**Chapter 1: Information System In a global Business Today**

**Learning Objectives**

After reading this chapter, you will be able to answer the following questions:

1. How are information systems transforming business, and what is their relationship to globalization?
2. Why are information systems so essential for running and managing a business today?
3. What exactly is an information system? How does it work? What are its management, organization, and technology components?
4. What are complementary assets? Why are complementary assets essential for ensuring that information systems provide genuine value for an organization?
5. What academic disciplines are used to study information systems? How does each contribute to an understanding of information systems? What is the sociotechnical systems perspective?

**Chapter Summary**

1. How are information systems transforming business, and what is their relationship to globalization?  
   E-mail, online conferencing, and cell phones have become essential tools for conducting business. Information systems are the foundation of fast-paced supply chains. The Internet allows many businesses to buy, sell, advertise, and solicit customer feedback online. Organizations are trying to become more competitive and efficient by digitally enabling their core business processes and evolving into digital firms. The Internet has stimulated globalization by dramatically reducing the costs of producing, buying, and selling goods on a global scale. New information system trends include the emerging mobile digital platform, online software as a service, and cloud computing.
2. Why are information systems so essential for running and managing a business today?  
   Information systems have become a foundation for conducting business. In many industries, survival and the ability to achieve strategic business goals are difficult without extensive use of information technology. Businesses today use information systems to achieve six major objectives: operational excellence; new products, services, and business models; customer/supplier intimacy; improved decision making; competitive advantage; and day-to-day survival.
3. What exactly is an information system? How does it work? What are its management, organization, and technology components?  
   From a technical perspective, an information system collects, stores, and disseminates information from an organization’s environment and internal operations to support organizational functions and decision making, communication, coordination, control, analysis, and visualization. Information systems transform raw data into useful information through three basic activities: input, processing, and output. From a business perspective, an information system provides a solution to a problem or challenge facing a firm and represents a combination of management, organization, and technology elements. The management dimension of information systems involves such issues as leadership, strategy, and management behaviour. The technology dimension consists of computer hardware, software, data management technology, and networking/telecommunications technology (including the Internet). The organization dimension of information systems involves such issues as the organization’s hierarchy, functional specialties, business processes, culture, and political interest groups.
4. What are complementary assets? Why are complementary assets essential for ensuring that information systems provide genuine value for an organization?  
   To obtain meaningful value from information systems, organizations must support their technology investments with appropriate complementary investments in organizations and management. These complementary assets include new business models and business processes, supportive organizational culture and management behaviour, appropriate technology standards, regulations, and laws. New information technology investments are unlikely to produce high returns unless businesses make the appropriate managerial and organizational changes to support the technology.
5. What academic disciplines are used to study information systems? How does each contribute to an understanding of information systems? What is a sociotechnical systems perspective?  
   The study of information systems deals with issues and insights contributed from technical and behavioural disciplines. The disciplines that contribute to the technical approach focusing on formal models and capabilities of systems are computer science, management science, and operations research. The disciplines contributing to the behavioural approach focusing on the design, implementation, management, and business impact of systems are psychology, sociology, and economics. A sociotechnical view of systems considers both technical and social features of systems and solutions that represent the best fit between them.

**Chapter 2 -** How Business Use Information System

**Learning Objectives**

After reading this chapter, you will be able to answer the following questions:

1. What are business processes? How are they related to information systems?
2. How do systems serve the different management groups in a business?
3. How do systems that link the enterprise improve organizational performance?
4. Why are systems for collaboration and teamwork so important, and what technologies do they use?
5. What is the role of the information systems function in a business?

**Chapter Summary**

1. What are business processes? How are they related to information systems?  
   A business process is a logically related set of activities that defines how specific business tasks are performed, and it represents a unique way in which an organization coordinates work, information, and knowledge. Managers need to pay attention to business processes because they determine how well the organization can execute its business, and they may be a source of strategic advantage. There are business processes specific to each of the major business functions, but many business processes are cross-functional. Information systems automate parts of business processes, and they can help organizations redesign and streamline these processes.
2. How do systems serve the different management groups in a business?  
   Systems serving operational management are transaction processing systems (TPS), such as payroll or order processing, that track the flow of the daily routine transactions necessary to conduct business. Management information systems (MIS) produce reports serving middle management by condensing information from TPS and are not highly analytical. Decision support systems (DSS) support management decisions that are unique and rapidly changing using advanced analytical models. All of these types of systems provide business intelligence that helps managers and enterprise employees make more informed decisions. These systems for business intelligence serve multiple levels of management and include executive support systems (ESS) for senior management that provide data in the form of graphs, charts, and dashboards delivered via portals using many sources of internal and external information.
3. How do systems that link the enterprise improve organizational performance?  
   Enterprise applications are designed to coordinate multiple functions and business processes. Enterprise systems integrate the key internal business processes of a firm into a single software system to improve coordination and decision making. Supply chain management systems help the firm manage its relationship with suppliers to optimize the planning, sourcing, manufacturing, and delivery of products and services. Customer relationship management (CRM) systems coordinate the business processes surrounding the firm’s customers. Knowledge management systems enable firms to optimize the creation, sharing, and distribution of knowledge. Intranets and extranets are private corporate networks based on Internet technology that assemble information from disparate systems. Extranets make portions of private corporate intranets available to outsiders.
4. Why are systems for collaboration and teamwork so important, and what technologies do they use?  
   Collaboration is working with others to achieve shared and explicit goals. Collaboration and teamwork have become increasingly important in business because of globalization, the decentralization of decision making, and growth in jobs in which interaction is the primary value-adding activity. Collaboration is believed to enhance innovation, productivity, quality, and customer service. Effective collaboration today requires a supportive organizational culture as well as information systems and tools for collaborative work. Collaboration tools include e-mail and instant messaging, wikis, videoconferencing systems, virtual worlds, social networking systems, cell phones, and Internet collaboration platforms, such as Google Apps/ Sites, Microsoft SharePoint, and Lotus Notes.
5. What is the role of the information systems function in a business?  
   The information systems department is the formal organizational unit responsible for information technology services. It is responsible for maintaining the hardware, software, data storage, and networks that make up the firm’s IT infrastructure. The department consists of specialists, such as programmers, systems analysts, project leaders, and information systems managers, and is often headed by a CIO.

**CHAPTER 3: Information Systems, Organizations, and Strategy**

**Learning Objectives**

After reading this chapter, you will be able to answer the following questions:

1. Which features of organizations do managers need to know about to develop and use information systems successfully? What is the impact of information systems on organizations?
2. How does Porter’s competitive forces model help companies develop competitive strategies using information systems?
3. How do the value chain and value web models help businesses identify opportunities for strategic information system applications?
4. How do information systems help businesses use synergies, core competencies, and network-based strategies to achieve competitive advantage?
5. What are the challenges posed by strategic information systems, and how should they be addressed?

**Chapter Summary**

1. Which features of organizations do managers need to know about to develop and use information systems successfully? What is the impact of information systems on organizations?  
   All modern organizations are hierarchical, specialized, and impartial, using explicit routines to maximize efficiency. All organizations have their own cultures and politics arising from differences in interest groups, and they are affected by their surrounding environment. Organizations differ in goals, groups served, social roles, leadership styles, incentives, types of tasks performed, and type of structure. These features help explain differences in organizations’ use of information systems. Information systems and the organizations in which they are used interact with and influence each other. The introduction of a new information system will affect organizational structure, goals, work design, values, and competition between interest groups, decision making, and day-to-day behaviour. At the same time, information systems must be designed to serve the needs of important organizational groups and will be shaped by the organization’s structure, business processes, goals, culture, politics, and management. Information technology can reduce transaction and agency costs, and these changes have been accentuated in organizations using the Internet. New systems disrupt established patterns of work and power relationships, so there is often considerable resistance to them when they are introduced.
2. How does Porter’s competitive forces model help companies develop competitive strategies using information systems?  
   In Porter’s competitive forces model, the strategic position of the firm, and its strategies, are determined by competition with its traditional direct competitors, but they are also greatly affected by new market entrants, substitute products and services, suppliers, and customers. Information systems help companies compete by maintaining low costs, differentiating products or services, focusing on market niche, strengthening ties with customers and suppliers, and increasing barriers to market entry with high levels of operational excellence.
3. How do the value chain and value web models help businesses identify opportunities for strategic information system applications?  
   The value chain model highlights specific activities in the business where competitive strategies and information systems will have the greatest impact. The model views the firm as a series of primary and support activities that add value to a firm’s products or services. Primary activities are directly related to production and distribution while support activities make the delivery of primary activities possible. A firm’s value chain can be linked to the value chains of its suppliers, distributors, and customers. A value web consists of information systems that enhance competitiveness at the industry level by promoting the use of standards and industry-wide consortia, and by enabling businesses to work more efficiently with their value partners.
4. How do information systems help businesses use synergies, core competencies, and network-based strategies to achieve competitive advantage?  
   Because firms consist of multiple business units, information systems achieve additional efficiencies or enhance services by tying together the operations of disparate business units. Information systems help businesses leverage their core competencies by promoting the sharing of knowledge across business units. Information systems facilitate business models based on large networks of users or subscribers who take advantage of network economics. A virtual company strategy uses networks to link to other firms so that a company can use the capabilities of other companies to build, market, and distribute products and services. In business ecosystems, multiple industries work together to deliver value to the customer. Information systems support a dense network of interactions among the participating firms.
5. What are the challenges posed by strategic information systems, and how should they be addressed?  
   Implementing strategic systems often requires extensive organizational change and a transition from one sociotechnical level to another. These changes, called strategic transitions, are often difficult and painful to achieve. Moreover, not all strategic systems are profitable, and they can be expensive to develop. Many strategic information systems are easily copied by other firms so that strategic advantage is not always sustainable.

**Chapter 4: Ethical and Social Issues in Information**

**Learning Objectives**

After reading this chapter, you will be able to answer the following questions:

1. What social, ethical, and legal issues are raised by information systems?
2. What specific principles for conduct can be used to guide ethical decisions?
3. Why do contemporary information systems, technology, and the Internet pose challenges to the protection of individual privacy and intellectual property?
4. How have information systems affected everyday life?

**Chapter Summary**

1. What ethical, social, and political issues are raised by information systems?  
   Information technology is introducing changes for which laws and rules of acceptable conduct have not yet been developed. Increasing computing power, storage, and networking capabilities—including the Internet—expand the reach of individual and organizational actions and magnify their impacts. The ease and anonymity with which information is now communicated, copied, and manipulated in online environments pose new challenges to the protection of privacy and intellectual property. The main ethical, social, and political issues raised by information systems centre around information rights and obligations, property rights and obligations, accountability and control, system quality, and quality of life.
2. What specific principles for conduct can be used to guide ethical decisions?  
   Six ethical principles for judging conduct include the Golden Rule, Immanuel Kant’s Categorical Imperative, Descartes’ Rule of Change, the Utilitarian Principle, the Risk Aversion Principle, and the Ethical “No Free Lunch” Rule. These principles should be used in conjunction with an ethical analysis.
3. Why do contemporary information systems technology and the Internet pose challenges to the protection of individual privacy and intellectual property?  
   Contemporary data storage and data analysis technology enables companies to easily gather personal data about individuals from many different sources and analyze these data to create detailed electronic profiles about individuals and their behaviours. Data flowing over the Internet can be monitored at many points. Cookies and other Web monitoring tools closely track the activities of Web site visitors. Not all Web sites have strong privacy protection policies, and they do not always allow for informed consent regarding the use of personal information. Traditional copyright laws are insufficient to protect against software piracy because digital material can be copied easily and transmitted to many different locations simultaneously over the Internet.
4. How have information systems affected everyday life?  
   Although computer systems have been sources of efficiency and wealth, they have some negative impacts. Computer errors can cause serious harm to individuals and organizations. Poor data quality is also responsible for disruptions and losses for businesses. Jobs can be lost when computers replace workers or tasks become unnecessary in reengineered business processes. The ability to own and use a computer may be exacerbating socioeconomic disparities among different racial, ethnic, and economic groups and social classes. Widespread use of computers increases opportunities for computer crime and computer abuse. Computers can also create health problems, such as repetitive strain injury (RSI), computer vision syndrome, and technostress.

**Chapter 5: IT Infrastructure and Emerging Technologies**

**Learning Objectives**

After reading this chapter, you will be able to answer the following questions:

1. What is information technology (IT) infrastructure, and what are its components?
2. What are the stages and technology drivers of IT infrastructure evolution?
3. What are the current trends in computer hardware platforms?
4. What are the current trends in software platforms?
5. What are the challenges of managing IT infrastructure and management solutions?

**Chapter Summary**

1. What is information technology (IT) infrastructure, and what are its components?  
   IT infrastructure is the shared technology resources that provide the platform for the firm’s specific information system applications. IT infrastructure includes hardware, software, and services that are shared across the entire firm. Major IT infrastructure components include computer hardware platforms, operating system platforms, enterprise software platforms, networking and telecommunications platforms, database management software, Internet platforms, and consulting services and systems integrators.
2. What are the stages and technology drivers of IT infrastructure evolution?  
   The five stages of IT infrastructure evolution are as follows: the mainframe era, the personal computer era, the client/server era, the enterprise computing era, and the cloud and mobile computing era. Moore’s Law deals with the exponential increase in processing power and decline in the cost of computer technology, stating that every 18 months the power of microprocessors doubles and the price of computing halves. The Law of Mass Digital Storage deals with the exponential decrease in t he cost of storing data, stating that the number of kilobytes of data that can be stored on magnetic media for $1 roughly doubles every 15 months. Metcalfe’s Law shows that a network’s value to participants grows exponentially as the network takes on more members. Also driving exploding computer use is the rapid decline in costs of communication and growing agreement in the technology industry to use computing and communications standards.
3. What are the current trends in computer hardware platforms?  
   Increasingly, computing is taking place on a mobile digital platform. Grid computing involves connecting geographically remote computers into a single network to create a computational grid that combines the computing power of all the computers on the network. Virtualization organizes computing resources so that their use is not restricted by physical configuration or geographical location. In cloud computing, firms and individuals obtain computing power and software as services over a network, including the Internet, rather than purchasing and installing the hardware and software on their own computers. A multicore processor is a microprocessor to which two or more processing cores have been attached for enhanced performance. Green computing includes practices and technologies for producing, using, and disposing of information technology hardware to minimize the negative impact on the environment. In autonomic computing, computer systems have capabilities for automatically configuring and repairing themselves. Power-saving processors dramatically reduce power consumption in mobile digital devices.
4. What are the current trends in software platforms?  
   Open source software is produced and maintained by a global community of programmers and is often downloadable for free. Linux is a powerful, resilient open-source operating system that can run on multiple hardware platforms and is used widely to run Web servers. Java is an operating-system- and hardware-independent programming language that is the leading interactive programming environment for the Web. Web services are loosely coupled software components based on open Web standards that work with any application software and operating system. They can be used as components of Web-based applications linking the systems of two different organizations or to link disparate systems of a single company. Companies are purchasing their new software applications from outside sources, including software packages, by outsourcing custom application development to an external vendor (which may be offshore), or by renting online software services (software as a service [SaaS]). Mashups combine two different software services to create new software applications and services. Apps are small pieces of software that run on the Internet, on a computer, or on a mobile device and are generally delivered over the Internet.
5. What are the challenges of managing IT infrastructure and management solutions?  
   Major challenges include dealing with platform and infrastructure change, handling infrastructure management and governance, and making wise infrastructure investments. Solution guidelines include using a competitive forces model to determine how much to spend on IT infrastructure and where to make strategic infrastructure investments, and establishing the total cost of ownership (TCO) of information technology assets. The TCO of technology resources includes not only the original cost of computer hardware and software but also costs for hardware and software upgrades, maintenance, technical support, and training.

**Chapter 6: Foundations of Business Intelligence**

After reading this chapter, you will be able to answer the following questions:

1. What are the problems of managing data resources in a traditional file environment, and how are they solved by a database management system?
2. What are the major capabilities of database management systems (DBMS), and why is a relational DBMS so powerful?
3. What are some important principles of database design?
4. What are the principal tools and technologies for accessing information from databases to improve business performance and decision making?
5. Why are information policy, data administration, and data quality assurance essential for managing the firm’s data resources?

**Summary**

1. What are the problems of managing data resources in a traditional file environment, and how are they solved by a database management system?  
   Traditional file management techniques make it difficult for organizations to keep track of all of the pieces of data they use in a systematic way and to organize these data so that they can be easily accessed. Different functional areas and groups were allowed to develop their own files independently. Over time, this traditional file management environment creates such problems as data redundancy and inconsistency, program–data dependence, inflexibility, poor security, and lack of data sharing and availability. A database management system (DBMS) solves these problems with software that permits centralization of data and data management so that businesses have a single, consistent source for all their data needs. Using a DBMS minimizes redundant and inconsistent files.
2. What are the major capabilities of DBMS, and why is a relational DBMS so powerful?  
   The principal capabilities of a DBMS include a data definition capability, a data dictionary capability, and a data manipulation language. The data definition capability specifies the structure and content of the database. The data dictionary is an automated or manual file that stores information about the data in the database, including names, definitions, formats, and descriptions of data elements. The data manipulation language, such as Structured Query Language (SQL), is a specialized language for accessing and manipulating the data in the database. The relational database is the primary method for organizing and maintaining data today in information systems because it is so flexible and accessible. It organizes data in two-dimensional tables called *relations*, with rows and columns. Each table contains data about an entity and its attributes. Each row represents a record, and each column represents an attribute or field. Each table also contains a key field to uniquely identify each record for retrieval or manipulation. Relational database tables can be combined easily to deliver data required by users, provided that any two or more tables share a common data element.
3. What are some important database design principles?  
   Designing a database requires both a logical design and a physical design. The logical design models the database from a business perspective. The organization’s data model should reflect its key business processes and decision-making requirements. The process of creating small, stable, flexible, and adaptive data structures from complex groups of data when designing a relational database is termed *normalization*. A well-designed relational database will not have many-to-many relationships, and all attributes for a specific entity will only apply to that entity. It will try to enforce referential integrity rules to ensure that relationships between coupled tables remain consistent. An entity relationship diagram graphically depicts the relationship between entities (tables) in a relational database.
4. What are the principal tools and technologies for accessing information from databases to improve business performance and decision making?  
   Powerful tools are available to analyze and access the information in databases. A data warehouse consolidates current and historical data from many different operational systems in a central database designed for reporting and analysis. Data warehouses support multidimensional data analysis, also known as *online analytical processing (OLAP)*. OLAP represents relationships among data as a multidimensional structure, which can be visualized as cubes of data and cubes within cubes of data, enabling more sophisticated data analysis. Data mining analyzes large pools of data, including the contents of data warehouses, to find patterns and rules that can be used to predict future behaviour and guide decision making. Text mining tools help businesses analyze large, unstructured data sets consisting of text. Web mining tools focus on analysis of useful patterns and information from the World Wide Web, examining the structures of Web sites and activities of site users as well as the contents of Web pages. Conventional databases can be linked via middleware to the Web or a Web interface to facilitate user access to an organization’s internal data.
5. Why are information policy, data administration, and data quality assurance essential for managing the firm’s data resources?  
   Developing a database environment requires policies and procedures for managing organizational data as well as a good data model and database technology. A formal information policy governs the maintenance, distribution, and use of information in the organization. In large corporations, a formal data administration function is responsible for information policy, as well as for data planning, data dictionary development, and monitoring data usage in the firm. Data that are inaccurate, incomplete, or inconsistent create serious operational and financial problems for businesses because they may create inaccuracies in product pricing, customer accounts, and inventory data and lead to inaccurate decisions about the actions that should be taken by the firm. Firms must take special steps to make sure they have a high level of data quality. These include using enterprise-wide data standards, databases designed to minimize inconsistent and redundant data, data quality audits, and data cleansing software.

**Chapter 7: Telecommunications, the Internet, and Wireless Technology**

After reading this chapter, you will be able to answer the following questions:

1. What are the principal components of telecommunications networks and key networking technologies?
2. What are the main telecommunications transmission media and types of networks?
3. How do the Internet and Internet technology work, and how do they support communication and electronic business (e-business)?
4. What are the principal technologies and standards for wireless networking, communication, and Internet access?
5. Why are radio frequency identification (RFID) and wireless sensor networks valuable for business?

**Summary**

1. What are the principal components of telecommunications networks and key networking technologies?  
   A simple network consists of two or more connected computers. Basic network components include computers, network interfaces, a connection medium, network operating system software, and either a hub or a switch. The networking infrastructure for a large company includes the traditional telephone system, mobile cellular communication, wireless local area networks, videoconferencing systems, a corporate Web site, intranets, extranets, and an array of local and wide area networks, including the Internet. Contemporary networks have been shaped by the rise of client/server computing, the use of packet switching, and the adoption of Transmission Control Protocol/Internet Protocol (TCP/IP) as a universal communications standard for linking disparate networks and computers, including the Internet. Protocols provide a common set of rules that enable communication among diverse components in a telecommunications network.
2. What are the main telecommunications transmission media and types of networks?  
   The principal physical transmission media are twisted copper telephone wire, coaxial copper cable, fibre-optic cable, and wireless transmission. Twisted wire enables companies to use existing wiring for telephone systems for digital communication, although it is relatively slow. Fibre-optic and coaxial cable are used for high-volume transmission but are expensive to install. Microwave and communications satellites are used for wireless communication over long distances. Local area networks (LANs) connect personal computers (PCs) and other digital devices together within a 500-metre radius and are used today for many corporate computing tasks. Network components may be connected together using a star, bus, or ring topology. Wide area networks (WANs) span broad geographical distances, ranging from several miles to continents, and are private networks that are independently managed. Metropolitan area networks (MANs) span a single urban area. Digital subscriber line (DSL) technologies, cable Internet connections, and T1 lines are often used for high-capacity Internet connections. Cable Internet connections provide high-speed access to the Web or corporate intranets at speeds of up to 10 megabits per second (Mbps). A T1 line supports a data transmission rate of 1.544 Mbps.
3. How do the Internet and Internet technology work, and how do they support communication and e-business?  
   The Internet is a worldwide network of networks that uses the client/server model of computing and the TCP/IP network reference model. Every computer on the Internet is assigned a unique numeric IP address. The domain name system (DNS) converts IP addresses to more user-friendly domain names. Worldwide Internet policies are established by organizations and government bodies, such as the Internet Architecture Board (IAB) and the World Wide Web Consortium (W3C). Major Internet services include e-mail, newsgroups, chatting, instant messaging, Telnet, file transfer protocol (FTP), and the Web. Web pages are based on Hypertext Markup Language (HTML) and can display text, graphics, video, and audio. Web site directories, search engines, and RSS (Really Simple Syndication) technology help users locate the information they need on the Web. RSS, blogs, social networking, and wikis are features of Web 2.0. Firms are also starting to realize economies by using Voice-over Internet Protocol (VoIP) technology for voice transmission and by using virtual private networks (VPNs) as low-cost alternatives to private WANs.
4. What are the principal technologies and standards for wireless networking, communication, and Internet access?  
   Cellular networks are evolving toward high-speed, high-bandwidth, digital packet-switched transmission. Broadband 3G networks are capable of transmitting data at speeds ranging from 144 kilobits per second (kbps) to more than 2 Mbps. 4G networks capable of transmission speeds that could reach 1 gigabits per second (Gbps) are starting to be rolled out. Major cellular standards include Code Division Multiple Access (CDMA), which is used primarily in North America, and Global System for Mobile Communications (GSM), which is the standard in much of the rest of the world. Standards for wireless computer networks include Bluetooth (802.15) for small personal area networks (PANs), Wi-Fi (802.11) for local area networks (LANs), and WiMax (802.16) for metropolitan area networks (MANs).
5. Why are radio frequency identification (RFID) and wireless sensor networks valuable for business?  
   RFID systems provide a powerful technology for tracking the movement of goods by using tiny tags with embedded data about an item and its location. RFID readers read the radio signals transmitted by these tags and pass the data over a network to a computer for processing. Wireless sensor networks (WSNs) are networks of interconnected wireless sensing and transmitting devices that are embedded into the physical environment to provide measurements of many points over large spaces.

**Chapter 8: Securing Information Systems**

After reading this chapter, you will be able to answer the following questions:

1. Why are information systems vulnerable to destruction, error, and abuse?
2. What is the business value of security and control?
3. What are the components of an organizational framework for security and control?
4. What are the most important tools and technologies for safeguarding information resources?

**Summary**

1. Why are information systems vulnerable to destruction, error, and abuse?  
   Digital data are vulnerable to destruction, misuse, error, fraud, and hardware or software failures. The Internet is designed to be an open system and makes internal corporate systems more vulnerable to actions from outsiders. Hackers can unleash denial-of-service (DoS) attacks or penetrate corporate networks, causing serious system disruptions. Wi-Fi networks can easily be penetrated by intruders using sniffer programs to obtain an address to access the resources of the network. Computer viruses and worms can disable systems and Web sites. The dispersed nature of cloud computing makes it difficult to track unauthorized activity or to apply controls from afar. Software presents problems because software bugs may be impossible to eliminate and because software vulnerabilities can be exploited by hackers and malicious software. End users often introduce errors.
2. What is the business value of security and control?  
   Lack of sound security and control can cause firms relying on computer systems for their core business functions to lose sales and productivity. Information assets, such as confidential employee records, trade secrets, or business plans, lose much of their value if they are revealed to outsiders or if they expose the firm to legal liability. New laws, such as the *Personal Information Protection and Electronic Documents Act (PIPEDA)*, require companies to practise stringent electronic records management and adhere to strict standards for security, privacy, and control. Legal actions requiring electronic evidence and computer forensics also require firms to pay more attention to security and electronic records management.
3. What are the components of an organizational framework for security and control?  
   Firms need to establish a good set of both general and application controls for their information systems. A risk assessment evaluates information assets, identifies control points and control weaknesses, and determines the most cost-effective set of controls. Firms must also develop a coherent corporate security policy and plans for continuing business operations in the event of disaster or disruption. The security policy includes policies for acceptable use and identity management. Comprehensive and systematic MIS auditing helps organizations determine the effectiveness of security and controls for their information systems.
4. What are the most important tools and technologies for safeguarding information resources?  
   Firewalls prevent unauthorized users from accessing a private network when it is linked to the Internet. Intrusion detection systems monitor private networks from suspicious network traffic and attempts to access corporate systems. Passwords, tokens, smart cards, and biometric authentication are used to authenticate system users. Antivirus software checks computer systems for infections by viruses and worms and often eliminates the malicious software, whereas antispyware software combats intrusive and harmful spyware programs. Encryption, the coding and scrambling of messages, is a widely used technology for securing electronic transmissions over unprotected networks. Digital certificates combined with public key encryption provide further protection of electronic transactions by authenticating a user’s identity. Companies can use fault-tolerant computer systems or create high-availability computing environments to make sure that their information systems are always available. Use of software metrics and rigorous software testing help improve software quality and reliability.

**Chapter 9: Achieving Operational Excellence and Customer Intimacy**

After reading this chapter, you will be able to answer the following questions:

1. How do enterprise systems help businesses achieve operational excellence?
2. How do supply chain management systems coordinate planning, production, and logistics with suppliers?
3. How do customer relationship management systems help firms achieve customer intimacy?
4. What challenges are posed by enterprise applications?
5. How are enterprise applications used in platforms for new cross-functional services?

**SUMMARY**

1. How do enterprise systems help businesses achieve operational excellence?  
   Enterprise software is based on a suite of integrated software modules and a common central database. The database collects data from and feeds the data into numerous applications that can support nearly all of an organization’s internal business activities. When new information is entered by one process, the information is made available immediately to other business processes. Enterprise systems support organizational centralization by enforcing uniform data standards and business processes throughout the company and a single unified technology platform. The firm-wide data generated by enterprise systems help managers evaluate organizational performance.
2. How do supply chain management systems coordinate planning, production, and logistics with suppliers?  
   Supply chain management systems automate the flow of information among members of the supply chain so that they can use it to make better decisions about when and how much to purchase, produce, or ship. More accurate information from supply chain management systems reduces uncertainty and the impact of the bullwhip effect. Supply chain management software includes software for supply chain planning and for supply chain execution. Internet technology facilitates the management of global supply chains by providing the connectivity for organizations in different countries to share supply chain information. Improved communication among supply chain members also facilitates efficient customer response and movement toward a demand-driven model.
3. How do customer relationship management systems help firms achieve customer intimacy?  
   Customer relationship management (CRM) systems integrate and automate customer-facing processes in sales, marketing, and customer service, providing an enterprise-wide view of customers. Companies can use this knowledge when they interact with customers to provide them with better service or to sell new products and services. These systems also identify profitable or unprofitable customers or opportunities to reduce the churn rate. The major customer relationship management software packages provide capabilities for both operational CRM and analytical CRM. They often include modules for managing relationships with selling partners (partner relationship management) and for employee relationship management.
4. What challenges are posed by enterprise applications?  
   Enterprise applications are difficult to implement. They require extensive organizational change, large new software investments, and careful assessment of how these systems will enhance organizational performance. Enterprise applications cannot provide value if they are implemented atop flawed processes, or if firms do not know how to use these systems to measure performance improvements. Employees require training to prepare for new procedures and roles. Attention to data management is essential.
5. How are enterprise applications used in platforms for new cross-functional services?  
   Service platforms integrate data and processes from the various enterprise applications (CRM, supply chain management, and enterprise systems), as well as from disparate legacy applications to create new composite business processes. Web services tie various systems together. The new services are delivered through enterprise portals, which can integrate disparate applications so that information appears to be coming from a single source. Open source, mobile, and cloud versions of some of these products are becoming available.

**Chapter 10: E-Commerce: Digital Markets, Digital Goods**

After reading this chapter, you will be able to answer the following questions:

1. What are the unique features of electronic commerce (e-commerce), digital markets, and digital goods?
2. What are the principal e-commerce business and revenue models?
3. How has e-commerce transformed marketing?
4. How has e-commerce affected business-to-business (B2B) transactions?
5. What is the role of mobile commerce in business, and what are the most important m-commerce applications?
6. What issues must be addressed when building an e-commerce Web site?

**SUMMARY**

1. What are the unique features of electronic commerce (e-commerce), digital markets, and digital goods?  
   E-commerce involves digitally enabled commercial transactions between and among organizations and individuals. Unique features of e-commerce technology include ubiquity, global reach, universal technology standards, richness, interactivity, information density, capabilities for personalization and customization, and social technology. Digital markets are said to be more “transparent” than traditional markets, with reduced information asymmetry, search costs, transaction costs, and menu costs, along with the ability to change prices dynamically based on market conditions. Digital goods, such as music, video, software, and books, can be delivered over a digital network. Once a digital product has been produced, the cost of delivering that product digitally is extremely low.
2. What are the principal e-commerce business and revenue models?  
   E-commerce business models are electronic retailers (e-tailers), transaction brokers, market creators, content providers, community providers, service providers, and portals. The principal e-commerce revenue models are advertising, sales, subscription, free/freemium, transaction fee, and affiliate.
3. How has e-commerce transformed marketing?   
   The Internet provides marketers with new ways of identifying and communicating with millions of potential customers at costs far lower than traditional media. Crowdsourcing utilizing “the wisdom of crowds” helps companies learn from customers in order to improve product offerings and increase customer value. Behavioural targeting techniques increase the effectiveness of banner, rich media, and video ads.
4. How has e-commerce affected business-to-business (B2B) transactions?  
   B2B e-commerce generates efficiencies by enabling companies to locate suppliers, solicit bids, place orders, and track shipments in transit electronically. Net marketplaces provide a single, digital marketplace for many buyers and sellers. Private industrial networks link a firm with its suppliers and other strategic business partners to develop highly efficient and responsive supply chains.
5. What is the role of mobile commerce (m-commerce) in business, and what are the most important m-commerce applications?  
   M-commerce is especially well suited for location-based applications, such as finding local hotels and restaurants, monitoring local traffic and weather, and providing personalized location-based marketing. Mobile phones and handhelds are being used for mobile bill payment, banking, securities trading, transportation schedule updates, and downloads of digital content, such as music, games, and video clips. M-commerce requires wireless portals and special digital payment systems that can handle micropayments.
6. What issues must be addressed when building an e-commerce Web site?  
   Building a successful e-commerce site requires a clear understanding of the business objectives to be achieved by the site and selection of the right technology to achieve those objectives. E-commerce sites can be built and hosted in-house or partially or fully outsourced to external service providers.

**Chapter 11: Managing Knowledge and Collaboration**

After reading this chapter, you will be able to answer the following questions:

1. What is the role of knowledge management and knowledge management programs in business?
2. What types of systems are used for enterprise-wide knowledge management, and how do they provide value for businesses?
3. What are the major types of knowledge work systems, and how do they provide value for firms?
4. What are the business benefits of using intelligent techniques for knowledge management?
5. What is the role of knowledge management and knowledge management programs in business?  
   Knowledge management is a set of processes to create, store, transfer, and apply knowledge in the organization. Much of a firm’s value depends on its ability to create and manage knowledge. Knowledge management promotes organizational learning by increasing the ability of the organization to learn from its environment and to incorporate knowledge into its business processes. There are three major types of knowledge management systems: enterprise-wide knowledge management systems, knowledge work systems, and intelligent techniques.
6. What types of systems are used for enterprise-wide knowledge management, and how do they provide value for businesses?   
   Enterprise-wide knowledge management systems are firm-wide efforts to collect, store, distribute, and apply digital content and knowledge. Enterprise content management systems provide databases and tools for organizing and storing structured documents and tools for organizing and storing semistructured knowledge, such as e-mail or rich media. Knowledge network systems provide directories and tools for locating firm employees with special expertise who are important sources of tacit knowledge. Often, these systems include group collaboration tools (including wikis and social bookmarking), portals to simplify information access, search tools, and tools for classifying information based on a taxonomy that is appropriate for the organization. Enterprise-wide knowledge management systems can provide considerable value if they are well designed and enable employees to locate, share, and use knowledge more efficiently.
7. What are the major types of knowledge work systems, and how do they provide value for firms?  
   Knowledge work systems (KWS) support the creation of new knowledge and its integration into the organization. KWS require easy access to an external knowledge base; powerful computer hardware that can support software with intensive graphics, analysis, document management, and communications capabilities; and a user-friendly interface. Computer-aided design (CAD) systems, augmented reality applications, and virtual reality systems, which create interactive simulations that behave like the real world, require graphics and powerful modelling capabilities. KWS for financial professionals provide access to external databases and the ability to analyze massive amounts of financial data very quickly.
8. What are the business benefits of using intelligent techniques for knowledge management?  
   Artificial intelligence lacks the flexibility, breadth, and generality of human intelligence, but it can be used to capture, codify, and extend organizational knowledge. Expert systems capture tacit knowledge from a limited domain of human expertise and express that knowledge in the form of rules. Expert systems are most useful for problems of classification or diagnosis. Case-based reasoning represents organizational knowledge as a database of cases that can be continually expanded and refined.

Fuzzy logic is a software technology for expressing knowledge in the form of rules that use approximate or subjective values. Fuzzy logic has been used for controlling physical devices and is starting to be used for limited decision-making applications. Neural networks consist of hardware and software that attempt to mimic the thought processes of the human brain. Neural networks are notable for their ability to learn without programming and to recognize patterns that cannot be easily described by humans. They are being used in science, medicine, and business to discriminate patterns in massive amounts of data. Genetic algorithms develop solutions to particular problems using genetically based processes, such as fitness, crossover, and mutation. Genetic algorithms are beginning to be applied to problems involving optimization, product design, and monitoring industrial systems where many alternatives or variables must be evaluated to generate an optimal solution. Intelligent agents are software programs with built-in or learned knowledge bases that carry out specific, repetitive, and predictable tasks for an individual user, business process, or software application. Intelligent agents can be programmed to navigate through large amounts of data to locate useful information and in some cases act on that information on behalf of the user.

Chapter 12: Enhancing Decision Making

After reading this chapter, you will be able to answer the following questions:

1. What are the different types of decisions and how does the decision-making process work?
2. How do information systems support the activities of managers and management decision making?
3. How do business intelligence and business analytics support decision making?
4. How do different decision-making constituencies in an organization use business intelligence?
5. What is the role of information systems in helping people working in a group make decisions more efficiently?

**SUMMARY**

1. What are the different types of decisions, and how does the decision-making process work?  
   The different levels in an organization (strategic, management, operational) have different decision-making requirements. Decisions can be structured, semistructured, or unstructured, with structured decisions clustering at the operational level of the organization and unstructured decisions at the strategic level. Decision making can be performed by individuals or groups and includes employees as well as operational, middle, and senior managers. There are four stages in decision making: intelligence, design, choice, and implementation. Systems to support decision making do not always produce better management and employee decisions that improve firm performance because of problems with information quality, management filters, and organizational culture.
2. How do information systems support the activities of managers and management decision making?  
   Early classic models of managerial activities stress the functions of planning, organizing, coordinating, deciding, and controlling. Contemporary research looking at the actual behaviour of managers has found that managers’ real activities are highly fragmented, variegated, and brief in duration and that managers shy away from making grand, sweeping policy decisions. Information technology provides new tools for managers to carry out both traditional and newer management roles, enabling them to monitor, plan, and forecast with more precision and speed than ever before and to respond more rapidly to the changing business environment. Information systems have been most helpful to managers by providing support for their roles in disseminating information, providing liaisons between organizational levels, and allocating resources. However, information systems are less successful at supporting unstructured decisions. Where information systems are useful, information quality, management filters, and organizational culture can degrade decision making.
3. How do business intelligence and business analytics support decision making?  
   Business intelligence (BI) and business analytics (BA) promise to deliver correct, nearly real-time information to decision makers, and the analytical tools help them quickly understand the information and take action. A BI environment consists of data from the business environment, the BI infrastructure, a BA toolset, managerial users and methods, a BI delivery platform (management information systems [MIS], decision support systems [DSS], or executive support systems [ESS]), and the user interface. There are six analytical functionalities that BI systems deliver to achieve these ends: predefined production reports, parameter-driven reports, dashboards and scorecards, ad hoc queries and searches, the ability to drill down, and the ability to model scenarios and create forecasts.
4. How do different decision-making constituencies in an organization use business intelligence?  
   Operational and middle management are generally charged with monitoring the performance of their firm. Most of the decisions they make are fairly structured. MIS producing routine production reports are typically used to support this type of decision making. For making unstructured decisions, middle managers and analysts will use DSS with powerful analytics and modelling tools, including spreadsheets and pivot tables. Senior executives making unstructured decisions use dashboards and visual interfaces to display key performance information affecting the overall profitability, success, and strategy of the firm. Balanced scorecard and business performance management are two methodologies used in designing ESS.
5. What is the role of information systems in helping people working in a group make decisions more efficiently?  
   Group decision support systems (GDSS) help people working together in a group arrive at decisions more efficiently. GDSS feature special conference room facilities where participants contribute their ideas using networked computers and software tools for organizing ideas, gathering information, making and setting priorities, and documenting meeting sessions.

**Chapter 13: Building Information Systems**

After reading this chapter, you will be able to answer the following questions:

1. How does a developing new system produce organizational change?
2. What are the core activities in the systems development process?
3. What are the principal methodologies for modelling and designing systems?
4. What are the alternative methods for developing information systems?
5. What are new approaches for system development in the digital firm era?

**SUMMARY**

1. How does developing new systems produce organizational change?  
   Developing a new information system is a form of planned organizational change. Four kinds of technology enabled change are (a) automation, (b) rationalization of procedures, (c) business process redesign, and (d) paradigm shift, with far-reaching changes carrying the greatest risks and rewards. Many organizations are using business process management to redesign work flows and business processes in the hope of achieving dramatic productivity breakthroughs. Business process management is also useful for promoting, total quality management (TQM), six sigma, and other initiatives for incremental process improvement.
2. What are the core activities in the systems development process?  
   The core activities in systems development are systems analysis, systems design, programming, testing, conversion, production, and maintenance. Systems analysis is the study and analysis of problems of existing systems and the identification of requirements for their solutions. Systems design provides the specifications for an information system solution, showing how its technical and organizational components fit together.
3. What are the principal methodologies for modeling and designing systems?  
   The two principal methodologies for modelling and designing information systems are structured methodologies and object-oriented development. Structured methodologies focus on modelling processes and data separately. The data flow diagram is the principal tool for structured analysis, and the structure chart is the principal tool for representing structured software design. Object-oriented development models a system as a collection of objects that combine processes and data. Object-oriented modelling is based on the concepts of class and inheritance.
4. What are the alternative methods for developing information systems?  
   The oldest method for developing systems is the systems life cycle, which requires that information systems be developed in formal stages. The stages must proceed sequentially and have defined outputs; each requires formal approval before the next stage can commence. The systems life cycle is useful for large projects that need formal specifications and tight management control over each stage of systems development, but it is very rigid and costly. Prototyping consists of developing an experimental system rapidly and inexpensively for end users to interact with and evaluate. Prototyping encourages end-user involvement in systems development and iteration of design until specifications are captured accurately. The rapid creation of prototypes can result in systems that have not been completely tested or documented or that are technically inadequate for a production environment. Using a software package reduces the amount of design, programming, testing, installation, and maintenance work required to develop a system. Application software packages are helpful if a firm does not have the internal information systems staff or financial resources to custom develop a system. To meet an organization’s unique requirements, packages may require extensive modifications that can substantially raise development costs. End-user development is the development of information systems by end users, either alone or with minimal assistance from information systems specialists. End-user-developed systems can be created rapidly and informally using fourth-generation software tools. However, end-user development may create information systems that do not necessarily meet quality assurance standards and that are not easily controlled by traditional means. Outsourcing consists of using an external vendor to develop (or operate) a firm’s information systems instead of the organization’s internal information systems staff. Outsourcing can save application development costs or enable firms to develop applications without an internal information systems staff. However, firms risk losing control over their information systems and becoming too dependent on external vendors. Outsourcing also entails “hidden” costs, especially when the work is sent offshore.
5. What are new approaches for systems development in the digital firm era?  
   Companies are turning to rapid application design, joint application design (JAD), agile development, and reusable software components to accelerate the systems development process. Rapid application development (RAD) uses object-oriented software, visual programming, prototyping, and fourth-generation tools for very rapid creation of systems. Agile development breaks a large project into a series of small subprojects that are completed in short periods using iteration and continuous feedback. Component-based development expedites application development by grouping objects into suites of software components that can be combined to create large-scale business applications. Web services provide a common set of standards that enable organizations to link their systems, regardless of their technology platform, through standard plug-and-play architecture.

**Chapter 14: Managing Projects**

After reading this chapter, you will be able to answer the following questions:

1. What are the objectives of project management, and why is it so essential in developing information systems?
2. What methods can be used for selecting and evaluating information systems projects and aligning them with the firm’s business goals?
3. How can firms assess the business value of information systems projects?
4. What are the principal risk factors in information systems projects?
5. What strategies are useful for managing project risk and system implementation?

**SUMMARY**

1. What are the objectives of project management, and why is it so essential in developing information systems (IS)?  
   Good project management is essential for ensuring that systems are delivered on time and within the budget and provide genuine business benefits. Project management activities include planning the work, assessing the risk, estimating and acquiring resources required to accomplish the work, organizing the work, directing execution, and analyzing the results. Project management must deal with five major variables: scope, time, cost, quality, and risk.
2. What methods can be used for selecting and evaluating information systems projects and aligning them with the firm’s business goals?  
   Organizations need an information systems plan that describes how information technology supports the attainment of their business goals and documents all their system applications and information technology (IT) infrastructure components. Large corporations will have a management structure to ensure the most important systems projects receive priority. Critical success factors, portfolio analysis, and scoring models can be used to identify and evaluate alternative information systems projects.
3. How can firms assess the business value of information systems projects?  
   To determine whether an information systems project is a good investment, one must calculate its costs and benefits. Tangible benefits are quantifiable, and intangible benefits that cannot be immediately quantified may provide quantifiable benefits in the future. Benefits that exceed costs should be analyzed using capital budgeting methods to make sure a project represents a good return on the firm’s invested capital. Real options pricing models, which apply the same techniques for valuing financial options to systems investments, can be useful when considering highly uncertain IT investments.
4. What are the principal risk factors in information systems projects?  
   The level of risk in a systems development project is determined by (1) project size, (2) project structure, and (3) experience with technology. Information systems (IS) projects are more likely to fail when there is insufficient or improper user participation in the systems development process, lack of management support, and poor management of the implementation process. There is a very high failure rate among projects involving business process reengineering, enterprise applications, and mergers and acquisitions because they require extensive organizational change.
5. What strategies are useful for managing project risk and system implementation?  
   Implementation refers to the entire process of organizational change surrounding the introduction of a new information system. User support and involvement and management support and control of the implementation process are essential, as are mechanisms for dealing with the level of risk in each new systems project. Project risk factors can be brought under some control by a contingency approach to project management. The risk level of each project determines the appropriate mix of external integration tools, internal integration tools, formal planning tools, and formal control tools to be applied.

**Chapter 15**

After reading this chapter, you will be able to answer the following questions:

1. What major factors are driving the internationalization of business?
2. What are the alternative strategies for developing global businesses?
3. How can information systems support different global business strategies?
4. What are the challenges posed by global information systems and management solutions for these challenges?
5. What are the issues and technical alternatives to be considered when developing international information systems?

**Summary**

1. What major factors are driving the internationalization of business?  
   The growth of inexpensive international communication and transportation has created a world culture with stable expectations or norms. Political stability and a growing global knowledge base that is widely shared also contribute to the world culture. These general factors create the conditions for global markets, global production, coordination, distribution, and global economies of scale.
2. What are the alternative strategies for developing global businesses?  
   There are four basic international strategies: domestic exporter, multinational, franchiser, and transnational. In a transnational strategy, all factors of production are coordinated on a global scale. However, the choice of strategy is a function of the type of business and product.
3. How can information systems support different global business strategies?  
   There is a connection between firm strategy and information systems design. Domestic exporters typically are centralized in domestic headquarters with some decentralized operations permitted. Multinationals typically rely on decentralized independence among foreign units with some movement toward development of networks. Franchisers almost always duplicate systems across many countries and use centralized financial controls. Transnational firms must develop networked system configurations and permit considerable decentralization of development and operations.
4. What are the challenges posed by global information systems and management solutions for these challenges?  
   Global information systems pose challenges because cultural, political, and language diversity magnifies differences in organizational culture and business processes and encourages proliferation of disparate local information systems that are difficult to integrate. Typically, international systems have evolved without a conscious plan. The remedy is to define a small subset of core business processes and focus on developing systems to support these processes. Tactically, managers will have to co-opt widely dispersed foreign units to participate in the development and operation of these systems, being careful to maintain overall control.
5. What are the issues and technical alternatives to be considered when developing international information systems?  
   Implementing a global system requires an implementation strategy that considers both business design and technology platforms. The main hardware and telecommunications issues are systems integration and connectivity. The choices for integration are to go either with a proprietary architecture or with open systems technology. Global networks are extremely difficult to develop and operate. Firms can build their own global networks, or they can create global networks based on the Internet (intranets or virtual private networks). The main software issues concern developing interfaces to existing systems and selecting applications that can work with multiple cultural, language, and organizational frameworks.