacturers, and suppliers in a supply chain.
            One of the major challenges in predicting inventory units.
        - **Push model**: AKA make-to-stock. Production process beginning with a customer demand forecast.
            - An educated guess as to customer demand
- Solutions to Supply Chain Problems:
    - **Vertical integration**: Business strategy in which a company buys its upstream suppliers to ensure that its essential supplies are available as soon as they are needed.
- Using Inventories to Solve Supply Chain Problems:
    - Most common solution is building inventories as insurance against supply chain uncertainties.
        - Drawback:
            - Very difficult to correctly determine inventory levels for each product and part.
        - A better solution is the JIT system.
            - **Just-in-time** (JIT) **inventory system**: The replenishment of inventory on an as-needed basis, reducing the overall inventory in stock.
- Sharing information:
    - Is a solution to solving supply chain issues, especially improving demand forecasts.
        - By sharing information along the supply chain.
    - Information sharing enables companies to implement a **pull model**: AKA make-to-order. Production process beginning with a customer order.
    - **Vendor-managed inventory**: Approach to inventory management where the retailer does not manage the

inventory for a particular product or group of products; instead, the supplier manages the entire inventory process.

Supply Chain Management Systems and Related Technologies:

- **Supply chain management** (SCM): The planning, organizing, and optimizing of the various activities performed along the supply chain.
    - **Inter-organizational information system** (IOS): Information system involving information flows among two or more organizations.
        - Benefits include:
            - Reduce the costs of routine business transactions
            - Improve the quality of the information flow by reducing or eliminating errors
            - Compress the cycle time involves in fulfilling business transactions
            - Eliminate paper processing and its associated inefficiencies and costs
            - Make the transfer and processing of information easier for users
    - Goal of SCM systems is to reduce the problems, or friction, along the supply chain.
        - Friction can involve:
            - Increased time, costs, and inventories as well as decreased customer satisfaction.
- The following 3 technologies in particular provide support for IOSs and SCM systems:
    - **Electronic data interchange** (EDI): Communication standard that enables business partners to exchange routine documents, such as purchasing orders, electronically.
        - Benefits:
            - Minimizes data entry errors (each entry checked by computer), length of the message may be shorter and the messages are secured, EDI reduces cycle time, increases productivity,

enhances customer service, and minimizes paper usage and storage.

- Drawbacks:
  - Involves a significant initial investment
  - Ongoing operating costs are high, due to the use of expensive, private VANs.
  - Traditional EDI system is inflexible
    - Difficult to make quick changes, such as adding business partners.
  - Long start-up period
  - Business processes must sometimes be restructured to fit EDI requirements
  - Many EDI standards in use today
    - As a result, one company might have to use several standards in order to communicate with different business partners.

- **Web services**: Applications delivered over the Internet using a set of shared protocols and standards, allowing different systems to "talk" with one another—that is, share data and services—without human intervention.
  - Benefits:
    - May be used in a variety of environments
      - Over the Internet
      - On an intranet inside a corporate firewall
      - On an extranet set up by business partners
    - Provide wide variety of tasks
      - Automating business processes to integrating components of an enterprise-wide system to streamlining on-line buying and selling.
  - **Service-oriented architecture** (SOA): The building of business applications using web services.
    - Closely related to web services.
- Extranets:
  - The primary goal of extranets is to foster collaboration between and among business partners.

        - Benefits:
            - Faster processes and information flow
            - Improved order entry
            - Customer service
            - Lower costs (for example, for communications, travel, and administrative overhead)
            - An overall improvement in business effectiveness
- Types of Extranets:
    - 3 major types of extranets:
        - A company and its dealers, customers, or suppliers:
            - Centered around a single company.
                - Example: FedEx extranet that allow customers to track the status of a delivery. Via the internet customers may check the status on-line, which saves FedEx on cost of having a human operator perform that task over the phone.
        - An industry's extranet:
            - Just as a single company can set up an extranet, the major players in the industry can team up to create an extranet that will benefit all of them.
        - Joint ventures and other business partnerships:
            - Partners in a joint venture use the extranet as a vehicle for communication and collaboration.
                - Examples: Bank of America's extranet for commercial loans.

Chapter 11 - Summary

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Mangers and Decision Making:

- **Management**: A process by which organizational goals are achieved through the use of resources.
    - People, money, energy, materials, information, space, and time.
    - Resources are considered inputs, achieving goals are considered outputs.
- **Productivity**: The ratio between the inputs to a process and the outputs from that process.

The Manager's Job and Decision Making:

- Consist of three basic roles:
    - Interpersonal roles
        - Figurehead, leader, liaison (relationship)
    - Informational roles:
        - Monitor, disseminator, spokesperson, analyzer
    - Decisional roles:
        - Entrepreneur, disturbance handler, resource allocator, negotiator
- Decision refers to a choice that individuals and groups make among two or more alternatives.
    - Diverse
    - Made continuously
    - Composed of three major phases:
        - Intelligence
            - Managers examine a situation and identify and define the problem.
                - Organizational objectives
                - Search and scanning procedures
                - Data collection
                - Problem identification
                - Problem classification
                - Problem statement
        - Design
            - Decision makers construct a model that simplifies the problem.

- **Model**: In decision making, a simplified representation, or abstraction, of reality.
    - Formulate a model (assumptions)
    - Set criteria for choice
    - Search for alternatives
    - Predict and measure outcomes

- Choice
    - Selecting a solution, which is tested "on paper." Once solution seems feasible, the decision is implemented.
        - Solution to the model
        - Sensitivity analysis
        - Selection of best (good) alternative
        - Plan for implementation (action)
        - Design of a control system

Why Managers Need IT Support:

- Number of alternatives is increasing, due to innovations in technology, improved communications, the development of global markets, and the use of the internet and e-business.
- Most decisions made under time pressure.
- Decisions are becoming more complex. Conducting a sophisticated analysis is important in order to make a good decision. Such analysis requires the use of modeling.
- Necessary to access remote information, consult with experts or conduct a group decision-making session, all without incurring large expenses.

What Information Technologies Are Available to Support Managers?

- **Business intelligence** (BI) **systems**: Information systems that provide computer- based support for complex, non- routine decisions, primarily for middle managers and knowledge workers.
    - Frequently related to data warehousing
- Decisions are classified along two major dimensions:
    - Problem Structure:

        - Structured decisions involve routine and repetitive problems for which standard solutions exist, such as inventory control.
            - Two basic criteria used to evaluate proposed solutions are minimizing costs and maximizing profits.
        - Unstructured decisions are "fuzzy," complex problems for which there are no cut-and-dried solutions. Human intuition often plays an important role in making the decision.
            - Planning new service offerings, hiring an executive, and choosing a et of research and development projects for the coming year.
        - Semi unstructured problems require a combination of standard solution procedures and individual judgment.
            - Semi structured problems are evaluating employees, setting marketing budgets for consumer products, performing capital acquisition analysis and trading bonds.
    - The Nature of Decisions:
        - Three broad categories that encompass all managerial decisions:
            - Operational control:
                - Executing specific tasks efficiently and effectively
            - Management control:
                - Acquiring and using resource sufficiently in accomplishing organizational goals.
            - Strategic planning:
                - The long-range goals and policies for growth and resource allocation.

The Decision Matrix:

- Three primary classes of problem structure and three broad categories of the nature of decisions can be combined in a decision-support matrix that consists of nine cells.

Business Intelligence:

- **Business Intelligence** (BI): Information systems that provide computer- based support for complex, non- routine decisions, primarily for middle managers and knowledge workers.
    - One specific use of BI applications consists in monitoring and managing an organizations performance according to key performance indicators such as revenue, return on investment, overhead, and operational costs.
    - **Corporate performance management**: The monitoring and managing of an organization's performance according to key performance indicators such as revenue, return on investment, overhead, and operational costs.
        - On-line businesses CPM includes additional factors such as number of page views, server load, network traffic, and transactions per second.
    - Two types of business intelligence applications:
        - Those that provide analysis tools (multi-dimensional data analysis, data mining, and decision support systems)
        - Those that provide easily accessible information in a structured format (digital dashboards)

Multi-dimensional data analysis (On-line Analytical Processing):

- Process of performing complex, multi-dimensional analyses of data stored in a database or data warehouse, typically using graphical software tools.
- Provides excellent view of what is happening or what has happened.
- Power of multi-dimensional analysis lies in its ability to analyze the data in such a way that allows users to quickly answer business questions.

Data Mining:

- Data mining explains why it is happening, helps predict what will happen in the future.
- **Data mining**: The process of searching for valuable business information in a large database, data warehouse, or data mart.
    - Performs two basic operations:
        - Predicting trends and behaviors

        - Can use data from past promotional mailings to identify people who are most likely to respond favorably to future mailings.
    - Identifying previously unknown patterns
        - Analyze retail sales data to discover seemingly unrelated products that are often purchased together.
        - Detecting fraudulent credit card transactions
- Retailing and sales: predicting sales, preventing theft and fraud, determining correct inventory levels and distribution schedules among outlets.
- Banking: Forecasting levels of bad loans and fraudulent credit card use, predicting credit card spending by new customers and determining which kinds of customers will best respond to new loan offers.
- Manufacturing and productions: Predicting machinery failures, finding key factors to help optimize manufacturing capacity
- Insurance: Forecasting claim amounts and medical coverage costs, classifying the most important elements that affect medical coverage, and predicting which customers will buy new insurance policies
- Police work: Tracking crime patterns, locations, and criminal behavior, identifying attributes to assist in solving criminal cases
- Health care: Correlating patients' demographics with critical illnesses, and developing better insights on how to identify and treat symptoms and their causes.
- Marketing: Classifying customer demographics that can be used to predict which customers will response to a ailing or buy a particular product.

Decision Support Systems:

- **Decision support systems** (DSS): System that combines models and data in an attempt to solve semi- structured and some unstructured problems.

- **Organizational decision support system** (ODSS): A decision support system that focuses on an organizational task or activity involving a sequence of operations and decision makers.
    - **Sensitivity analysis**: The study of the impact that changes in one (or more) parts of a model have on other parts.
        - Changes in input variables have on output variables
        - Sensitive model means that small changes in conditions dictate a different solutions
        - Nonsensitive model changes in conditions do not significant change the recommended solution.
    - **What-if analysis**: The study of the impact of a change in the assumptions (input data) on the proposed solution.
        - What will happen to the total inventory cost *if* the originally assumed cost of carrying inventories is not 10 percent but 12 percent?
    - **Goal-seeking analysis**: Study that attempts to find the value of the inputs necessary to achieve a desired level of output.
        - BI system yielded a profit of 2 million. Management may want to know what sales volume and additional advertising would be necessary to generate a profit of 3 million. In such case, a goal-seeking analysis needs to be conducted.

Digital Dashboards: Information systems that support all managers of the organization by providing rapid access to timely information and direct access to structured information in the form of reports.

- Capabilities of Digital Dashboards:
    - Drill-down: Ability to go to details, at several levels; can be done by a series of menus or by direct queries.
    - Critical success factor (CSF): Calculates the factors most critical for the success of business. These can be organizational, industry, departmental, etc.
    - Key performance indicator (KPI): Calculates the specific measures of CSFs.
    - Status access: Latest data available on KPI or some other metric, ideally in real time.

    - Trend analysis: Short-, medium0, and long-term trend of KPIs or metrics, which are projected using forecasting methods
    - Ad-hoc analysis: Analyses made any time, upon demand, and with any desired factors and relationships.
    - Exception reporting: Reports that highlight deviations larger than certain thresholds. Reports may include only deviations.

The Management Cockpit:

- Key performance indicators and information relating to critical success factors are displayed graphically on the walls of a meeting room, called the management cockpit room.
- Within the room, four walls are designated by color: black, red, blue and white.
    - Black shows the principal success factors and financial indicators.
    - Red measures market performance.
    - Blue projects the performance of internal processes and employees.
    - White indicates the status of strategic projects.
    - Flight desk, a six-screen, high-end PC, enables executives to drill down to detailed information. External information needed for competitive analysis can easily be imported into the room.

Data Visualization Technologies

- **Geographic information system** (GIS): A computer- based system for capturing, integrating, manipulating, and displaying data using digitized maps.
    - Every record has an identified geographical location.
        - Hence, Geocoding, in which enables users to generate information for planning, problem solving, and decision making.
        - Makes it easy to visualize the data for managers by utilizing the graphical format.

- **Virtual reality** (VR): Interactive, computer- generated, three-dimensional graphics delivered to the user through a head-mounted display.
    - An individual believes what he or she is doing is real even though it is artificially created.
    - Applications:
        - Manufacturing:
            - Training, design testing and the interpretation of results, safety analysis, virtual prototyping, engineering analysis, and ergonomic analysis.
        - Business:
            - Real estate presentation and evaluation, advertising, presentations in e-commerce, and presentation of financial data.
        - Medicine:
            - Training of surgeons (with simulators), interpretation of medical data, planning of surgeries, and physical therapy.
        - Research and Education:
            - Virtual physics lab, representation of complex mathematics, and galaxy configurations.
        - Amusement:
            - Virtual museums, three-dimensional racecar games (on PCs), air combat simulation (on PCs), and virtual reality arcades and parks.
        - Architecture:
            - Design of buildings and other structures.

Intelligent system: The various commercial applications of artificial intelligence.

- **Artificial intelligence** (AI): A subfield of computer science concerned with studying the thought processes of humans and representing the effects of those processes via machines.
    - Behavior by a machine that, if performed by a human being, would be considered intelligent.

        - Intelligence includes learning or understanding from experience, making sense of ambiguous or contradictory messages, and responding quickly and successfully to new situations.
    - **Turing test**: A test for artificial intelligence in which a human interviewer, conversing with both an unseen human being and an unseen computer, cannot determine which is which; named for English mathematician Alan Turing.

Major Intelligent Systems:

- **Expert system** (ES): Information systems that attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain.
    - Can support or replace decision makers.
    - Most widely applied AI technology
    - Most successful AI technology
- **Natural language processing** (NLP): Communicating with a computer in the user's native language.
    - **Natural language understanding**: AKA speech (voice) recognition. The ability of a computer to comprehend instructions provided in ordinary language, via the keyboard or by voice.
        - Input side of NLP
        - Easy to use, more people are able to speak than type
        - Higher cost for a more sophisticated system, as well as the inability for a system to recognize longer sentences.
    - **Natural language generation**: AKA voice synthesis. Technology that enables computers to produce ordinary language, by "voice" or on a screen, so people can understand computers more easily.
        - Expensive
- **Neural network**: A system of programs and data structures that approximates the operation of the human brain.
    - Help solve a wide range of problems from airline security to infectious disease control.
    - Standard in combatting fraud for credit card, health care, and telecommunications industries, and they are playing an

increasingly important role in todays stepped-up international efforts to prevent money laundering.

- Fuzzy Logic:
    - Branch of mathematics that deals with uncertainties by simulating the process of human reasoning.

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Information Technology Project Management:

- **Projects**: A targeted effort to create a specific business- related outcome.
    - Short-term
    - Form of products/services
    - **IS project management**: A directed effort to plan, organize, and manage resources to bring about the successful achievement of specific information systems goals.
        - **Triple constraints of project management**: Three factors—time, cost, and scope—that constrain all IS projects.
            - Time: Window of opportunity in which a project must be completed to provide a benefit to the organization.
            - Cost: Actual amount of resources, including cash and labor, that an organization can commit to completing a project.
            - Scope: Refers to the processes that ensure that the project includes all the work required—and only the work required—to complete the project successfully.
                - Additionally, throughout the project, the organization should have effective security in place.
- The Project Management Process:
    - Traditional approach involves five distinct phases that are sequential including:
        - Initiation:
            - Clearly define the problem that the project is intended to solve and goals that it is to achieve.
            - Identify and secure the resources required for the project
            - Analyze costs and benefits of the project
            - Identify potential risks
            - Future users be involved
            - The same as the systems investigation phase

        - Planning:
            - Every project objective and every activity associated with that objective must be identified and sequenced.
                - Utilizing dependence diagrams, program evaluation and review technique (PERT), critical path method (CPM), and a timeline diagram called the Gantt chart.
            - Enables managers to ensure activities are performed in a logical sequence and how long the entire project will take.
        - Execution:
            - Implements the plan by coordinating people and resources.
        - Monitoring and Control:
            - Consists of the following three steps
                - Monitoring on going project activities
                - Comparing project variables with actual plan
                - Identifying corrective actions
        - Completion:
            - When it is formally accepted by the organization the project is completed.
            - Contracts are finalized, and fulfilled and settled.
            - Lessons are all learned.
- Project Management Failure:
    - Reasons:
        - Lack of sufficient planning at the start of a project
        - Difficulties with technology compatibility
            - New may not work with existing
        - Lack of commitment by management in providing the necessary resources
        - Poorly defined project scope
        - Lack of sufficient time to complete the project

Justifying IT Applications:

- Assessing costs:
    - Allocating fixed costs among the different IT projects is a difficult task.
        - Fixed costs for IT include the following:
            - Infrastructure cost
            - Cost of IT services
            - IT management cost
    - Unanticipated costs should also be taken into account
        - Tax changes
- Assessing benefits:
    - Evaluating IT projects for benefits is typically even more complex than calculating their costs.
        - Harder to quantify benefits
            - Many of them are intangible
        - Organization uses IT for many different purposes
        - New technology provided benefits that are unpredicted/untested.
- Conducting cost-benefit analysis:
    - Four common approaches:
        - Net present value (NPV):
            - Works well when costs and benefits are well defined or "tangible" enough to be converted into monetary values.
            - Converts future values of benefits to their present-value equivalent by "discounting" them at the organization's cost of funds.
        - Return on investment (ROI):
            - Management's effectiveness in generating profits with its available assets.
        - Break-even analysis:
            - Benefits = costs
        - Business case approach:
            - Helps clarify how the organization can best use its resources to accomplish its IT strategy. Helps organization concentrate on justifying the investment. Also focuses on risk management and

on how an IT project corresponds with the organization's mission.

Strategies for Acquiring IT Applications:

- Once an organization justified an IT investment, the next step is to decide how to pursue it.
    - Several options include
        - Buy the applications (off-the-shelf approach)
            - Buying existing package can be a cost-effective and time-saving strategy compared with developing the application in-house.
            - May buy multiple packages to perform various needs
            - One cannot satisfy all needs.
            - When buy option is not available organizations frequently consider leasing.
            - Advantages:
                - Many different types available
                - Software can be tried out before purchase
                - Much time can be saved by buying rather than building
                - Company can know what is getting before it invests in the product
                - Company is not the first and only user, so software has been tested
                - Purchased software may avoid the need to hire personnel specifically dedicated to a project.
            - Disadvantages:
                - Software may not exactly meet the company's needs.
                - Software may be difficult or impossible to modify
                - Company will not have control over software improvements

        - Purchased software can be difficult to integrate with existing
        - Vendors may drop product
        - Software is controlled by another company with its own priorities and business considerations
        - Lack of intimate knowledge in the purchasing company about how the software works is why it works that way
- Lease the applications
    - Generally includes the features that are most commonly needed by organizations in a provided industry.
    - Companies apply the 80/20 rule when evaluating vendor software.
        - If the application meets the company needs to 80% than the company should seriously consider changing its business processes to use the remaining 20%.
    - Leasing can be conducted in the following three ways
        - Lease the application from a software vendor and install it on the company's premises. Vendor installs the application and frequently will offer to contract for the support and maintenance of the system. Many conventional applications are leased this way.
        - **Application service provider**: An agent or vendor who assembles the software needed by enterprises and packages them with outsourced development, operations, maintenance, and other services.
        - **Software-as-a-service** (SaaS): A software delivery method in which a vendor hosts the

applications and provides them as a service to customers over the Internet.
        - User does not own the software, rather it just pays for using it.
    - Use open-source software
        - Use open-source software to develop applications in-house.
    - Outsource
        - **Outsourcing**: Use of outside contractors or external organizations to acquire IT services.
    - Develop the application in-house
        - Time-consuming and costly
        - Often results in better fit with the organization's specific requirements

The Traditional System Development Life Cycle:

- **Systems development life cycle** (SDLC): Traditional structured framework, used for large IT projects, that consists of sequential processes by which information systems are developed.
    - Consists of six processes:
        - Systems investigations
            - Addresses the business problem
            - Main task is the feasibility study
            - Three basic solutions to any business problem include:
                - Do nothing
                - Modify or enhance the exiting system
                - Develop a new system
            - **Feasibility study**: Investigation that gauges the probability of success of a proposed project and provides a rough assessment of the project's feasibility.
                - Provides a rough estimate in the technical, economic, and behavioral feasibility.
            - After feasibility study is conducted a GO or NO-GO decision is reached by the IT Steering Committee.

            - **IT steering committee**: A committee, composed of a group of managers and staff representing various organizational units, set up to establish IT priorities and to ensure that the management information systems function is meeting the needs of the enterprise.
- **Systems analysis**: *The examination of the business problem that the organization plans to solve with an information system.*
    - Most difficult aspect is identifying what requirements need to be met.
    - When requirements are suffice it proceeds to the next step
- **Systems design**: Specifications that describe how the new system will provide a solution to the business problem.
    - Specifies the following:
        - System outputs, inputs, and user interfaces
        - Hardware, software, databases, telecommunications, personnel, and procedures
        - A blueprint of how these components are integrated
    - Once specs are agreed upon, it should be frozen.
        - **Scope creep**: The addition of functions to an information system after the project has begun.
- Programming and testing
    - **Programming**: The translation of a system's design specifications into computer code.
        - Lengthy and time consuming
    - The translation of a system's design specifications into computer code.
- **Implementation**: The process of converting from an old computer system to a new one.

        - Three major conversion strategies:
            - **Direct conversion**: Implementation process in which the old system is cut off and the new system is turned on at a certain point in time.
            - **Pilot conversion**: Implementation process that introduces the new system in one part of the organization on a trial basis; when the new system is working properly, it is introduced in other parts of the organization.
            - **Phased conversion**: Implementation process that introduces components of the new system in stages, until the entire new system is operational.
    - Operation and maintenance
        - Operates until needs replacement
        - Maintenance includes debugging, updating, and adding new functions.
- **Systems analysts**: IS professionals who specialize in analyzing and designing information systems.
- **Programmers**: IS professionals who modify existing computer programs or write new computer programs to satisfy user requirements.
- **Technical specialists**: Experts on a certain type of technology, such as databases or telecommunications.
- **Systems stakeholders**: All people who are affected by changes in information systems.

Advantages and Disadvantages of System Acquisition:

- Traditional systems development (SDLC):
    - Advantages:
        - Forces staff to systematically go through every step in a structured process
        - Enforces quality by maintaining standards
        - Has lower probability of missing important issues in collecting user requirements.

    - Disadvantages:
        - Users may be unwilling or unable to study the specifications they approve
        - Takes too long to go from the original ideas to a working system
        - Users have trouble describing requirements for a proposed system
- Prototyping:
    - Advantages:
        - Helps clarify user requirements
        - Helps verify the feasibility of the design
        - Promotes genuine user participation
        - Promotes close working relationship between systems developers and users
        - Works well for ill-defined problems
    - Disadvantages:
        - May encourage inadequate problem analysis
        - Not practical with large numbers of users
        - Users may not provide up the prototype when the system is completed
- Joint Application Design:
    - Advantage:
        - Saves time
    - Disadvantage:
        - Difficult to get all users to attend JAD meeting
- Integrated Computer-Assisted Software Engineering (ICASE):
    - Adv:
        - Can produce systems with a longer effective operational life
    - Dis:
        - Difficult to customize
- Rapid Application Development (RAD):
    - Adv:
        - Speeds up systems development
    - Dis:

        - Produces functional components of final systems, but not final systems
- End-User Development:
    - Adv:
        - Frees up IT Resources
    - Dis:
        - Documentation may be inadequate

Alternative Methods and Tools for Systems Development:

- **Prototyping**: *An approach that defines an initial list of user requirements, builds a prototype system, and then improves the system in several iterations based on users' feedback.*
    - **Prototype**: A small-scale working model of an entire system or a model that contains only the components of the new system that are of most interest to the users.
- **Joint application design** (JAD): A group- based tool for collecting user requirements and creating system designs.
- **Computer-aided software engineering** (CASE): Development approach that uses specialized tools to automate many of the tasks in the systems development life cycle; upper CASE tools automate the early stages of the life cycle, and lower CASE tools automate the later stages.
    - **Integrated CASE** (ICASE) **tools**: Computer- aided software engineering (CASE) tools that provide links between upper CASE and lower CASE tools.
- **Rapid application development** (RAD): A development method that uses special tools and an iterative approach to rapidly produce a high- quality system.
- **Agile development**: A software development methodology that delivers functionality in rapid iterations, measured in weeks, requiring frequent communication, development, testing, and delivery.
- **End-user development**: The development by an organization's end users of their own applications with little or no formal assistance from the IT department

- **Component-based development**: A software development methodology that uses standard components to build applications.
  Object-oriented development: A systems development methodology that begins with aspects of the real world that must be modeled to perform a task

Vendor and Software Selection:

- Identify potential vendors
- Determine the evaluation criteria
  - **Request for proposal** (RFP): Document that is sent to potential vendors inviting them to submit a proposal describing their software package and how it would meet the company's needs.
- Evaluate vendors and packages
- Choose the vendor and package
- Negotiate a contract
- Establish a **service level agreement** (SLAs): Formal agreements regarding the division of work between a company and its vendors.

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Hardware refers to the physical equipment used for the input, processing, output, and storage of activities of a computer system. Consists of the following:

- **Central Processing Unit** (CPU): Manipulates the data and control the tasks performed by the other components.
- **Primary storage**: Temporarily stores data and program instructions during processing.
- **Secondary storage**: External to the CPU; stores data and programs for future use.
- **Input technologies**: Accept data and instructions and convert them to a form that the computer can understand.
- **Output technologies**: Present data and information in a form people can understand.
- **Communications technologies**: Provide for the flow of data from external computer networks (e.g., the Internet and intranets) to the CPU, and from the CPU to computer networks.

Strategic Hardware Issues:

- Most important issues is what the hardware enables, how it is advancing and how rapidly it is advancing.
- Utilizing computer hardware is a key to achieving competitive advantage.
    - How do firms keep up with rapid price and performance advancements in hardware?
    - How often should organization upgrade computers and storage systems?
    - Portable computers allow individuals to work from home or from anywhere, will these new work styles benefit employees and the organizations? How is such style of new work manageable?

Innovations in Hardware Utilization:

- **Server farm**: Massive data center containing thousands of servers.
- Virtualization: Servers no longer have to be dedicated to a particular task.
    - **Server virtualization**: The use of software to partition a server into separately operating virtual machines.
    - Benefits:

        - Lower cost on purchasing physical servers, energy, space in the data center, cooling, personnel, and maintenance.
        - Enhanced organizational agility, virtualization helps organizations to quickly modify their systems to respond to changing demands.
        - Focus of IT department can shift from the technology itself to the services that the technology can provide.
- **Grid computing**: A process that applies the unused processing resources of many geographically dispersed computers in a network to form a virtual supercomputer.
- **Utility computing**: A type of computing where a service provider makes computing resources available to a customer as needed.
    - AKA. Subscription computing and On-demand computing.
    - Save on cost of actually owning hardware infrastructure.
    - Also provides fault tolerance, redundancy, and scalability (expandable). That is, if one server fails, another takes it place.
    - Servers can easily be added as they are needed.
- **Cloud computing**: A type of computing where tasks are performed by computers physically removed from the user and accessed over a network.
    - Incorporates grid and utility computing on a global basis.
    - Benefits:
        - Lower infrastructure costs
    - Drawbacks:
        - Privacy, security and reliability concerns.
    - Small companies are able to rent and pay for what they use saving costs on infrastructure.
- **Edge computing**: The process by which parts of website content and processing are located close to the user to decrease response time and lower processing costs.
    - 3 components in edge computing:
        - Computer that you use to access the website
        - Small, relatively inexpensive servers—edge servers—located at your ISP (internet service provider).

        - Server of the companies website your are accessing.
    - First goes to the cached information of the edge server provided by your ISP, if additional information is needed, request is sent to companies servers that is being accessed.
- **Autonomic computing** (AKA autonomic systems): Computer systems designed to manage themselves without human intervention.
- **Nanotechnology**: The creation of materials, devices, and systems at a size of 1 to 100 nanometres (billionths of a metre).

The Computer Hierarchy:

- 5 Generations of Computer Technology:
    - Vacuum tubes, transistors, integrated circuits, ultra-large-scale integrated circuits, massively parallel processing.
        - Each generation provided increasing storage capacity and processing power while simultaneously decreasing costs.
- Organized from the most powerful to least.
- **Supercomputers**: Computers with the most processing power available; used primarily in scientific and military work for computationally demanding tasks on very large data sets.
    - Example: Military and scientific applications.
    - Also used in commercial applications, banks and health-care organizations.
    - Operate at a petaflop
- **Mainframe**: Relatively large computers used in large enterprises for extensive computing applications that are accessed by thousands of users.
    - Examples: Airline reservations systems, corporate payroll programs, website transaction processing systems (e.g., Amazon and eBay),student grade calculation and reporting.
    - Mainframe less expensive than a supercomputer. Terabytes of primary and secondary storage.
    - Operate at a teraflop
    - Firms move back from distributed systems to mainframe is called recentralization.
    - Reason for such move:

        - Support high transaction levels associated with e-commerce.
        - Reduce the total cost of ownership of distributed systems.
        - Simplifying administration
        - Reducing support-personnel requirements
        - Improving system performance.
    - Mainframe computing provides a secure, robust environment in which to run strategic, mission-critical applications.
- Midrange Computers:
    - **Minicomputers**: Relatively small, inexpensive, and compact midrange computers that perform the same functions as mainframe computers, but to a more limited extent.
    - Minicomputers are a type of server:
        - **Server**: Smaller mid-range computers that support networks, enabling users to share files, software, and other network devices.
    - Minicomputers are more scalable than mainframes due to the cost aspect.
    - Rack servers: Pizza-box-sized servers that can be stacked in racks.
    - Blade: Card about the size of a paperback book on which the memory, processor, and hard drives are mounted.
- **Workstations**: Powerful desktop-size computers that run computationally intensive scientific, engineering, and financial applications.
    - Provide high speed calculations and high resolutions graphic displays.
    - Used widely within scientific and business communities.
    - Include electronic and mechanical design, medical imaging, scientific visualization, 3-D animation and video editing.
    - Personal computers and workstation computers distinction is negligible (tiny, insignificant).
- **Microcomputers**: The smallest and least expensive category of general-purpose computers; also called micros, personal computers, or PCs.

- Major categories of microcomputers are:
  - Desktop PCs:
    - Desktop Personal Computer. Standard tool for business and the home. Includes a CPU and a separate but connected monitor and keyboard. Gigabytes of primary storage, rewritable CD-ROM and DVD drive and several terabytes of secondary storage.
    - **Fat client**: Standard personal computer with hard disk and memory attached to a network.
  - Thin-Client Systems:
    - Servers: Computers that provide a variety of services for clients, including running networks, processing websites, processing e-mail, and many other functions.
    - Clients: Computers on which users perform their tasks, such as word processing, spreadsheets, and others.
    - **Thin-client systems**: Desktop computer systems that do not offer the full functionality of a PC.
      - Example: Microsoft office is not installed on thin-client systems, instead they use a network to access such applications.
    - Benefits:
      - Fast application deployment
      - Centralized management
      - Lower cost of ownership
      - Easier installation, management, maintenance, and support.
    - Disadvantage:
      - If network fails, then users can do very little on their computers.
  - **Laptop and notebook computers**: Small, easily transportable, lightweight microcomputers.
    - Portable

        - Notebook computers are smaller than laptops in general.
        - Designed to be convenient and easy to transport as possible.
        - Cost more than desktops.
        - Provide processing power and data outside an office environment.
    - **Ultra-mobile PCs**: Small, mobile computer that has the full functionality of a desktop computer, but is smaller and lighter than traditional laptops and notebooks.
        - Have multiple input methods, including touch screen, stylus, speech and Bluetooth or traditional keyboard.
    - **Netbook**: A very small, lightweight, low-cost, energy-efficient, portable computer, typically optimized for Internet-based services such as web browsing and e-mailing.

Computing Devices:

- Wearable computers (wearable devices): Designed to be worn and used on the body. Used in UPS (freight delivery), aerospace, securities, trading, law enforcement, and the military.
    - Example: a Tablet an employee from UPS carries for your courier carries.
- Embedded computers: computers that are placed inside other products.
    - Example: Car has more than 3,000 embedded computers, called "controllers," that monitors every function from braking to engine performance to seat controls with memory.

Input and Output Technologies:

- Input technologies allow people and other technologies to put data into a computer. Includes two types:
    - Human data-entry:
        - Requires a certain amount of human effort to input data.

        - Examples: Keyboards, mouse, pointing stick, trackball, joystick, touchscreen, stylus, voice recognition.
    - Source-data automation devices input data with minimal human intervention.
        - Benefits:
            - Speed up data collection
            - Reduce errors
            - Gather data at the source of a transaction or other event
                - Example: Barcode scanners, automated teller machines (ATMs), magnetic stripe reader, POS terminals, optical character recognition sensors, cameras, heads-up displays, radio frequency identification.
- Output devices:
    - Monitors:
        - Cathode Ray Tubes: Video screens on which an electron beam illuminates pixels on display screen.
        - Liquid crystal display (LCDs): Flat displays that have liquid crystals between two polarizers to form characters and images on a backlit screen.
        - Flexible displays: Thin, plastic, bendable computer screens.
        - Organic light-emitting diodes (OLEDs): Displays that are brighter, thinner, lighter, cheaper, faster, and take less power to run than LCDs.
        - Retinal scanning displays: Displays that project image directly onto a viewers retina; used in medicine, air traffic control, and controlling industrial machines.
    - Printers:
        - Laser: Laser beams to write information on photosensitive drums; produce high-resolution text and graphics.

        - Inkjet: Printer that shoots fine streams of colored ink onto paper; usually less expensive to buy than laser printers, but can be more expensive to operate.
        - Plotters: Printers that uses computer-direct pens for creating high-quality images, blueprints, schematics, drawings of new products, etc.
    - Voice Output: Speaker/headset that can output sounds to any type; voice output is a software function that uses this equipment.
    - Electronic Book Reader: Wireless, portable reading device with access to books, blogs, newspapers, and magazines.
    - Pocket Projector: Projector in a hand-held device that provides an alternative display method to alleviate the problem of tiny display screens in hand-held devices. Pocket projectors will project digital images onto any viewing surface.
- **Multimedia technology**: Computer-based integration of text, sound, still images, animation, and digitized full-motion video.
    - Merges capabilities of computers with televisions, VCRs, CD players, DVD players, video and audio recording equipment, and music and gaming technologies.

The Central Processing Unit:

- **Central processing unit** (CPU): Hardware that performs the actual computation or "number crunching" inside any computer.
    - **Microprocessor**: The central processing unit, made up of millions of transistors embedded in a circuit on a silicon wafer or chip.
        - Commonly referred to as chips.

How the CPU works:

- Consists of different parts which perform various functions.
    - **Control unit**: Part of the microprocessor in the central processing unit that sequentially accesses program instructions, decodes them, and controls the flow of data to and from the arithmetic-logic unit, the registers, the caches,

primary storage, secondary storage, and attached output devices.
    - **Arithmetic-logic unit**: Portion of the CPU that performs the mathematic calculations and makes logical comparisons.
    - **Registers**: High-speed storage areas in the CPU that store very small amounts of data and instructions for short periods of time.
- Inputs enter and are stored until they are needed. At that point, they are retrieved and processed, and the output is stored and then delivered somewhere.

Advances in Microprocessor Design:

- **Moore's law**: Prediction by Gordon Moore, an Intel co-founder, that microprocessor complexity would double approximately every 2 years.
- Prediction arose mainly from the following changes:
    - Miniaturized transistor production
    - Making physical layout of the chip's components as compact and efficient as possible
    - Using materials for the chip that improve conductivity (flow) of electricity.
    - Placing multiple processors on a single chip.
        - Example: Multicore chips
- Additionally Moore's law predicted costs as well.
- **Microcontrollers**: Embedded computer chips that usually cost less and work in less-demanding applications than microprocessors.
    - Examples: Cellular telephones, toys, automobiles sensors.

Computer Memory and Storage Systems:

- Basic types of computer memory include primary and secondary storage.
- Memory Capacity:
    - **Binary units**: The form in which data and instructions can be read by the CPU—only 0s and 1s.
    - **Bits**: Binary digit (0s and 1s), the only data that a CPU can process.
    - Kilobyte: 1,000 bytes approximately (1,024).

    - Megabyte: 1 million bytes approximately
        - Memory (RAM)
    - Gigabyte: 1 billion bytes approximately
        - Hard drive
    - Terabyte: 1 trillion bytes approximately
    - Petabyte: 1,000 terabytes approximately
    - Exabyte: 1,000 petabytes approximately
    - Zettabyte: 1,000 exabytes approximately
- Primary Storage:
    - **Primary storage**: (also called main memory) High-speed storage located directly on the motherboard that stores data to be processed by the CPU, instructions telling the CPU how to process the data, and operating systems programs.
        - Stores three types of information for very brief periods of time:
            - Data processed by the CPU
            - Instructions for the CPU as to how to process the data
            - Operating system programs that manage various aspects of the computer's operation.
    - Four types of primary storage:
        - Register:
            - Part of the CPU. Least capacity, storing extremely limited amounts of instructions and data only immediately before and after processing
        - **Random access memory** (RAM): The part of primary storage that holds a software program and small amounts of data when they are brought from secondary storage.
            - Dynamic Ram: offer greatest capacities and the lowest cost per bit, but they are relatively slow.
            - Static Ram: costs more than DRAM but it is faster. Preferred choice for performance-sensitive applications.
            - Magnetic Ram: Emerging technology. Uses magnetism, rather than electricity, to store data.

Major advantage is it is non-volatile (retains data when power is shut off). MRAM only requires a tiny amount of electricity. MRAM combines the high speed of SRAM and storage capacity of DRAM and the non-volatility of flash memory.

- **Cache memory**: A type of primary storage where the computer can temporarily store blocks of data used more often and that a processor can access more rapidly than main memory (RAM).
  - Faster than RAM because the instructions travel a shorter distance to the CPU. More frequent use of instructions are stored in cache memory. Less frequent remain in RAM until they are transferred to cache. Infrequent use of blocks remain in secondary storage.
- **Read-only memory**: Type of primary storage where certain critical instructions are safeguarded; the storage is non-volatile and retains the instructions when the power to the computer is turned off.
  - Example: instructions needed to start or "boot" the computer after it has been shut off.

- Secondary Storage:
  - **Secondary storage**: Technology that can store very large amounts of data for extended periods of time.
    - Includes the following characteristics:
      - Non-volatiles
      - Takes more time to retrieve data from secondary storage than it does from RAM
      - Cheaper than primary storage
      - Can take place on a variety of media, each with its own technology
    - Magnetic Media:
      - **Magnetic tape**: A secondary storage medium on a large open reel or in a smaller cartridge or cassette.

- Slowest method for retrieving data, because all data are placed on the tape sequentially.
- Cheapest storage medium.
- **Sequential access**: Data access in which the computer system must run through data in sequence in order to locate a particular piece.

- **Magnetic disks**: A form of secondary storage on a magnetized disk that is divided into tracks and sectors that provide addresses for various pieces of data.
  - **Hard disks**: A form of secondary storage on a magnetized disk that is divided into tracks and sectors that provide addresses for various pieces of data.
    - Low cost, high speed, and large storage capacity, data may be retrieved in a non sequential manner due to addresses being assigned to stored data.
      - "direct access storage devices"
  - PCs and workstations use one of two high-performance disk interface standards:
    - Enhanced Integrated Drive Electronics (EIDE): Offers good performance, inexpensive and supports up to four disks, tapes, or CD-ROM drives.
    - Small Computer Systems Interface (SCSI): More expensive than EIDE drives, but they offer a faster interface and support more devices.
      - Used for graphics workstations, server-based storage, and large databases.

- Optical Storage Devices:

        - **Optical storage devices**: A form of secondary storage in which a laser reads the surface of a reflective plastic platter.
            - Slower than magnetic hard drives, but they are less susceptible to damage from contamination and they are less fragile.
        - **Compact disk read-only memory**: An optical disk that can be written once and then read repeatedly.
            - High capacity, low cost, high durability.
            - Cannot be written on.
        - **Digital video disk**: An optical storage device used to record digital video.
        - **Holographic memory**: An optical technology that uses a three-dimensional medium to store data.
        - **Flash memory devices**: Electronic storage devices that contain no moving parts, use flash memory, and use 30 times less battery power than hard drives.
            - **Thumb drive**: Storage device that fits into the USB port of a personal computer and is used for portable storage.
                - Universal serial bus
                - Replaced magnetic floppy disks for portable storage.
- Enterprise Storage Systems:
    - **Enterprise storage system**: An independent, external storage system that includes two or more storage devices.
        - Three types of enterprise storage systems include:
            - **Redundant arrays of independent disks**: An enterprise storage system that links groups of standard hard drives to a specialized microcontroller that coordinates the drives so they appear as a single logical drive.

- **Storage area network**: An enterprise storage system architecture for building special, dedicated networks that allow rapid and reliable access to storage devices by multiple servers.
    - **Storage over IP**: Technology that uses the Internet protocol to transport stored data between devices within a storage area network; sometimes called IP over SCSI or iSCSI.
    - **Storage visualization software**: Software used with storage area networks to graphically plot an entire network and allow storage administrators to monitor all devices from a single console.
- **Network-attached storage**: An enterprise storage system in which a special-purpose server provides file storage to users who access the device over a network.
    - Plug-and-play server. No user retraining or software is needed.

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Significance of Software:

- **Software**: A set of programs that enables the hardware to process data.
- **Computer programs**: The sequence of instructions for the computer that make up software.
- **Stored program concept**: Modern hardware architecture in which stored software programs are accessed and their instructions are executed (followed) in the computer's CPU, one after another.
- **Documentation**: A written description of the functions of a software program.
- **Systems software**: The class of computer instructions that serves primarily as an intermediary between computer hardware and application programs; provides important self-regulatory functions for computer systems.
    - Examples: Loading itself when the computer is first turned on and providing commonly used sets of instructions for all applications.
    - Systems programming refers to both the creation and the maintenance of systems software.
- **Application software**: The class of computer instructions that directs a computer system to perform specific processing activities and provide functionality for users.
    - Examples: Broad as word processing or narrow as an organization’s payroll program.
        - Application programming refers to both the creation and the modification and improvement of application software.

Systems Software:

- Two major functional categories:
    - **System control programs**: A software program that controls the use of the hardware, software, and data resources of a computer system.
        - **Operating Systems** (OS): The main system control program, which supervises the overall operations of the

computer, allocates CPU time and main memory to programs, and provides an interface between the user and the hardware.

- Functions of the Operating System:
  - **Multi-tasking**: The management of two or more tasks, or programs, running concurrently on the computer system (one CPU).
  - **Multi-threading**: A form of multi-tasking that runs multiple tasks within a single application, simultaneously.
    - Word processor might edit one document while spell check another.
  - **Multiprocessing**: Simultaneously processing more than one program by assigning them to different processors (multiple CPUs).
  - **Virtual memory**: A feature that simulates more main memory than actually exists in the computer system by extending primary storage into secondary storage.
  - **Graphical user interface system** (GUI): System software that allows users to have direct control of visible objects (such as icons) and actions, which replace command syntax.
  - **Social interface**: A user interface that guides the user through computer applications by using cartoon-like characters, graphics, animation, and voice commands.
  - **Haptic interface**: An interface that allows the user to feel a sense of touch by applying forces, vibrations, and/or motions to the user.
  - **Spatial operating environment**: A user interface where the user stands or sits in front of one or more computer screens, gesturing with gloved hands to move images around, touch

virtual objects, trace shapes, and navigate complex data.

- Types of Operating Systems:
  - **Operating environment**: A set of computer programs that adds features that enable developers to create applications without directly accessing the operating system; functions only with an operating system.
  - **Plug-and-play**: A feature that enables the operating system to recognize new hardware and install any necessary software (called device drivers) automatically.
- **System support programs**: Software that supports the operations, management, and users of a computer system by providing a variety of support services. Examples include system utility programs, performance monitors, and security monitors.
  - **System utilities**: A program that accomplishes common tasks such as sorting records, creating directories and subdirectories, locating files, and managing memory usage.
    - Program that accomplishes common tasks including sorting records, creating directories, locating files, etc.
  - **System performance monitors**: A program that monitors the processing of jobs on a computer system and monitors system performance in areas such as processor time, memory space, and application programs.
    - Program that monitors the processing of jobs on a computers system and system performance.
  - **System security monitors**: A program that monitors a computer system to protect it and its resources from unauthorized use, fraud, or destruction.

- Program that monitors computer system to protect it and its resources from unauthorized use, fraud, or destruction.

Application Software:

- Types of application software:
  - **Proprietary application software**: Software that addresses a specific or unique business need for a company; it may be developed in-house or commissioned from a software vendor.
  - **Contract software**: A specific software program developed for a particular company by a vendor.
  - **Off-the-shelf application software**: Software purchased, leased, or rented from a vendor that develops programs and sells them to many organizations; can be standard or customizable.
    - **Package**: A computer program developed by a vendor and available for purchase in pre-packaged form.
- Categories of personal application software:
  - **Personal application software**: General-purpose, off-the-shelf application program that supports general types of processing, rather than being linked to any specific business function.
  - Spreadsheets: Uses rows and columns to manipulate primarily numerical data. Example: Microsoft Excel, Corel Quattro Pro
  - Word Processing: Allows users to manipulate primarily text with many writing and editing features. Example: Microsoft Word, Corel WordPerfect.
  - Desktop Publishing: Extends word processing software to allow the production of finished, camera-ready documents, which may contain photographs, diagrams, and other images combined with text in different fonts. Example: Microsoft Publisher, QuarkXPress

- Data Management: Allows users to store, retrieve, and manipulate related data. Example: Microsoft Access, FileMaker Pro
- Presentation: Allows users to create and edit graphically rich information to appear to appear on electronic slides. Example: PowerPoint, Corel Presentations.
- Graphics: Allows users to create, store, and display or print charts, graphs, maps, and drawings. Example: Adobe Photoshop, Corel DRAW
- Personal Information Management: Allow users to create and maintain calendars, appointments, to-do lists, and business contacts. Example: IBM Lotus Notes, Microsoft Outlook
- Personal Finance: Allow users to maintain checkbooks, track investments, monitor credit cards, and bank and pay bills electronically. Example: Quicken, Microsoft Money
- Web Authoring: Allow users to design websites and publish them on the Web. Example: Microsoft FrontPage, Macromedia, Dreamweaver.
- Communications: Allows users to communicate with other people over any distance. Example: Novell Groupwise, Internet Explorer, Messenger.
- **Speech recognition software** (voice recognition software): Software that recognizes and interprets human speech, either one word at a time (discrete speech) or in a stream (continuous speech).

Open Systems:

- **Open systems**: A model of computing products that work together by use of the same operating system with compatible software on all the different computers that would interact with one another in an organization.
- **Open-Source software**: Software made available in source code form at no cost to developers.
  - Shareware allows no access to the underlying code
  - Freeware is copyrighted software that is made available to the user free of charge for an unlimited time.

- Open-source software is copyrighted and distributed with license terms ensuring that the source code will always be available.
- Have worldwide communities who write and maintain the code. Inside each community only a small group of developers (core developers) allow to modify or submit changes to the code. Other developers submit code to the core developers.
- Benefits:
  - High-quality, reliable, flexible, low-cost software.
    - Many cases, more reliable than commercial software, due to the code being developed by many, bugs are discovered early and quickly and are fixed immediately.
- Drawbacks:
  - Organizations have to buy maintenance-support contracts from a third party if they do not have in-house technical experts.
  - Ease of use? Amount of time and expense needed to train users? Compatibility with existing systems or with the systems of business partners?
- Examples of Open-Source include:
  - GNU
  - Linux operating system
  - Apache web server
  - Sendmail SMTP e-mail server
  - Perl programming language
  - Firefox browser
  - Oracle Open Office

Programming Languages:

- Allow people to write instructions that tell computers what to do.
- All computer languages must be translated into binary digits for processing.
- **Compiler**: A type of systems software that converts other computer languages into machine language.

- Categories of Programming Languages:
    - First Generation Language (Machine): Consists of 0s and 1s; extremely difficult to use by programmers.
    - Second Generation Language (Assembly): More user-friendly then machine language; uses mnemonics for people to use.
    - Third Generation Language (Procedural): Requires the programmer to specify, step by step, exactly how the computer must accomplish a task.
    - Fourth Generation Language (Non-procedural): Allows the user to specify the desired result without having to specify step-by-step procedures; simplifies and accelerates the programming process.
    - Visual Programing Language: Employed within a graphical environment and use a mouse, icons, symbols on the screen, or pull-down menus to make programming easier.
    - **Object-oriented languages**: A programming language that summarizes a small amount of data with instructions about what to do with the data.
        - **Methods**: In object-oriented programming, an instruction about what to do with summarized data objects.
        - **Object**: In object-oriented programming, the combination of a small amount of data with instructions about what to do with the data.
        - **Reusability feature**: Feature of object-oriented languages that allows objects created for one purpose to be used in a different object-oriented program if desired.
            - Example: **Java**: Object-oriented programming language, developed by Sun Microsystems, that

provides programmers the ability to develop applications that work across the Internet.
    - **Applets**: A small Java application that can be included in an HTML page on the Internet.
- **Hypertext markup language** (HTML): The standard programming language used on the Web to create and recognize hypertext documents.
    - **Hypertext**: An approach to document management in which documents are stored in a network of nodes connected by links and are accessed through interactive browsing.
    - **Hyperlinks**: A link that connects document nodes in hypertext.
    - **Hypertext document**: The combination of nodes, links, and supporting indexes for any particular topic in hypertext.
- **Extensible markup language** (XML): A programming language designed to improve the functionality of web documents by providing more flexible and adaptable data identification.
    - XML and HTML are not the same.
        - Purpose of HTML is to help build web pages and display data on web pages.
            - Does say how data will be displayed
            - HTML cannot be used to send complex messages that include different files.
        - Purpose of XML is to describe data and information.
            - Does not say how data will be displayed.
            - XML may be used to send complex messages that include different files

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General Behavioral Actions:

- Do not provide personal information to strangers in any format (physical, verbal, or electronic)
- Protect your SIN
- Protect your credit cards.
    - Do not sign back of card, input "ask for photo identification" in signature space.
- Virtual credit cards for online purchases, Citibank and Discover.
- Do not write complete card number on a cheque to pay one of your accounts in the "For" line of your cheque. Instead, write only the last four digits.
- Limit use of debit cards.
- Use a shredder to discard mail or old records.
    - Cross-cut, or confetti, shredder.

Computer-Based Actions:

- Check browser history to determine if someone else was using the Internet on your computer.
- Social networking sites may be dangerous. Consider changing the privacy settings to better protect yourself.
- Never open unrequested attachments to e-mail files. Even those from people you know and trust.
- Never open attachments or web links in e-mails from people you do not know.
- Never accept files transferred to you during Internet chat or instant messaging sessions.
- Never download any files or software over the Internet from websites you do not know. Never download files or software that you have not requested.
- Test your computer using one of the free scans available on the Internet.
- Install a security suite on your computer.
- Install an anti-malware product on your computer.
- Install a firewall on your computer.
    - Allows your computer to run in stealth mode on the Internet.

    - Firewalls should block outbound connections that you do not initiate.
    - Firewall should not let your computer access the Internet on its own.
- Install an Antispyware product on your computer.
- Install monitoring software on your computer.
    - Used to track employee productivity.
    - May also be used by hackers in a virus to lock your keystrokes and trap your passwords.
- Install content filtering software on your computer.
    - Can block access to undesirable websites, and record and view all websites visited.
    - Records both sides of chat conversations.
- Install anti-spam software on your computer.
    - Helps control spam.
- Install proactive intrusion detection and prevention software on your computer.
    - Prevx
- Manage Patches
    - Install all patches immediately.
        - Patches for Windows
    - Typically released to repair security problems.
- Use a browser other than Internet Explorer
- Using an operating system other than Windows
    - Linux and Mac OS X are less attractive targets for malware.

Protecting Your Portable Devices and Information:

- Keep your laptop in an inconspicuous container.
- Do not leave your laptop unattended in plain view.
- Install a laptop security system
    - Caveo
- 2-factor authentication.
- Encrypt your entire hard drive.
- Laptop tracing tools.

Internet Explorer 7:

- Protected Mode:

    - Cannot modify any of the files and settings without your consent.
- ActiveX Opt-In:
    - Automatically disables all but a small group of well known, pre-approved controls.
- Fix My Settings:
    - Reset your security settings to the Medium-High default level.
- Windows Defender:
    - Protects you against spyware and thus helps prevent malware from penetrating your system via piggyback download on spyware.
- Phishing Filter
    - An opt-in feature that maintains a list of websites that should be blocked by scanning for suspicious website characteristics.
    - Known phishing websites are denoted by turning the Address Bar red.
- Delete Browsing History:
    - One-click cleanup so that you can easily and quickly erase all personal information stored in the browser.

Internet Explorer 8:

- New feature called InPrivate.
    - InPrivate Browsing helps prevent your browser from retaining your browsing history, temporary Internet files, cookies, and user names and passwords, thus leaving no evidence of your browsing or search history.

Other Actions That You Can Take on Your Computer:

- Detect a worm by making sure your system is exhibiting unexplained hard disk activity, connects to the Internet by itself without any action on your part, seems to be short on available memory, family, friends, or colleagues notify you that they have received an odd e-mail message from you, that they are sure you did not send.
- Detect a Trojan Horse
- Turn off peer-to-peer (P2P) file sharing
- Look for New and unusual files
    - Search for *.* in All Files and Folders

    - Click the When Was It Modified button, and select Within the Last Week
    - Click on the Search button
- Detect fake websites
    - Looking at the URL or installing software.

Protecting Your Privacy:

- Use strong passwords.
- Adjust your privacy on your computer.
- Surf the Web anonymously.
    - Use an anonymizer website as a proxy server.
    - Use an anonymizer as a permanent proxy server in your web browser.
- E-mail anonymously using re-mailer products.
- StealthSufer II ID Protect.
    - A thumb drive that allows you to surf the Web with anonymity from any computer, even if you use a wireless (Wi-Fi) connection.
- Erase your Google search history.

Preparing for Personal Disasters:

- Safety deposit boxes for important papers.
- Fireproof safe at home where you can store other important papers.

Wireless Security:

- Hide your service set identifier (SSID).
- Use encryption.
- Filter out media access control (MAC) addresses.
- Limit Internet Protocal (IP) Addresses.
    - Ideally the number of computers on your network.
- Sniff out intruders.
- Prior to connecting to a private hotspot do the following:
    - Use virtual private networking (VPN) technology to connect to your organization’s network.
    - Use Remote Desktop to connect to a computer that is running at your home.
    - Configure the Windows firewall to be “on with no exceptions.”
    - Only use websites that use secure socket layer (SSL) for any financial or personal transactions.

- Wireless security software may be purchased for extra security.

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Telecommunications system: consists of hardware and software that transmit information from one location to another.

- May transmit text, data, graphics, voice, documents, or full-motion video information.
- Use 2 basic types of signals including analog and digital.
- **Analog signals**: are continuous waves that transmit information by altering the characteristics of the waves.
    - Amplitude (higher the height – higher the sound) and
    - Frequency (Higher the pitch – tighter the waves)
        - All sounds are analog, travelling to human ears in the form of waves.
- **Digital signals**: Discrete pulses that are either on or off, representing a series of bits (0s and 1s).
    - In binary form that can be clearly interpreted by computers.
    - Bits are the only data a CPU can process

Basic components of a telecommunications system are:

- Devices
    - Include all types of hardware
        - Smart phones to supercomputers
        - Devices serve as both transmitters and receivers
- **Communication Processors**: hardware devices that support data transmission and reception across a telecommunications system.
    - **Modems**: converts digitals signals to analog signals, a process called modulation, and analog signals to digital signals, a process called demodulation.
        - Digital → Analog = Modulation
        - Analog → Digital = Demodulation
        - **Cable modems**: modems that operate over coaxial cable (i.e., TV). Offer high-speed access to the Internet or corporate intranets.
            - Shared line, when large amount of users access it, they will slow it down.
        - Dial-up
            - 56Kbps
        - DSL (digital subscriber line)

        - Modems operate on the same lines as voice telephones and dial-up modems, but DSL signals do not interfere with voice service.
        - Always maintain a connection.
    - **Multiplexer**: an electronic device that allows a single communications channel to carry data transmission simultaneously from many sources.
    - **Front-end processor**: A small secondary computer, dedicated solely to communication, that manages all routing communications with peripheral devices.
- Communications Media and Channels:
    - **Communications channels**: Pathway for communicating data from one location to another.
    - Two types of media Cable and Broadcast.
        - **Cable (wireline media)**: Communications channels that use physical wires or cables to transmit data and information.
            - Twisted-pair wire and coaxial cable are made of copper, and fiber-optic cable is made of glass.
        - **Twisted-pair**: Strands of copper wire twisted together in pairs.
            - Used for all business telephone wiring.
            - ADV:
                - Inexpensive, widely available, easy to work with unobtrusive (low profile)
            - DIS:
                - Slow (low bandwidth), subject to interference, easily tapped (low security).
        - **Coaxial Cable**: Insulated copper wire; used to carry high-speed data traffic and television signals.
            - Higher bandwidth than twisted-pair, less suspect able to electromagnetic interference.
            - Relatively expensive and inflexible, easily tapped (low to medium security), somewhat difficult to work with

        - **Fiber-optic Cables**: Thousands of very thin filaments of glass fibers, surrounded by cladding, that transmit information via light pulses generated by lasers.
            - Very high bandwidth, relatively inexpensive, difficult to tap (good security)
            - Difficult to work with (difficult to splice)
        - **Broadcast (wireless media)**: Communications channels that use electromagnetic media (the "airwaves") to transmit data.

Transmission Speed:

- **Bandwidth**: refers to the range of frequencies available in any communications channel.
    - The greater the bandwidth the greater the channel capacity.
- **Narrowband**: A transmission speed up to 64 Kbps that can now reach speeds of up to 2 Mbps.
- **Broadband**: A transmission speed ranging from 256 Kbps up to several terabits per second.
- Twisted-pair wire: up to 1 Gbps
- Microwave: up to 600 Mbps
- Satellite: up to 600 Mbps
- Coaxial cable: up to 1 Gbps
- Fiber-optic Cable: more than 40 Tbps

Transmission Technologies:

- **Integrated services digital network (ISDN)**: A high-speed technology that allows users to transfer voice, video, image, and data simultaneously, over existing telephone lines.
- **Digital subscriber line** (DSL): A high-speed, digital data-transmission technology using existing analog telephone lines.
- **Asynchronous transfer mode** (ATM): Data transmission technology that uses packet switching and allows for almost unlimited bandwidth on demand.

- **Synchronous optical network** (SONET): An interface standard for transporting digital signals over fiber-optic lines; allows the integration of transmissions from multiple vendors.
- **T-carrier system**: A digital transmission system that defines circuits that operate at different rates, all of which are multiples of the basic 64 Kbps used to transport a single voice call.

Types of networks:

- **Computer network**: system that connects computers via communications media so that data can be transmitted among them.
    - **Local Area Network**: connects two or more devices in a limited geographical region, usually within the same building, so that every device on the network can communicate with every other device.
        - **Switch**: A special-purpose computer that allows devices in a local area network to communicate directly with each other.
        - **Network interference card** (NIC): allows the device to physically connect to the LAN's communications medium.
            - This medium is typically unshielded twisted-pair wire (UTP).
        - **File server (network server)**: A computer that contains various software and data files for a local area network, and contains the network operating system.
        - **Gateway**: communications processor that connects dissimilar networks by translating from one set of protocols (rules that govern the functioning of a network) to another.
        - **Bridge**: Communications processor that connects two networks of the same type.

        - **Router**: Communications processor that routes messages through several connected LANs or across a wide area network such as the Internet.
        - **Wireless Local Area Networks** (WLANs): provide LAN connectivity over short distances, typically less than 150 meters.
    - **Wide Area Networks** (WANs): networks that cover large geographic areas.
        - **Value-added network** (VAN): A private, data-only network that is managed by an outside third party and used by multiple organizations to obtain economies in the cost of network service and network management.
    - **Enterprise Network**:
        - A network composed of interconnected multiple LANs and WANs.
        - **Backbone networks**: The main fiber-optic network that links the nodes of a network.

Network Fundamentals:

- **Protocol**: The set of rules and procedures governing transmission across a network.
    - **Ethernet**: A common local area network protocol.
      Transmission control protocol/internet protocol (TCP/IP): A file transfer protocol that can send large files of information across sometimes unreliable networks with assurance that the data will arrive uncorrupted.
        - **Internet protocol** (IP): responsible for disassembling, delivering, and reassembling the data during transmission.
        - **Packet switching**: The transmission technology that breaks up blocks of text into packets.
        - TCP/IP functions in four layers:
            - Application layer

        - **Hypertext transfer protocol** (HTTP): The communications standard used to transfer pages across the Web portion of the Internet; defines how messages are formulated and transmitted.
    - Transport layer
    - Internet layer
    - Network interface layer

Types of Network Processing:

- **Distributed processing**: divides processing work among two or more computers.
    - **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).
        - **Servers**: Smaller mid-range computers that support networks, enabling users to share files, software, and other network devices.
        - **Clients**: A computer, such as a user's personal computer, that uses any of the services provided by servers.
    - **Peer-to-peer processing**: type of client/server distributed processing in which each computer acts as both a client and a server.

The Internet:

- **Internet**: The massive network that connects computer networks of businesses, organizations, government agencies, and schools around the world, quickly, seamlessly, and inexpensively.
- **Intranet**: A private network that uses Internet software and TCP/IP protocols.
- **Extranet**: A network that connects parts of the intranets of different organizations.
- **Darknets**: A private network that runs on the Internet but is open only to users who belong to it.

Connecting via an On-line Service:

- **Internet service provider** (ISP): a company that offers internet connections for a fee.
    - Bell, Rogers, TekSavvy
        - **Network access points** (NAPs): ISPs connect to one another using NAPs. A computer that acts as an exchange point for Internet traffic and determines how traffic is routed.

Connecting via Other Means

- **Internet kiosks**: A terminal for public Internet access.
- Dial-up
- ISDN
- DSL
- Cable Modem
- Satellite
- Wireless
- Fiber-to-the-home (FITH)

Addresses on the Internet:

- **Internet protocol** (IP) **address**: An assigned address that uniquely identifies a computer on the Internet.
- **Domain name system** (DNS): The system administered by the Internet Corporation for Assigned Names and Numbers (ICANN) that assigns names to each site on the Internet.
- **Domain names**: The name assigned to an Internet site, consisting of multiple parts, separated by dots, which are translated from right to left.
- **Top-level domain** (TLD): The rightmost part of an Internet name, indicating the type of organization that owns the site.
- IPv4 and IPv6 are IP Addressing Schemas
- **Internet2**: A new, faster telecommunications network that deploys advanced network applications such as remote medical diagnosis, digital libraries, distance education, on-line simulation, and virtual laboratories.

The World Wide Web:

- The internet functions as a transport mechanism.
    - E-mail runs on the Internet.

- World Wide Web is an application that uses those transport functions.
- **World Wide Web (the Web, WWW, or W3)**: A system of universally accepted standards for storing, retrieving, formatting, and displaying information via a client/server architecture; it uses the transport functions of the Internet.
- **Homepage**: a text and graphical screen display that usually welcomes the user and explains the organization that has established the page.
    - Most cases, homepages lead users to other pages.
- **Website**: All the pages of a particular company or individual.
- **Webmaster**: Person in charge of an organizations website.
- **Uniform resource locator** (URL): The set of letters that identifies the address of a specific resource on the Web.
- **Browsers**: Software applications through which users primarily access the World Wide Web.
- **Surfing**: The process of navigating around the Web by pointing and clicking a web browser.