

Management Information Systems MIS 310

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Enterprise Architecture and IS Infrastructure

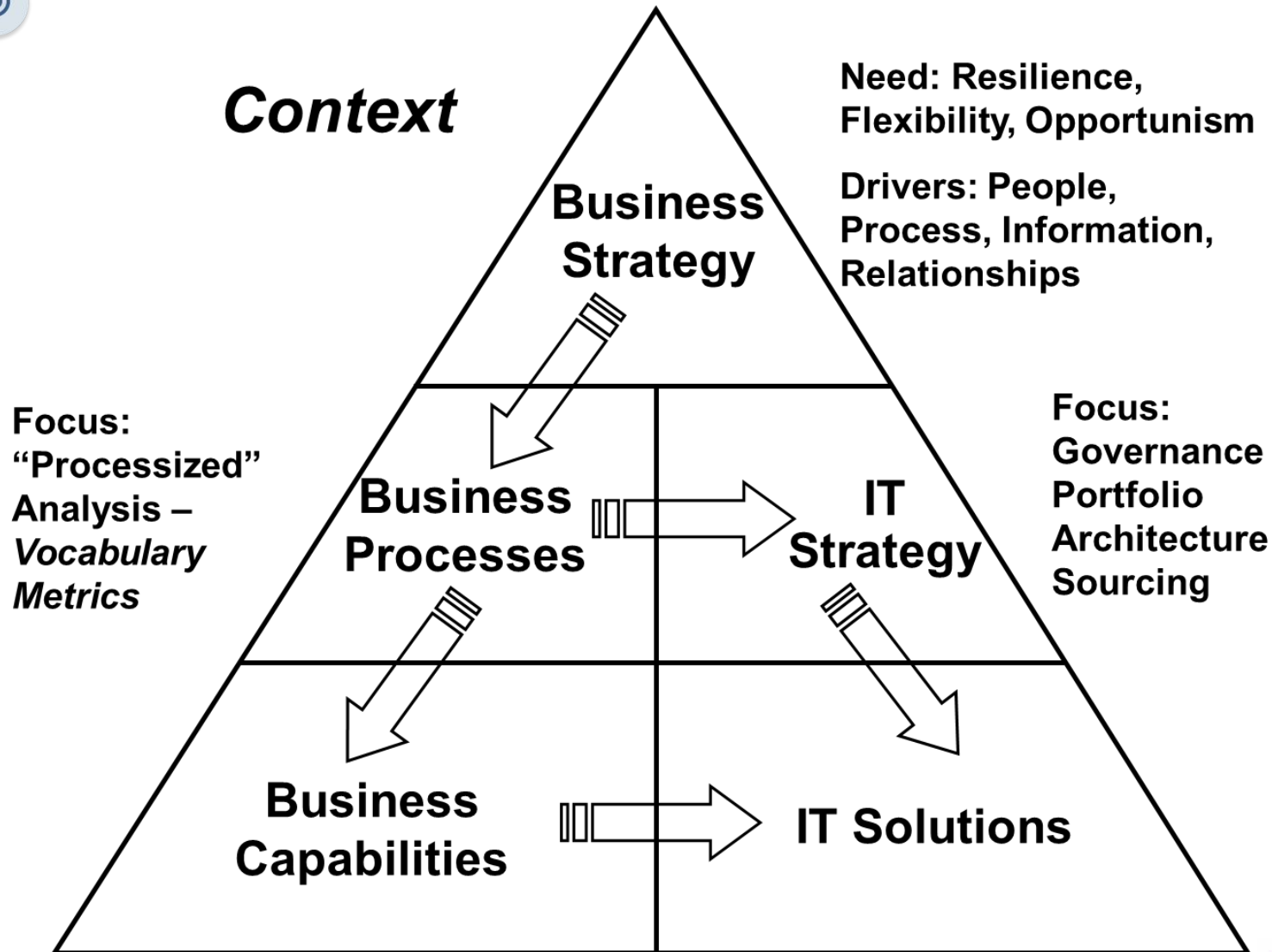
Enterprise Architecture



- **Enterprise Architecture** (EA) is a well-defined practice for conducting enterprise analysis, design, planning, and implementation, using a holistic approach at all times, for the successful development and execution of strategy.

https://en.wikipedia.org/wiki/Enterprise_architecture

Enterprise Architecture: Big Picture





- | Classification Names | | Version 3.0 | | | | | | Classification Names | |
|---|--|--|--|---|---|---|---|---|-------------|
| Audience Perspectives | | What | How | Where | Who | When | Why | | Model Names |
| | | <i>Composite Integrations</i> | | <i>Alignment</i> | | <i>Composite Integrations</i> | | | |
| Executive Perspective
<i>(Business Context Planners)</i> | ↓
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⇿ | Inventory Identification

List: Inventory Types | Process Identification

List: Process Types | Distribution Identification

List: Distribution Types | Responsibility Identification

List: Responsibility Types | Timing Identification

List: Timing Types | Motivation Identification

List: Motivation Types | Scope Contexts
<i>(Scope Identification Lists)</i> | |
| Business Mgmt Perspective
<i>(Business Concept Owners)</i> | | Inventory Definition

— Business Entity
— Business Relationship | Process Definition

— Business Transform
→ Business Input/Output | Distribution Definition

— Business Location
→ Business Connection | Responsibility Definition

— Business Role
→ Business Work Product | Timing Definition

— Business Interval
+ Business Moment | Motivation Definition

— Business End
— Business Means | Business Concepts
<i>(Business Definition Models)</i> | |
| Architect Perspective
<i>(Business Logic Designers)</i> | | Inventory Representation

— System Entity
— System Relationship | Process Representation

— System Transform
→ System Input /Output | Distribution Representation

— System Location
→ System Connection | Responsibility Representation

— System Role
→ System Work Product | Timing Representation

— System Interval
+ System Moment | Motivation Representation

— System End
— System Means | System Logic
<i>(System Representation Models)</i> | |
| Engineer Perspective
<i>(Business Physics Builders)</i> | | Inventory Specification

— Technology Entity
— Technology Relationship | Process Specification

— Technology Transform
→ Technology Input /Output | Distribution Specification

— Technology Location
→ Technology Connection | Responsibility Specification

— Technology Role
→ Technology Work Product | Timing Specification

— Technology Interval
+ Technology Moment | Motivation Specification

— Technology End
— Technology Means | Technology Physics
<i>(Technology Specification Models)</i> | |
| Technician Perspective
<i>(Business Component Implementers)</i> | | Inventory Configuration

Tool Entity
Tool Relationship | Process Configuration

Tool Transform
Tool Input /Output | Distribution Configuration

Tool Location
Tool Connection | Responsibility Configuration

Tool Role
Tool Work Product | Timing Configuration

Tool Interval
Tool Moment | Motivation Configuration

Tool End
Tool Means | Tool Components
<i>(Tool Configuration Models)</i> | |
| Enterprise Perspective
<i>(Users)</i> | | Inventory Instantiations

Operations Entities
Operations Relationships | Process Instantiations

Operations Transforms
Operations In/Outputs | Distribution Instantiations

Operations Locations
Operations Connections | Responsibility Instantiations

Operations Roles
Operations Work Products | Timing Instantiations

Operations Intervals
Operations Moments | Motivation Instantiations

Operations Ends
Operations Means | Operations Instances
<i>(Implementations)</i> | |
| The Enterprise | | Inventory Sets | Process Flows | Distribution Networks | Responsibility Assignments | Timing Cycles | Motivation Intentions | The Enterprise | |
| Audience Perspectives | | <i>Composite Integrations</i> | | <i>Alignment</i> | | <i>Composite Integrations</i> | | | |

*Hierarchical integration lines are shown for example purposes only and are not a complete set. Composite, integrative role standards connecting every cell hierarchically potentially exist.

EA: Heat Map Framework



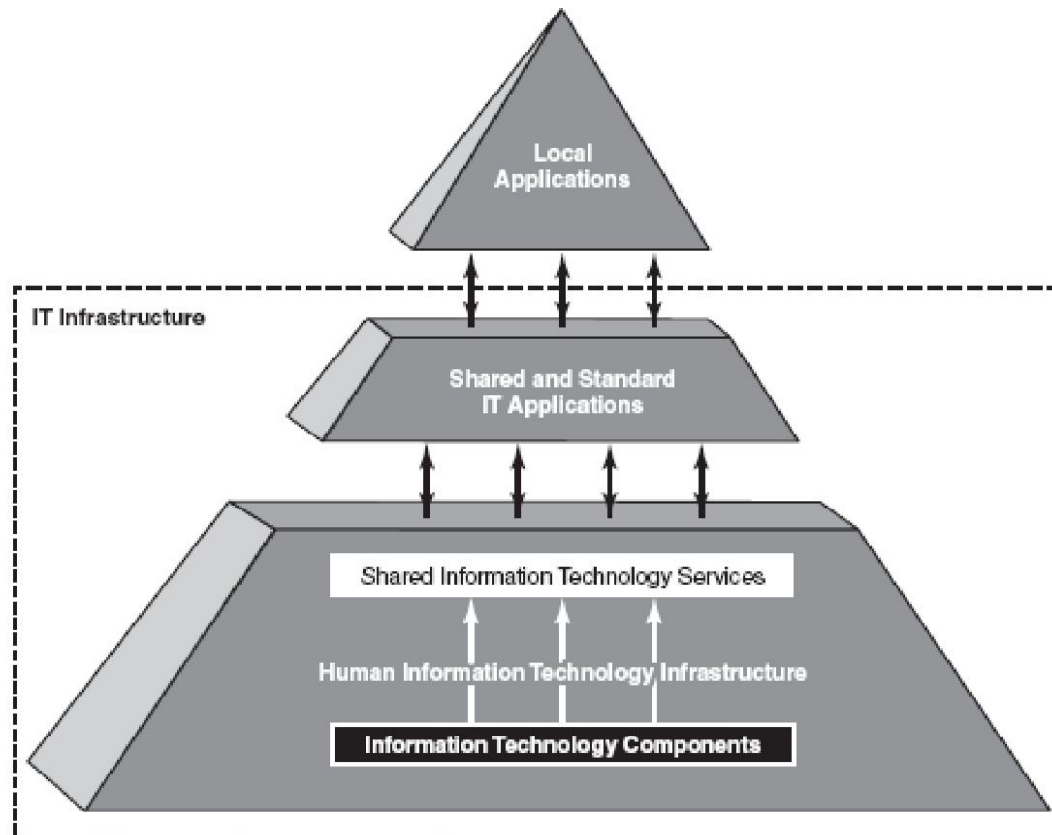
		Business competencies				
		Customers	Products/ services	Channels	Logistics	Business administration
Accountability level	Direct	Market strategy Customer service strategy Marketing strategy	Merchandise planning Channel planning Assortment planning Space planning Promotion planning Product development Sourcing	Channel strategy Store design Real estate strategy Internet design Catalog/call center design	Network design Warehouse design Demand/flow planning	Corporate strategy Corporate planning Financial planning Corporate governance
	Control	Campaign management Service management	Product flow Planogramming Allocation Inventory mgt/OTB Demand forecasting Price management Content management Vendor management	Channel management Labor management Order management Real estate, construction and facilities management Loss prevention	Inbound routing Receipt scheduling Delivery scheduling Carrier management	Business performance management Treasury and risk management Legal and regulatory compliance Inventory control Cash and banking
	Execute	Customer service Customer communications Marketing Advertising Public relations	Item management Product management PO management Vendor management Replenishment Revenue/clearance management	Order management Inventory management Merchandise management Price/sign management	Warehouse management Transportation management Fleet management Reverse logistics	Financial accounting and reporting Indirect procurement HR administration IT systems and operations

 Hot components

Source: IBM Business Consulting Services.

The IS Infrastructure

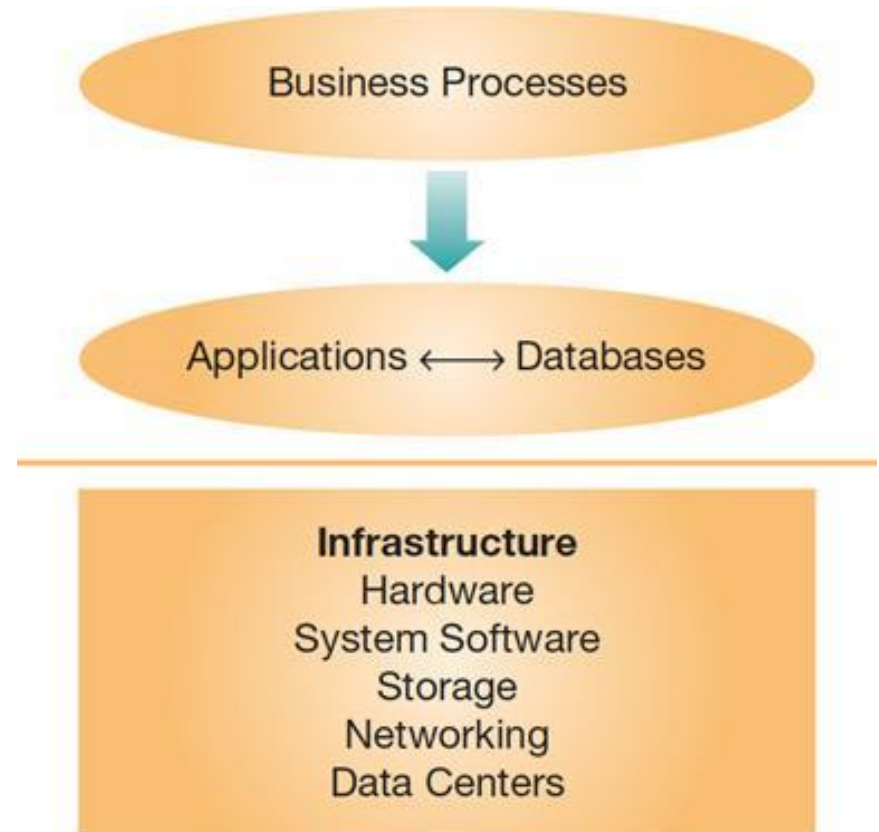
- “The hardware, software, and telecommunication/ networking systems or equipment together provide the underlying foundation to support the organization’s goals.”



IS Infrastructure Components



- Hardware
- Software
 - System
 - Application
 - Databases
- Storage
- Networking
- Data Centers



IS Infrastructure Components: Hardware



Type of Computer	Number of Simultaneous Users	Physical Size	Typical Use	Random Access Memory	Typical Cost (in US\$)
Supercomputer	One to many	Like an automobile to as large as multiple rooms	Scientific research	5,000+ GB	Up to \$100 million
Mainframe	1,000+	Like a refrigerator	Transaction processing, enterprise-wide applications	Up to 3,000 GB	Up to \$10 million
Server	10,000+	Like a DVD player and mounted in a rack to fitting on a desktop	Providing websites or access to databases, applications or files	Up to 512 GB	Up to \$50,000
Workstation	Typically one	Fitting on a desk-top to the size of a file cabinet	Engineering, medical, graphic design	Up to 512 GB	Up to \$100,000
Personal computer	One	Fitting on a desk-top	Personal productivity	512 MB to 32 GB	Up to \$5,000
Mobile device	One	Handheld	Personal productivity	512 MB to 2 GB	Up to \$750



Evolution of IT Infrastructure: Hardware

Mainframe/Mini Computers



Personal Computer



Client/Server Computing



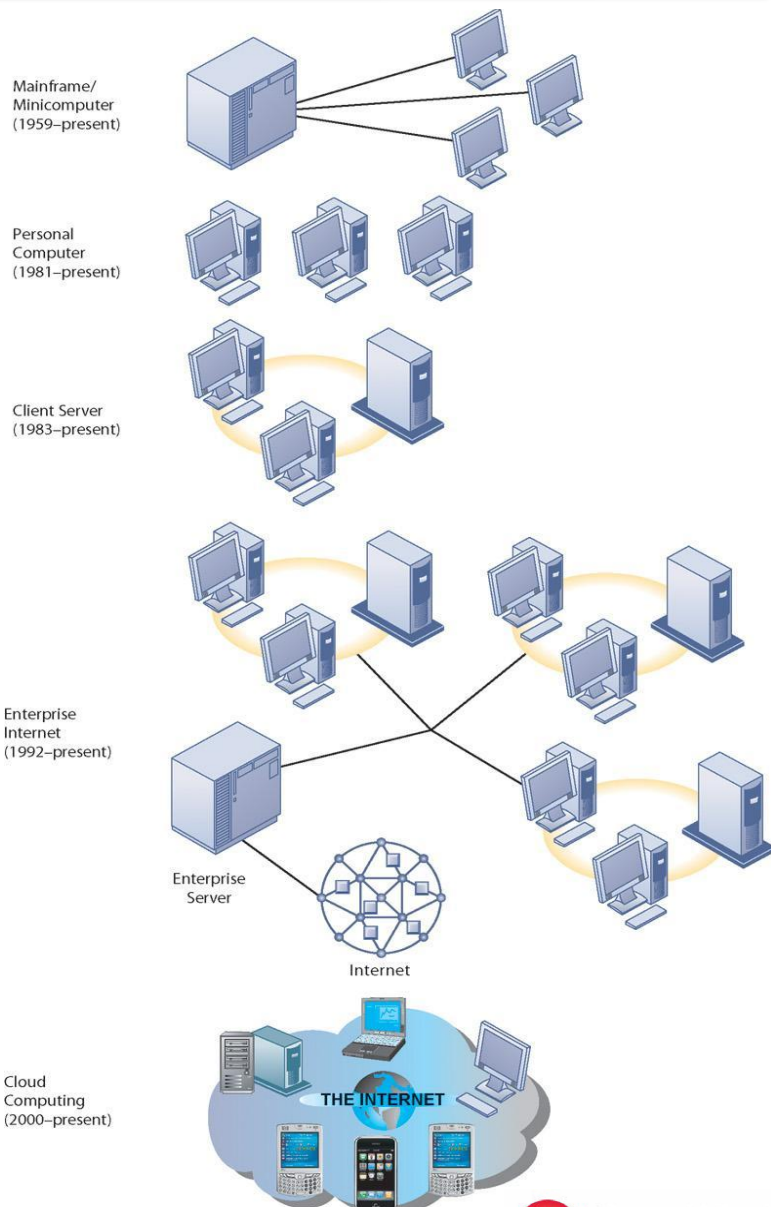
Web-based enterprise applications



**Cloud Computing/mobile device
BYOD (Bring Your Own Devices)**



Pervasive computing



IS Infrastructure Components: System Software



- Controls computer hardware operations
- Operating systems
 - Examples: Windows, OS X, Ubuntu, Linux
 - Manages hard drives and storage
 - Manages keyboard, mouse, monitor, and printers
 - Coordinates application access to computing resources



IS Infrastructure Components: Software



- Application Software
 - Software tools used to complete the work required to operate and manage an organization
 - Process automation
 - Decision support
 - Other business and user needs
- Databases
 - Collections of data
 - Organized to facilitate data searches

IS Infrastructure Components: Storage



Storage Type

Purpose

Operational

For processing transactions or for data analysis

Backup

Short-term copies of organizational data, used to recover from system related disaster (Backup data are frequently overwritten with newer backups)

Archival data

Long-term copies of organizational data, often used for compliance and reporting purposes

IS Infrastructure Components: Networking

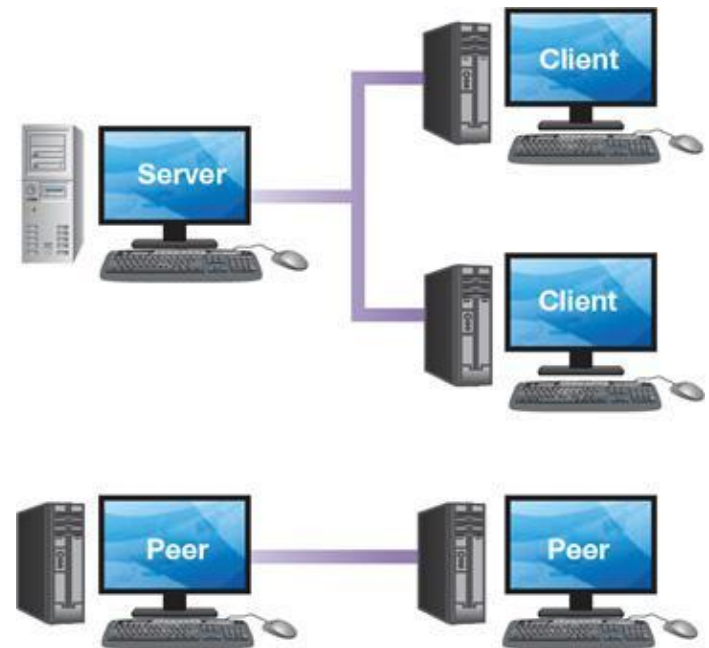


- Both human and computer communication involve senders, a message to share, and receivers.
- Network requires:
 - Sender and receiver
 - Transmission pathway
 - Rules/protocols for communication

IS Infrastructure Components: Servers, Clients, and Peers



- Servers
 - Host (serve up) data, databases, files applications, Web sites, video, and other content for access over the network
- Clients
 - Consume hosted resources
- Peers (P2P)
 - Serve and consume resources, both a server and a client interacting with similar computers



IS Infrastructure Components: Types of Networks



Type	Usage	Size
Personal area network (PAN)	Wireless communication between devices (Bluetooth)	Under 10 meters
Local area network (LAN)	Sharing of data, software applications, or other resources between several users	Typically within a building
Wide area network (WAN/Wi-Fi)	Connect multiple LANs, often with distributed ownership and management	Large physical distance spanning multiple buildings or the area of a city to worldwide (Internet)

IS Infrastructure Components: Data Centers



- Large amounts of data to be managed
- Dedicated space for infrastructure components such as data centers
- Data center centralization facilitates
 - Management
 - Repairs
 - Upgrades
 - Security

Review Questions

- What is the Zachman Framework used for?
- What is difference between operating and application software?
- What is the main function of a server computer?
- What is the function that could be performed by a peer computer but not by a client computer?

IS Infrastructure Evolution: Moore's Law



- Dr. Gordon Moore
 - Co-founder of Intel
 - Theorized that the number of transistors on a chip would double every two years
 - Computing power would double every two years
 - Has been relatively accurate to this date
 - ✓ First CPU had 2,200 transistors
 - ✓ The latest CPUs have over 10 billion transistors
 - Contrary factors: Heat dissipation needs, power consumption concerns
 - Nanotechnology: May shrink size of transistors to width of several atoms.

IS Infrastructure Evolution: Moore's Law



- Moore's Law and related price/performance trends are behind the price decreases across a wide variety of tech products and services.

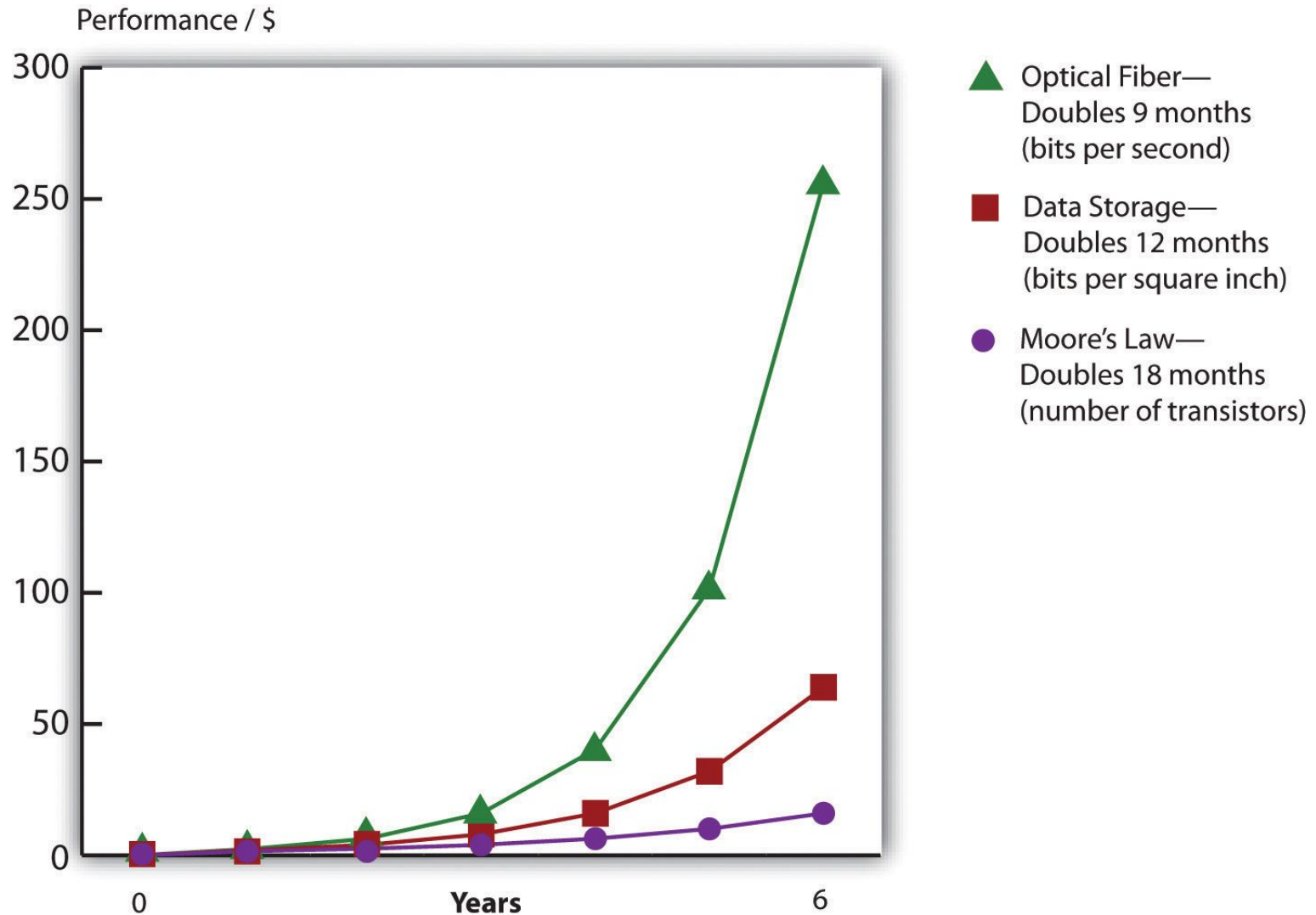
Amazon Kindle		Apple	
First Generation	Fourth Generation	iPod	iCloud
250 MB	2 GB	5 GB	5 GB
November 2007	September 2011	October 2001	October 2011
\$399	\$79	\$399	Free

IS Infrastructure Evolution: Moore's Law

- 20 years of mergers and acquisitions — 1993 to 2013



Advancing Rates of Technology



Source: Adopted from Shareholder Presentation by Jeff Bezos, Amazon.com, 2006.

Technology Drivers of IS Infrastructure Evolution



- Moore's law and micro-processing power
- Law of Mass Digital Storage
 - The amount of data being stored each year doubles
- Metcalfe's Law and Network Economy
 - Value or power of a network grows exponentially as a function of the number of network members
 - a network's value is proportional to the square of the number of nodes in the network.
 - As network members increase, more people want to use it (demand for network access increases)
 - Downside to network effects
 - exponentially growing networks become harder to control, coordinate or curate.

[The Network Effects of Uber](#)

Review Questions

- What does Moore's law tell us?
- How has Moore's law impacted the economy?
- What is network effect?
- Does network value increase linearly or exponentially? What law predicts it?

IS Infrastructure: Issues

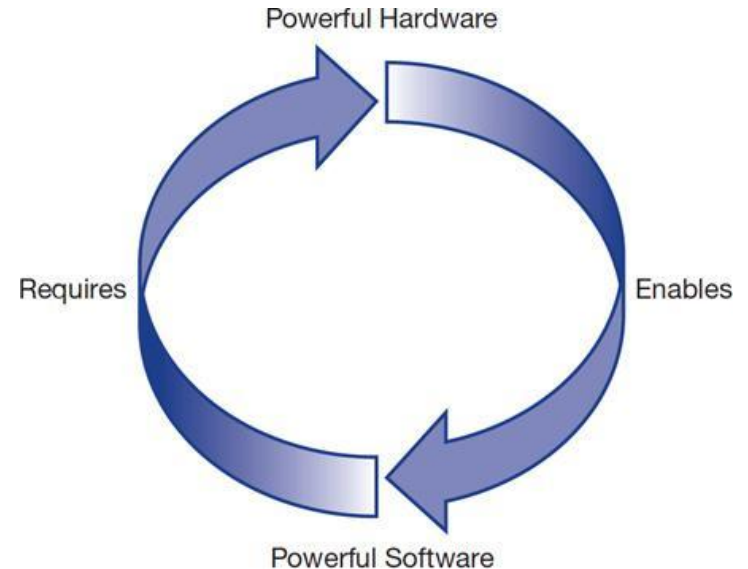
- Rapid Obsolescence and Shorter IT Cycles
- Big Data and Rapidly Increasing Storage Needs
- Demand Fluctuations
- Increasing Energy Needs



IT Cycles and Obsolescence

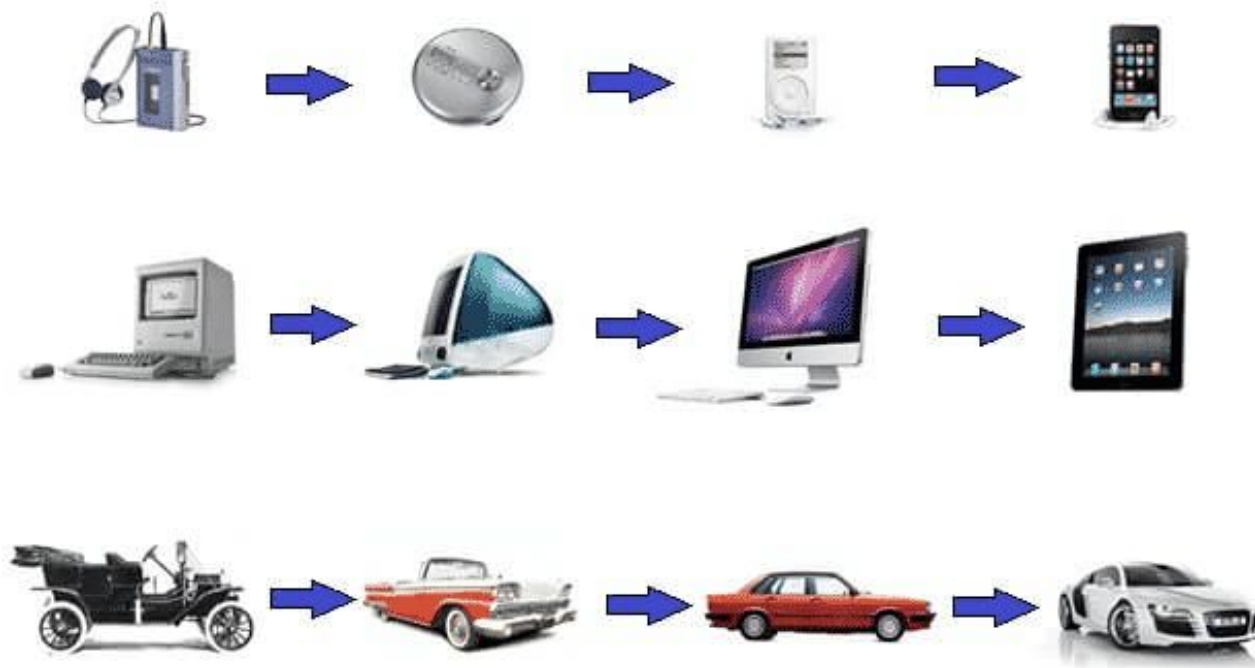


- Powerful computers enable new applications
- New applications drive efficiencies
- New applications often make old hardware obsolete
- Obsolete hardware requires replacement



IT Cycles and Obsolescence

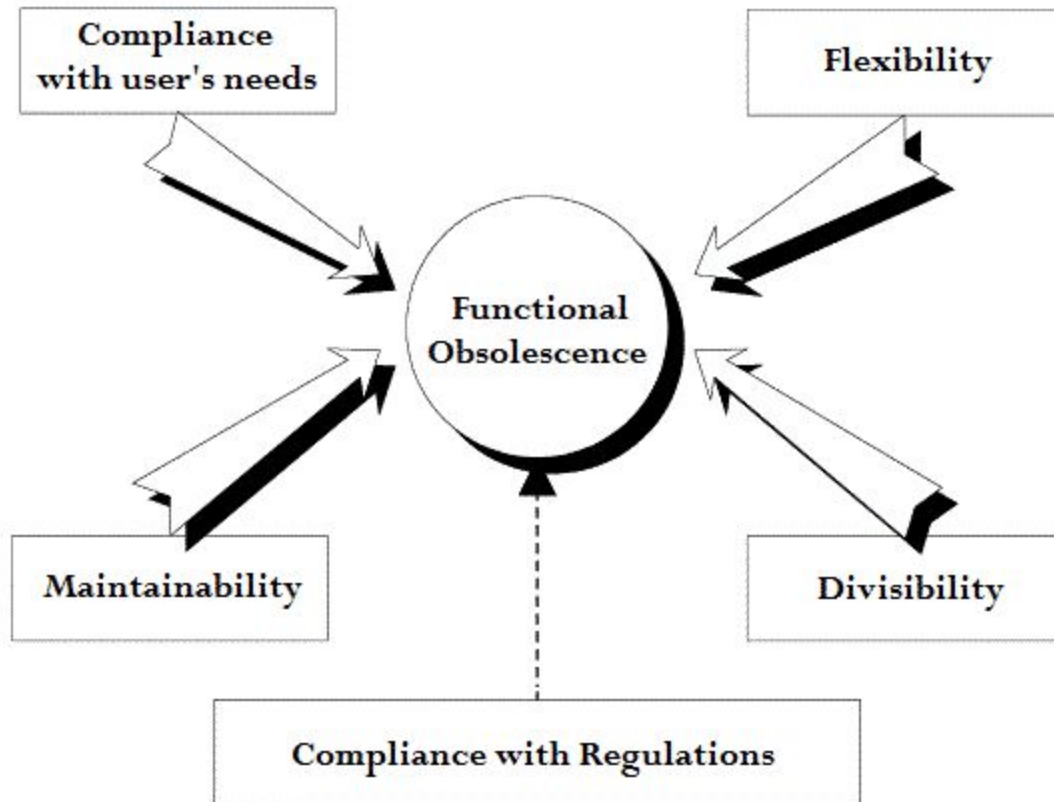
Technology Obsolescence



www.electricalfundablog.com

- An upgraded product or a superior technology overtakes its predecessor.

IT Cycles and Obsolescence



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- **Functional Obsolescence**
 - System is not able to perform its intended function and it becomes costly to maintain it for high/ optimum performance

IT Cycles and Obsolescence



- Planned Obsolescence
 - It is deliberately designing a product not to long last.

NO LONGER COMPATIBLE



Big Data and Rapidly Increasing Storage Needs



- Firms collect unprecedented levels of data
 - Business intelligence
 - Legal compliance (e.g., Sarbanes-Oxley)
- Unprecedented levels of data require unprecedented infrastructure capabilities
 - More storage space, powerful hardware, and database management
 - Ever-increasing Internet bandwidth
 - Vicious cycle: enhanced capacity drives new applications, requiring even more capacity

Demand Fluctuations



- Many companies face demand fluctuations
 - Seasonal fluctuations (e.g., December holidays)
 - Monthly fluctuations (month-end spikes)
- Demand fluctuations create inefficiencies
 - Up to 70% of IS capacity only used 20% of the time
 - IS infrastructure is typically not readily scalable
 - Changing internal capacity takes time
 - Cloud computing (next section) may be the answer

Increasing Energy Needs

- Computing can require a lot of power
 - Hardware draws power, which generates heat
 - Heat requires cooling, which requires more power
- Data centers can use large amounts of power
 - 15 to 17 kilowatts per rack
 - Large data centers have hundreds of server racks
 - More power is required for cooling and lost through other inefficiencies

Discussion Questions

- Of the four primary components of an information system (technology component, data, people, organization), which do you think is the most important to the success of a business organization? Support your answer with an example from your personal experience.
- Why is Moore's Law important for managers? How does it influence managerial thinking? Explain what impact does Moore's Law have on a specific business. Use real-world examples.
- What's special about falling chip prices compared to price drops for other products like food? Use real-world examples that best support your answer.
- How are switching costs and network effects related to each other? How do they affect competition? Support your answers with specific examples.
- How does hardware and software obsolescence affect your life? Give examples of experiences with outdated hardware or software. How did you deal with these situations?

Sources:

Joseph Valacich, Christoph Schneider, *Information Systems Today: Managing in the Digital World*, 8th Edition

John Gallaugher, *Information Systems: A Manager's Guide to Harnessing Technology*, v. 7.0

Minder Chen, Ph.D., Management Information Systems Lectures