1. Information Technology Basics

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Learning Objectives

- Understand the effects of information systems on business.
- Explain why information systems are so essential in business today.
- Define an information system and describe its management, organization, and technology components.
- Define complementary assets and explain how they ensure that information systems provide genuine value to an organization.
- Describe the different academic disciplines used to study information systems and explain how each contributes to our understanding of them.
- Explain what is meant by a sociotechnical systems perspective.

Outline

1. The Role of IT in Business Today
2. Perspectives on IS and IT
3. Contemporary approaches to Information Systems

The New Yankee Stadium
The New Yankee Stadium Looks to the Future

**Problem:**
Yankee fans choosing to watch games on TV or choose other forms of entertainment

- **Solutions:** Use information systems to enhance experience. Game coverage, statistics, delivered via ubiquitous HDTV monitors, mobiles can order concessions, view replays
- **Cisco Systems provides technology** to make Yankee Stadium the most wired in all of baseball
- Demonstrates IT’s role in providing new products and services.
- Illustrates the benefits of utilizing networks and mobile applications to enhance entertainment, information.

The Role of Information Technology in Business Today

- How information systems are transforming business
  - Emerging mobile digital platform
  - Growing business use of “big data”
  - Growth in cloud computing
- Globalization opportunities
  - Internet has drastically reduced costs of operating on global scale
  - Increases in foreign trade, outsourcing
  - Presents both challenges and opportunities

The Role of IT in Business Today

Information Technology Capital Investment

**FIGURE 1-1** Information technology capital investment, defined as hardware, software, and communications equipment, grew from 32 percent to 52 percent of all invested capital between 1980 and 2009.
The Role of IT in Business Today

- In the emerging, fully digital firm
  - Significant business relationships are digitally enabled and mediated
  - Core business processes are accomplished through digital networks
  - Key corporate assets are managed digitally
- Digital firms offer greater flexibility in organization and management
  - Time shifting, space shifting

How Information Systems Are Transforming Business

- By June 2012, more than 104 million businesses worldwide had dot-com addresses registered.
- More than 184 million Americans shop online, and 150 million have purchased online.
- Social networking site Facebook attracted 204 million monthly visitors in 2014 Q2 in USA and over 1.3 billion worldwide.
- New laws require businesses to store more data for longer periods.
- Changes in business result in changes in jobs and careers.

What’s New in IT?

New technologies
- Cloud computing
- Software as a service (SaaS)
- Mobile digital platform

People and behavior changes
- Managers use social networks, collaboration.
- Employees have access to powerful decision aids.
- Virtual meetings are accepted and used.

Organizations
- Web 2.0 applications widely adopted
- Telework gains momentum
- Co-creation of value, collaboration across firms

What’s New in IT?

<table>
<thead>
<tr>
<th>CHANGE</th>
<th>BUSINESS IMPACT</th>
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<tr>
<td>Cloud computing platform emerges as a major business area of innovation</td>
<td>A flexible collection of computers on the Internet begins to perform tasks traditionally performed on corporate computers. Major business applications are delivered online as an Internet service (Software as a Service, or SaaS).</td>
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<td>Big data</td>
<td>Businesses look for insights from huge volumes of data from Web traffic, e-mail messages, social media content, and machines (sensors) that require new data management tools to capture, store, and analyze.</td>
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<td>A mobile digital platform emerges to compete with the PC as a business system</td>
<td>The Apple iPhone and Android mobile devices are able to download hundreds of thousands of applications to support collaboration, location-based services, and communication with colleagues. Small tablet computers, including the iPad, Google Nexus, and Kindle Fire, challenge conventional laptops as platforms for consumer and corporate computing.</td>
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What's New in IT?

**MANAGEMENT**
- Managers adopt online collaboration and social networking software to improve coordination, collaboration, and knowledge sharing.
- Business intelligence applications accelerate more powerful data analytics and interactive dashboards provide real-time performance information to managers to enhance decision making.
- Virtual meetings proliferate managers adopt telepresence videoconferencing and web conferencing technologies to reduce travel time and cost, while improving collaboration and decision making.

**ORGANIZATIONS**
- Social business businesses use social networking platforms, including Facebook, Twitter, and internal corporate social tools, to deepen interactions with employees, customers, and suppliers.
- Telework gains momentum in the workplace the Internet, wireless laptops, smartphones, and tablet computers make it possible for growing numbers of people to work away from the traditional office. Fifty-five percent of U.S. businesses have some form of remote work program.

- Co-creation of business value sources of business value shift from products to solutions and experiences, and from internal sources to networks of suppliers and collaboration with customers. Supply chains and product development become more global and collaborative; customer interactions help firms define new products and services.

**iPhone and iPad applications used in business:**

With its stunning multitouch display, full Internet browsing, messaging, video and audio transmission, and document management. Apple’s iPhone has set a new standard for mobile phones: all-purpose platform for mobile computing.

1. Salesforce.com
2. FedEx Mobile
3. QuickOffice Connect
4. Documents to Go
5. GoodReader
6. Evernote
7. WebEx

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**Strategic business objectives of IT**

- Growing interdependence between ability to use information technology and ability to implement corporate strategies and achieve corporate goals
- Business firms invest heavily in IT to achieve six strategic business objectives:
  1. Operational excellence
  2. New products, services, and business models
  3. Customer and supplier intimacy
  4. Improved decision making
  5. Competitive advantage
  6. Survival

**Operational Excellence**

- Improvement of efficiency to attain higher profitability
- Information systems, technology an important tool in achieving greater efficiency and productivity
- Example: Walmart’s RetailLink system links suppliers to stores for superior replenishment system
  - Power of combining information systems and best business practices to achieve operational efficiency $28 per square foot (competitors: less than $12)
  - Most efficient store in world as result of digital links between suppliers and stores
New Products, Services, and Business Models

- **Business model**: describes how company produces, delivers, and sells product or service to create wealth

- Information systems and IT a major enabling tool for new products, services, business models

- Examples: Apple’s iPod, iTunes, iPhone, iPad, Google’s Android OS, and Netflix

- Drastic changes in business models in recent years

Customer and Supplier Intimacy

- Serving customers well leads to customers returning, which raises revenues and profits
  - Example: High-end hotels (e.g. Mandarin Oriental hotel) that use computers to track customer preferences and use to monitor and customize environment

- Intimacy with suppliers allows them to provide vital inputs, which lowers costs
  - Example: J.C.Penney’s information system which links sales records to contract manufacturer

Improved Decision Making

- Without accurate information:
  - Managers must use forecasts, best guesses, luck
  - Leads to:
    - Overproduction, underproduction of goods and services
    - Misallocation of resources
    - Poor response times
    - Poor outcomes raise costs, lose customers

- Example: Verizon’s Web-based digital dashboard to provide managers with real-time data on customer complaints, network performance, line outages, etc.

Strategic business objectives of IT

- **Operational excellence**: 
  - Improvement of efficiency to attain higher profitability

- **New products, services, and business models**: 
  - Enabled by technology

- **Customer and supplier intimacy**: 
  - Serving customers raises revenues and profits
  - Better communication with suppliers lowers costs

- **Improved decision making**
  - More accurate data leads to better decisions
Competitive Advantage

- Often results from achieving previous business objectives

- Advantages over competitors:
  - Delivering better performance
  - Charging less for superior products
  - Responding to customers and suppliers in real time

- Examples: Toyota, Apple, Walmart, UPS
  - Toyota: uses TPS (Toyota Production System) to achieve high levels of efficiency and quality

Survival

- Information technologies as necessity of business
- May be:
  - Industry-level changes, e.g. Citibank’s introduction of ATMs
  - Governmental regulations requiring record-keeping
    Examples: Toxic Substances Control Act, Sarbanes-Oxley Act

Outline

1. The Role of IT in Business Today
2. Perspectives on IS and IT
3. Contemporary approaches to Information Systems

What is an Information System?

- Information technology: the hardware and software a business uses to achieve objectives.

- Information system:
  - Set of interrelated components
  - Collect, process, store, and distribute information
  - Support decision making, coordination, and control

- Information vs. data
  - Data are streams of raw facts
  - Information is data shaped into meaningful form
The Interdependence Between Organizations and Information Technology

In contemporary systems there is a growing interdependence between a firm's information systems and its business capabilities. Changes in strategy, rules, and business processes increasingly require changes in hardware, software, databases, and telecommunications. Often, what the organization would like to do depends on what its systems will permit it to do.

Figure 1.2

Difference between Data and Information

Raw data from a supermarket checkout counter can be processed and organized to produce meaningful information, such as the total unit sales of dish detergent or the total sales revenue from dish detergent for a specific store or sales territory.

Figure 1.3

Three activities of information systems produce information organizations need

1. **Input**: Captures raw data from organization or external environment
2. **Processing**: Converts raw data into meaningful form
3. **Output**: Transfers processed information to people or activities that use it

**Feedback:**
- Output returned to appropriate members of organization to help evaluate or correct input stage

**Computer/Computer program vs. information system**
- Computers and software are technical foundation and tools, similar to the material and tools used to build a house
Functions of an Information System

An information system contains information about an organization and its surrounding environment. Three basic activities—input, processing, and output—produce the information organizations need. Feedback is output returned to appropriate people or activities in the organization to evaluate and refine the input. Environmental actors, such as customers, suppliers, competitors, stockholders, and regulatory agencies, interact with the organization and its information systems.

Figure 1.4

Information Systems Are More Than Computers

Using information systems effectively requires an understanding of the organization, management, and information technology shaping the systems. An information system creates value for the firm as an organizational and management solution to challenges posed by the environment.

Figure 1.5

Organizational dimension of information systems

- Hierarchy of authority, responsibility
  - Senior management
  - Middle management
  - Operational management
  - Knowledge workers
  - Data workers
  - Production or service workers

Figure 1.6

Levels in a Firm

Business organizations are hierarchies consisting of three principal levels: senior management, middle management, and operational management. Information systems serve each of these levels. Scientists and knowledge workers often work with middle management.

Figure 1.6
Organizational dimension of information systems (cont.)

- **Separation of business functions**
  - Sales and marketing
  - Human resources
  - Finance and accounting
  - Manufacturing and production

- **Unique business processes**

- **Unique business culture**

- **Organizational politics**

Management dimension of information systems

- Managers set organizational strategy for responding to business challenges
- In addition, managers must act creatively:
  - Creation of new products and services
  - Occasionally re-creating the organization

Technology dimension of information systems

- Computer hardware and software
- Data management technology
- Networking and telecommunications technology
  - Networks, the Internet, intranets and extranets, World Wide Web
- IT infrastructure: provides platform that system is built on

Case 1: video 1: UPS Global Operations with the DIAD

https://www.youtube.com/watch?v=xXsE4P-sAE
Watch both videos, read Case 1 and then discuss the following questions:

1. List the various ways that DIAD improves customer service.
2. Write out the steps a package takes from pick-up by a UPS driver to delivery including the role of DIAD, the UPS Data Center, and the UPS Package Center.
3. What role does wireless communication play in the UPS systems? List the different types of wireless connectivity and describe their function.
4. Why doesn’t UPS use much more powerful and smaller smartphones like the iPhone or Android?
5. Why is the DIAD V better than the DIAD IV?
6. How does UPS’s investment in IT help it achieve the strategic business objectives?

1. List the various ways that DIAD improves customer service

- Faster pickup and delivery schedules.
- Real-time tracking of packages based on bar-code technology, and using Wi-Fi and cellular connections;
- A local Bluetooth network to connect the driver with the truck.
- GPS built into the unit to help drivers locate delivery and pickup locations.
- Color screen for customer to read shipping documents.

2. Write out the steps a package takes from pick-up by a UPS driver to delivery including the role of DIAD, the UPS Data Center, and the UPS Package Center.

- Smart label created
- Information sent to processing center
- Information processed—stored, address corrected
- Information matched to dispatch plan
- Package is sorted
- Another label is printed specifying delivery truck and position on truck
- Geo software used to continuously update dispatch plans for trucks based on current load
- Information is displayed on the DIAD IV identifying drop off order, position on truck
- At delivery, package scanned. Information sent wirelessly to processing center
- Customers sign on the dotted line on the DIAD IV.
- Main processing centers store complete track of package for customer tracking
Case 1: UPS Global Operations with the DIAD

3. What role does wireless communication play in the UPS systems? List the different types of wireless connectivity and describe their function.

DIAD IV is wirelessly connected to the main processing centers and the package centers. Generally UPS trucks contain a transceiver to work with the local driver's DIAD IV, and then communicate that information wirelessly back to the UPS processing center.

**Types of Wireless Connectivity:**
- CDMA and GSM: cellular connection between drivers, trucks, and central clearance facilities
- Wi-Fi: wireless connections between drivers, trucks, and central clearance facilities used whenever trucks within range of Wi-Fi hotspots or WiMax towers
- Bluetooth: wireless connections between the DIAD hand held and on-board truck computers; also provides connectivity between trucks and the clearing facility when the truck is on premises.

4. Why doesn't UPS use much more powerful and smaller smartphones like the iPhone or Android?

- The DIAD units are much more robust than consumer smartphones and can withstand larger drops, rain and intermittent submersion, and other abuse.
- While many features of the DIAD are also available on smartphones, the DIAD is optimized for these features (like scanning bar codes, using multiple cellular carriers) whereas ordinary smartphones are not.

5. Why is the DIAD V better than the DIAD IV?

- Perhaps the biggest improvement is ergonomic: a smaller unit that can fit into a driver's hand, and can be one-hand operated. The new unit weighs only 1.5 pounds, versus 5 pounds for the old unit.
- The new DIAD has a much faster response time and processor; In addition, the screen has a higher resolution, making it easier and more accurate to use, especially for customers who sign shipping bills on the unit; the screen is backlit for night use.
- The DIAD V also has greater wireless flexibility, being able to choose the optimal local carrier.

6. How does UPS's investment in IT help it achieve the strategic business objectives described in Chapter 1?

- The most important contributions of technology to UPS strategic objectives is the greatly enhanced operational efficiency; the compression of time to deliver; the development of new services like tracking, and overnight or 2-day service; the closeness to the customer; improvements in the quality and speed of decisions related to packages.
- Firms that made these investments in IT benefit by achieving significant competitive advantage over others in the package delivery business. FedEx remains a much smaller but competitive service especially in the overnight market. Other competitors have largely disappeared.
Dimensions of UPS tracking system

- **Organizational:**
  - Procedures for tracking packages and managing inventory and provide information

- **Management:**
  - Monitor service levels and costs

- **Technology:**
  - Handheld computers, bar-code scanners, networks, desktop computers, etc.

Business perspective on information systems

- **Information system is instrument for creating value**

- **Investments in information technology will result in superior returns:**
  - Productivity increases
  - Revenue increases
  - Superior long-term strategic positioning

Business information value chain

- Raw data acquired and transformed through stages that add value to that information
- Value of information system determined in part by extent to which it leads to better decisions, greater efficiency, and higher profits
- **Business perspective:**
  - Calls attention to organizational and managerial nature of information systems

The Business Information Value Chain

From a business perspective, information systems are part of a series of value-adding activities for acquiring, transforming, and distributing information that managers can use to improve decision making, enhance organizational performance, and, ultimately, increase firm profitability.
Complimentary assets: organizational capital and the right business model

- Investing in information technology does not guarantee good returns
- Considerable variation in the returns firms receive from systems investments
- Factors:
  - Adopting the right business model
  - Investing in complementary assets (organizational and management capital)

Variation in Returns On Information Technology Investment

Although, on average, investments in information technology produce returns far above those returned by other investments, there is considerable variation across firms.

Complementary assets: complementary assets include:

- Assets required to derive value from a primary investment
- Firms supporting technology investments with investment in complementary assets receive superior returns
- E.g.: invest in technology and the people to make it work properly

- Organizational assets, e.g.
  - Appropriate business model
  - Efficient business processes

- Managerial assets, e.g.
  - Incentives for management innovation
  - Teamwork and collaborative work environments

- Social assets, e.g.
  - The Internet and telecommunications infrastructure
  - Technology standards
Contemporary Approaches to Information Systems

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines.

Figure 1.9

Contemporary Approaches to Information Systems

- Technical approach
  - Emphasizes mathematically based models
  - Computer science, management science, operations research

- Behavioral approach
  - Behavioral issues (strategic business integration, implementation, etc.)
  - Psychology, economics, sociology

Sociotechnical view

- Optimal organizational performance achieved by jointly optimizing both social and technical systems used in production

- Helps avoid purely technological approach
In a sociotechnical perspective, the performance of a system is optimized when both the technology and the organization mutually adjust to one another until a satisfactory fit is obtained.