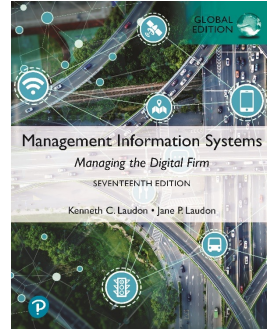


Management Information Systems: Managing the Digital Firm

Seventeenth Edition, Global Edition



Pearson

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Chapter 5

IT Infrastructure and Emerging
Technologies

1

Learning Objectives

- 5.1 What is IT infrastructure, and what are the stages and drivers of IT infrastructure evolution?
- 5.2 What are the components of IT infrastructure?
- 5.3 What are the current trends in computer hardware platforms?
- 5.4 What are the current computer software platforms and trends?
- 5.5 What are the challenges of managing IT infrastructure and management solutions?
- 5.6 How will MIS help my career?

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Video Cases

- Case 1: Rockwell Automation Fuels the Oil and Gas Industry with the Internet of Things (IoT)
- Case 2: ESPN.com: The Future of Sports Broadcasting in the Cloud
- Case 3: Netflix: Building a Business in the Cloud

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Grab Leverages Information Technology to Enhance Its Services

- Problem
 - providing customers with timely service and drivers with enough fares
 - matching demand with resources in an unpredictable sector
- Solutions
 - Managed cloud infrastructure
 - On-demand, scalable services
- Illustrates use of cloud computing to improve effectiveness and control costs

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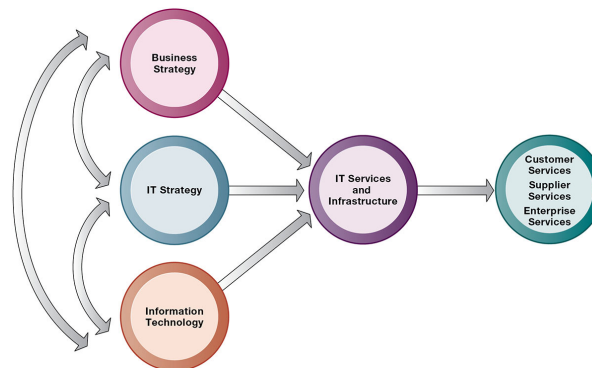
Defining IT Infrastructure

- Set of physical devices and software required to operate an enterprise
- Set of firm-wide services including:
 - Computing platforms providing computing services
 - Physical facilities management services
 - IT management, education, and other services
- “Service platform” perspective
 - More accurate view of value of investments

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



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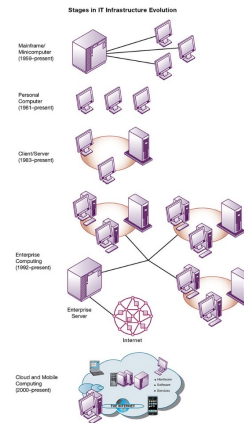
Evolution of IT Infrastructure

- General-purpose mainframe and minicomputer era: 1959 to present
- Personal computer era: 1981 to present
- Client/server era: 1983 to present
- Enterprise computing era: 1992 to present
- Cloud and mobile computing: 2000 to present

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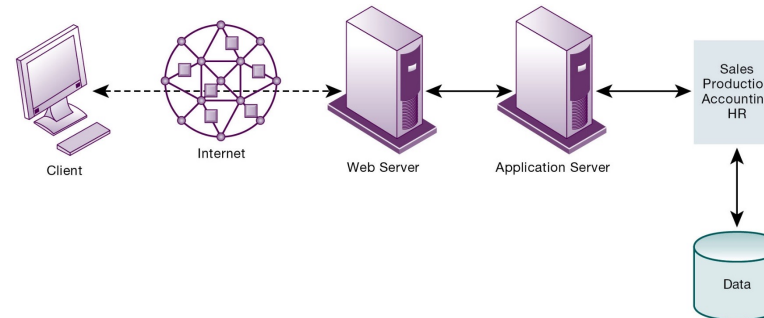
Figure 5.2 Stages in IT Infrastructure Evolution



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



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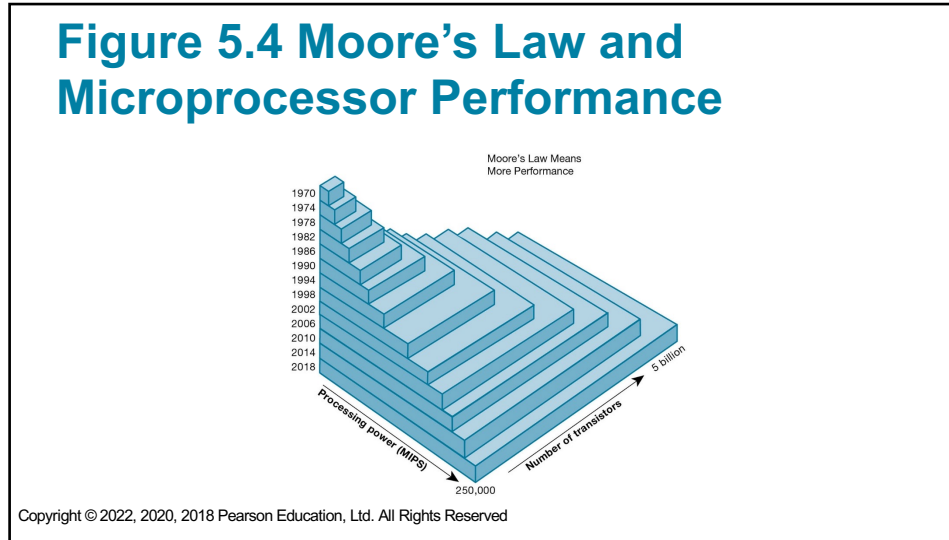
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Technology Drivers of Infrastructure Evolution (1 of 2)

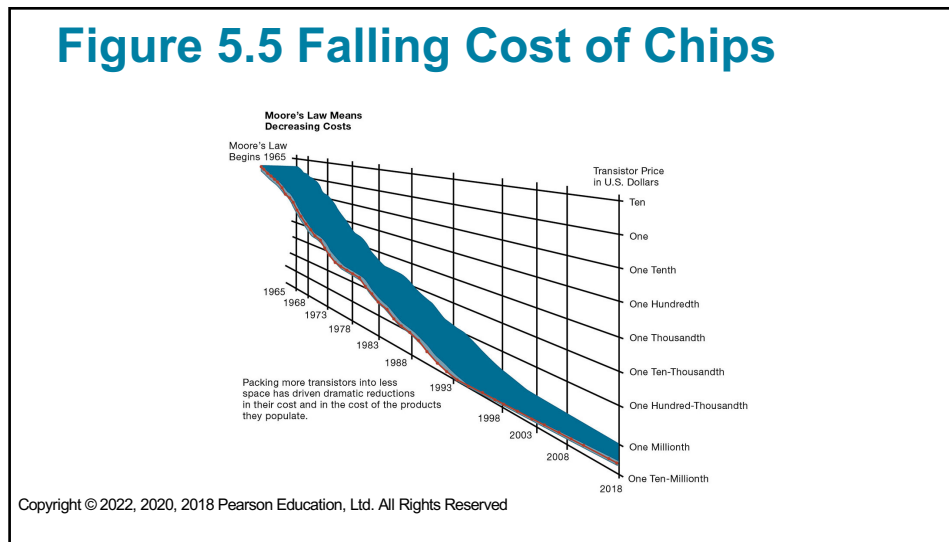
- Moore's law and microprocessing power
 - Computing power doubles every 2 years
 - Nanotechnology
- Law of Mass Digital Storage
 - The amount of data being stored each year doubles
- Metcalfe's Law and network economics
 - Value or power of a network grows exponentially as a function of the number of network members

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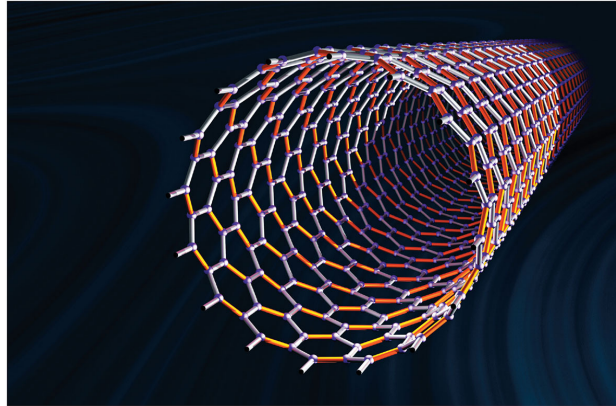


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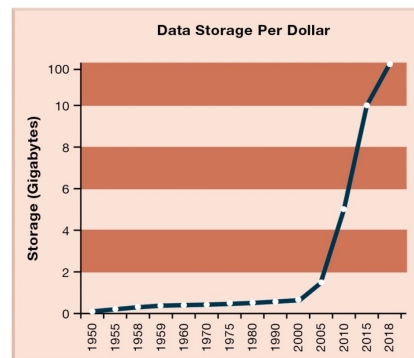
Nanotubes



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Figure 5.6 The Amount of Storage Per Dollar Rises Exponentially, 1950–2016



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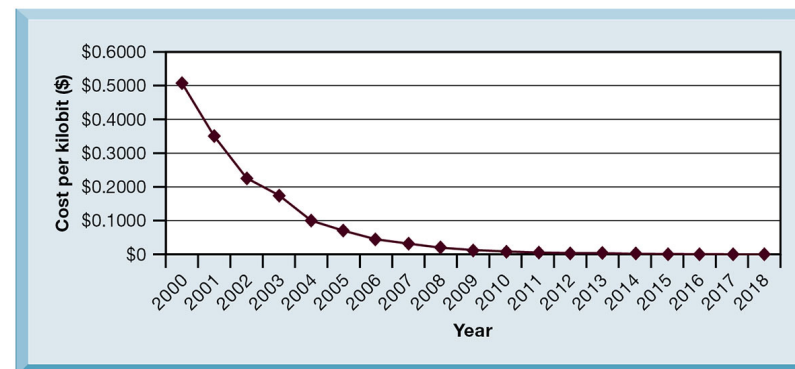
Technology Drivers of Infrastructure Evolution (2 of 2)

- Declining communication costs and the Internet
 - Exponential growth in size of the Internet
- Standards and network effects
 - Technology standards
 - Specifications that establish the compatibility of products and the ability to communicate in a network
 - Unleash powerful economies of scale and result in price declines

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Figure 5.7 Exponential Declines in Internet Communications Costs (\$/MBPS)



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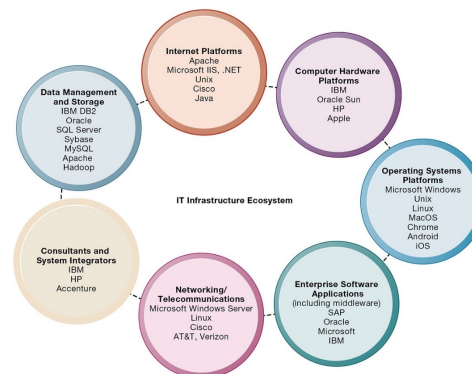
What Are the Components of IT Infrastructure?

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 system integration services

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Figure 5.8 The IT Infrastructure Ecosystem



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Computer Hardware Platforms

- Client machines
 - Desktop PCs, laptops
 - Mobile computing: smartphones, tablets
 - Desktop chips vs. mobile chips
- Servers
- Mainframes
 - IBM mainframe
 - Digital workhorse for banking and telecommunications networks

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Operating System Platforms

- Corporate servers
 - Windows Server
 - Unix
 - Linux
- Client level
 - Microsoft Windows
 - Android, iOS, Windows 10 (mobile/multitouch)
 - Google's Chrome OS (cloud computing)

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Enterprise Software Applications

- In 2020, firms are expected to spend over \$500 billion on software for enterprise applications
- Largest providers: SAP and Oracle
- Middleware providers: IBM, Oracle

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Data Management and Storage

- Database software providers
 - IBM (DB2)
 - Oracle
 - Microsoft (SQL Server)
 - SAP Sybase (Adaptive Server Enterprise),
 - MySQL (Oracle)
 - Apache Hadoop

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Networking/Telecommunications Platforms

- Network operating systems
 - Windows Server, Linux, Unix
- Network hardware providers
 - Cisco, Juniper Networks
- Telecommunication services
 - Telecommunications, cable, telephone company charges for voice lines and Internet access
 - AT&T, Verizon

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Internet Platforms

- Hardware, software, management services to support company websites, intranets
 - Web-hosting services
 - Routers
 - Cabling or wireless equipment
- Internet hardware server market
 - IBM, Dell, Oracle, HP
- Web development tools/suites
 - Microsoft (Visual Studio and .NET), Oracle-Sun (Java), Adobe

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Consulting and System Integration Services

- Even large firms do not have resources for full range of support for new, complex infrastructure
- Leading consulting firms: Accenture, IBM Global Services, HP, Infosys, Wipro Technologies
- Software integration: ensuring new infrastructure works with legacy systems
- Legacy systems: older TPS created for mainframes that would be too costly to replace or redesign

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What Are the Current Trends in Computer Hardware Platforms? (1 of 5)

- The mobile digital platform
 - Smartphones
 - Tablet computers
 - Digital e-book readers and apps (Kindle)
 - Wearable devices
- Consumerization of IT and BYOD (bring your own device)
 - Forces businesses and IT departments to rethink how IT equipment and services are acquired and managed

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Interactive Session: Technology: Open Source Innovation

- Class discussion
 - How do companies benefit from releasing their proprietary software as open source?
 - How do software firms in the East in particular benefit from releasing their source code?
 - Select a business and describe how open source innovation can give it a comparative advantage.

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What Are the Current Trends in Computer Hardware Platforms? (2 of 5)

- Quantum computing
 - Uses quantum physics to represent and operate on data
 - Dramatic increases in computing speed
- Virtualization
 - Allows single physical resource to act as multiple resources (i.e., run multiple instances of OS); also enables multiple physical resources (such as storage devices) to appear as a single logical resource (such as in software-defined storage (SDS))
 - Reduces hardware and power expenditures
 - Facilitates hardware centralization

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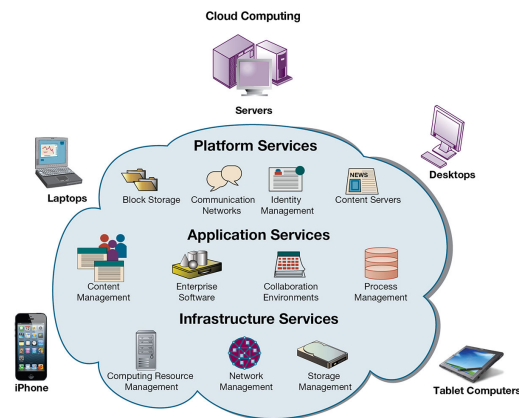
What Are the Current Trends in Computer Hardware Platforms? (3 of 5)

- Cloud computing
 - On-demand computing services obtained over network
 - Infrastructure as a service (IaaS)
 - Software as a service (SaaS)
 - Platform as a service (PaaS)
 - Cloud can be public or private
 - Allows companies to minimize IT investments
 - Drawbacks: Concerns of security, reliability
 - Hybrid cloud computing model

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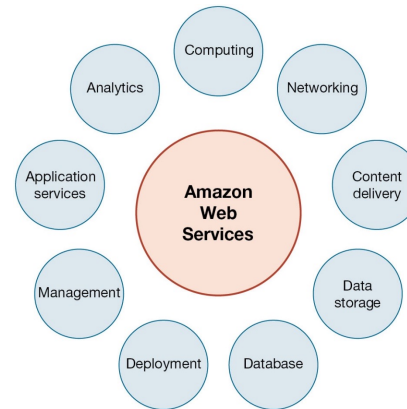
Figure 5.9 Cloud Computing Platform



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Figure 5.10 Amazon Web Services



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Interactive Session: Organizations: Glory Finds Solutions in the Cloud

- Class discussion
 - Why did Glory choose a cloud solution as opposed to modernizing the systems it had?
 - Why was it necessary to hire a systems integrator firm?
 - What were the main organizational change requirements for implementing the new cloud platform?
 - Why did management choose a regional rollout strategy? Why in the UK?

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What Are the Current Trends in Computer Hardware Platforms? (4 of 5)

- Edge computing
 - Servers at the edge of the network, near the source of the data
 - Reduces latency and network traffic

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What Are the Current Trends in Computer Hardware Platforms? (5 of 5)

- Green computing (Green IT)
 - Practices and technologies for manufacturing, using, disposing of computing and networking hardware
 - Reducing power consumption a high priority
 - Green data centers
- High-performance, power-saving processors
 - Multicore processors
 - Power-efficient microprocessors

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What Are the Current Computer Software Platforms and Trends? (1 of 3)

- Linux and open-source software
 - Produced by community of programmers
 - Examples: Apache web server, Mozilla Firefox browser, OpenOffice
 - Linux
- Software for the web: Java, HTML, and HTML5
 - Java Virtual Machine
 - Web browsers
 - HTML and HTML5
 - Ruby and Python

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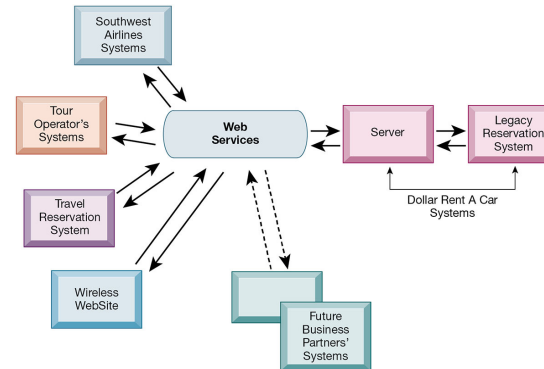
What Are the Current Computer Software Platforms and Trends? (2 of 3)

- Web services and service-oriented architecture
 - Web services
 - XML: Extensible Markup Language
 - SOA: service-oriented architecture
 - Set of self-contained services that communicate with one another to create a working software application
 - Software developers reuse these services in other combinations to assemble other applications as needed

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Figure 5.11 How Dollar Rent A Car Uses Web Services



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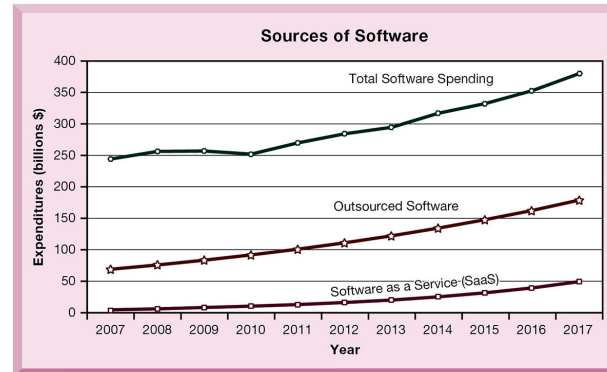
What Are the Current Computer Software Platforms and Trends? (3 of 3)

- Software outsourcing and cloud services
 - Software packages and enterprise software
 - Software outsourcing
 - Cloud-based software services and tools
 - Service Level Agreements (SLAs): formal agreement with service providers
- Mashups and apps

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Figure 5.12 Changing Sources of Firm Software



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Dealing with Platform and Infrastructure Change

- As firms shrink or grow, IT needs to be flexible and scalable
- Scalability
 - Ability to expand to serve larger number of users
- For mobile computing and cloud computing
 - New policies and procedures for managing these new platforms
 - Contractual agreements with firms running clouds and distributing software required

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Management and Governance

- Governance
- Who controls IT infrastructure?
- How should IT department be organized?
 - Centralized
 - Central IT department makes decisions
 - Decentralized
 - Business unit IT departments make own decisions
- How are costs allocated between divisions, departments?

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Making Wise Infrastructure Investments

- Under-investment and over-investment can hamper firm performance
- Rent-versus-buy
- Cloud computing
 - Security requirements
 - Impact on business processes and workflow
- Outsourcing

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Total Cost of Ownership (TCO) Model

- Analyzes direct and indirect costs
- Hardware, software account for only about 20% of TCO
- Other costs: Installation, training, support, maintenance, infrastructure, downtime, space, and energy
- TCO can be reduced
 - Use of cloud services, greater centralization and standardization of hardware and software resources

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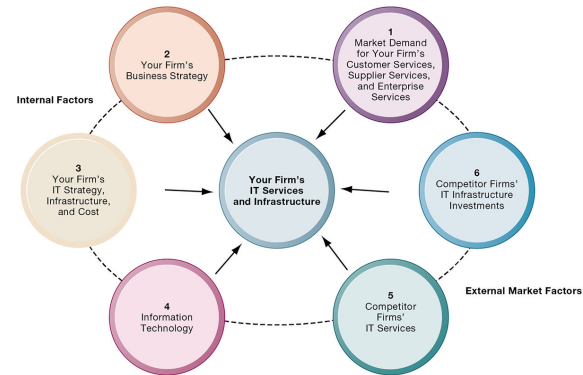
Competitive Forces Model for IT Infrastructure Investment

- Market demand for firm's services
- Firm's business strategy
- Firm's IT strategy, infrastructure, and cost
- Information technology assessment
- Competitor firm services
- Competitor firm IT infrastructure investments

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Figure 5.13 Competitive Forces Model for IT Infrastructure



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How Will MIS Help My Career?

- The Company: A1 Tech IT Consulting
- Position Description: Entry-level IT consultant
- Job Requirements
- Interview Questions
- Author Tips

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