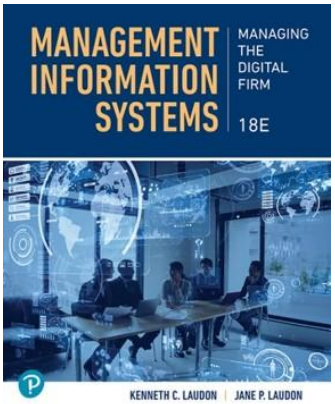
Management Information Systems: Managing the Digital Firm

Eighteenth Edition



Chapter 5

IT Infrastructure and Emerging Technologies

Learning Objectives (1 of 2)

5.1 Discuss IT infrastructure and its evolution

5.2 Describe the components of IT infrastructure

5.3 Discuss the mobile platform, apps, and BYOD

5.4 Discuss quantum computing and green computing

5.5 Discuss virtualization and cloud computing

Learning Objectives (2 of 2)

5.6 Describe contemporary software platforms

5.7 Discuss alternative ways of obtaining software

5.8 Describe IT infrastructure for AI

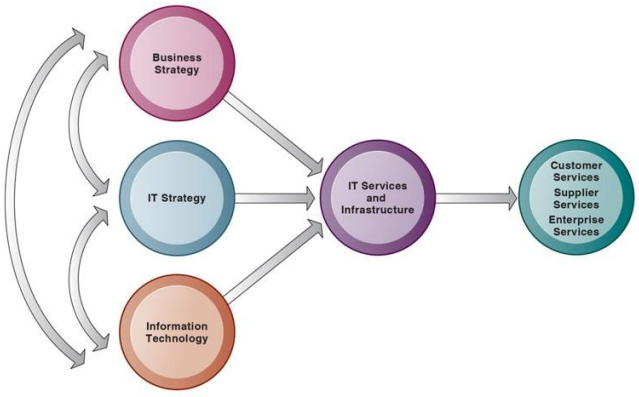
5.9 Discuss IT infrastructure management challenges

5.10 Understand how the information in this chapter can help your career

Discuss IT Infrastructure and Its Evolution (1 of 6)

- A firm's IT infrastructure includes
  - Investment in hardware, software, and services
  - Consulting, education, and training, as well
  - Shared across an entire firm or across entire business units in the firm

Figure 5.1 Connections Between the Firm, IT Infrastructure, and Business Capabilities



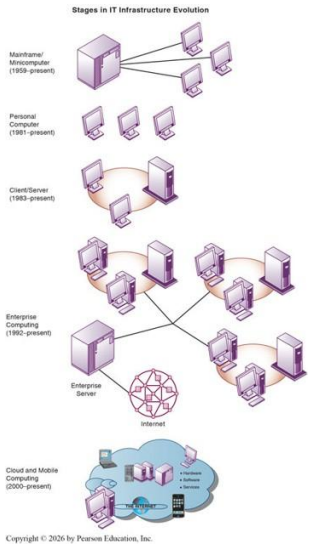
Discuss IT Infrastructure and Its Evolution (2 of 6)

- Set of firmwide services composed of both human and technical capabilities include
  - Computing platforms
  - Telecommunications services
  - Data management services
  - Application software services
  - Physical facilities management services

Discuss IT Infrastructure and Its Evolution (3 of 6)

- Set of firmwide services composed of both human and technical capabilities include
  - IT management services
  - IT standards services
  - IT education services
  - IT research and development services

Figure 5.2 Eras in Infrastructure Evolution



Discuss IT Infrastructure and Its Evolution (4 of 6)

- Five eras of computers:
  - General-purpose mainframe and minicomputer computing
  - Personal computers
  - Client/server
  - Enterprise computing
  - Cloud and mobile computing

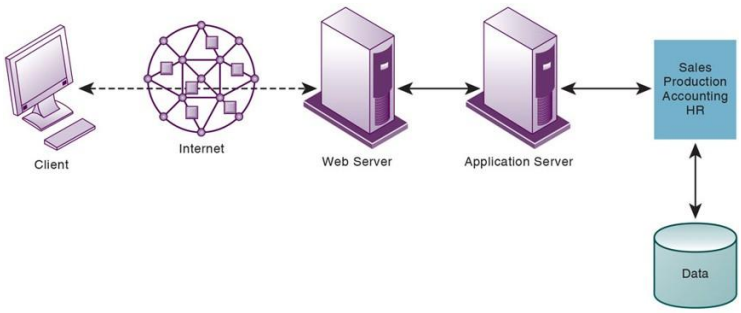
Discuss IT Infrastructure and Its Evolution (5 of 6)

- Client/server computing
  - The computing architecture most widely used today
  - A model of computing in which a client is connected in a network with one or more servers
    - Client: Various types of devices that can request access to services or resources
    - Server: Computers that are dedicated to performing common functions that the clients on a network need
      - File storage
      - Software applications
      - Printing
      - Internet access

Discuss IT Infrastructure and Its Evolution (6 of 6)

- Web server
  - Responsible for locating and managing stored web pages
  - Delivers web pages to a client in response to a request for service
- Application server
  - Handles all application operations between a browser-based client and an organization's back-end business applications or databases

Figure 5.3 Multitiered (N-Tier) Client/Server Network

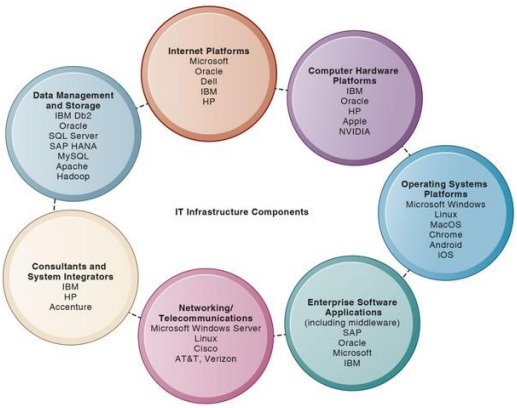


Describe the Components of IT Infrastructure (1 of 5)

The components of I T infrastructure

1. Computer hardware platforms
2. Operating system platforms
3. Enterprise software applications
4. Data management and storage
5. Networking/telecommunications platforms
6. Internet platforms
7. Consulting and system integration services

Figure 5.4 IT Infrastructure



Describe the Components of IT Infrastructure (2 of 5)

- Computer hardware platforms
  - Computer hardware provides technology for computer processing, and includes
    - Mainframes, servers, desktop computers, tablets, smart phones, as well as sensors and wearable devices such as smartwatches

Describe the Components of IT Infrastructure (3 of 5)

- Operating system platforms
  - Operating system
    - System software that manages and controls activities of a computer
  - Microsoft Windows operating system
    - Over 68 percent of desktop computers and tablets use some form of this operating system
  - Chrome OS
  - Android
  - iOS
  - Multitouch
  - Microsoft Windows Server
  - UNIX

Describe the Components of IT Infrastructure (4 of 5)

- Enterprise software applications
  - An important component of IT infrastructure
  - Largest providers: S A P and Oracle
  - Middleware providers: I B M and Oracle
- Data management and storage
  - Enterprise database management software: Responsible for organizing and managing a firm's data
  - Can be efficiently accessed and used for operations and decision making
  - The leading database software providers: IBM(Db2), Oracle, Microsoft (SQL Server), and SAP (HANA)

Describe the Components of IT Infrastructure (5 of 5)

- Network operating software (NOS)
  - Windows Server, Linux
- Internet platforms
  - Hardware, software, and services to support company websites
    - Web-hosting services
- Consulting and system integration services
  - Software integration means ensuring new infrastructure works with older, legacy systems (older system that continues to be used to avoid higher cost systems)
  - Ensuring new elements of the infrastructure work together

Discuss the Mobile Platform, Apps, and BYOD

- The mobile platform
  - Smartphones; small, lightweight subnotebooks; tablets; car infotainment systems; wearable devices; and digital e-book readers
- Apps
  - A software program that can be accessed via the Internet
- Consumerization of I T and B Y O D
  - Forces businesses and I T departments to rethink how I T equipment and services are acquired and managed
  - Bring your own device (BYOD) into the workplace

Discuss Quantum Computing and Green Computing

- Two contemporary infrastructure trends
  - Quantum computing
    - Uses quantum physics to represent and operate on data
    - Dramatic increases in computing speed
  - Green computing (or green IT)
    - Refers to practices and technologies for designing, manufacturing, using, and disposing of computers and other IT equipment in order to minimize environmental impact

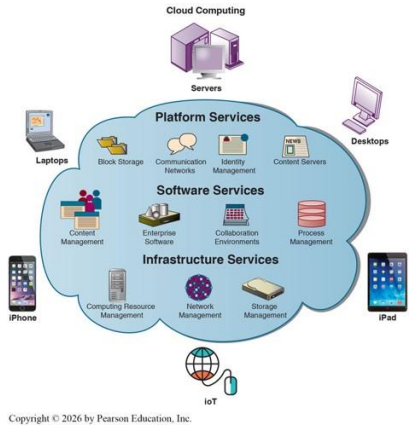
Discuss Virtualization and Cloud Computing (1 of 6)

- Virtualization
  - Computing resources not restricted by physical configuration or geographic location
  - Enables a single physical resource (such as a server or a storage device) to appear to the user as multiple logical resources
  - Reduces hardware and power expenditures
  - Facilitates hardware centralization

Discuss Virtualization and Cloud Computing (2 of 6)

- Cloud computing
  - A model of computing in which computer processing, storage, software, and other services are provided as
    - A shared pool of virtualized resources over a network, primarily the Internet

Figure 5.5 Cloud Computing Platform



Discuss Virtualization and Cloud Computing (3 of 6)

- Cloud computing can be used to provide three different types of services
  - Infrastructure as a service (IaaS)
  - Software as a service (SaaS)
  - Platform as a service (PaaS)

Figure 5.6 Amazon Web Services

Discuss Virtualization and Cloud Computing (4 of 6)

- There are several different cloud computing models
  - Public cloud
  - Private cloud
  - Industry-cloud platform
  - Hybrid cloud

Discuss Virtualization and Cloud Computing (5 of 6)

- All of the major cloud computing vendors—Amazon (AWS), Microsoft Azure, Google Cloud Platform (GCP), Microsoft Azure, and Salesforce—offer a wide range of AI services

Discuss Virtualization and Cloud Computing (6 of 6)

- Edge computing
  - A method of optimizing cloud computing systems by performing some data processing on a set of linked servers at the edge of the network, near the source of the data
    - Useful when sensors or other IoT devices do not need to be constantly connected to a central cloud
    - Reduces delays in transmitting and processing large quantities of data needed for AI applications

Describe Contemporary Software Platforms

- Four major themes in contemporary software platform evolution
  - Open-source software
  - Java, HTML, and HTML5
  - Web services
  - Software outsourcing and cloud software services

Open-Source Software

- Software produced by a community of thousands of programmers around the world
  - Free
  - Can be modified by users
  - All works derived from the original code must be free
  - Not restricted to any specific operating system or hardware technology

Software for the Web: Java, HTML, and HTML5 (1 of 2)

- Java
  - An operating system-independent, processor-independent, object-oriented programming language
  - Created by Sun Microsystems

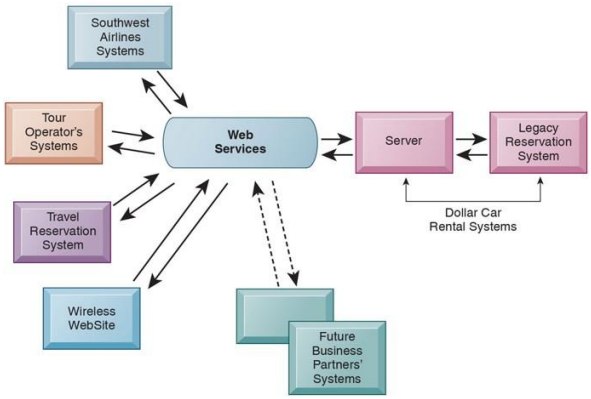
Software for the Web: Java, HTML, and HTML5 (2 of 2)

- Web browser
  - Easy-to-use software tool with a graphical user interface
  - Displays web pages
  - For accessing the web and other Internet resources
  - Hypertext Markup Language (HTML)
    - Page description language for specifying how text, graphics, video, and audio are placed on a web page
  - HTML5
  - JavaScript
    - Another core technology for making web pages more dynamic

Web Services

- Refer to a set of loosely coupled software components that exchange information with each other
  - Using universal web communication standards and languages
  - Extensible Markup Language (XML)
    - Foundation technology for web services

Figure 5.7 How Dollar Car Rental Uses Web Services



Discuss Alternative Ways of Obtaining Software (1 of 4)

- Three external sources for software
  - Software packages from a commercial software vendor
  - Cloud-based software services and tools (SaaS/PaaS)
  - Outsourcing custom application development to an external vendor

Discuss Alternative Ways of Obtaining Software (2 of 4)

- Commercial software
  - Prewritten commercially available set of software programs that eliminates the need for a firm to write its own software programs
  - Typically, software is downloaded from a vendor's website or may use the software as a cloud service delivered over the Internet
    - Pay a subscription fee

Discuss Alternative Ways of Obtaining Software (3 of 4)

- Cloud-based software
  - Hosted on servers in data centers
  - Service-level agreement (SLA)
    - Formal contract between customers and service providers
      - Defines specific responsibilities of the service provider and the level of service expected by the customer

Discuss Alternative Ways of Obtaining Software (4 of 4)

- Software outsourcing
  - Enables a firm to contract custom software development or maintenance to outside firms
    - Often operate offshore in low-wage areas of the world where there are many skilled IT specialists

Describe IT Infrastructure for AI

- Developing and running AI applications require specialized hardware and software
  - Based on the size of the dataset
  - Based on the intended use of the application

AI and Edge Computing (Edge AI)

- Edge AI refers to the deployment of AI algorithms and AI models
  - Directly on local edge devices such as smartphones, sensors, or IoT devices

Discuss IT Infrastructure Management Challenges (1 of 3)

- Creating and managing a coherent IT infrastructure raises multiple challenges
  - Dealing with platform and technology changes (including cloud and mobile computing)
  - Management and governance
  - Making wise infrastructure investments

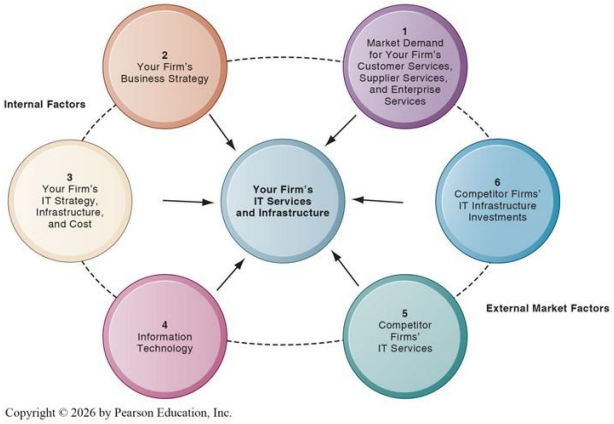
Discuss IT Infrastructure Management Challenges (2 of 3)

- As firms grow, they often quickly outgrow their infrastructure
  - Scalability needed
    - Ability of a computer, product, or system to expand to serve a large number of users without breaking down
- Mobile device management (MDM) software
  - Monitors, manages, and secures mobile devices that are deployed across multiple mobile service providers
    - Across multiple mobile operating systems being used in the organization

Discuss IT Infrastructure Management Challenges (3 of 3)

- IT infrastructure is a major investment for the firm
  - How much should the firm spend on infrastructure?
    - The rent-versus-buy decision
    - Cloud computing is often a low-cost way to increase scalability and flexibility
    - Total cost of ownership (TCO)

Figure 5.8 Competitive Forces for IT Infrastructure



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