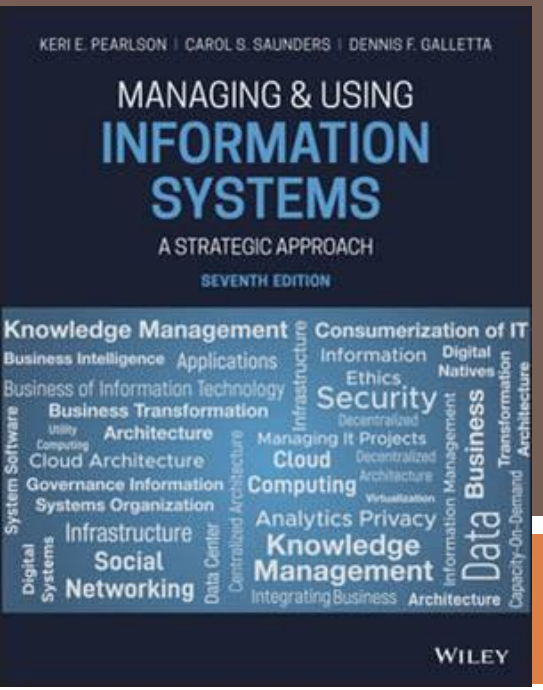
CHAPTER 6
ARCHITECTURE AND INFRASTRUCTURE



Managing & Using Information Systems: A Strategic Approach (7th Edition), Pearlson, Saunders, & Galletta

Chapter Introduction

- This chapter provides managers with an overview of IT architecture and infrastructure issues and designs.
- It begins by translating a strategy into IT architecture and then from the architecture into infrastructure.
- The manager's role is then discussed, and an example of a fictitious company, GiantCo.com, is used to show how strategy leads to infrastructure.

Chapter Introduction

- The framework used to describe the basic components of architecture and infrastructure, introduced in Chapter 1, is revisited here, providing a language and structure for describing hardware, software, network, and data considerations.
- Common architectures are then presented, including
  - Centralized architecture
  - Decentralized architecture
  - Web-based service-oriented architecture (SOA).

Chapter Introduction

- Architectural principles are covered, followed by a discussion of enterprise architecture.
- Virtualization and cloud computing, two current architectural considerations, are reviewed.
- The chapter concludes with a discussion of managerial considerations that apply to any architecture.

CASE: Mohawk

- Mohawk, a paper mill (제지공장) established in 1931 in upstate New York, provided an unexpected example of modern information systems architecture.
- Contrary to a common assumption that information technology was not critical to traditional manufacturing industry players facing a declining market, the firm embraced cloud computing since it enabled the business to strategically transform itself in three ways:

CASE: Mohawk

1. Moving from a primary focus on manufacturing to providing service.
2. Shifting from a self-sufficient (자급자족할 수 있는) model to one of collaboration with a network of partners.
3. Ensuring that the partner network was flexible and its capabilities were tightly integrated with those of Mohawk.

CASE: Mohawk

- Mohawk accomplished this flexibility by using service-oriented architecture (SOA) tools, which enabled the firm to scale technology services (and expenses) up and down instantaneously according to its needs.
- Also, applications under SOA were added or subtracted as needed, helping to manage costs while increasing flexibility and capacity throughout the transformation.

CASE: Mohawk

- Mohawk's new envelope manufacturing facility served as a vivid example to illustrate the benefits of flexibility.
- Along the way, the company learned of the anticipated bankruptcy of the largest envelope manufacturing firm in the United States and saw an opportunity for new business.
- Managers developed a list of six outsourced firms to turn its premium papers into envelopes.

CASE: Mohawk

- After six months of using those suppliers and investing in building its own in-house envelope manufacturing capabilities, Mohawk was able to shift to an insourcing model for 90% of its volume.
- Using cloud services avoided the information systems difficulties usually inherent in such a large-scale strategic transformation.
- Mohawk realized additional benefits from their ability to more easily manage capacity needs.

CASE: Mohawk

- As processing volumes increased and decreased, sometimes on a seasonal basis and sometimes due to new or discontinued lines of business, Mohawk experienced corresponding increases and decreases in its requirements for information systems capacity such as space, servers, and processing.
- Its cloud approach allowed the company to set up or dismantle (deconstruct) servers quickly and at a fraction of the cost of purchasing them outright (entirely).
- Mohawk's experience shows that cloud computing is not just a mechanism to avoid or reduce costs or to gain operational benefits.

CASE: Mohawk

- The cloud and associated services can support a transformation of the business itself.
- Mohawk's mission changed from "making paper" to "making connections," which enabled them to sell consumers five times the number of products sold previously to just a few large distributors.
- While partners offered many of Mohawk's products, the system provided capabilities to sell from Mohawk's own inventory or from the partners in a seamless way directly to many thousands of small businesses and consumers via its website.

CASE: Mohawk

- Mohawk was able to make the changes it believed were necessary by shifting to an enhanced web services platform that enabled other organizations and customers to request information, inquire about freight charges and pricing, place orders, and pay for their orders through connections with banks.
- The platform enabled designers to "mash up" (combine) applications as needed on web sites that could be built rather quickly.
- Each feature "plugs in" using tools that made it easy to connect the websites to existing databases.

➢ Plug-in: a small piece of software that adds a feature to a larger program or makes a program work better

CASE: Mohawk

- Business benefits to Mohawk included the following:

1. Shaking the pre-cloud annual earnings decreases by 2%-5% per year to tripling its earnings in two years.
2. Automating its transaction processes, saving $1 million to $2 million annually in staff costs.
3. Increasing its product variety fivefold.
4. Increasing its customer base from 10-15 distributors to 100 business partners and many thousands of direct customers.

CASE: Mohawk

- Not all firms base their entire operations on a cloud platform that permits integration with other organizations.
- But Mohawk's experiences can be considered to be "cutting edge."
- The Mohawk story illustrates how infrastructure decisions can enable the strategic objectives of a firm.

- Cutting edge: the newest and most advanced area of activity in an art, science, etc.
- If you are at the cutting edge of a particular field of activity, you are involved in its most important or most exciting developments.

CASE: Mohawk

- However, building such an infrastructure cannot come first.
- Firms must begin by:
  - Determining their strategic vision,
  - Determining the IS architecture needed to fulfill that vision, and then
  - Making it all tangible by putting together an IS infrastructure.
- In Mohawk's case, leaders had a vision to move boldly into the consumer space, and information systems enabled them to do that efficiently.

From Vision to Implementation

- Architecture translates strategy into infrastructure (Figure 6.1).

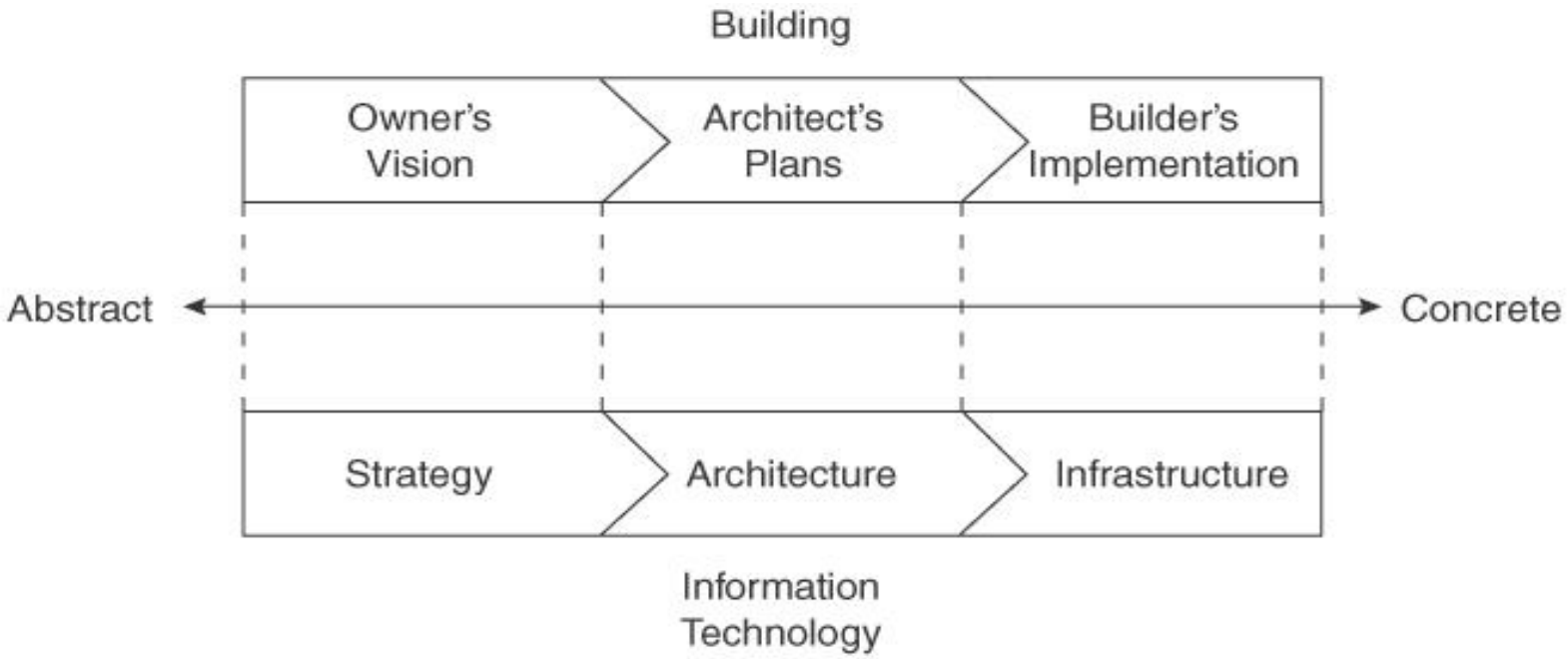
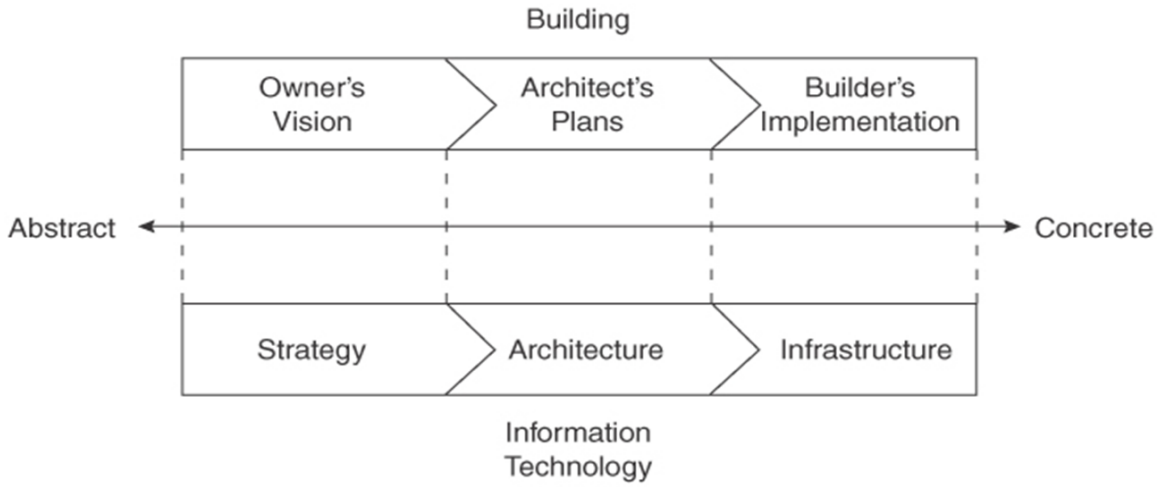


Figure 6.1 From Abstract to Concrete – Building vs. IT

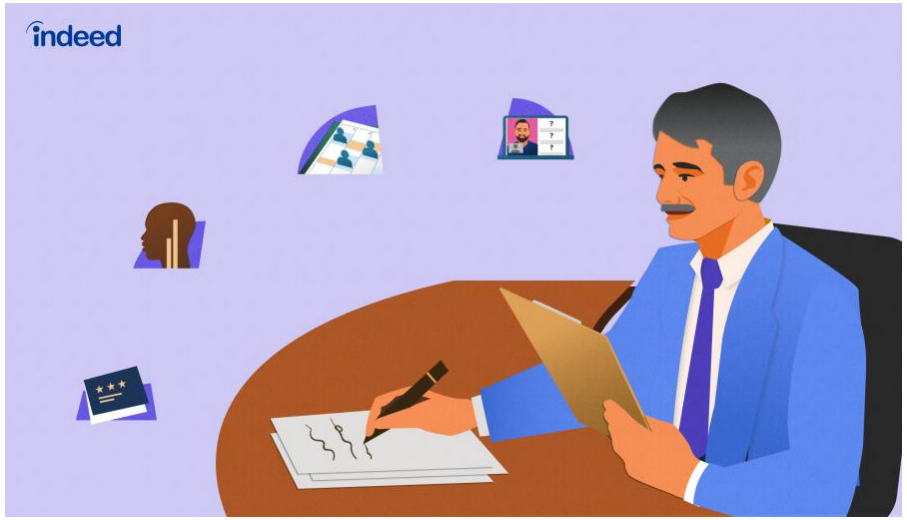
From Vision to Implementation

- Home architect develops a blueprint of a proposed house --based on customer.
- Business architect develops a blueprint of a company's proposed systems -- based on strategy.
- This "blueprint" is used for translating business strategy into a plan for IS.
- The IT infrastructure is everything that supports the flow and processing of information (hardware, software, data, and networks).



The Manager's Role

- Must understand what to expect from IT architecture and infrastructure.
- Must clearly communicate business vision.
- May need to modify the plans if IT cannot realistically support them.
- Manager MUST be involved in the decision making process.



The Leap from Strategy to Architecture to Infrastructure

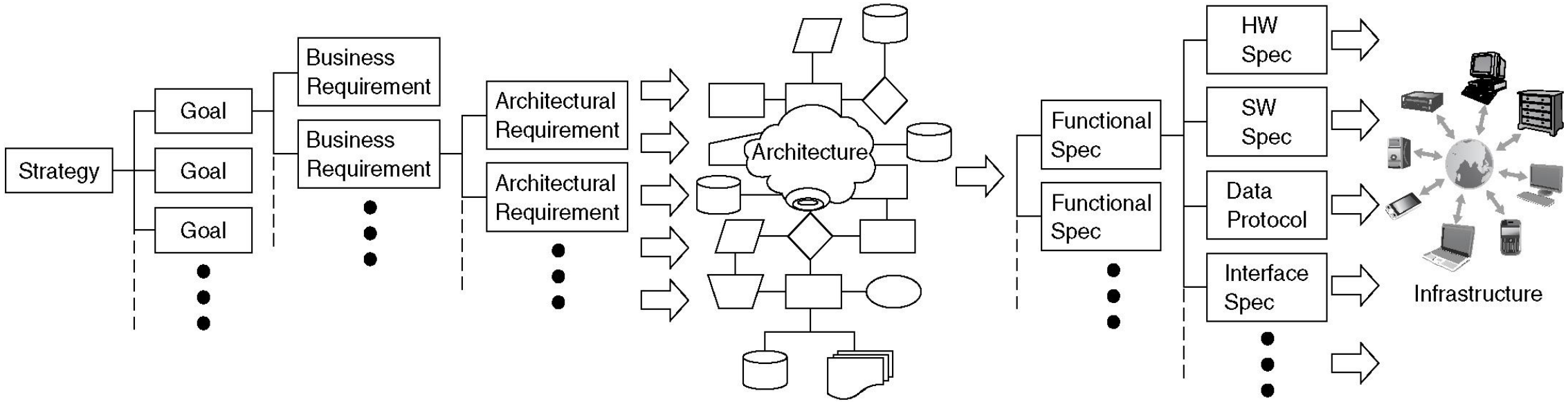


Figure 6.2 – From Strategy to Architecture to Infrastructure

From Strategy to Architecture

- Manager starts out with a strategy.
- Strategy is used to develop more specific goals.
- Business requirements must be determined for each goal so the architect knows what IS must accomplish.

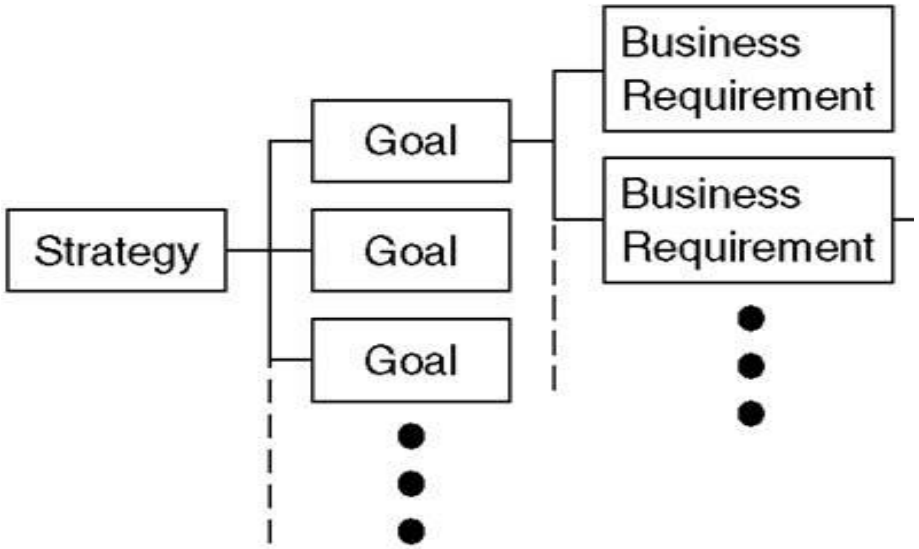


Figure 6.2.1 From Strategy to Business Requirements

From Strategy to Architecture: Example

- Strategy: Be a customer-oriented company.
- Goal: 30-day money back guarantee.
  - Business Requirement: ability to track purchases.
  - Business Requirement: ability to track problems.
- Goal: Answer email questions within 6 hours.
  - Business Requirement: Ability to handle the volume.
  - Business Requirement: Ability to track purchases.
- Architectural Requirement:
  - Database that can handle all details of more than a 30-day history.

From Business Requirement to Architecture

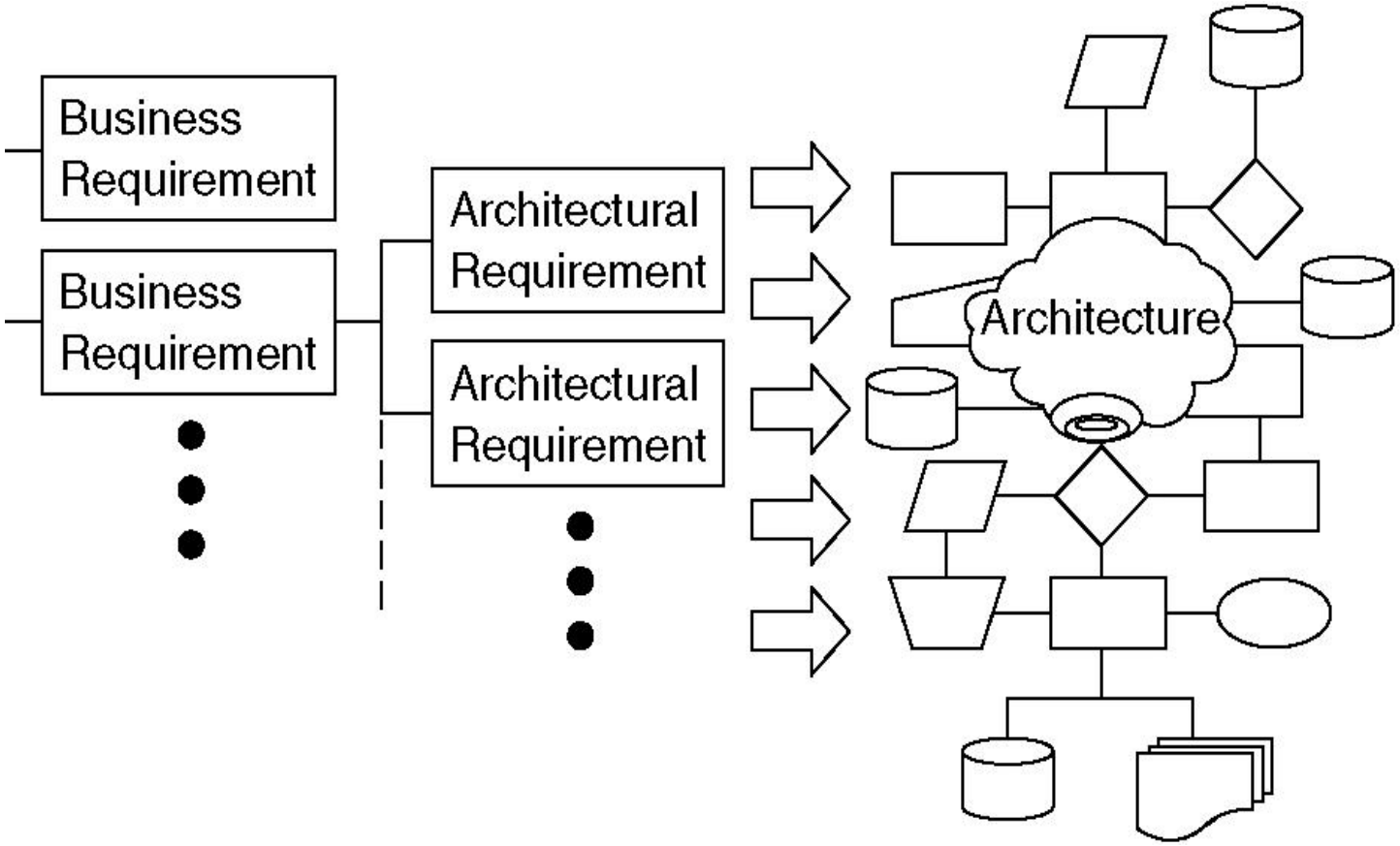


Figure 6.2.2 From Business Requirements to Architecture

From Architecture to Infrastructure

- Adds more detail to the architectural plan.
  - Actual hardware, software, data, and networking
- Components need coherent combination.

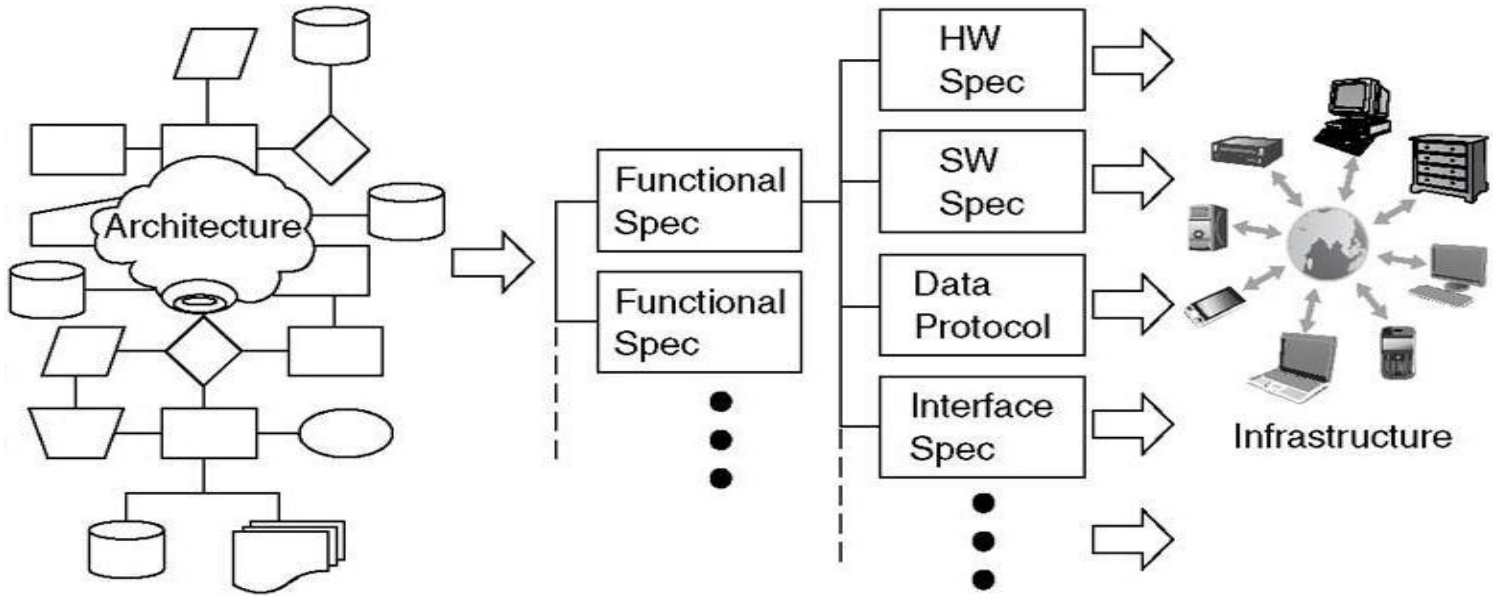


Figure 6.2.3 From Architecture to Infrastructure

From Architecture to Infrastructure: Example

- Architectural Requirement: Database that can handle all details of more than a 30-day history.
  - Functional Specification: be able to hold 150,000 customer records, 30 fields; be able to insert 200 records per hour.
  - Hardware specification: 3 gigaherz Core 2 Duo Server.
  - Hardware specification: half terabyte RAID level 3 hard drive array.
  - Software specification: Apache operating system.
  - Software specification: My SQL database.
  - Data protocol: IP (internet protocol).

➢ RAID (Redundant Array of Inexpensive Disks): 소용량 저장장치 여러 대를 배열로 묶어서 대용량 저장장치를 만드는 기술로, 가격이 저렴하고 장애 발생시 복구 기능이 있어 서버 컴퓨터에서 널리 사용되는 기술

A Framework for the Translation

- Considerations for moving from strategy to architecture to infrastructure:
  - Hardware – physical components
  - Software – programs
  - Network – software and hardware
  - Data – utmost concern: data quantity & format
- What-Who-Where is a useful framework
  - Figure 1.6 IS Strategy Matrix (28p.)

A Framework for the Translation

	What	Who	Where
Hardware	• The physical components of the system	• System users and managers	• Physical location of devices (cloud, data center, etc.)
Software	• The programs, applications, and utilities	• System users and managers	• Hardware it resides on and physical location on that hardware
Networking	• The way hardware is connected to other hardware, to the Internet, and to other outside networks	• System users and managers • Company that provides the service	• Where the nodes, the wires, and other transport media are located
Data	• Bits of information stored in the system	• Owners of data • Data Administrators	• Where the information resides

Figure 1.6 Information Systems Strategy Matrix.

A Framework for the Translation

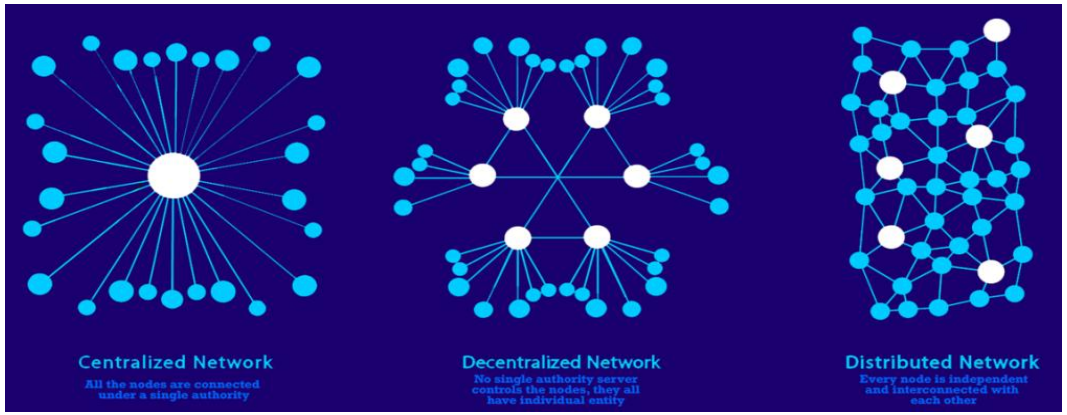
- Managers must begin with an overview that is complete.
- The framework must answer the what, who and where questions for each infrastructure component.
  - What is the specific type of technology?
  - Who is involved (individuals, groups, departments)?
  - Where is everything located?
- Figure 6.3 contains questions that typify those asked in addressing architecture and infrastructure issues associated with each component.
- Figure 6.3 shows the connections between strategy and systems.

Component	What		Who		Where	
	Architecture	Infrastructure	Architecture	Infrastructure	Architecture	Infrastructure
Hardware	What type of personal device will our users use?	What size hard drives do we equip our laptops with?	Who knows the most about servers in our organization?	Who will operate the server?	Does our architecture require centralized or distributed servers?	What specific computers will we put in our Tokyo data center?
Software	Does fulfillment of our strategy require ERP Software?	Shall we go with SAP or Oracle Applications?	Who is affected by a move to SAP?	Who will need SAP training?	Does our geographical organization require multiple database instances?	Can we use a cloud instance of Oracle for our database?
Network	How much bandwidth do we need to fulfill our strategy?	Will the Cisco switch provide what we need?	Who needs a connection to the network?	Who provides our wireless network?	Will we let each user's phone be a hotspot?	Shall we lease a cable or use satellite?
Data	What data do we need for our sales management system?	What format will we store our data in?	Who needs access to sensitive data?	How will authorized users identify themselves?	Will backups be stored on-site or off-site?	Will data be in the cloud or in our datacenter?

Figure 6.3 Infrastructure and Architecture Analysis Framework with Sample Questions

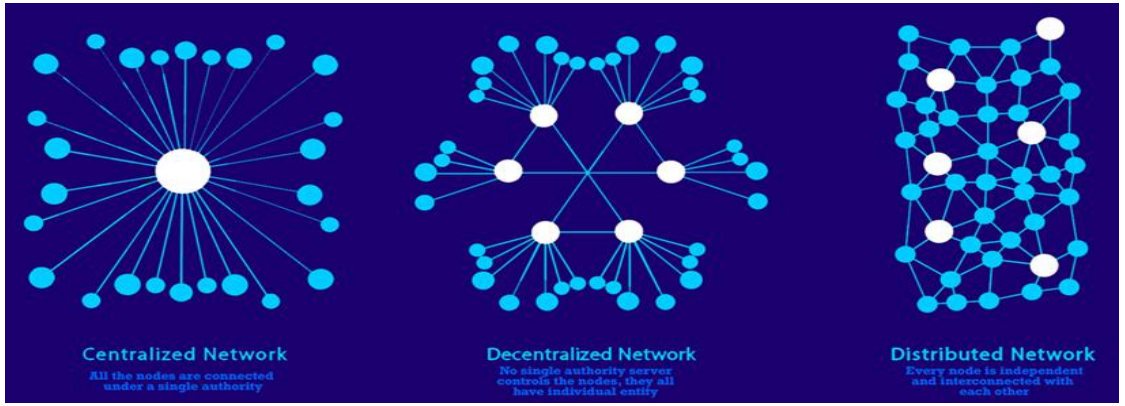
IT Architecture Configurations

- Centralized architecture: everything is purchased, supported, and managed centrally via a data center.
  - A large data center with a mainframe and a number of legacy mainframe environments.
  - Many computers are linked together to form a centralized IT core that operates very much like the mainframe, providing the bulk of IT services necessary for the business.



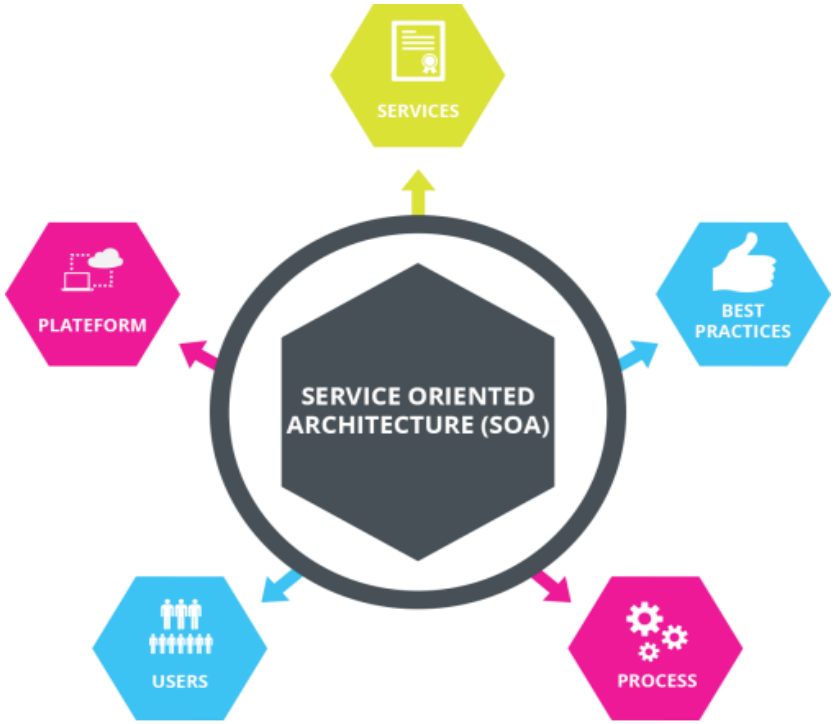
IT Architecture Configurations

- Decentralized architecture arranges the hardware, software, networking, and data in a way that distributes the processing and functionality between multiple small computers, servers, and devices.
  - Relies heavily on a network to connect them.
  - Utilizes numerous servers located in different physical locations.
  - A server-based architecture.



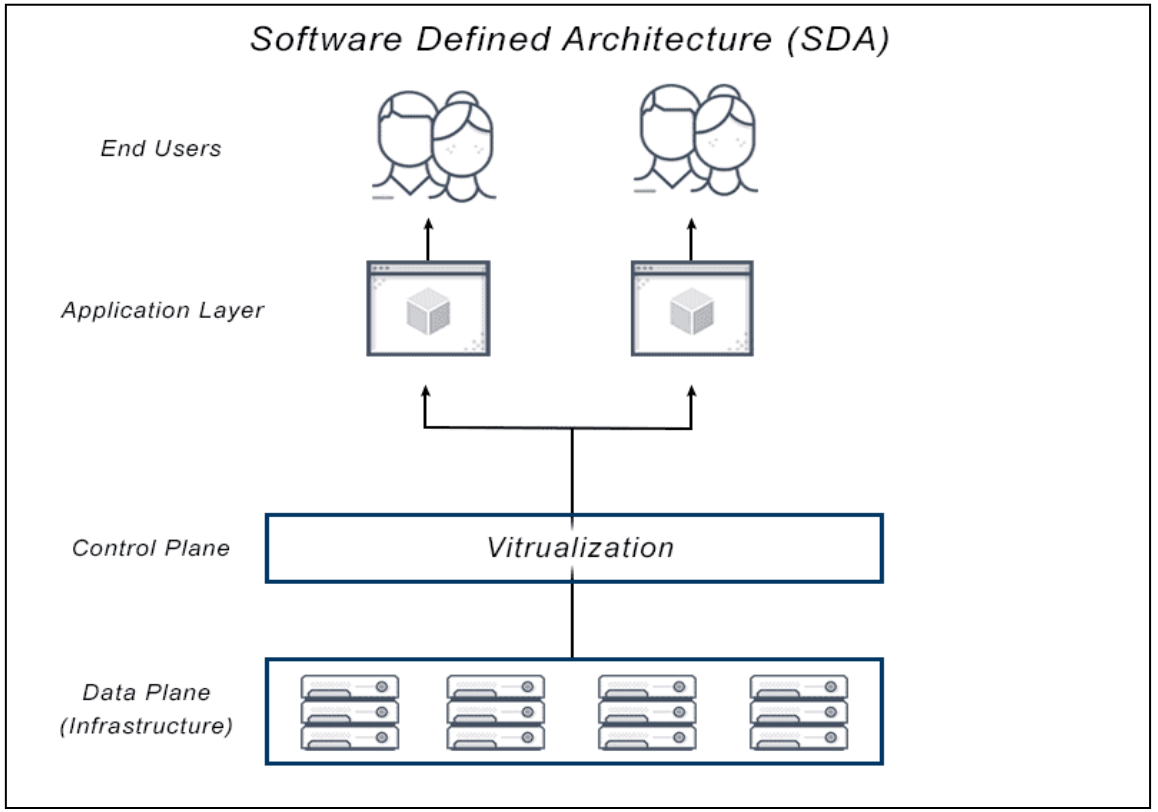
IT Architecture Configurations

- Service-oriented Architecture (SOA) utilizes relatively small chunks of functionality available for many applications or reuse.
  - Useful for building applications quickly.
  - Offers managers a modular and componentized design that is easily modifiable.
  - SOA utilizes software-as-a-service (SaaS) or Web services.



IT Architecture Configurations

- Software-Defined Architecture
  - Allocates or removes resources by itself.
  - Instantly reconfigures under load or surplus.



IT Architecture Configurations

- Software-Defined Architecture
  - Birdbath example:
    - ✓ Thanks to the Oprah Winfrey show, sales went from 10 per month to 80,000.
    - ✓ Increased sales seen as an attack with static system.
    - ✓ Adaptive system warns other parts of sales fluctuations, preventing lost sales.

IT Architecture Configurations

- Software-Defined Architecture
  - Famous Coffee Shop example:
    - ✓ WiFi shares lines with production systems.
    - ✓ Problems in one can be shunted (moved or sent) to another.
    - ✓ Also, coffee bean automatic reordering.
    - ✓ Spot market purchasing.
    - ✓ High potential for decreasing costs.

Architecture	Description	Other Terms	When to Use?
Centralized Architecture	• A large central computer system runs all applications and stores all data. • Typically, the computer is housed in a data center and managed directly by the IT department • Networking allows users to access remotely.	• Mainframe Architecture	• To make it easier to manage. • All functionality is located in one place. • When the business is highly centralized.
Decentralized Architecture	• Computing power is spread out among a number of devices in different locations. • Servers in different locations, personal computers, laptops, smartphones, and tablets are also included. • The "client" devices can perform many of the services needed with only occasional requests to central servers for data and services	• Server-based Architecture	• To modularize and address concerns about scalability. • When the business is primarily decentralized.

Figure 6.4.1 Common Architecture

Architecture	Description	Other Terms	When to Use?
Service-Oriented Architecture (SOA)	• Software is broken down into services “orchestrated" and connected to each other. • Together those services form an application for an entire business process. • The services are often offered from multiple vendors on the Internet and are combined to form applications.	• Cloud-based Architecture	• To be agile. • Reusability and componentization can create new apps. • When the business is new and rapid app design is important.
Software-Defined Architecture	• Infrastructure reconfigures based on load or time of day. • Infrastructure can be reconfigured autonomously based on rules.	• Software-Defined Network, Network Virtualization	• When resources need to be flexible and reconfigured often. • When usage varies dramatically depending on time of day.

Figure 6.4.2 Common Architecture

Centralized Versus Decentralized Architectures

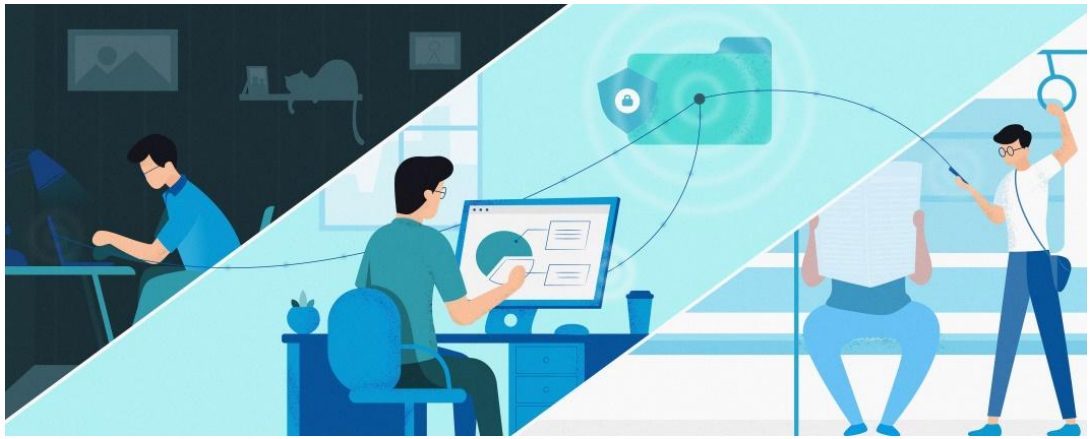
- A manager must be aware of the trade-offs when considering centralized versus decentralized architectures.
  - Decentralized architectures are more modular than centralized architectures.
  - Additional servers can be added with relative ease and provide greater flexibility for adding clients with specific functionality for specific users.
  - Decentralized organizational governance, such as that associated with the networked organization structure, is consistent with decentralized architectures.

Other Architectures

Peer to peer architecture	• Allows networked computers to share resources without a central server.
Wireless (mobile) architecture	• Allows communication without laying wires.
Web-based architecture	• Places information on web servers connected to the Internet.
Cloud-based architecture	• Places both data and processing methods on servers on the Internet, accessible anywhere.
Capacity-on-demand	• Enables firms to make available more processing capacity or storage when needed.

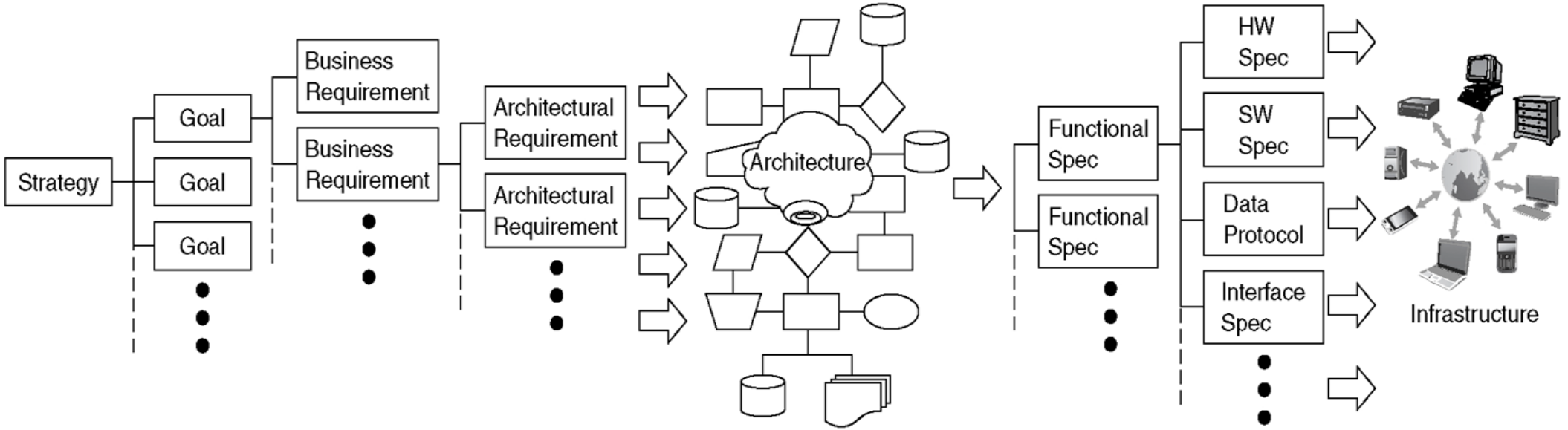
Other Architectures

- Bring Your Own Device (BYOD)
  - Employees bring their own devices and connect to enterprise systems.
    - ✓ Raises issues with capacity, security, and compatibility.
    - ✓ Consumerization of IT – the push for employees and customers to use their own devices to access corporate systems and the ensuing (following) issues to make them work.



From Strategy to Architecture to Infrastructure: An Example

- This section considers a simple example to illustrate the process of converting strategy to architecture to infrastructure:
- We introduce GiantCo.com, a fictitious competitor of Amazon and Walmart, which sells a wide variety of products online.



Define the Strategic Goals

1. To increase the period of a money-back guarantee (환불 보장) from one week to a month.
2. To provide cross-selling opportunities by temporarily discounting accessories or items that complement those purchased within the previous year.
3. To provide a return shipping label with every purchase.
4. To decrease out-of-stock occurrences by 20%.
5. To answer e-mails within 24 hours.

Translate Strategic Goals to Business Requirements

- Consider more closely only the first two of GiantCo.com's strategic goals:
  1. To increase the period of a money-back guarantee from one week to a month.
  2. To suggest goods that complement all those sold to a customer in the past year.
- Business requirements
  - At least a year's worth of sales for all customers.
  - All refunds provided to customers.
  - Return patterns by customer to detect excesses.
  - Sales of complementary goods to provide advice for future potential purchasers.

Translate Business Requirements into Architecture

- The database needs to store the sales data for all customers for more than an entire year.
- The data can be used for many purposes, including summarizing for an annual report and identifying whether customers who wish to return goods are within the 30-day period.
- It also provides the foundation for suggesting complementary goods when coupled with data pinpointing goods that are related.
- As customers use the website, the sales data can be very useful for their own decision making.

Translate Architecture to Infrastructure

Hardware	Software	Network	Data
• 19 Servers: 18 for sales, 1 for accounting • LaCie 10-GB Thunderbolt RAID hard drive storage system 	• ERP systems with modules for Sales, Accounting, Inventory • Enterprise Application Integration (EAI) software • Apache operating system • MySQL database software	• Cable modem to ISP • Dial-up lines for backup • Cisco routers, hubs, and switches • Firewalls from CheckPoint	• Databases: Sales, Inventory, Accounting, Complementary items

Figure 6.5 GiantCo.com Infrastructure Components

➢ RAID: Redundant Array of Independent (Inexpensive) Disks

Architectural Principles

- Based on a set of principles or fundamental beliefs about how the architecture should function.
- Architecture principles must be consistent with both the enterprise values as well as the technology used in the infrastructure.
- The number of principles vary widely.
- Principles should define the desirable behaviors of the IT systems and the role of the organization(s) that support it.
- Sample architectural principles
  - Figure 6.6

Architectural Principles

Principle	Description of What the Architecture Should Promote
Ease of Use	• Ease of use in building and supporting the architecture and solutions based on the architecture.
Single Point of View	• A consistent, integrated view of the business regardless of how it is accessed.
Buy rather than Build	• Purchase of applications, components, and enabling frameworks unless there is a competitive reason to develop them internally.
Speed and quality	• Acceleration of time to market for solutions while still maintaining required quality levels.
Flexibility and agility	• Flexibility to support changing business needs while enabling evolution of the architecture and the solutions built on it.

Figure 6.6.1 Sample Architectural Principles

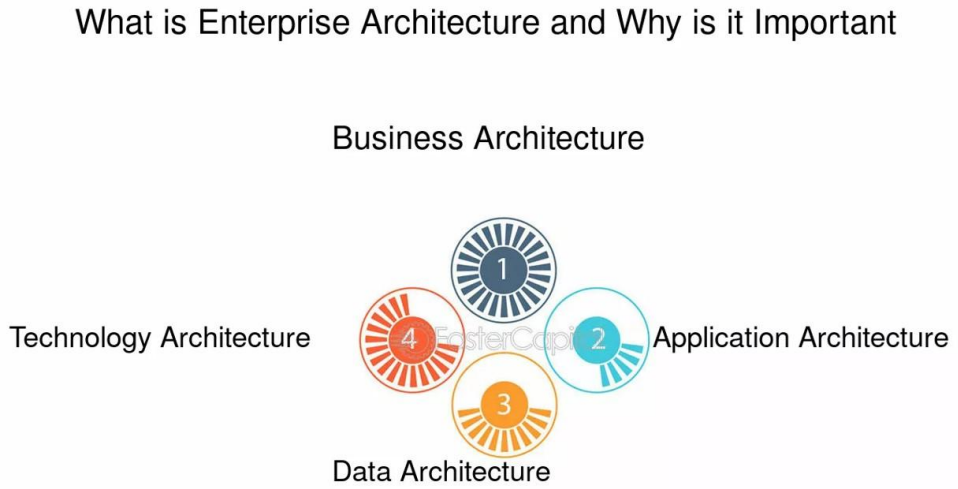
Architectural Principles

Principle	Description of What the Architecture Should Promote
Innovation	• Incorporation of new technologies, facilitating innovation.
Data Security	• Data protection from unauthorized use and disclosure.
Common Data Vocabulary	• Consistent definitions of data throughout the enterprise, which are understandable and available to all users.
Data Quality	• Accountability of each data element through a trustee responsible for data quality.
Data Assets	• Management of data like other valuable assets

Figure 6.6.2 Sample Architectural Principles

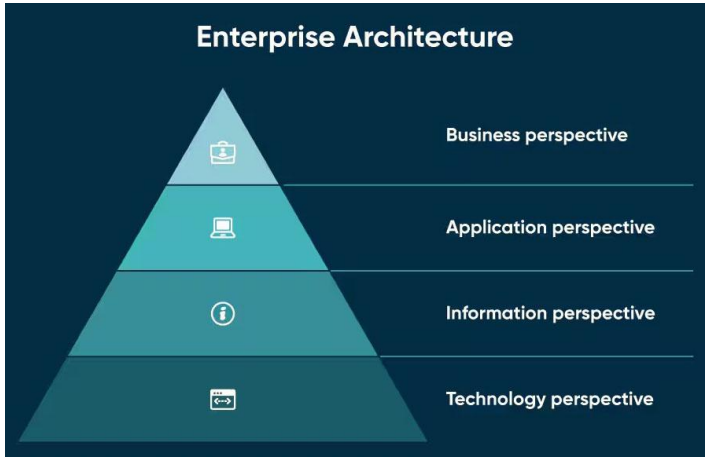
Enterprise Architecture (EA)

- The "blueprint" for all IS and their interrelationships in the firm.
- The basis of EA is business strategy.
- EA specifics how information technologies support business processes, align with business needs, and produce business outcomes.
- EA also includes the standard technical capabilities and activities for all parts of the enterprise and guidelines for making choices.



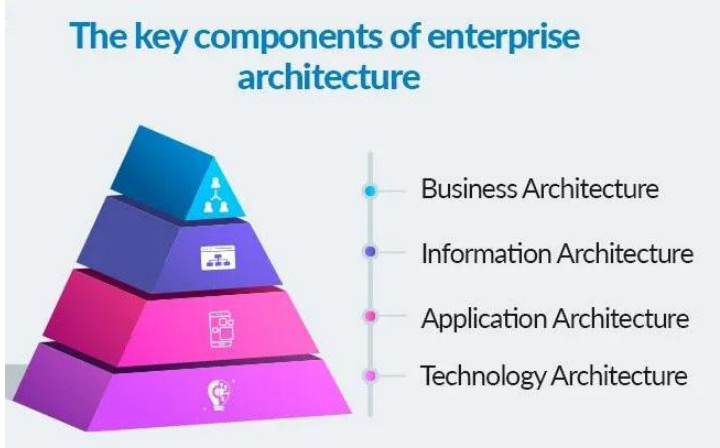
Enterprise Architecture

- The components of an enterprise architecture typically include four key layers:
  1. Business Layer: The common business organizations, strategies, functions, and models that describe how business is done and the important cross-functional business processes used in the business.
  2. Application Layer: The applications that support business processes, specifying relationships between processes and between applications.



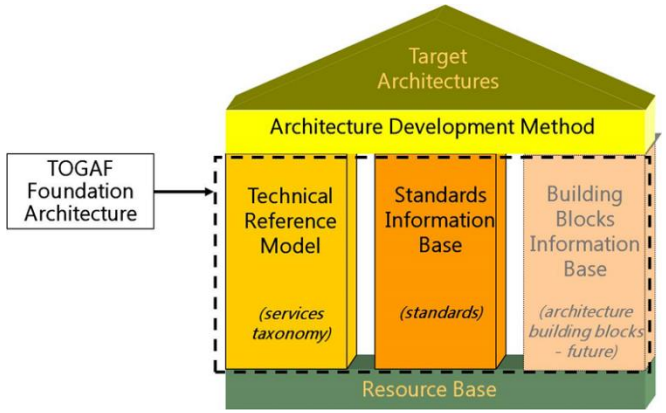
Enterprise Architecture

- The components of an enterprise architecture typically include four key layers:
  3. Information Layer: The enterprise information assets used by business processes and enterprise applications.
     - ✓ This layer specifies physical storage and access for data such as operational and analytics data.
  4. Technology Layer: The hardware and software infrastructure, including IT standards, structures, and the plans for IT, which create the technical foundation for the organization.



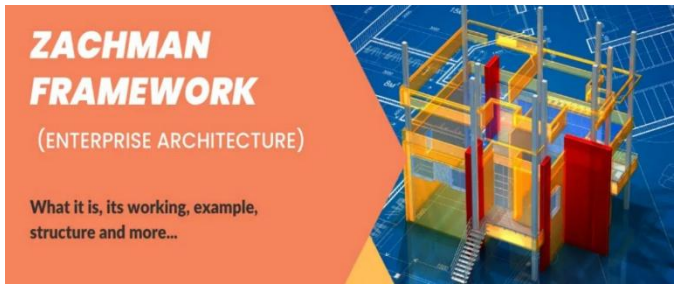
Enterprise Architectures: TOGAF

- TOGAF: The Open Group Architecture Framework
- TOGAF's strength is that it provides a process for architecture development taking managers from a more generic to a specific architecture for their organizations.
- It includes a methodology and set of resources for developing an enterprise architecture.
- TOGAF is designed to translate strategy into architecture and then into a detailed infrastructure; however, it supports a much higher level of architecture that includes more components of the enterprise.



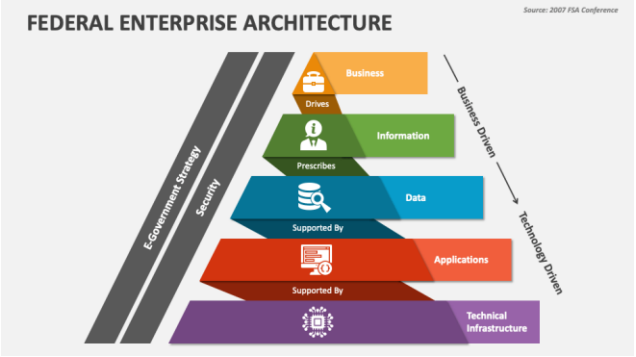
Enterprise Architectures: Zachman

- Zachman is a taxonomy for organizing the design documents, models, and other artifacts of the architecture.
- It provides a way to categorize all the components needed to create an architecture.
- Zachman determines architectural requirements by providing a broad view that helps guide the analysis of the detailed view.
- This framework's perspectives range from the company's scope, to its critical models and, finally, to very detailed representations of the data, programs, networks, security, and so on.
- The models it uses are the conceptual business model, the logical system model, and the physical technical mode.



Enterprise Architectures: FEA

- Federal Enterprise Architecture (FEA) is the enterprise architecture of the U.S. Federal Government, providing a common approach for agencies and organizations to integrate strategic, business, and technology management of their information systems.
- This architecture has "Federal Segments" that are cross-agency business areas, and therefore needing information systems that also cross different agencies.
- This architecture is built upon the Zachman Framework, but has a different methodology for implementing it.



Enterprise Architectures: Gartner

- The Gartner EA starts with an enterprise architecture vision that involves all impacted leaders and gets alignment for where the business is going.
- The vision is then translated into business, information, and technical architectures.
- The strength of this approach is the close alignment with business vision, which yields strong business value.
- But the weakness is that after the architectures are articulated, the implementation process is less specified and likely to require consultant help to complete.

Enterprise Architectures

Architecture	Descriptions	High-Level Overview
TOGAF (The Open Group Architecture Framework)	• A process for creating an enterprise architecture	• Four architectures: business, application, data, and technical architecture
Zachman	• A taxonomy for the artifacts of an enterprise architecture	• Six descriptive foci for the architecture (data, function, network, people, time, and motivation) and six key player perspectives (planner, owner, designer, builder, subcontractor, and enterprise)

Figure 6.7.1 Common Enterprise Architectures

Enterprise Architectures

Architecture	Descriptions	High-Level Overview
FEA (Federal Enterprise Architecture)	• Models, taxonomy, and processes originally created to build an enterprise architecture for the U.S. Government	• Five reference model: business, service, components, technical, and data
Gartner	• An active process for creating an enterprise architecture bringing together business owners, technology implementers, and information specialists	• Uses an ongoing process of creating, maintaining, and revisiting the EA to keep it current and vital to the organization focused on the business strategy of where the business wants to go and how it will get there.

Figure 6.7.2 Common Enterprise Architectures

Virtualization and Cloud Computing

- Virtualization Infrastructure
  - Computing capabilities, storage, and networking provided by a third party or group of vendors, usually over the Internet or through a private network (e.g., virtualized desktop).
  - Includes servers, storage, backup, network, and disaster recovery.
  - Enables resources to be shared and allocated as needed by the user.
  - Makes maintenance easier since resources are centralized.

가상화란 무엇인가? - 개념과 종류

Virtualization and Cloud Computing

- Cloud Computing
  - Virtual infrastructure provided over the Internet.
  - SaaS (Software as a Service)
  - PaaS (Platform as a Service)
  - IaaS (Infrastructure as a Service).
  - A cloud is a large cluster of virtual servers or storage devices.

클라우드 컴퓨팅 (Cloud Computing)이란?

Virtualization and Cloud Computing

- Users purchase capacity-on-demand.
- Utility computing
  - Computing capability is purchased on an as-needed basis.
- Examples of applications in the cloud:
  - Salesforce.com
  - Facebook
  - Gmail
  - Windows Azure
  - Apple iTunes
  - LinkedIn

유틸리티 컴퓨팅 (Utility Computing)
사용량 기반 IT 서비스 소비 모델

Virtualization and Cloud Computing

- Benefits of virtualization and cloud computing:
  - Consolidated physical servers.
  - Reduced physical costs of the data center.
  - No upgrading.
  - No maintenance, power, or electricity costs.
  - No need for physical space or storage servers.
  - Increased speed of attaining additional capacity (provisioning).

Virtualization and Cloud Computing

- Managers must also understand the risks of a third-party supplier.
  - Retooling existing applications for the cloud's infrastructure.
  - No established standards for virtual infrastructure.
  - Applications not porting easily from one vendor's infrastructure to another's.
- As coordination costs drop and platforms in the cloud open up, cloud computing utilization will increase.

Understanding Existing Architecture

- The primary reason to base architecture on an organization's strategic goals is to allow for inevitable future changes to:
  - The business environment.
  - Organization.
  - IT requirements.
  - The technology itself.

Understanding Existing Architecture

- Future consideration for IT architecture should include:
  - Analysis of the existing architecture.
  - The strategic time frame.
  - Technological advances: adaptability, scalability, standardization, maintainability, security
  - Financial constraints.
- Evaluate the IT requirements of an evolving business strategy against current IT capacity.

Understanding Existing Architecture

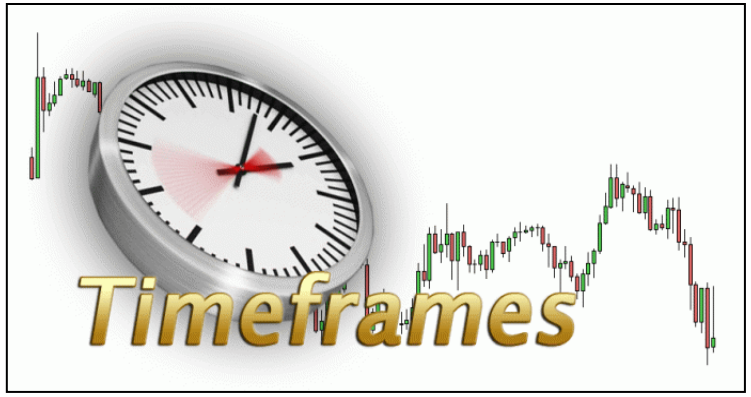
- Relevant questions for managers:
  - What IT architecture is already in place?
  - Is the company developing the IT architecture from scratch?
  - Is the company replacing an existing architecture?
  - Does the company need to work within the confines of an existing architecture?
  - Is the company expanding an existing architecture?
- A strong business strategy is a prerequisite for IT architecture design, which is a prerequisite for infrastructure design.

Understanding Existing Architecture

- Managers can derive the most value and incur minimal loss when working with legacy architectures and infrastructures by objectively analyzing:
  - The existing architecture and infrastructure.
  - The strategy served by the existing architecture.
  - The ability of the existing architecture and infrastructure to further the current strategic goals.
- Managers must ensure that the architecture will satisfy their strategic requirements and that it is modern and efficient.

Assessing Strategic Time Frame

- Understanding the life span of IT infrastructure and architecture is critical.
- Strategic time frames depend on industry-wide factors such as:
  - The level of commitment to fixed resources
  - Maturity of the industry
  - Cyclicality
  - Barriers to entry



Assessing Strategic Time Frame

- Architectural longevity depends not only on the strategic planning horizon, but also on the nature of a manager's reliance on IT and on the specific rate of advances affecting the information technologies on which he or she depends.
- Today's architectures must be designed with maximum flexibility and scalability to ensure handling of future business changes.

Assessing Technical Issues: Adaptability

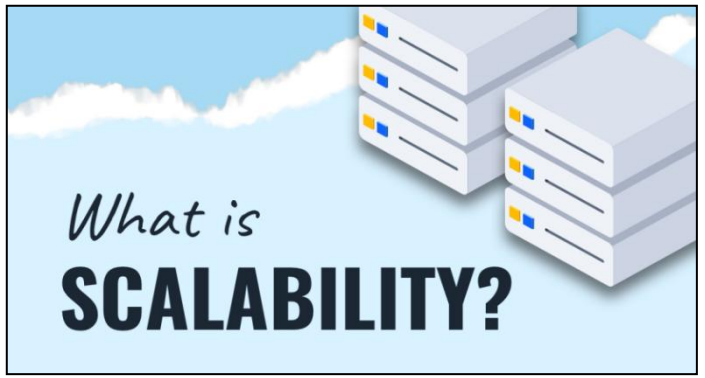
- Can the architecture adapt to emerging technologies?
- Must be able to handle and absorb technological advances.
  - Innovations in storage capacity and computing power.
  - Unexpected technological leaps.
- Consider both hardware and software.

Assessing Technical Issues: Adaptability

- Guidelines for planning adaptable IT architecture and infrastructure:
  - Plan for applications and systems that are independent and loosely coupled rather than monolithic.
  - Set clear boundaries between infrastructure components.
  - Provide access to all users when it makes sense to do so (e.g. security concerns) when designing a network architecture.

Assessing Technical Issues: Scalability

- Refers to how well an infrastructure component can adapt to increased, or in some cases decreased, demands.
- A scalable network system should start with just a few nodes but have the ability to easily expand to thousands of nodes.
- It is important to analyze the impact of strategic business decisions on IT architecture and infrastructure.
- Ensure a contingency plan exists for potential unexpected effects of a strategy change.



Assessing Technical Issues: Standardization

- Hardware and software use a common standard.
- Easier to plug into infrastructure or architecture (e.g., Microsoft Office suite).
  - Interfaces often accompany the standard.
  - It is easy to move data between systems.

Assessing Technical Issues: Maintainability

- The manager needs to ask:
  - How easy is it to maintain the infrastructure?
  - Are replacement parts available?
  - Are support services available?
- Maintainability is a key technical consideration.
  - The complexity of the systems increases the number of things that can go wrong, need fixing, or need replacing.
- Should a technology become obsolete, costs skyrocket for parts and expertise.

Assessing Technical Issues: Security

- Major concern for business and IT managers.
- Must protect key data and process elements of the IT infrastructure.
- Extends outside the boundaries of the company (e.g., customer data).
- Innovations encrypt or disguise sensitive information, financial information, and business information.
- Securing assets in a highly centralized, mainframe architecture means building protection around the centralized core.
- Decentralized, server-based architecture is more difficult to secure due to the dispersion of servers.

Assessing Technical Issues: Security

- Web-based SOA that utilizes SaaS and capacity on demand raises a whole new set of security issues.
- The security of networks continues to improve through:
  - Innovations such as authentication, passwords, digital signatures, encryption, secure servers, and firewalls.
  - New schemes for security such as securing specific assets instead of just securing the perimeter of a system.
- Managing security is often a matter of managing risk.
  - Assessing the likelihood of a breach and the cost of that breach in terms of loss and recovery.

Assessing Financial Issues

- IT infrastructure components should be evaluated based on their expected financial value.
- Payback from IT investments is difficult to quantify.
  - Takes the form of increased productivity, increased interoperability with business partners, improved service for customers, etc.
  - Focus on how IT investments enable business objectives rather than on their quantitative returns.

Assessing Financial Issues

- Payback from IT investments is difficult to quantify.
  - Quantify returns on infrastructure investments by:
    - ✓ Quantifying costs.
    - ✓ Determining the anticipated life cycles of system components.
    - ✓ Quantifying benefits.
    - ✓ Quantifying risks.
    - ✓ Considering ongoing dollar costs and benefits.

Criteria	Architecture	Infrastructure
Strategic Time Frame	• Indefinite: GiantCo.com's strategic goal is to be able to respond to customer need.	• NA
Technology Advances	• Database technology is fairly stable, but transaction capacity needs to be assessed, and links with smaller suppliers and customers verified.	• NA
Financial Issues		
NPV of Investment	• NA-In this limited case, NPV analysis applies only to infrastructure.	• GiantCo.com will analyze NPV of various hardware and software solutions and ongoing costs before investing.
Payback Analysis	• GiantCo.com expects the new architecture to pay for itself within three years.	• Specific options will be evaluated using conservative sales growth projections to see how they match the three-year goal.
Incidental Investments	• The new architecture represents a moderate shift in the way GiantCo.com does business and will require extensive training and work force adjustment.	• Training costs for each option will be analyzed. • Re-deployment costs for employees displaced by the outsourcing must also be considered.

Figure 6.8.1 GiantCo.com's Managerial Considerations

Criteria	Architecture	Infrastructure
Growth Requirements/ Scalability	• Outsourcing should provide more scalability than GiantCo.com's current model, which is constrained IT capacity. • New innovations will be identified to provide scalability of volume.	• The scalability required of various new hardware and software components is not significant, but options will be evaluated based on their ability to meet scalability requirements.
Standardization	• NA	• GiantCo.com will adopt the MySQL standard, and make it a requirement of all developers for consistency.
Maintainability	• The new architecture raises some maintenance issues, new product introductions will mandate constant updates to the rules of complementary goods.	• Various options will be evaluated for their maintenance and repair costs.
Staff Experience	• The new model will require new skills and expertise.	• Current staff is not familiar with MySQL. Training and work force adjustment will be needed. • Some new staff will be hired.
Security	• GiantCo.com will lock down resources for traveling personnel.	• GiantCo.com will adopt a Pulse Secure VPN for securely connecting traveling personnel with network resources.

Figure 6.8.2 GiantCo.com's Managerial Considerations